BEFORE THE CONTROLLER OF PATENTS
THE PATENT OFFICE BRANCH, MUMBAI

In the matter of:

Indian Patent 270765
Formerly 1863/MUMNP/2009
Date of Patent: 10.03.2009
Date of Grant: 18.01.2016

And

In the matter of:

Application for Compulsory Licence under Section 92(1) read with Section 92(3) of The Patents Act, 1970

By:

Natco Pharma Limited **...Applicant**
An Indian company of
NATCO House, Road No. 2, Banjara Hills
Hyderabad 500 034, Telangana State, India

The Applicant above-named respectfully submits as follows:

I. BACKGROUND TO THIS APPLICATION

1. The present application is being filed in the light of the grave and life threatening public health emergency which is currently prevailing in India due to the resurgence of the Covid-19 virus through a second wave since at least early February 2021.
2. Covid-19 was declared a pandemic in March 2020 and a national lockdown declared for a period of 25 days. The Central Government invoked its powers under the National Disaster Management Act and empowered the National Disaster Management Authority (NDMA) to take such measures as are necessary to ensure that the spread of this virus was limited/minimised. The NDMA declared the affliction of this virus a pandemic and has instituted various measures from March 2020 which are ongoing even as of now.
3. Reports in the public domain as of 03.05.2021 indicate that the number of people in India affected by Covid-19 is over 2 crore. The figures also state that while over 1.6 Crore people have recovered from Covid-19, over 34 lakh people continue to be afflicted, and

there are officially over 2 lakh deaths. Daily newspaper reports show an alarming rise not only in the number of cases, but also in the number of fatalities due to Covid-19.

4. All of the above are a matter of public record.

5. A significant reason for such high fatalities as well as the prolonged treatment regimen has been the lack of access to essential medicines for treatment of Covid – 19 partly due to lack of supply and also partly due to lack of affordability.

6. The graveness of the situation is such that all institutions in India, including the Hon'ble Supreme Court as well as various High Courts such as the Hon'ble High Court of Delhi are directly involved in evolving mechanisms by which the fundamental right to health of the residents of India is not just protected but also actively ensured with no discrimination based solely on lack of access inter alia, due to lack of availability of essential medicines or lack of affordability of such essential medicines.

7. For ease of reference, the interim Judgment of the Hon'ble Supreme Court of India in Suo Motu Writ Petition (C) 3/2021 dated 29.04.2021 is annexed herewith as **ANNEXURE – 1**. The Order of the Hon'ble Delhi High Court in Rakesh Malhotra v. GNCTD dated 20.04.2021 is annexed herewith as **ANNEXURE – 2**.

8. The seriousness of the situation can also be seen from the fact that the Drug Controller General of India as far back as 19.03.2020 issued a notification by which if any drug had received Emergency Use Authorisation for Covid -19 treatment, similar approval could be granted in India through a Special Regulatory Pathway involving inter alia waiver of/abbreviation/limitation of clinical studies etc. A copy of this notification is annexed herewith as **ANNEXURE – 3**.

II. ABOUT THE APPLICANT

9. The Applicant above-named is a company incorporated under The Companies Act, 1956 in 1981. It has its' registered office at NATCO House, Road No. 2, Banjara Hills, Hyderabad 500 034, Telangana Stage, India. The Applicant is in the business of research, development, manufacture and marketing of pharmaceutical substances and finished formulations for the Indian and international markets. The Applicant's underlying philosophy from its inception has been to make speciality medicines available for all. Natco set up its Research Center in 1997, and has consistently been at the forefront of making pharmaceutical products available at affordable prices.

10. The Applicant today has around 5000 employees, sister companies in several countries such as Canada, Brazil, Australia, and the US. It also partners, where required and appropriate, with other entities globally to ensure that the best of technologies and manufacturing practices are implemented and quality medicines are made available globally. Apart from its corporate vision of ensuring affordable medicines for all, the Natco family also works with equal vigour and dedication on issues such as ensuring medical care, education etc. in various parts of India. The background of the Applicant can be seen from the Annual Reports for the years 2018-2019 and 2019-2020 are annexed herewith as **ANNEXURE – 4 Colly**.

11. The Applicant has two facilities for manufacture of Active Pharmaceutical Ingredients (API's), and six facilities for manufacture of formulations which are spread across India. It also has a fully functional Research & Development Center in Sanathnagar in Hyderabad. The Applicant has approvals from various global regulatory authorities such as the US Food & Drug Administration (USFDA), the European Medicines Agency (EMEA), MFDS Korea, Infarmed-Brazil etc.

12. The Applicant has made critical contributions towards ensuring access to essential medicines available in an affordable manner across all sections of society. Some of these are outlined below:

    a. Teriflunomide and Glatiramer Acetate for treatment of multiple sclerosis;
    b. Posaconazole for antifungal treatment
    c. Apixaban for cardiovascular (specifically Deep Vein Thrombosis) treatment
    d. Oseltamivir monophosphate for Swine flu treatment
    e. Sofusbovir for Hepatitis C treatment
    f. Imatininb Mesylate for treatment of chronic myelogenous leukemia
    g. Erlotinib HCl for treatment of non-small cell lung cancer
    h. Regorafenib for treatment of colorectal cancer
    i. Sorafenib for treatment of kidney cancer
    j. Ticagrelor for treatment of Type II diabetes
    k. Liposomal Doxurubicin used in chemotherapy for treatment in breast cancer, Kapsi's sarcoma, lymphoma, and bladder cancer
    l. Daclatasvir for treatment of Hepatitis C

13. It is humbly submitted that the Applicant is the only entity which sought, fought, and secured a Compulsory License for Sorafenib for treatment of kidney cancer, thus making an otherwise unaffordable drug easily and readily accessible to the common person in India.

III. SUBJECT MATTER OF THE PRESENT APPLICATION

14. The present application for compulsory licence under Section 92 of the Act is in relation to a pharmaceutical product called Baricitinib.

15. Baricitinib is a selective and reversible Janus kinase inhibitor which works in respect of both JAK1 and JAK2 subtypes. Janus kinases which are tyrosine protein kinases have a significant role to play in the proinflammatory pathway signalling that is usually overactivated in autoimmune disorders such as rheumatoid arthritis. Baricitinib is reported to function by blocking the actions of JAK1 and JAK2 by disrupting the activation of downstream signalling molecules and proinflammatory mediators.

16. Baricitinib has been shown to have significant anti-inflammatory effect as well as preservation of bone and cartilage and with little or no detectable adverse hematologic effect in the treatment of rheumatoid arthritis. Baricitinib is reportedly approved for rheumatoid arthritis treatment in the European Union in 2017 and is believed to have received approval in India in 2018.

(i) BARICITINIB APPROVAL STATUS

17. Baricitinib was reportedly first approved in the European Union in February of 2017 as a second-line orally administered treatment for moderate to severe active rheumatoid arthritis in adults, either as a monotherapy or when combined with methotrexate. It is marketed under the trade name *Olumiant*.

18. Baricitinib is believed to have been approved in India sometime in 2018 for the same indication, namely second-line orally administered treatment for moderate to severe active rheumatoid arthritis in adults, either as a monotherapy or when combined with methotrexate.

19. A copy of the Olumiant leaflet is annexed herewith as **ANNEXURE – 5.**

(ii) BARICITINIB AND ITS USE FOR COVID-19 PATIENTS

20. As far back as 15.02.2020, the international renowned Journal *The Lancet* had reported that Baricitinib could be trialled for use in Covid-19 treatment pending development of

a vaccine. This was based on ai modelling and was predicated on the fact that Baricitinib could be effective to disrupt the AP2 associated protein kinase (AAK1) pathway which regulates endocytosis and could be useful in reducing viral entry and inflammation. This was followed by another article in April 2020 which reiterated the potential use of Baricitinib in Covid – 19 treatment using a combination of anti-viral and anti-inflammatory pathway regulation. Copies of the Articles from *The Lancet* are annexed herewith as **ANNEXURE – 6 Colly**.

21. In August 2020, the EMBO Molecular Medicine Journal reported that there was support in real time for the AI-predicted use of Baricitinib in Covid-19 treatment. The Journal reports that in a series of patients with bilateral COVID-19 pneumonia, Baricitinib treatment was associated with clinical and radiologic recovery, a rapid decline in SARS-CoV-2 viral load, inflammatory markers, and IL-6 levels. A Copy of the EMBO Molecular Medicine Article is annexed herewith as **ANNEXURE – 7**. This report also states that data supported further evaluation of the anticytokine and anti-viral activity of Baricitinib and further assessment in randomised clinical trials in hospitalised Covid-19 patients.

22. In December 2020, a report in the New England Journal of Medicine reported that Baricitinib + Remdesivir was superior to Remdesivir alone in reducing recovery time and accelerating improvement in clinical status among patients with Covid-19, notably among those receiving high-flow oxygen or non-invasive ventilation. The combination was also reported as being associated with fewer serious adverse events. A copy of this literature reference is annexed herewith as **ANNEXURE – 8**.

23. To avoid prolix, the Applicant relies on the contents of the above documents in support of the undeniable fact that Baricitinib is an essential medicine for Covid-19 treatment as an adjunct to Remdesivir prescription, particularly in patients requiring oxygen support and non-invasive ventilation.

24. The United States Food & Drug Administration granted Emergency Use Authorisation of Baricitinib in combination with Remdesivir for the treatment of COVID-19 on 19.11.2020. A copy of this USFDA Communication is annexed herewith as **ANNEXURE – 9**. The relevant portion of the USFDA Emergency Use Authorisation is reproduced hereinbelow:

> ***"I. Criteria for Issuance of Authorization***
> *I have concluded that the emergency use of baricitinib for the treatment of COVID-19 when administered as described in the Scope of Authorization (Section II) meets*

the criteria for issuance of an authorization under Section 564(c) of the Act, because:
1. SARS-CoV-2 can cause a serious or life-threatening disease or condition, including severe respiratory illness, to humans infected by this virus;

2. Based on the totality of scientific evidence available to FDA, it is reasonable to believe that baricitinib, in combination with remdesivir, may be effective in treating suspected or laboratory confirmed COVID-19 in hospitalized adults and pediatric patients 2 years of age or older requiring supplemental oxygen, invasive mechanical ventilation, or ECMO, and that, when used under the conditions described in this authorization, the known and potential benefits of baricitinib when used in combination with remdesivir to treat COVID-19 in such patients outweigh the known and potential risks of such product; and

3. There is no adequate, approved, and available alternative to the emergency use of baricitinib, in combination with remdesivir, for treatment of suspected or laboratory confirmed COVID-19 in hospitalized adults and pediatric patients 2 years of age or older requiring supplemental oxygen, invasive mechanical ventilation, or ECMO."

25. The Applicant is informed that physicians now regularly prescribe Baricitinib as a stand alone or in combination with Remdesivir for treatment in Covid-19 patients. The prescribed dosage is one tablet per day for a maximum of 14 days.

(iii) PATENT POSITION REGARDING BARICITINIB

26. The Applicant's search has shown up one granted patent for Baricitinib, viz. Indian Patent 270765 (IN'765). A copy of the E-Register of IN'765 is annexed herewith as **ANNEXURE – 10**. A copy of IN'765 as granted (as per records of the IPO on IPAIRS) is annexed herewith as **ANNEXURE – 11**. The Applicant is not disputing the fact that IN'765 covers Baricitinib.

27. The patent is owned as of 05.07.2018 by Incyte Holdings Corporation. While there is a reference in the E-Register to a licence having been granted to an entity called Eli Lilly & Co., and having been recorded in July 2019, (a) firstly this was done after assignment was recorded in 2018, and (2) a copy of such licence is unavailable for public inspection.

28. The Forms 27 filed on IN'765 for the calendar years 2019 and 2020 respectively are annexed herewith as **ANNEXURE – 12 Colly**.

29. It is submitted that the relevance and criticality of Baricitinib in treatment of Covid-19 has also been recognised and noted by the Hon'ble High Court of Delhi through its Order dated 20.04.2021 in *Rakesh Malhotra v. GNCTD* (supra).

IV. CONDITIONS FOR APPLICATION OF SECTION 92 OF THE ACT

i. Existence of a national public health emergency

30. The Applicant submits that this is an undisputed position – that there is in fact a grave national public health emergency. In support of this position, reliance is placed on the declaration of a pandemic by the NDMA as referred to above, which has not been withdrawn. Reliance is also placed on the DCGI/CDSCO Notification of 19.03.2020 which is operative across all drugs useful for Covid-19 treatment.

31. Reliance is also placed on the Judgments of the Hon'ble Supreme Court of India dated 29.04.2021 and of the Hon'ble Delhi High Court of 20.04.2021 referred to above.

32. It is submitted that the above trigger the operation of Section 92, and in particular Section 92(1) and 92(3) of the Act for the reasons as given hereinbelow:

a. The National Disaster Management Authority declares a pandemic in March 2020 which continues to operate as of date;

b. On 19.03.2020, the Central Drugs Standard Control Organisation through the DCGI, which operates under the direction and control of the Ministry of Health & Family Welfare, Government of India, issued a pan-India and drug-agnostic notification declaring that in the light of the prevailing Covid-19 pandemic, any drug approved anywhere in the world for Emergency Use Authorisation would be entitled to the same status i.e. Emergency Use Authorisation through a Special Regulatory Pathway in India;

c. On 19.11.2020, the USFDA notified and approved Baricitinib for Emergency Use Authorisation in the USA under Section 564 of the Federal Food, Drug & Cosmetics Act of USA as amended or added by the Pandemic and All-Hazards Preparedness Reauthorisation Act of 2013 (PAHPRA), which is pari materia with Section 92 of The Patents Act, 1970;

d. The CDSCO/DCGI ahs through its letters of 29.04.2021 recognised that there is a public health emergency due to Covid 19 pandemic and that there is an unmet medical need and has approved such Emergency Use Authorisation for manufacture of Baricitinib API and 1 mg, 2mg and 4mg tablets for Emergency Use in Covid-19 pandemic. Copies of such letters are annexed herewith as **ANNEXURE – 13 Colly**.

33. In the light of the above, the first requirement, namely the recognition by the Central Government of the existence of a national emergency due to public health concerns as well as extreme urgency is satisfied, and in particular in relation to Baricitinib.

ii. Unmet need in India

34. The Applicant submits that there is an unmet need for Baricitinib both due to lack of supply as well as lack of affordability of even what is or has been supplied under the brand Olumiant by Eli Lilly

35. In this connection, the Applicant respectfully submits as follows:

a. Admittedly, the use of Baricitinib with remdesivir reduces hospital time, increases chances of survival and also has minimal adverse events associated therewith.

b. According to the Forms 27 filed on IN'765 for calendar years 2019 and 2020, the amount of Baricitinib tablets introduced in India are as follows:

2019:

2mg tablets:	263 at a total value of INR 849569.00
4mg tablets:	7997 at a total value of INR 25832709.00
Physician's samples:	810 at a total value of INR2616543.00

The total number of tablets are 8870 at an average cost per tablet of INR 3230.00 per tablet.

2020: (when pandemic continued to be ongoing)

2mg tablets:	1627 at a total value of INR 5255698.00
4mg tablets:	5763 at a total value of INR 18616219.00
Physician's samples:	995 at a total value of 3214149.00

The total number of tablets are 8385, again at an average cost per tablet of INR 3230.00 per tablet. Indeed the number of tablets appears to have reduced from 2019 to 2020 calendar years.

c. Olumiant is not manufactured in India but is only imported as per the Forms 27.

d. The total number of Covid-19 patients currently undergoing treatment is over 34 lakhs, and the numbers are only increasing on a daily basis.

e. A large number of such patients are prescribed Remdesivir injection.

f. The Baricitinib course regimen for Covid -19 is for a period of upto 14 days.

g. The tablets of Olumiant imported through 2020 by Lilly would serve at best to meet the needs of only approximately 600 patients.

iii. Unmet need to due to lack of supply

36. This firstly shows that there is a significant lack of access in terms of availability of such medicine to patients across India – even assuming only 25% of the Covid-19 patients are prescribed Remdesivir injection, and therefore can also avail of the benefit of co-treatment with Baricitinib, this in itself works out a patient population of approximately 8.5 lakh patients. The actual numbers are likely to be significantly higher – and will be known only after detailed studies regarding prescription of remdesivir and Baricitinib become available.

iv. Unmet need due to price/lack of affordability

37. Even if Eli Lilly undertakes to meet the full requirement, a significant barrier to access remains the price of the product. The per tablet cost is INR 3230.00. For a 14-day treatment regimen the price works out to INR 45220.00 per patient. As is self-evident this is not only more than the median average income of most families, it is actually more than the monthly income of even most qualified professionals across India. Simply put, this is classic price gouging and in itself reduces access to a very limited and extremely affluent section of Indian population.

v. Conditions of Section 92(3) satisfied

38. Critically, as stated hereinabove, it is an admitted position that Eli Lilly only imports the tablets and that too in limited quantities. Eli Lilly itself has a very narrow distribution network and it is inconceivable that it will ever be able to service the needs of the Indian population for Baricitinib in times of Covid-19 pandemic. Of necessity, any baricitinib product imported by Lilly will be limited in access to at best a few urban centers such as Delhi or Mumbai, if at all.

vi. Additional Factors

39. The Hon'ble High Court of Delhi in Rakesh Malhotra supra itself recognised that there is a need to invoke provisions such as Section 92 in relation inter alia to Baricitinib. The need to invoke compulsory licensing provisions under Section 92 and Government use provisions under Seciton 100 has also been noted by the Hon'ble Supreme Court in its judgment of 29.04.2021. One of the drugs under discussion and consideration during the hearing on 29.04.2021 before the Hon'ble Court was Baricitinib.

40. Thus, the above factors all show that the Learned Controller is not only empowered, but is also required to exercise discretion under Section 92(3) of the Act and issue a

compulsory licence in relation to IN'765 for Baricitinib for the period that the Covid-19 pandemic continues to subsist in India.

V. THE APPLICANT'S PREPAREDNESS FOR LAUNCH OF BARICITINIB

41. The Applicant had applied for Emergency Use Authorisation on 02.12.2020 before the DCGI/CDSCO.

42. On 11.12.2020, the Applicant wrote to the patentee seeking a voluntary licence and offering to pay a royalty of 7% on net profits. A copy was also marked to the purported licensee Eli Lilly. A copy of this communication is annexed as **ANNEXURE – 14**.

43. Till date there has been no response from the patentee. Instead communications were received on behalf of the licensee demanding certain confidential details to which the licensee is neither entitled to nor has any justification been shown as to why such information was being requested by Lilly. Simply put, a purported licensee cannot demand confidential information where the patentee itself has remained signally silent. Nothing was shown that Eli Lilly was in fact even authorised by Incyte Holdings Corporation to address such communications.

44. The Applicant respectfully submits that it is prepared to manufacture and launch Baricitinib in three separate dosage forms 1 mg, 2 mg and 4 mg tablets immediately for the purpose of co-treatment in Remdesivir treatment as per approvals granted by the CDSCO/DCGI for Emergency Use Authorisation.

45. The Applicant is devoting its existing facilities for production and its pan-India distribution network for this purpose. For example, Baricitinib product will be made available across India to hospitals directly on prescriptions issued by Registered Medical Practitioners to patients in critical care and under conditions approved by the Regulatory Authorities.

46. The Applicant stipulates that it has received such Emergency Use Authorisations. As can be seen from such authorisations, the DCGI itself has recognised that not only is there an emergency, there is an unmet medical need.

47. The Applicant 's products pricing details are as below:

    4 mg tablet: INR 30.00 per tablet, i.e. INR 420.00 for a maximum 14 day course

    2 mg tablet: INR 20.00 per tablet, i.e. INR 280.00 for a maximum 14 day course

    1 mg tablet: INR 15.00 per tablet, i.e. INR 210.00 for a maximum 14 day course

(Note: actual prices may vary due to factors such as GST etc., and any local variations. However, the Applicant is dedicated to ensuring that the variations are kept to a minimum).

48. As can be seen from the above, the pricing is structured not from the motive of profit at any cost, but access at any cost.

49. The Applicant has performed bioequivalence studies which were submitted to the regulatory authorities and the Applicant's product has been found to be bioequivalent to the reference product Olumiant. A synopsis of such studies is filed herewith as **ANNEXURE – 15**.

50. A detailed statement regarding the Applicant's baricitinib manufacturing capacity will be filed shortly. It is undisputed that that the Applicant has the capability – the total quantum over time details will be submitted shortly. In addition, the Applicant will be using its well established distribution network to ensure supply of its Baricitinib product to hospitals, Government facilities for treatment of Covid-19 etc.

51. In addition to the above, the Applicant had also filed an intervention application on 23.04.2021 before the Hon'ble Supreme Court of India in Suo Motu Writ Petition No. 3/2021 seeking inter alia the following directions:

    a. A direction that its application for Emergency Use Authorisation in relation to Baricitinib which had been filed as far back as 02.12.2020 be heard and disposed of expeditiously on merits by the regulatory authority. This has now been rendered moot due to the approvals granted on 29.04.2021;

    b. A direction that any application for compulsory licence be heard and disposed off expeditiously by the concerned authorities. This prayer is currently under consideration of the Hon'ble Supreme Court.

52. The Applicant is moving the present application on an urgent basis and reserves the right to file additional supporting documents and material as may be necessary in support of its case. The Applicant also undertakes to file any additional information as may be required by the Learned Controller subject only to conditions of confidentiality.

PRAYER

53. In the light of the above, the Applicant respectfully prays that the Learned Controller be pleased to exercise the duty mandated under Section 92(1) read with 92(3) of the Act

and grant the Applicant the Compulsory Licence requested and on the following terms and conditions:

a. Recognise the right of the Applicant to manufacture and market Baricitinib both as bulk API and 1 mg, 2 mg, and 4mg tablets as approved by the DCGI/CDSCO;
b. The compulsory licence will be with respect to Covid-19 indication only;
c. The compulsory licence will be limited to the territory of India, and till such time as the prevailing pandemic situation continues;
d. Payment of 7% royalty on net profits;
e. Preference is to be given to patients in the economically weaker sections, government (both central and state government) welfare schemes and in remoter areas of the Country;
f. In deserving cases, the product will be made available free of cost to patients.

54. The Applicant requests that no adverse decision be taken without providing the Applicant an opportunity of being heard in the matter.

Most respectfully submitted

Dated this the 3rd day of May 2021.

For Natco Pharma Limited



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ANNEXURE - 1

Reportable

IN THE SUPREME COURT OF INDIA
CIVIL ORIGINAL JURISDICTION

Suo Motu Writ Petition (Civil) No.3 of 2021

IN RE: DISTRIBUTION OF ESSENTIAL SUPPLIES AND SERVICES DURING PANDEMIC.

O R D E R

This order has been divided into the following sections to facilitate analysis:

A Introduction

B Outline of the Disaster Management Act

C Medical Infrastructure

C.1 Submissions in UOI's Affidavits

C.2 National Policy for Admission in Hospitals

D Oxygen allocation and availability

E Vaccines

E.1 Vaccine capacity and disbursal

E.2 Vaccine pricing

F Potentiality of Compulsory Licensing for vaccines and essential drugs

G Supply of Essential Drugs

G.1 Submissions in the Central Government's Affidavits

G.2 Recommendations

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H Recommendations for augmenting healthcare workforce

I Epilogue

J Conclusion

A Introduction

1 The genesis of this *suo motu* writ petition is in an order dated 22 April 2021. This Court took note of the unprecedented humanitarian crisis in the country, following the outbreak of the COVID-19 pandemic. Notices were issued to the Union of India[1], the Governments of the States and Union Territories[2], and to several petitioners who were before the High Courts. The Court observed:

> "the Union Government, the State Governments/Union Territories and the parties, who appeared to have approached the High Courts to show cause why uniform orders be not passed by this Court in relation to
> a) Supply of oxygen;
> b) Supply of essential drugs;
> c) Method and manner of vaccination; and
> d) Declaration of lockdown"

The Court directed the Central Government to :

> "1. Report on the existence or otherwise and requirement of setting up of a coordinating body that would consider allocation of the above resources in a consultative manner (with the involvement of concerned States and Union Territories).
> 2. Consider declaration of essential medicines and medical equipment including the above articles as essential commodities in relation to COVID.
> 3. In respect of coordination of logistical support for inter-State and intra-State transportation and distribution of the above resources."

2 The Court also had appointed an *Amicus Curiae* to assist it. However, the *Amicus Curiae* was, on his request, relieved of his position on 23 April 2021. Hearings in the matter were then conducted on 27 April 2021, where the Court appointed two new *Amici:* Mr Jaideep Gupta and Ms Meenakshi Arora, learned Senior Counsel. They will be assisted by Mr Kunal Chatterjee and Mr Mohit Ram,

[1] "**UOI**", referred interchangeably as "**Central Government**"
[2] Collectively referred as "**State Government**"

learned counsel and Advocate-on-Record. The Court began the hearing by noting that the jurisdiction it assumed under Article 32 did not automatically lead to the erosion of a High Court's jurisdiction under Article 226. Rather, the Court stressed on the importance of the jurisdiction under Article 226, and how High Courts may be better equipped to deal with issues within their own States. However, this Court assumed jurisdiction over issues in relation to COVID-19 which traverse beyond state boundaries and affect the nation in its entirety.

3 The Court noted that it was in receipt of an affidavit dated 23 April 2021 filed by the UOI. However, the Court directed the UOI to file an additional affidavit and the respective governments of the States/Union Territories to file fresh affidavits on four issues. The relevant extract of the order reads thus:

> "(i) Supply of oxygen – The Court should be apprised by the Union of India on
> (a) The projected demand for oxygen in the country at the present point of time and in the foreseeable future;
> (b) The steps taken and proposed to augment the availability of oxygen, meeting both the current and projected requirements;
> (c) The monitoring mechanism for ensuring the supply of oxygen, particularly to critically affected States and Union Territories as well as the other areas;
> (d) The basis on which allocation of oxygen is being made from the central pool; and
> (e) The methodology adopted for ensuring that the requirements of the States are communicated to the Central Government on a daily basis so as to ensure that the availability of oxygen is commensurate with the need of each State or, as the case may be, Union Territory.
>
> (ii) Enhancement of critical medical infrastructure, including the availability of beds, Covid treatment centres with duly equipped medical personnel on the basis of the projected requirement of healthcare professionals and anticipated requirements. The Union government will consider framing a policy specifying the standards and norms to be observed for admitting patients to hospitals and covid centres and the modalities for admission;

(iii) The steps taken to ensure due availability of essential drugs, including Remdesivir and Favipiravir among other prescribed drugs and the modalities which have been set up for controlling prices of essential drugs, for preventing hoarding and for ensuring proper communication of the requirements at the level of each District by the District health authorities or Collectors to the Health Departments of the States and thereafter by the states to the Union Ministry of Health and Family Welfare so that the projected requirements are duly met and effectively monitored on a daily basis.

(iv) Vaccination
(a) Presently two vaccinations have been made available in the country, namely, Covishield and Covaxin;
(b) As of date, the vaccination programme has extended to all citizens of the age of 45 years and above;
(c) From 1 May 2021, the vaccination programme is to be opened up also to persons between the age groups of 18 to 45, in addition to the existing age group categories. The Union of India shall clarify (i) the projected requirement of vaccines as a result of the enhancement of coverage; (ii) the modalities proposed for ensuring that the deficit in the availability of vaccines is met; (iii) steps proposed for enhancement of vaccine availability by sourcing stocks from within and outside the country; (iv) modalities for administering the vaccines to meet the requirements of those in the older age group (forty five and above) who have already received the first dose; (v) modalities fixed for administering the vaccine to meet the additional demand of the 18-45 population; (vi) how the supplies of vaccines will be allocated between various states if each state is to negotiate with vaccine producers; and (vii) steps taken and proposed for ensuring the procurement of other vaccines apart from Covishield and Covaxin and the time frame for implementation; and
(d) The basis and rationale which has been adopted by the Union government in regard to the pricing of vaccines. The government shall explain the rationale for differential pricing in regard to vaccines sourced by the Union government on one hand and the states on the other hand when both sources lead to the distribution of vaccines to citizens."

4 This Court then received an additional affidavit dated 29 April 2021 from the UOI, and fresh affidavits by the various States/UTs addressing the four issues mentioned in its order dated 27 April 2021. In the hearing conducted on 30 April 2021, this Court heard submissions by Mr Tushar Mehta, learned Solicitor

General of India, who was appearing on behalf of the Central Government. Several other counsels have made brief interjections, including Mr Vikas Singh, Senior Counsel and President of the Supreme Court Bar Association. This Court also heard a presentation on oxygen supply in India by Ms Sumita Dawra, Additional Secretary, Department of Promotion of Industry and International Trade, Ministry of Commerce and Industry. As such, unless specified otherwise, the directions and observations in the present order are limited to the UOI.

5 During the course of the hearing, this Court directed that the individual States/UTs shall be given an opportunity to discuss their affidavits at a later hearing. Further, the Court also directed the learned *Amici* to prepare a tabular compilation in relation to all the Interlocutory Applications which have been filed in this petition. On the basis of the issues raised, they shall also be considered in a later hearing. Before delving into a substantive discussion, we would like to clarify that the jurisdiction exercised in this matter is merely to facilitate a dialogue of relevant stakeholders, the UOI, the States and this Court, in light of the pressing humanitarian crisis, and not with a view to usurp the role of the executive and the legislature. This bounded-deliberative approach[3] is exercised so that the UOI and States can justify the rationale behind their policy approach which must be bound by the human rights framework which presently implicates the right to life under Article 21 and right to equality under Article 14 of the Constitution.

[3] Sandra Fredman, "Adjudication as Accountability: A Deliberative Approach" in Nicholas Bamforth and Peter Leyland (eds), *Accountability in the Contemporary Constitution* (Oxford University Press, 2013)

B Outline of the Disaster Management Act

6 The Disaster Management Act, 2005[4] came into effect on 26 December 2005. The DMA provides for the effective management of disasters and matters connected or incidental to such disasters. COVID-19 falls under the definition of a disaster under Section 2(d)[5] of the DMA and the provisions of the DMA were invoked for the first time to deal with the present pandemic. Under Section 6(2)(i) of the DMA, the National Disaster Management Authority[6] issued an order dated 24 March 2020 directing the Ministries, UOI, State/UTs and their authorities to take effective measures to prevent the spread of COVID-19 in the country. Thereafter, the Home Secretary, Ministry of Home Affairs as the Chairperson of the National Executive Committee, which assists the NDMA in its functions, in an order dated 24 March 2020 issued guidelines for the initial 21 days' lockdown on account of COVID-19.

7 Section 2(e) defines disaster management as a continuous and integrated process of planning, organizing, coordinating and implementing measures in relation to the disaster. Section 2(e) provides:

> "2…
> (e)"disaster management" means a continuous and integrated process of planning, organizing, coordinating and implementing measures' which are necessary or expedient for--
> (i) prevention of danger or threat of any disaster;
> (ii) mitigation or reduction of risk of any disaster or its' severity or consequences;
> (iii) capacity-building;

[4] "**DMA**"
[5] ""2…(d) "disaster" means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area;"
[6] "**NDMA**"

(iv) preparedness to deal with any disaster;
(v) prompt response to any threatening disaster situation or disaster;
(vi) assessing the severity or magnitude of effects of any disaster;
(vii) evacuation, rescue and relief;
(viii) rehabilitation and reconstruction;.."

Section 2(n) of DMA defines a "National Plan" as the plan for disaster management for the whole country prepared under Section 11 of DMA. Section 3 of the DMA constitutes the NDMA with the Prime Minister as the Chairperson, *ex officio*. Section 6 lists down the powers and functions of the NDMA. Under Section 6(2)(b), NDMA has the power to approve the National Plan. Section 11 of the DMA provides the procedure for drawing up and implementation of the National Plan in the following terms:

"11. National Plan
(1) There shall be drawn up a plan for disaster management for the whole of the country to be called the National Plan.
(2) The National Plan shall be prepared by the National Executive Committee having regard to the National Policy and in consultation with the State Governments and expert bodies or organisations in the field of disaster management to be approved by the National Authority.
(3) The National Plan shall include--
(a) measures to be taken for the prevention of disasters, or the mitigation of their effects;
(b) measures to be taken for the integration of mitigation measures in the development plans;
(c) measures to be taken for preparedness and capacity building to effectively respond to any threatening disaster situations or disaster;
(d) roles and responsibilities of different Ministries or Departments of the Government of India in respect of measures specified in clauses (a), (b) and (c).
(4) The National Plan shall be reviewed and updated annually.
(5) Appropriate provisions shall be made by the Central Government for financing the measures to be carried out under the National Plan.
(6) Copies of the National Plan referred to in sub-sections (2) and (4) shall be made available to the Ministries or Departments of the Government of India and such Ministries

> or Departments shall draw up their own plans in accordance with the National Plan."

8 A National Plan includes, *inter alia*, measures for disaster prevention, mitigation, preparedness and roles and responsibilities of different Ministries in terms of Section 11(3) of DMA. A National Plan for the entire country was prepared in the year 2016 and was revised and notified in November, 2019. The National Plan, 2019 provides a framework to the Government agencies to deal with different aspects of disaster management. Section 11(4) of the DMA provides that the National Plan is to be revised and updated annually making it a 'dynamic document'. The executive summary of the National Plan succinctly captures its purpose and contours in the below extract:

> "...The National Disaster Management Plan (NDMP) provides a framework and direction to the government agencies for all phases of disaster management cycle. The NDMP is a "dynamic document" in the sense that it will be periodically improved keeping up with the emerging global best practices and knowledge base in disaster management. It is in accordance with the provisions of the DM Act, 2005, the guidance given in the National Policy on Disaster Management (NPDM) 2009, and the established national practices..."

9 Section 12 of the DMA empowers the NDMA to recommend guidelines for the minimum standard of relief to be provided to persons affected by disaster. NDMA can create guidelines stipulating minimum standards of relief for providing ex gratia assistance on account of loss of life and restoration of means of livelihood in terms of Section 12(iii) of DMA. In light of the human suffering and loss of livelihood that has accompanied this pandemic, NDMA may consider laying down minimum standards of relief in this regard. We clarify that this is not

a direction of this Court, however a suggestion that can be looked into by the NDMA. Under Section 12(iv) of the DMA, the NDMA has been given wide powers to provide guidelines for any such relief that may be necessary.

10 In addition to the above provisions, Section 35 of the DMA empowers the Central Government to take measures which it deems to be necessary or expedient for the purpose of disaster management. Section 35(2)(a) provides for coordination of actions between the Central Government and State Governments and their respective authorities in relation to disaster management. Section 35(2)(e) obliges the Central Government to assist and cooperate with the State Governments as requested by them or otherwise deemed appropriate by it.

11 Section 36 of DMA provides for the responsibilities that have to be undertaken by the Ministries or Departments of the Central Government. While Section 36(h) empowers the Central Government to take any actions that it may consider necessary for disaster management, Section 36(d) specifically enables it to review its policies with a view to incorporate provisions necessary for prevention of disaster, mitigation or preparedness. Under Section 36(f), it is the responsibility of every Ministry or Department of Central Government to provide assistance to the State Governments for (i) drawing up mitigation, preparedness and response plans, capacity-building, data collection and identification and training of personnel in relation to disaster management; (iii) carrying out rescue and relief operations in the affected area; (iii) assessing the damage from any disaster; and (iv) carrying out rehabilitation and reconstruction. Section 35(g) provides that the Central Government is responsible for making available its resources to the National Executive Committee or a State Executive Committee

for the purposes of, *inter alia*, transporting personnel and relief goods to and from the affected area.

12 The provisions of Sections 35 and 36 of the DMA that have been discussed above have been enacted in the spirit of cooperative federalism in order to ensure that Central Government can assist and enable the State Governments to effectively tackle the disaster in question.

13 The learned Solicitor General has submitted that the Central Government is operating under the broad framework of the National Plan and the plan is already in force. The plan specifically deals with "Biological and Public Health Emergencies". Further, different States have their own Disaster Management Plans in place. It has been submitted that the National Plan does not and cannot contain step by step instructions or specific directions for the day to day management of the pandemic by the Government agencies. Such aspects are kept open for executive decision, in view of the dynamic nature of the disaster in question. Further, since COVID-19 is a novel virus, the knowledge in relation to such a virus is contemporaneous in nature and is subject to constant development. A three Judge bench of this Court in its judgement in **Centre for Public Interest Litigation** vs **Union of India**[7] had noted that there was no need to develop a fresh National Plan under Section 11 for COVID-19 since a National Plan was already in place, which was being supplemented by various orders and measures taken by competent authorities under DMA. Justice Ashok Bhushan, speaking for this Court, observed that:

[7] 2020 SCC OnLine SC 652

> "40. The Disaster Management Act, 2005 contain ample powers and measures, which could be taken by the National Disaster Management Authority, National Executive Committee and Central Government to prepare further plans, guidelines and Standard Operating Procedure (SOPs), which in respect to COVID-19 had been done from time to time. Containment Plan for Novel Coronavirus, 2019 had been issued by Ministry of Health and Family Welfare, Government of India. There were no lack of guidelines, SOPs and Plan to contain COVID-19, by Nodal Ministry had been brought on record issued by Ministry of Health and Family Welfare, Government of India, i.e., Updated Containment Plan for Large Outbreaks Novel Coronavirus Disease, 2019 (COVID-19)."

14 Therefore, the National Plan, 2019 can be supplemented by the issuance of additional guidelines to tackle any aspect of disaster management including the issue of admission to hospitals and access to essential drugs and vaccines in respect of COVID-19.

C Medical Infrastructure

C.1 Submissions in UOI's Affidavits

15 In relation to the broad issue of medical infrastructure, the Central Government begins its affidavit dated 23 April 2021 and additional affidavit dated 29 April 2021 by describing its 'three-tier setup' of Covid Care Centers[8], Dedicated COVID Health Centers[9] and Dedicated COVID Hospitals[10] which was recommended to the States for tackling the COVID-19 pandemic, for which the UOI also provided funds under an emergency response package from the National Health Mission and State Disaster Response Fund.

[8] "**CCC**"
[9] "**DCHC**"
[10] "**DCH**"

16 The present status of these is: (i) 2,084 DCH (of which 89 are under the Central Government and the rest 1,995 with State Governments); (ii) 4,043 DCHC; and (iii) 12,673 CCC. Cumulatively, they have 18,52,265 beds in total, out of which 4,68,974 beds are in DCH. It was also noted that Central Government hospitals have also been converted into DCH.

17 Further, tertiary care hospitals under ESIC, Defence, Railways, paramilitary forces, Steel Ministry, *et al*, are also being leveraged for case management. Even as many as 3816 railways coaches spread over 16 railway zones have been converted into CCC. Finally, the DRDO has also set up large field hospitals with capacities ranging from 1,000 to 10,000 isolation beds.

18 It was noted that through coordination between Central Government and State Governments, isolation beds (with/without oxygen) were increased to around 15.7 lakhs, as compared to 10,180 before the first lockdown; similarly, ICU beds were increased to more than 85,000, as compared to 2,168 before the first lockdown. Similar upgrades were provided to necessary equipment such as Ventilators, N95 masks and PPEs.

19 The affidavit provides the following details of the efforts taken by UOI to create projections for each State, and how it was communicated to them:

(i) It has developed an IT module for projections of expected cases based on ongoing caseload, so as to alert States and districts to be prepared in advance. The projections by the Central Government were regularly shared in writing with the States, along with reports containing emergency

plans. This tool was also made available to States, to map their own projections at the State level;

(ii) Details of the meetings conducted by the Prime Minister, the Minister of Health and Family Welfare, the Cabinet Secretary, the Secretary (H) and the DGHS were provided; and

(iii) Details of letters (which seem to have been sent on a monthly basis) sent by the Central Government to the State Governments indicate that they informed the State Governments of the projected cases for the coming month, along with the number of Oxygen Supported Beds, ICU Beds and of Ventilators that will be required to manage the projected cases. Thereby, the State Governments which were found lacking in their numbers were directed to ramp up their facilities.

20 In relation to the preparedness for the second wave of the COVID-19 pandemic, the affidavits state that:

(i) After the first wave, the Central Government has been consistently writing to the State Governments from 4 December 2020 with numbers of projected cases, along with the directions requiring them to arrange the necessary infrastructure which will be needed;

(ii) State Governments were requested by the UOI to formulate a comprehensive plan in relation to:

(a) Bed capacities, ICU beds, further identification of additional hospitals, preparation of field hospital facilities, ensuring sufficient oxygen supported beds and oxygen supplies;

(b) Deployment of requisite HR training and mentoring of doctors and nurses for management of patients, strengthen ambulance services and centralized call center-based services for allocation of beds;

(c) Suitable initiatives for (among other things) achieving and maintaining adequate level of testing, surveillance and risk communication for promoting wearing of masks, physical distancing, hand hygiene;

(d) Sufficient referral linkages for districts with deficit infrastructure through deployment of additional ambulances, wherever necessary; and

(iii) On 20 April 2021, the Ministry of Health and Family Welfare[11] wrote to the State Governments with their projections and reminded them also of the funding avenues being made available to all States under NHM funding, State Disaster Response Fund, and other initiatives.

21 The affidavits also note that the Central Government had developed a live portal with all the States and districts where they were asked to feed in their data of cases and details such as people under home isolation, on isolation beds (with or without oxygen) and on ICU beds. Further, the State Governments were also directed to feed in details of the COVID dedicated health care infrastructure created by them, besides the details of containment zones so specified by them. However, the Central Government has alleged that States and districts did not upload their data regularly enough. Additionally, there was also a 'Facility App' which could be used by Covid Health facilities to monitor their patients as well as the availability of logistics with their health facility. However, the Central

[11] "**MoHFW**"

Government alleges that States, districts and facilities did not use this Facility App.

C.2 National Policy for Admission in Hospitals

22 It has been submitted by the Central Government that health being a state subject, the medical infrastructure is largely created and maintained by the respective State Governments. Since we are yet to hear from the State Governments, we shall not be issuing any directions or making comprehensive observations in relation to this issue.

23 However, based on the affidavits submitted by the Central Government and the hearings which followed, we have come to understand that there is no national policy on how admissions must take place in the various tiers of hospitals (CCC, DCHC and DCH). Gaining admission into a hospital with a bed is one of the biggest challenges being faced by most individuals during this second wave of the COVID-19 pandemic. Left to their own devices, citizens have had to suffer immeasurable hardship. Different states and local authorities follow their own protocols. Differing standards for admission in different hospitals across the nation leads to chaos and uncertainty. The situation cannot brook any delay. Accordingly, we direct the Central Government to frame a policy in this regard, in exercise of its statutory powers under the DMA, which will be followed nationally. The presence of such a policy shall ensure that no one in need is turned away from a hospital, due to no fault of their own. Such a policy should, *inter alia*, address the following issues in relation to admission:

(i) Requirement of a positive test for COVID-19 virus, which may become difficult for many individuals since testing facilities are overwhelmed, test results are taking inordinately long time and the new strain of the COVID-19 virus is sometimes not even picked up by a regular RT-PCR test;

(ii) Some patients are being refused service based on arbitrary factors. For example, the hospitals in Ahmedabad were initially refusing to take in patients who did not arrive in the government-run '108' ambulances. While this rule has now been removed, after objections were noted by the Gujarat High Court during hearings in a *suo motu* public interest litigation[12], we note that such rules cannot be allowed to crop up in other places;

(iii) Some reports have also been brought to our attention that hospitals are refusing to admit individuals who cannot produce a valid ID card which shows that they belong to the city where the hospital is located. Given how overstretched our hospitals are during the second wave of the COVID-19 pandemic, it is entirely plausible that individuals may travel to other cities in desperation, since beds may not be available in their city. The rural health infrastructure is seriously deficient. Hence, no hospital should be allowed to deny them entry solely based on this reason or any other issues with identity proofs;

(iv) A related issue is when individuals often get their family member admitted in a hospital in one city, but have to travel to another city to look for oxygen or essential drugs and are denied their use because they are to be bought

[12] **Suo Motu** vs **State of Gujarat**, R/Writ Petition (PIL) No 53 Of 2021

for an individual admitted in a different city. As was true for the above such rule, this is also unacceptable and should not be allowed;

(v) Admissions to hospital must be based on need. The Central Government, in consultation with the respective State Governments, must formulate guidelines on the stage at which hospitalization is required so as to ensure that scarce hospital beds are not occupied by persons who do not need hospitalization. This aspect should be based on the advice of medical experts and can be suitably altered given the needs of each State (or regions within the State) and in the course of the experiences gained during the pandemic; and

(vi) Directions are hereby issued to all States, Union Territories, and all public agencies, to ensure that the above orders are implemented forthwith. The Central, State and Union Territory governments shall issue necessary orders and circulars, incorporating the above directions, within three days, which shall be in force till replaced by an appropriate uniform policy, devised by the central government, statutorily.

D Oxygen allocation and availability

24 The Central Government has argued the following:

(i) By its order dated 11 September 2020, the Ministry of Home Affairs[13], in exercise of its powers under Section 10(2)(h) of the DMA had constituted an Empowered Group-II as an inter-ministerial body to ensure availability of essential medical equipment and oxygen management;

(ii) Medical oxygen is critical to treatment of COVID affected patients. The entire available capacity of oxygen is used for supply for industrial and medical use, which is in the form of Liquid Medical Oxygen[14]. The major suppliers for both industrial and medical oxygen are steel plants in the public and private sectors, and private entities;

(iii) Oxygen is not produced evenly in India. While some States may be oxygen producing States such as Maharashtra, Rajasthan and Jharkhand; other States/UTs such as Delhi, Goa and Madhya Pradesh, do not have production capacity and rely on supply of oxygen from oxygen producing States;

(iv) For an estimation of the required oxygen supply, an Empowered Group I was constituted which categorized patients into three categories:

- Class I comprising of 80% of the cases which are mild and do not require oxygen;

[13] "**MHA**"
[14] "**LMO**"

- Class II comprising of 17% cases which are moderate and can be managed on non-ICU beds and 50% of these may require oxygen @10L/min; and
- Class III comprising of 3% of cases which are severe ICU cases requiring approximately 24L/min oxygen.

(v) On the basis of the categorization provided by Empowered Group I, oxygen requirement of different States on the basis of active cases is being calculated which is around 8462 MT. Based on the trend of active cases, the "doubling rate of cases" is calculated for each State, which implies, the number of days in which COVID cases are likely to double. The number of active cases are projected on the basis of the doubling rate and oxygen requirement is calculated. These projections get changed daily on the basis of real time change;

(vi) In order to ensure supply of oxygen to all States, a mapping exercise of the sources of supplies with the demand of medical oxygen to the critically affected States was undertaken jointly by the Department of Promotion of Industry and Internal Trade, MoHFW, Ministry of Steel, Petroleum and Explosives Safety Organisation, oxygen manufacturers etc. During the course of the mapping exercise, States were requested to indicate their projections for requirement of medical oxygen based on expected active case load. These projections were to be given as on 20 April, 25 April, and 30 April 2021. The following was the forecast provided by the major States:

S. No.	State	Forecast for requirement for medical oxygen (MT) as on		
		Apr-20	Apr-25	Apr-30
1	Maharashtra	1500	1750	2000
2	Uttar Pradesh	400	650	800
3	Chhattisgarh	215	295	382
4	Karnataka	300	155	111
5	Kerala	89	99	104
6	Delhi	300	349	445
7	Tamil Nadu	200	320	465
8	Madhya Pradesh	445	565	700
9	Rajasthan	125	124	124
10	Gujarat	1000	1050	1200
11	Haryana	180	180	180
12	Punjab	126	82	82
TOTAL		**4880**	**5619**	**6593**

(vii) Based on these projections, an indicative mapping framework was drawn up and approved by an order dated 15 April 2021, which provided the name of the supply point, the State to which supply was allocated and the quantity to be supplied. Subsequently, due to continuous changes in the number of cases and the need for medical oxygen, a revised projection was issued by States for 20 April 2021, which provided:

S. No.	State	Forecast for requirement for medical oxygen (MT) for 20th April		
		Initial	Revised	Remarks
1	Maharashtra	1500	1500	-
2	Uttar Pradesh	400	800	100% increase
3	Chhattisgarh	215	215	-
4	Karnataka	300	300	-

S. No.	State	Forecast for requirement for medical oxygen (MT) for 20th April		
		Initial	Revised	Remarks
5	Kerala	89	89	-
6	Delhi	300	700	133% increase
7	Tamil Nadu	200	200	-
8	Madhya Pradesh	445	445	-
9	Rajasthan	125	147	18% increase
10	Gujarat	1000	1000	-
11	Haryana	180	180	-
12	Punjab	126	126	-
13	Telangana	-	350	-
14	Andhra Pradesh	-	400	-
15	Uttarakhand	-	75	-
TOTAL		**4880**	**5619**	

(viii) Following this, a revised supply plan for medical oxygen to 15 States for meeting their demand was issued by an order dated 18 April 2021. Certain States, such as Delhi, Rajasthan, Punjab, Uttar Pradesh, Uttarakhand and Madhya Pradesh, faced challenges despite this allocation. Issues such as logistical bottlenecks in transportation, incidents of local authorities in disrupting supplies to other states were reported. Due to this, allocation orders were further amended by orders dated 21 April 2021, 22 April 2021, 24 April 2021, 25 April 2021 and 26 April 2021. The MHA also issued orders dated 22 April 2021 and 25 April 2021 under the DMA to direct States/UTs to ensure uninterrupted movement of medical oxygen;

(ix) The major principles on the basis of which the amendments were made were to: (a) ensure that projected requirement of LMO is allocated as far as possible; (b) allocate sources located within the State or closest to the State while balancing requirements from States which have no/low internal

manufacturing capacity; (c) ensure feasible transportation; (d) ensure minimum disruptions in existing supply chains;

(x) As an instance, the allocation summary for 28 April 2021 has been placed on record:

Sl No	State	Production Capacity on 28/04/2021 (MT)	Need of State (MT)	Existing Allocation (MT)	Oxygen lifted by the respective States on 26/04/2021 (MT)
1	Maharashtra	1209.18	1784	1784	1389.19
2	Goa	No Bulk Manufacturing Plant	11	11	
3	Gujarat	847.00	1000	975	904.20
4	Dadra & Nagar Haveli	No Bulk Manufacturing Plant	20	20	
5	Karnataka	625.00	770	802	441.19
6	Madhya Pradesh	No Bulk Manufacturing Plant	649	649	613.82
7	Delhi	No Bulk Manufacturing Plant	470	490	361.90
8	Haryana	246.86	180	232	228.64
9	Uttar Pradesh	244.00	857	857	640.68
10	Punjab	No Bulk Manufacturing Plant	137	177	180.38
11	Chandigarh		20	40	
12	Tamil Nadu	366.00	280	220	396.48

(xi) After the Central Government procures and allocates the quantity of medical oxygen to each State, it is the State Government's responsibility to arrange transportation to pick up their allotted quantity from the supply point;

(xii) Given the fact that the mapping exercise has to be continuously updated according to the need of the situation across States, the Central Government also put in an interactive mechanism called the "Virtual Central Control Room" consisting of senior officers of Additional/Joint Secretary rank to monitor and find solutions to any problems that may arise on a real time basis. We have been apprised that the daily allocation of the

supply of oxygen is sanctioned and uploaded on this virtual room, in which the Chief Secretaries of all States/UTs are members;

(xiii) In addition to the management of supply and demand of medical oxygen, the Central Government has also taken the following steps to ensure augmentation of supply in the country:

(a) **Licenses to industrial gas manufacturers:** By an order dated 7 April 2020, the Drug Controller General of India[15] allowed licenses to be issued to industrial gas manufacturers for manufacturing medical oxygen within 24 hours of receipt of the application by DCGI;

(b) Enhanced production of LMO in steel plants and by private manufacturers: Steps have been taken to reduce production of other liquid products which are required for manufacturing steel (such as argon and nitrogen) and enhance the capacity of liquid oxygen. This has resulted in immediate enhancement of 293 MT. Additionally, the steel sector has made available the liquid oxygen in its storage tanks (approx. 16,000 MT as on 21 April 2021). Supplies have increased from 1000 MT in the first week of April 2021 to 2600 MT on 21 April 2021. Moreover, private manufacturers have also enhanced production of medical oxygen;

(c) Restrictions on use of industrial oxygen: By an order dated 18 April 2021, the MoHFW restricted industrial use of oxygen. Supply of oxygen for all industrial use was completely prohibited on 21 April 2021, except for certain industries such as ampoules and vials; pharmaceuticals;

[15] "**DCGI**"

petroleum refineries; nuclear energy facilities; and oxygen cylinder manufacturers. These have added 1000 MT of additional oxygen;

(d) **Augmentation in availability of tankers:** India has 1224 oxygen tankers (16732 MT capacity) and efforts are being made to increase this capacity to 2000 tankers through conversion of nitrogen and argon tankers and import of 138 cryogenic tankers;

(e) **Commissioning of PSA plants:** Pressure Swing Absorption[16] is a technology to generate oxygen at a local level. PSA plants established in hospitals enable self-sufficiency in generation of oxygen. MoHFW is in the process of commissioning 162 PSA Plants (154 MT capacity). The following statistics have been furnished :

Number of plants installed:	38
Number of plants to be installed by 30 April 2021	21
Number of plants to be installed by 31 May 2021	105
Number of plants to be installed by 30 June 2021[17]	51
Number of PSA Plants for district headquarters (under planning)	500

(f) **Import of medical oxygen:** A global tender was floated to import 50,000 MT of medical oxygen to be supplied in 90 days and quotations have been received. As an interim measure, quotations from bidders were called within 24 hours as to the quantities they could offer, prices etc. Orders have been placed with 2 foreign suppliers, i.e., SSB Cryogenic Equipment Ltd. for 200 MT and Gulf Industrial Gases Abu

[16] "**PSA**"
[17] As per the affidavit dated 23 April 2021, the UOI has stated that "a further 105 plants will be installed by 31.05.2021 and thereafter increasing to 156 plants by 30.06.2021."

Dhabi for 1800 MT. Another order is also being placed with M/s Ultra-Pure Gases India for import of 500-1500 MT;

(g) **Augmentation of availability of cylinders:** 1,02,400 oxygen cylinders were procured in April and May 2020 and distributed to States. Orders for additional 1,27,000 cylinders were placed on 21 April 2021. The Central Government proposes to address the additional demand through regulated portable oxygen system technology;

(h) **Setting up of jumbo container based COVID hospitals using gaseous oxygen**: Apart from LMO, the gaseous oxygen production capacity in the steel sector is 43,000 MT per day against which 26,000 MT per day is being produced. Two private entities, AMNS and JSW are setting up "Jumbo" COVID centres with 1000 bed oxygen facilities in Hazira, Vijayanagar and Dolvi using gaseous oxygen; and

(i) **Transportation by Air & Rail:** Railways are being used for long distance transport of tankers through 'roll on roll off' service and an "Oxygen Express" - a double engine train which gets a green corridor - is being run from supply point to destination. As an instance, the first rake with 7 empty tankers reached Mumbai from Vizag to transport 105 MT from RINL Vizag to Kalamboli. In addition to this, defence aircraft for carrying empty tankers to supply point are being deployed. However, it is technically not possible to bring in oxygen filed tankers in an aircraft.

25 During the course of the hearing, the Solicitor General has also sought to lay down the facts and figures pertaining to production and supply of oxygen, daily supply to States and challenges faced in supply chain logistics before the

Court by means of a power point presentation. We note the submission of the Solicitor General that the figures given in the power point presentation are revised on a daily basis and that the presentation is not to be treated as a submission made on oath by the Solicitor General, which may give rise to a cause of action for litigation in future either before this Court or the High Courts. Ms Sumita Dawra, Additional Secretary, Department of Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, who is one of the senior administrative officers in charge of oxygen procurement and supply coordination, has given an overview of these issues and made a presentation before us. We would like to record our appreciation for the contribution made by Ms Dawra and her team, who despite being infected by the COVID-19 virus, has continued to work and manage the supply of medical oxygen that the country so desperately needs today. It is through the earnest contribution of officers such as Ms Dawra, who are working round the clock, that the country is able to deal with the storm created by one of the worst humanitarian crises we have seen.

26 Based on the above facts and figures, the Solicitor General has stated that there is no dearth of oxygen supply in the country as on date and steps are being taken continuously to augment the supply of oxygen. Having said that, the Solicitor General has also admitted that there has been a shortage of supply to certain States and has attributed this shortage to various factors including the failure of State Governments to lift the allocated quantity of oxygen from the supply point; transportation bottlenecks caused by inter-State movement of tankers; and technical failure of certain plants leading to reassessment of allocation on a real time basis.

PART D

27 Submissions have also been made on the issue of supply of oxygen by Mr Rahul Mehra, learned Senior Counsel appearing for the Government of National Capital Territory of Delhi[18]. Mr Rahul Mehra submits that the GNCTD is facing an acute shortage of the supply of oxygen as it had been allocated a substantially lower quantity of oxygen as against its projected demand. Mr Mehra pointed out that initially as on 15 April 2021, the projected demand of GNCTD for 20 April 2021 was 300 MT/day, for 25 April 2021 it was 349 MT/day, and for 30 April 2021 it was 445 MT/day. However, due to a surge in cases, the projected demand was revised by GNCTD on 18 April 2021 to 700MT/day and this was immediately communicated to the Central Government. Despite the increase in projected demand, the supply of oxygen to GNCTD has continued in terms of the allocation order dated 25 April 2021, in which 490 MT/day were allocated. As against this as well, the manufacturers have only been able to supply 445 MT/day. Mr Mehra has clarified that as on the date of the hearing their demand was 700MT/day, however their projected demand for the coming days is stated to be 976 MT/day as the GNCTD has planned an increase in medical infrastructure, including beds with oxygen cylinders and beds for patients in intensive care unit.

28 Opposing his submission, the Solicitor General and Ms Dawra stated that no revised projections have been received from GNCTD till date. The Solicitor General has also sought to highlight that the government of GNCTD has failed to offtake the allocated quantity of oxygen from the supply point.

29 Having heard the submissions of both counsels on the issues pertaining to supply of oxygen to GNCTD, we note that the Central Government (on page 63)

[18] "**GNCTD**"

in its affidavit dated 23 April 2021 has admitted that the projected demand for GNCTD as of 20 April 2021 had increased by 133% from 300 MT/day to 700 MT/day. According to the figures of allocation given in the affidavit dated 23 April 2021 and the presentation given by Ms Dawra, the existing allocation of GNCTD remains at 490 MT/day. This situation must be remedied forthwith. The situation on the ground in Delhi is heart rending. Recriminations between the Central Government (which contends that GNCTD has not lifted its allocated quantity) and GNCTD (which contends that despite its projected demand the quantity allocated has not been enhanced) can furnish no solace to citizens whose lives depend on a thin thread of oxygen being available. On the intervention of the Court during the hearing, the Solicitor General states that he has instructions to the effect that GNCTD's demand of medical oxygen will be met and that the national capital will not suffer due to lack of oxygen. We issue a peremptory direction in those terms. In the battle of shifting responsibility of supplying/off-taking of oxygen, lives of citizens cannot be put in jeopardy. The protection of the lives of citizens is paramount in times of a national crisis and the responsibility falls on both the Central Government and the GNCTD to cooperate with each other to ensure that all possible measures are taken to resolve the situation. Learned Senior Counsel for GNCTD has assured the court after taking instructions at the 'highest' level that the issue will be resolved completely in a spirit of co-operation. During the course of the hearing, the Solicitor General has assured that henceforth he will ensure that the deficit of oxygen is rectified and supply is made to the GNCTD according to their projected demand (which may be revised in the future) on a day by day basis. We accept his submission and

direct compliance within 2 days from the date of the hearing, that is, on or before midnight of 3 May 2021.

30 With regard to the issue of the supply and availability of medical oxygen for the entire country, we have noted that efforts are being made to augment the availability of oxygen. While the Central and State Governments are in the process of managing the supply of oxygen, at the same time, it is critical that a buffer emergency stock of oxygen is created so that in the event that the supply chain is disrupted to any one or more hospitals in an area for any reason, the buffer or emergency stocks can be used to avoid loss of human lives. These emergency stocks must be so distributed so as to be easily accessible without delay in every local area. We have also seen the situation that has developed in the last 24 hours in Delhi where patients, including among them medical professionals, died because of the disruption of supplies and the time lag in the arrival of tankers. This deficit shall be rectified immediately by the Central Government by creating buffer stocks and collaborating with the States through the virtual control room on a 24 by 7 basis. In view of the deaths which are being caused daily by the disruption of supplies, this direction is more crucial than ever. We therefore, direct the Central Government in collaboration with the States to prepare a buffer stock of oxygen to be used for emergency purposes to ensure supply lines continue to function even in unforeseen circumstances. The location of the emergency stocks shall be decentralised so as to be immediately available if the normal supply chain is disrupted to any hospital for any reason. The emergency stocks shall be created within the next four days. The replenishment of the emergency stocks will also be monitored on a real time basis through the

virtual control room in active consultation with each state/UT. This is in addition to the day to day allocations.

31 In addition to the above, we direct the Central Government to consider the following suggestions, which may assist in increasing the availability of oxygen and ensure transparency of demand-supply management, and provide a clarification to this Court:

(i) We understand that the Virtual Central Control Room of the Central Government displays the allocation of supply of oxygen by the Central Government to each State/UT. By extension of this, a mechanism for displaying real time updates of supply of oxygen from each State to hospitals in each district, along with the remaining stock of oxygen with the hospitals may be maintained and shared with the citizens to ensure transparency. This will also ensure that citizens can easily identify the hospitals where medical aid can be availed;

(ii) The government shall clarify the steps being taken on planning on the use of oxygen concentrators to reduce the demand of LMO, such that LMO is needed only for critical patients. A comprehensive plan on augmenting the production/import of these oxygen concentrators may be considered;

(iii) The expected supply of oxygen/containers to be received from outside India should be suitably augmented to cater to anticipated increases in the demand and shortfall of domestic availability. Pending the early finalization of the global tender a decision may be taken on the need to continue imports to bridge the gap in availability; and

(iv) A review shall be made of any restrictions on inter-State travel of trucks or tankers carrying oxygen/other medical aid equipment (such as GST related issues, documentation) which might cause a hindrance in their movement.

The Central Government may consider implementing a system to track and map the supply tankers which would allow better management of resources and allow diversion of resources from one State to the other in case of emergencies.

E Vaccines

32 The previous order of this Court dated 27 April 2021 directed the Central Government to clarify, *inter alia*: (i) the projected availability of vaccines and proposed steps to boost supply and distribution; and (ii) the vaccine pricing and distribution *among* states. Upon perusing the affidavits filed by the Central Government and after having the benefit of oral arguments of the Solicitor General, we have arrived at the following understanding on the two broad issues outlined above. We would once again re-iterate that we do not attempt to delve into the role of the executive in designing policy choices. We are merely seeking to enter into a dialogue with the relevant stakeholders in order to ensure probity and transparency of the measures underway. We are cognizant that it is ultimately up to the executive to frame and implement policies that it deems appropriate, with the topmost regard to public interest.

E.1 Vaccine capacity and disbursal

33 The Central Government has apprised us of its constitution of a National Expert Group on Vaccine Administration for COVID-19[19] on 7 August 2020 and operationalization of the immunization programme from December 2020. It was further stated that as of 26 April 2021, over 13.5 crore vaccine doses (approx. 9% of the Indian population) have been administered to Frontline Workers, Healthcare Workers and persons who are 45 years of age and higher in the 3 Phases of immunization. It was submitted that these vaccines have been

[19] "**NEGVAC**"

centrally procured and administered free of cost to the abovementioned groups who were identified based on specific vulnerabilities and a higher mortality rate on account of the COVID-19 infection.

34 On 20 April 2021, the Central Government rolled out a revised strategy of COVID-19 vaccination for all persons over 18 years of age, with effect from 1 May 2021. This new age group consists of approximately 59 crore people, which would require 122 crore vaccine doses under the current two-dose vaccine regime of Covishield and Covaxin which have been authorized for emergency use in India. This revised strategy enables vaccine procurement by State Governments and private hospitals, purportedly for accelerating the immunization programme which is critical to curb the pandemic. In response to the query of this Court on the necessity of the revised strategy, the Central Government furnished the following justification:

> "During the ongoing consultation with the states, demands/concerns were raised by the various State Governments to expand the scope of vaccination drive to include the beneficiaries beyond the priority groups identified by NEGVAC as approved by Central Government. As a matter of co-operative federalism, it was felt necessary to allow play in the joints and to de-centralize vaccine procurement and to enable the States to expand vaccination drives to other groups between the age of 18-44 years. However, **since the priority group as identified by Union of India (which had more vulnerability) was not fully vaccinated, it was considered imperative to carry out two drives separately i.e. in a decentralized manner to achieve higher efficiency and reach. Thus the States were given a participatory role to undertake the procurement of vaccine and for vaccination of any other 'groups identified drive' for the 18-44 age group. This would also keep the existing drive of critical groups unobstructed as the 50 percent of the vaccines procured through the GoI channel would continue to support and provide free of cost vaccine to the most vulnerable age groups of 45 years plus in the country health care workers and frontline worker**

> **identified by the Union of India who were entitled to get vaccinated under Phase II."**
>
> **(emphasis supplied)**

35 In response to the queries of the Court on how the supplies of vaccines will be allocated between various states if each State Government is to negotiate with vaccine producers, the Central Government has furnished the following justification in order to iron out the inequities between States:

> "**For the remaining 50% non-government of India channel, the states and the private hospitals are free to procure vaccine for 18-44 years population, however, to have an equitable distribution of vaccine across the country, states have been allocated the available vaccine quantity in proportion to the population between 18-44 years of age of the respective state so as to ensure equitable distribution of vaccine as there is a possibility of some states having better bargaining power due to geographical advantage etc.**"
>
> **(emphasis supplied)**

36 During the course of the hearing, this Court has expressed its reservations *prima facie* on the validity of the revised policy under which the states and private hospitals are to procure 50% of the vaccines in order to immunize persons in the 18-44 years age group. For one thing, even this age group would consist of persons who suffer from vulnerabilities. Once the vaccination programme has been opened up for persons other than the 45 plus age group, it would not be logical to impose the obligation to source vaccinations for the 18-44 age group on the State Governments. This will, *inter alia*, leave each State Government to negotiate supply schedules, delivery points and other logistical arrangements with the manufacturers. At present, there are only two manufacturers for the authorized vaccines (with one other vaccine - Sputnik V, in the process of

manufacture). The available stock of vaccines is not adequate to deal with the requirements of both the categories. The Central Government must take the responsibility of providing guidance to every State on the quantities to be supplied to each State, the vaccine(s) being allocated, the period of delivery, and the number of persons who can be covered for vaccination, among other details. Leaving the State Governments to negotiate directly with manufacturers will produce chaos and uncertainty. The object of vaccinating the 18-44 age group cannot be achieved in the absence of stocks being available.

37 Besides the above issues, the Central Government is directed to clarify the following issues in order to ensure the protection of the fundamental rights to equality and to life and personal liberty for all persons who will be eligible to take the vaccine from 1 May 2021:

(i) Whether the Central and State Governments have introduced any initiatives for ensuring the immunization of persons who do not have access to digital resources as otherwise the mandatory requirement of registration over the Co-WIN digital portal for persons in the age group of 18-44 years will deprive a large class of citizens of vaccination;

(ii) Since the Central Government commits to vaccinating persons over 45 years, free of cost, in view of their vulnerability, whether walk-in facilities for vaccination will continue for these persons after 1 May 2021;

(iii) Whether the Central or State Governments propose to undertake targeted vaccination drives for persons who are providing on-ground assistance during the second wave of the pandemic - such as crematorium workers,

who were not considered as Frontline or Healthcare workers for Phase 1 of the vaccination drive;

(iv) Whether, and if so what, steps being undertaken by INYAS, the nation-wide mass awareness campaign for COVID-19 vaccination, for ensuring outreach in rural areas and socio-economically underprivileged sections of society including the possibility of using mobile vans, vehicles and railways to vaccinate such people as well as those living in remote areas, near their doorsteps so as to minimize their travel and potential infection with COVID-2019. Efforts must also be made that a lack of an identity proof does not create a hindrance in the process of immunization of all individuals, specifically, the underprivileged;

(v) Whether the Central government will revisit its policy by procuring 100% of the doses which can then be equitably disbursed to the State Governments; and

(vi) Since the vaccine administration is now to be a shared responsibility of the Union and the States, the Central Government and the State Governments shall provide- (a) a breakup of the current and projected availability of vaccine stocks for the next 6 months; and (b) a timeline for achieving immunization of the newly eligible 59 crore persons who are aged between 18-44 years.

These issues are of vital importance, since vaccination appears to be one of the most important strategies to combat further spread of the pandemic, and would also provide a measure of security and assure the people about their health and well-being.

E.2 Vaccine pricing

38 Since the advent of the revised rollout strategy with effect from 1 May 2021, only persons aged 45 years and above are guaranteed a free vaccine. The reason of higher efficiency and speed has been furnished as a justification for enabling State Governments and private hospitals to directly procure vaccines. We have come to understand that a few State Governments have committed to free immunization under the revised strategy. On specific enquiry on the rationale in regard to the differential pricing for procurement by the Central Government and the State Governments, the Central Government has furnished the following justification:

> "**It is submitted that liberty to decide prices on arm's length basis by and between the State Government and hospitals is based on the concept of creating an incentivized demand for the private vaccine manufacturers in order to instill a competitive market resulting in increased production of vaccines and market driven affordable prices for the same**. Simultaneously, the free vaccination by the Central Government for above referred priority age groups would continue and it is always open for each State Government either to offer free vaccination or subsidise it for the additional identified earmarked priority group identified by the State Governments [age 18-44 years].
>
> 63. The new strategy was devised after multiple Inter-Ministerial teams were deputed by Govt. of India to various manufacturing sites to understand their requirement and to provide pro-active and customized support to significantly augment vaccine production capacities [which is the prime priority of the Central Government at this juncture], in the form of advance payments, facilitating more sites for production etc. **This approach, on the one hand, incentivizes vaccine manufacturers to rapidly scale up their production and on the other hand, it would also attract new vaccine manufacturers. It would make pricing, procurement and administration of vaccines more flexible and competitive and would further ensure augmented vaccine production as well as wider availability of vaccines in the countr**y."
>
> (**emphasis supplied**)

39 *Prima facie*, there are several aspects of the vaccine pricing policy adopted by the Central government which require that policy be revisited. All vaccines, whether in the quantity of 50% purchased by the Central Government or the remaining 50%, are to be used for vaccinating citizens. The end use is the same. The Central Government proposes to purchase half of the total quantity falling within its fifty per cent quota while for the rest, the manufacturers would declare in advance the price to be fixed, allowing the State Governments to negotiate their terms. As of date, the manufacturers have suggested two different prices, a lower price which is applicable to the Central Government and a higher price which is applicable to the quantities purchased by the State Governments. It is likely that compelling the State Governments to negotiate with manufacturers on the ground of promoting competition and making it attractive for new vaccine manufactures will result in a serious detriment to those in the age group of 18 to 44 years, who will be vaccinated by the State Governments. The social strata of this age group also comprises persons who are *Bahujans* or belong to other under privileged and marginalized groups, like many in the other population age groups. They may not have the ability to pay. Whether or not essential vaccines will be made available to them will depend upon the decision of each State Government, based on its own finances, on whether or not the vaccine should be made available free or should be subsidized and if so, to what extent. This will create disparity across the nation. The vaccinations being provided to citizens constitute a valuable public good. Discrimination cannot be made between different classes of citizens who are similarly circumstanced on the ground that while the Central government will carry the burden of providing free vaccines for the 45 years and

above population, the State Governments will discharge the responsibility of the 18 to 44 age group on such commercial terms as they may negotiate. *Prima facie*, the rational method of proceeding in a manner consistent with the right to life (which includes the right to health) under Article 21 would be for the Central Government to procure all vaccines and to negotiate the price with vaccine manufacturers. Once quantities are allocated by it to each State Government, the latter would lift the allocated quantities and carry out the distribution. In other words, while procurement would be centralized, distribution of the vaccines across India within the States/UTs would be decentralized. While we are not passing a conclusive determination on the constitutionality of the current policy, the manner in which the current policy has been framed would *prima facie* result in a detriment to the right to public health which is an integral element of Article 21 of the Constitution. Therefore, we believe that the Central Government should consider revisiting its current vaccine policy to ensure that it withstands the scrutiny of Articles 14 and Article 21 of the Constitution.

40 In light of the justification offered for non-interference in the prices that are set by the manufacturers, irrespective of their variance from the prices for procurement of the Central Government, we would like to seek the following clarifications:

(i) Whether any other alternatives were considered by the Central Government for ramping up the immunization drive in India, particularly in light of its initial strategy of a centralized free immunization drive;

(ii) The methodology which the Central Government was envisaging to procure adequate vaccine doses for the population prior to the revised strategy which was announced amidst the second wave of COVID-19; and

(iii) Whether any studies and figures were relied upon in order to arrive at the conclusion that decentralized procurement would spur competitive markets to incentivize production and eventually drive down the prices of the vaccines. Whether these studies are of relevance in a pandemic when vaccines are a scarce and essential commodity which is being produced by a limited number of manufacturers for a limited number of vaccines.

41 The Central Government has submitted that the Finance Ministry has sanctioned a credit of Rs 3000 crores for Covishield manufacturer - Serum Institute of India[20] and Rs 1500 crores to Covaxin manufacturer - Bharat Biotech. Additionally, another Rs 65 crores is stated to have been provided to Bharat Biotech's production center at Bangalore. In bolstering its argument for augmentation of vaccine production, the Central Government has provided the Court with further information on advance funding (of unspecified amounts) that is being provided to R&D and manufacturing facilities. In light of this investment, the Central Government should consider revisiting its policy bearing in mind what has been stated above, the following issues and other relevant information:

[20] "**SII**"

(i) Whether, and if so, the Finance Ministry or any other funding organization of the Government of India have made any grants/sanctions to Bharat Biotech and the SII in the past, like the current infusion of Rs 1500 crores and Rs 3000 crores, respectively. If so, breakup and corelation with the total cost of development and production of the two vaccines;

(ii) Whether the current procurement prices for the Central Government account for infusion of funds for production, infrastructure and other aid provided by it. If so, the basis on which the same benefit is denied to procurement by State Governments which equally service the needs of citizens; and

(iii) The full extent of direct and indirect grant/aid provided for research, development and manufacture of all existing vaccines and future vaccines that it proposes to authorize. For instance, the Central Government has submitted in its affidavit that the Department of Biotechnology has facilitated the trials for Sputnik V.

F Potentiality of Compulsory Licensing for vaccines and essential drugs

42 Several drugs that are at the core of the COVID treatment protocol are under patents in India including Remdesivir, Tociluzumab and Favipiravir. On 2 October 2020, a communication was issued by the UOI, along with South Africa, to the Council for Trade-Related Aspects of Intellectual Property which stated that there were several reports about intellectual property rights hindering timely

provisioning of affordable medical products to patients[21]. The communication also reported that some members of the World Trade Organization had carried out urgent amendments to their national patent laws to expedite the process of issuing compulsory/government use licenses.

43 In India, the patent regime is governed by the Patents Act, 1970[22], Section 92 of which envisages the grant of a compulsory license, *inter alia*, in circumstances of national emergency and extreme urgency. Once a declaration of national emergency is made, and the relevant patents notified, any person interested in manufacturing the drug can make an application to the Controller General of Patents who can then issue a compulsory license. The patentee would be paid a reasonable royalty as fixed by the Controller General of Patents. Further, under Section 100 of the Patents Act, the Central Government can authorize certain companies to use any patents for the "purpose of the government". Indian companies can begin manufacturing the drugs while negotiating the royalties with the patentees. If the Central Government or its authorized company is not able to reach an agreement with the patentee, the High Court has to fix the reasonable royalty that is to be paid to the patentee. Another alternative is for the Central Government to acquire the patents under Section 102 from the patentees. If the Central Government and the patentee is not able to reach a consensus on the price of the patents, it is up to the High Court to fix the royalty. Additionally, under Section 66 of the Patents Act, the Central Government is also entitled to revoke a patent in the public interest.

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[21] Council for Trade-Related Aspects of Intellectual Property Rights, Waiver From Certain Provisions Of The Trips Agreement For The Prevention, Containment And Treatment Of Covid-19, Communication From India And South Africa, IP/C/W/669, 2nd October, 2020, *available at* https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/IP/C/W669.pdf&Open=True

[22] "**Patents Act**"

44 The utilization of these flexibilities has also been detailed in the Trade Related Aspects of Intellectual Property Rights Agreement[23]. Even as TRIPS obliges countries to ensure a minimum level of patent protection, it creates a permissive regime for the carving out of exceptions and limitations that further public health objectives[24]. This is evident from a conjoint reading of Articles 7, 8, 30 and 31 of TRIPS. Article 7 outlines the objectives of the TRIPS as being to ensure the effective enforcement of intellectual property in a way that, *inter alia*, is 'conducive to social and economic welfare'. Article 8 gives member countries the freedom to take measures that protect public health and nutrition. Article 8(2) allows for the taking of TRIPS-compatible measures aimed at preventing the abuse of intellectual property rights. Articles 30 and 31 deal with exceptions to the rights of patent owners, by allowing grant of compulsory licenses. It leaves countries with significant breathing space to determine how the compulsory licensing or government-use levers can be triggered. While such determinations must be made on the individual merits of each case[25], the aforesaid caveat does not apply when the compulsory license grant is for national emergency, extreme urgency or public non-commercial use[26].

45 According to the 2001 Doha Declaration, TRIPS should be interpreted in a manner supportive of the right of members to protect public health and to promote access to medicines[27]. It recognizes the right of WTO members to use the full extent of the TRIPS flexibilities to secure this objective. Para 5(b) of the Doha

[23] "**TRIPS**"
[24] Report of the United Nations Secretary-General's High-Level Panel on Access to Medicines Promoting Innovation and Access to Health Technologies, (United Nations Secretary-General, 2016), p. 16.
[25] TRIPS Agreement, Article 31(a).
[26] TRIPS Agreement, Article 31(b).
[27] World Trade Organization, 'Ministerial Declaration of 14 November 2001' (November 2001) WT/MIN(01)/DEC/1, 41 ILM 746, para 4.

Declaration provides the freedom to each member to grant compulsory licenses and to determine the grounds on which the licenses are granted. Para 5(c) leaves it up to each nation to determine what constitutes a national emergency or extreme urgency. In the context of the COVID-19 pandemic, we note that several countries such as Canada and Germany have relaxed the legal regimes governing the grant of compulsory licenses[28].

46 Whether and if so, the extent to which these provisions should be utilized is a policy decision for the Central Government. We have flagged the issue for its consideration. We have only outlined the legal framework within which the Central Government can possibly consider compulsory licensing and government acquisition of patents. The Central Government is free to choose any other course of action that it deems fit to tackle the issue of vaccine requirements in an equitable and expedient manner, which may involve negotiations with domestic and foreign producers of vaccines. We clarify that it is up to the Central

[28] 'COVID-19 IP Policy Tracker' (WIPO, 16 July 2020), *available at* https://www.wipo.int/covid19-policy-tracker/#/covid19-policy-tracker/access.

Government to choose the best possible measures it can undertake during the current crisis keeping in mind that public interest is of paramount importance.

G Supply of Essential Drugs

G.1 Submissions in the Central Government's Affidavits

47 In relation to the broad issue of "Supply of Essentials", in its affidavit dated 23 April 2021 and additional affidavit 29 April 2021, with respect to Remdesivir, the UOI urged that:

(i) Remdesivir is a patented drug which is being manufactured in India under licensing agreements between the patent holder, M/s Gilead, a US based company and seven Indian companies. Under such agreements, these Indian companies are allowed to manufacture Remdesivir for distribution;

(ii) In its affidavit dated 23 April 2021, it was submitted on behalf of the Central Government that the current production is about 74 lakhs vials per month and once the additional manufacturing sites of the seven manufacturers become operational by May 2021, the production capacity will increase to 90 lakhs vials per month. In its additional affidavit dated 29 April 2021, the Central Government has submitted that as on 23 April 2021, the production capacity has increased to 1.03 crore vials per month;

(iii) The Central Government allocated 11 lakhs vials of Remdesivir to nineteen States with a high case load between 21 to 30 April through a letter issued on 21 April 2021. This allocation was revised and expanded to all States and UTs through a letter issued on 24 April 2021;

(iv) The Central Government has directed the States to appoint nodal officers to ensure unrestricted and timely movement of Remdesivir. A control room has been set up in this regard by the National Pharmaceutical Pricing Authority[29] which is monitoring supplies as allocated. A helpline has been set up by NPPA and manufacturers have been directed to address the hindrances in the movement of the drug. A WhatsApp group with nodal officers has also been created to enable coordination and officials of MHA, NPPA and CDSCO are also part of the group;

(v) Remdesivir, its Active Pharma Ingredients[30] and formulations have been placed under export ban since 11 April 2021;

(vi) The Ministry of Finance has issued a notification on 20 April 2021 exempting customs duty on the Remdesivir injection, and API of Remdesivir and Betacyclodexterin, which are used in the manufacture of the injection. All the SEZ/EOU manufacturing units of M/s Mylan and M/s Honous Lab, who are manufacturing Remdesivir on behalf of some of the seven manufacturers have also been directed to start manufacturing Remdesivir for domestic supply;

(vii) CDSCO has directed all State Drug Controllers on 10 April 2021 to conduct a special investigation drive to prevent hoarding and black-marketing of Remdesivir in the country. DCGI and State Drug Controllers have been taking stringent action against such activities and enforcement action has been taken in thirty-four cases across the country;

[29] "**NPPA**"
[30] "**API**"

(viii) MHA has issued an advisory on 22 April 2021 to States and Union Territories to facilitate smooth movement of supplies. A "Covid Drug Management Cell" consisting of the Department's Senior Officers and others has been constituted on 26 April 2021 to oversee and identify common concerns raised by States in relation to Remdesivir;

(ix) NPPA has revised the maximum retail price of a 100 mg/vial of Remdesivir to Rs 3500; and

(x) The Central Government is also looking at the possibility of importing Remdesivir.

48 The UOI made the following submissions on the availability of Tociluzumab injections:

(i) Tociluzumab is manufactured by a Swiss Company, M/s Roche, which does not have any manufacturing facility in India or any agreements with domestic pharma companies to manufacture the drug. It is imported in the country by Cipla. India is completely dependent on imports;

(ii) It is listed as an investigational therapy drug (off-label) under the National Clinical Management Protocol for COVID-19 for severe cases. There are domestically produced alternatives which are equivalent to or better than Tociluzumab such as itulizumab, dexamethasone and methyl prednisolone. However, an incorrect public perception has been created that only Tociluzumab can treat the inflammatory burst condition in COVID-19 patients since it is an imported drug. This has led to the acute shortage in the availability of the drug and has created public panic; and

(iii) The supply of Tociluzumab is being monitored by NPPA and CDSCO.

49 The UOI has made the following submissions on the availability of other drugs:

(i) The National Clinical Management Protocol for COVID-19 does not include Favipirarvir (popularly known as Fabiflu) due to insufficient peer reviewed evidence to substantiate its use in mild to moderate cases of COVID-19. However, it is being prescribed by certain doctors. The clinical management protocol is a dynamic document which is reviewed periodically and is subject to further evaluation based on medical research and evidence that comes up in future; and

(ii) On 24 April 2021, Department of Pharmaceuticals[31], NPPA and DCGI had reviewed the production and supply of other drugs such as Favipiravir, Enoxaparin, Ivermectin, Methylprednisolone, Paracetamol and Hydroxy-chloroquine. A meeting was conducted on 25 April 2021 by NPPA and DCGI with manufacturers to review stock position, availability and production plans.

G.2 Recommendations

50 In respect of the essential drugs, this Court has been informed that the Central Government is taking steps to augment the production of Remdesivir. It has been brought to our notice that seven Indian companies are manufacturing this drug under a licensing agreement with a US based company, M/s Gilead. The current production capacity as on 23 April 2021 is noted to be at 1.03 crores vials per month. The Central Government should provide us with the details of the actual rate of production and a breakup of demand for the drug from different

[31] "**DoP**"

States. Further, while it has been submitted on behalf of the Central Government that it is allocating the stocks based on a rational criterion of equitable distribution keeping in mind the existing constraints on the availability of the drug, this Court should be provided with details of the methodology used for such allocation.

51 We have been informed by the Central Government in its affidavit that NPPA has revised the maximum retail price of Remdesivir to Rs 3500. However, it has come to our notice that several other drugs which are being prescribed by doctors for treating COVID-19 patients like Favipiravir, Tociluzumab, Enoxaparin, Ivermectin, Methylprednisolone, Paracetamol and Hydroxy-chloroquine are being priced at exorbitant rates creating issues of access and affordability. While this is not a direction of this Court, the Central Government can consider invoking its statutory powers under paragraphs 19 and 20 of the Drugs Price Control Order, 2013. Under paragraph 19[32] of the Drugs Price Control Order, 2013 the Government in extraordinary circumstances, if it considers necessary in public interest, can fix a ceiling price or retail price of the drug for a certain period. COVID-19 is a crisis of an unprecedented nature and qualifies as an extraordinary circumstance. It will be in public interest to ensure that the price of essential drugs is fixed in such a manner that it is available even to the most marginalized sections of the society. The Government can even monitor the prices of the drugs under paragraph 20[33] of the Drugs Price Control Order, 2013

[32] "19: Fixation of the Ceiling Price Under Certain Circumstances: Notwithstanding anything contained in this order, the Government may, in case of extraordinary circumstances, if it considers necessary to do so in public interest, fix the ceiling price or retail price of any drug, as it may deem fit and where the ceiling price or retail price of the drug is already fixed and notified, the Government may allow an increase or decrease in the ceiling price or the retail price, as the case may be, irrespective of annual wholesale price index of that year."
[33] "20: Monitoring the Prices of Non-Scheduled Formulations: (1) the Government shall monitor the maximum retail prices (MRP) of all the drugs, including the non-scheduled formulations and ensure that no manufacturer increases the maximum retail price of a drug more than ten percent of maximum retail price during preceding twelve months and where the increase is beyond ten percent of maximum retail price, it shall reduce the same to

and ensure that no manufacturer increases the prices of the drugs by more than 10% of the maximum retail price during the preceding 12 months and where the increase is beyond 10% of the maximum retail price, it can oblige the manufacturer to reduce it to the level of 10% for the next 12 months.

52 The Central Government has submitted that it plans to import Remdesivir. It can also consider importing other essential drugs to meet the immediate demand of the drug while the production is ramped up. We hasten to clarify that this does not constitute a direction of this Court and ultimately this decision falls under the domain of the executive.

53 We note that there are certain medicines which are being prescribed by doctors which are not mentioned in the National Clinical Management Protocol for COVID-19 like Favipiravir. However, since these medicines are being prescribed by doctors, people are facing significant inconvenience in obtaining them due to their shortage in certain parts of the country. The Central Government should consider whether the production of such medicines should be augmented to meet the demand or instructions should be given to the doctors to not recommend such medicines unless they have been included in the national protocol.

54 It has been submitted on behalf of the Central Government that on 24 April 2021, DoP, NPPA and DGCI reviewed the production and supply of drugs such as Favipiravir, Enoxaparin, Ivermectin, Methylprednisolone, Paracetamol and Hydroxy-chloroquine. The supply of Remdesivir and Tociluzumab is already under the consideration of the Central Government. A meeting was also held on

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the level of ten percent of maximum retail price for next twelve months. (2) The manufacturer shall be liable to deposit the overcharged amount along with interest thereon from the date of the increase in price in addition to the penalty."

25 April 2021 by DoP, NPPA and DGCI with the manufacturers to review stock position, availability and production plans. The Central Government should provide details of estimated demand of essential drugs mentioned above, production capacity, existing stocks, details of allocation and supply of such drugs.

55 As discussed in **Section F**, the Central Government can also consider using its powers under Sections 92, 100 or 102 of the Patents Act to increase production of essential drugs to ensure that it is commensurate to the demand. The Central Government's affidavit testifies to existence of capacity of public sector organizations and institutes, which can assist in augmenting production of various drugs and formulations. The utilization of these capabilities to augment production, once licensing is resorted to, will be in the interests of the general public. This Court is further of the opinion that *prima facie* the present circumstance warrant the government's examination of its the extraordinary powers, meant to be used in extreme situations, such as the current pandemic, for fixing drug prices, be it vaccines, or patented formulations, having regard to the provisions of the Drugs and Cosmetics Act, 1940 and other provisions[34]. We are cognizant that invocation of the above provisions, if any, is ultimately a policy decision of the Central Government and may encompass negotiations with the concerned stakeholders. We hope that the Central Government will adopt a route that best serves the public interest.

[34] Paragraph 3 and 19 of the Drugs Price Control Order, 2013

G.3 Black Marketing

56 This Court would like to take judicial notice of the fact that several critical drugs, used to treat COVID-19, such as Remdesivir and Tocilizumab, are being sold at significantly inflated prices or in fake form. This is a condemnable attempt to exploit people's misery and profit from their helplessness.

57 In order to clamp down on this practice, the Central Government can consider constituting a special team to identify and prosecute those who: (a) sell medical grade oxygen/COVID-19 medicines at exorbitant prices; and (b) sell fake substances and recover the concerned substances. A protocol for ambulances must also be evolved to avoid citizens being exploited by extracting unconscionable charges. The Central Government can consider creating a platform for easy reporting and redressal of such cases.

H Recommendations for augmenting healthcare workforce

58 It is common knowledge that a large number of medical, nursing and pharmacy students, who graduated in 2020 and would be in the process of graduating in 2021, would be available to augment the workforce in the health sector. The Central Government should, we feel, look into this aspect, and ensure the optimal manner of utilization of their services, regard being had, of course, to their safety and well-being.

59 The Central Government should also consider using health care workforce available with the armed forces and para military forces for the purpose of vaccination.

I Epilogue

60 The World Health Organisation[35], while discussing the rapid spread of COVID-19 has not only labelled it an epidemic but also an "infodemic", due to the overabundance of information on the internet, which was riddled with misinformation and disinformation[36]. This highlights the key role internet and technology currently has in all our lives, as the COVID-19 pandemic rages on. Indeed, the WHO recently also conducted a study to understand how individuals between the ages of 18-40 years dealt with the ongoing pandemic using social media[37].

61 It is only appropriate then that when many cities in India are suffering through the second wave of the COVID-19 pandemic, many have turned to the internet, using applications/websites to find critical support. On these platforms, online communities led by members of the civil society and other individuals, have assisted the needy in multiple ways – often by helping them procure oxygen, essential drugs or find a hospital bed through their own networks or by amplifying original requests, and even by offering moral and emotional support. However, it is with deep distress that we note that individuals seeking help on such platforms have been targeted, by alleging that the information posted by them is false and has only been posted in social media to create panic, defame the administration or damage the "national image". We do not hesitate in saying that such targeting

[35] "**WHO**"
[36] "Managing the COVID-19 infodemic: Promoting healthy behaviours and mitigating the harm from misinformation and disinformation - Joint statement by WHO, UN, UNICEF, UNDP, UNESCO, UNAIDS, ITU, UN Global Pulse, and IFRC" (*WHO*, 23 September 2020) available at <https://www.who.int/news/item/23-09-2020-managing-the-covid-19-infodemic-promoting-healthy-behaviours-and-mitigating-the-harm-from-misinformation-and-disinformation>
[37] "Social media & COVID-19: A global study of digital crisis interaction among Gen Z and Millennials" (*WHO*, 23 September 2020) available at <https://www.who.int/news-room/feature-stories/detail/social-media-covid-19-a-global-study-of-digital-crisis-interaction-among-gen-z-and-millennials>

shall not be condoned, and the Central Government and State Governments should ensure that they immediately cease any direct or indirect threats of prosecution and arrest to citizens who air grievances or those that are attempting to help fellow citizens receive medical aid. If this does keep happening even after the current order, this Court shall be constrained to use the powers available to it under it contempt jurisdiction. We also direct that all Directors General of Police shall ensure compliance down the ranks of the police forces within their jurisdictions.

62 In these trying times, those desperately seeking help for their loved ones on these platforms should not have their misery compounded through the actions of the State and its instrumentalities. Further, there are two more crucial reasons why such a clampdown on information sharing must be absolutely stopped immediately.

63 The first reason is because sharing information widely is in itself an important tool in combating public tragedies, like the current COVID-19 pandemic. In **K.S. Puttaswamy (Privacy-9J.)** vs **Union of India**[38], one of us (DY Chandrachud, J) speaking for four Judges of a nine-Judge bench of this Court noted academic literature documenting the widespread availability of information and the resultant acknowledgement of the problem is what prevented the drought in Maharashtra in 1973 from becoming as bad as the Bengal Famine of 1943, where the British tried to deny the problem even existed. It was noted thus:

> "267. Civil and political rights and socio-economic rights do not exist in a state of antagonism. The conditions necessary for realising or fulfilling socio-economic rights do not postulate

[38] (2017) 10 SCC 1

the subversion of political freedom. The reason for this is simple. Socio-economic entitlements must yield true benefits to those for whom they are intended. This can be achieved by eliminating rent-seeking behaviour and by preventing the capture of social welfare benefits by persons who are not entitled to them. Capture of social welfare benefits can be obviated only when political systems are transparent and when there is a free flow of information. Opacity enures to the benefit of those who monopolise scarce economic resources. **On the other hand, conditions where civil and political freedoms flourish ensure that governmental policies are subjected to critique and assessment. It is this scrutiny which subserves the purpose of ensuring that socio-economic benefits actually permeate to the underprivileged for whom they are meant. Conditions of freedom and a vibrant assertion of civil and political rights promote a constant review of the justness of socio-economic programmes and of their effectiveness in addressing deprivation and want. Scrutiny of public affairs is founded upon the existence of freedom. Hence civil and political rights and socio-economic rights are complementary and not mutually exclusive.**

268. Some of these themes have been addressed in the writings of the Nobel laureate, Amartya Sen. Sen compares the response of many non-democratic regimes in critical situations such as famine with the responses of democratic societies in similar situations. [Amartya Sen, Development as Freedom (Oxford University Press, 2000) at pp. 178-79.]…

269. In the Indian context, Sen points out that the Bengal famine of 1943 “was made viable not only by the lack of democracy in colonial India but also by severe restrictions on reporting and criticism imposed on the Indian press, and the voluntary practice of “silence” on the famine that the British-owned media chose to follow” [Amartya Sen, The Idea of Justice (Penguin Books, 2009) at p. 339.] . Political liberties and democratic rights are hence regarded as “constituent components” of development. [Id, at p. 347] In contrast during the drought which took place in Maharashtra in 1973, food production failed drastically and the per capita food output was half of that in sub-Saharan Africa. Yet there was no famine in Maharashtra where five million people were employed in rapidly organised public projects while there were substantial famines in sub-Saharan Africa. This establishes what he terms as “the protective role of democracy”. Sen has analysed the issue succinctly:

“The causal connection between democracy and the non-occurrence of famines is not hard to seek. Famines kill millions of people in different countries in the world, but they

> don't kill the rulers. The kings and the presidents, the bureaucrats and the bosses, the military leaders and the commanders never are famine victims. And if there are no elections, no opposition parties, no scope for uncensored public criticism, then those in authority don't have to suffer the political consequences of their failure to prevent famines. Democracy, on the other hand, would spread the penalty of famines to the ruling groups and political leaders as well. This gives them the political incentive to try to prevent any threatening famine, and since famines are in fact easy to prevent (the economic argument clicks into the political one at this stage), the approaching famines are firmly prevented." [Amartya Sen, Development as Freedom (Oxford University Press, 2000) at p. 180.]..""
>
> **(emphasis supplied)**

As such, preventing clampdowns on sharing of information on online platforms is not just in the interest of individuals sharing the information, but the larger democratic structures of our nation. Without the ready availability of such information, it is entirely possible that the COVID-19 pandemic may turn into a tragedy worse than what it already is.

64 The second reason is because sharing information widely will help in the creation of a "collective public memory" of this pandemic. The presence of collective public memory, which refers "*to an extant and taken-for-granted group memory*"[39], is important for the creation of knowledge of the problems plaguing us today, so they may be passed on across time[40]. This is important since we do not have to travel back too much in our past to realise that the pandemic caused by the "Spanish" flu of 1918, which is said to have infected every third person in the world and killed between 50-100 million individuals (compared to the 17 million

[39] Theodore O. Prosise, 'The collective memory of the atomic bombings misrecognized as objective history: The case of the public opposition to the national air and space museum's atom bomb exhibit', (1998) 62 Western Journal of Communication 3:316-347, pg 318
[40] Bryan Hubbard and Marouf A. Hasian, 'Atomic Memories of the 'Enola Gay': Strategies of Remembrance at the National Air and Space Museum' (1998) 1 Rhetoric and Public Affairs 3:363-385, pg 364

who died in World War I), has been almost entirely erased from our collective public memory[41]. Therefore, the widespread sharing of information by individuals living through the COVID-19 pandemic becomes crucial. Furthermore, the role of Courts in creating and preserving this collective public memory cannot be understated. Professors Austin Sarat and Thomas R. Kearns, in their book *History, Memory, and the Law*, describe the function that is played by Courts in the following terms[42]:

> "Law in the modern era is, we believe, one of the most important of our society's technologies for preserving memory. Just as the use of precedent to legitimate legal decisions fixes law in a particular relation to the past, memory may be attached, or attach itself, to law and be preserved in and through law. Where this is the case, it serves as one way of orienting ourselves to the future. **As Drucilla Cornell puts it: "Legal interpretation demands that we remember the future." In that phrase, Cornell reminds us that there are, in fact, two audiences for every legal act, the audience of the present and the audience of the future. Law materializes memory in documents, transcripts, written opinions; it re-enacts the past, both intentionally and unconsciously, and it is one place where the present speaks to the future through acts of commemoration.**
>
> **Because the litigated case creates a record, courts can become archives in which that record serves as the materialization of memory. Due process guarantees an opportunity to be heard by, and an opportunity to speak to, the future. It is the guarantee that legal institutions can be turned into museums of unnecessary, unjust, undeserved pain and death. The legal hearing provides lawyers and litigants an opportunity to write and record history by creating narratives of present injustices, and to insist on memory in the face of denial.** By recording such history and constructing such narratives lawyers and litigants call on an imagined future to choose Justice over the "jurispathic" tendencies of the moment."
>
> **(emphasis supplied)**

[41] Jonathan Freedland, 'History suggests we may forget the pandemic sooner than we think' (*The Guardian*, 29 January 2021) available at <https://www.theguardian.com/commentisfree/2021/jan/29/history-forget-pandemic-spanish-flu-covid>

[42] Austin Sarat and Thomas R. Kearns, *History, Memory, and the Law* (University of Michigan Press, 2009) pgs 12-13

Hence, in the present proceedings, we hope to not only initiate a dialogue so as to better tackle the current COVID-19 pandemic but also to preserve its memory in our public records, so that future generations may evaluate our efforts and learn from them.

65 We speak not only as members of this Court, but also as grateful citizens of the country, and commend the outstanding work of our all healthcare professionals (doctors, nurses, healthcare workers, laboratory technicians, ward staff, ambulance drivers, crematorium workers etc.) during this crisis. They have truly gone beyond their call of duty and toiled day in and day out, relentlessly without rest amidst great challenges. It is absolutely necessary to take urgent steps for their well-being to ensure that our appreciation for their tremendous efforts is not reduced to rhetoric. This is especially important since another factor which affects how collective public memory of any event is created is by the rhetoric surrounding it[43]. As such, our public memory of this public event has to transcend its conception as a "war" against the virus of COVID-19 itself, but rather to remember that it is "*the complex epidemiological circumstances that promote these outbreaks and the under-resourced health systems that are tasked with disease containment*"[44]. While the healthcare professionals have been at the forefront of tackling this crisis, we have to recognize their contribution as medical healthcare professionals who have undertaken "*to protect public health using*

[43] Nicole Maurantonio, "The Politics of Memory" in Kate Kenski and Kathleen Hall Jamieson (eds), *The Oxford Handbook of Political Communication* (Oxford University Press, 2014)
[44] Luke Shors, 'Waging Another Public Health "War?"' (*Think Global Health*, 26 February 2020) available at <https://www.thinkglobalhealth.org/article/waging-another-public-health-war>

proven scientific evidence and best practices and to serve to community at large"[45], and not just as "CORONA WARRIORS".

66 We also do not hesitate to note that the treatment meted out to these public healthcare professional during this COVID-19 pandemic has sometimes been less than ideal. The following are some of the issues we wish to highlight:

(i) Recently, there were reports that the Pradhan Mantri Garib Kalyan Package Insurance Scheme, an insurance scheme of Rs 50 lakhs which had been extended to about 22 lakh healthcare professionals, was set to expire on 24 March 2021 and would not be renewed. While we are happy to note that UOI's affidavit of 23 April 2021 states that this Scheme has been extended for one year starting April 2021, we have also been informed that till date only 287 claims have been settled under it, which includes claims from the families of 168 doctors who died after contracting COVID-19 while treating patients. We direct the Central Government to inform this Court as to how many claims are pending under the Scheme, and the timeline within which the Central Government expects to settle them;

(ii) Healthcare personnel are at an obvious heightened risk of contracting the COVID-19 virus. However, we are aware of reports that indicate that infected healthcare personnel are left to fend for themselves without adequate availability of beds, oxygen or essential drugs. Further, some of them have also often been asked to report back to duty within 10 days of first testing positive for COVID-19 (provided they are asymptomatic), even

[45] Elena N. Naumova, 'The traps of calling the public health response to COVID-19 "*an unexpected war against an invisible enemy*"' (2020) Journal of Public Health Policy (2020) 41:233-237, pg 233

though a longer recuperation period is often recommended. While we are dealing with a terrible second wave of the COVID-19 pandemic, there must be an effective policy to ensure that the nation truly acknowledges their effort and creates incentives for them. We hope it will be remedied soon by the Central and State Governments through the introduction of appropriate guidelines and measures;

(iii) It is unclear what measures are currently being taken to ensure that healthcare personnel can continue to serve others while not risking the health of their family members. We hope that the respective State Governments, with necessary assistance from the Central Government, can ensure this takes place; and

(iv) The Central Government should, we feel examine and ensure that in addition to the schemes it has framed, other facilities such as availability of food, resting facilities during intervals between work, transportation facilities, non-deduction of salary or leave account, if afflicted by COVID 2019 or related infection, overtime allowance, in both public and private hospitals, and a separate helpline for doctors, and healthcare professionals, in cases of COVID 2019 related emergencies, is provided. All these, we feel, would show these professionals that we do not show our appreciation in mere words, but also care for them.

67 The issues mentioned above are only symptomatic of the other broader issues that are being faced by healthcare professionals, who are instrumental in combating the pandemic. Hence, we hope their welfare is considered seriously by the Central and State Governments. Further, we would wish to use this order to

place on record our sincerest appreciation for all the public healthcare professionals - not just limited to the doctors, but also nurses, hospital staff, ambulance drivers, sanitation workers and crematorium workers. It is through their dedicated efforts that the effect of COVID-19 pandemic is being currently tackled in India.

68 In light of the continuing surge of infections in the second wave of the pandemic, we direct the Central Government and State Governments to put on record the efforts taken to curb the spread of the virus and the measures that they plan on taking in the near future. At the same time, we would seriously urge the Central and State Governments to consider imposing a ban on mass gatherings and super spreader events. They may also consider imposing a lockdown to curb the virus in the second wave in the interest of public welfare. Having said that, we are cognizant of the socio-economic impact of a lockdown, specifically, on the marginalized communities. Thus, in case the measure of a lockdown is imposed, arrangements must be made beforehand to cater to the needs of these communities.

J Conclusion

69 The present order has primarily considered the submissions (written and oral) of the UOI. These submissions have been reproduced here as a matter of public record and to contextualize the clarifications that are being sought by our Court in order to serve its dialogic role. We reiterate, for abundant caution, that the data and submissions reproduced above are not its endorsement or acceptance. In terms of the above discussion, we hereby pass the following directions:

(i) The UOI shall ensure, in terms of the assurance of the Solicitor General, that the deficit in the supply of oxygen to the GNCTD is rectified within 2 days from the date of the hearing, that is, on or before the midnight of 3 May 2021;

(ii) The Central Government shall, in collaboration with the States, prepare a buffer stock of oxygen for emergency purposes and decentralize the location of the emergency stocks. The emergency stocks shall be created within the next four days and is to be replenished on a day to day basis, in addition to the existing allocation of oxygen supply to the States;

(iii) The Central Government and State Governments shall notify all Chief Secretaries/Directors General of Police/Commissioners of Police that any clampdown on information on social media or harassment caused to individuals seeking/delivering help on any platform will attract a coercive exercise of jurisdiction by this Court. The Registrar (Judicial) is also directed to place a copy of this order before all District Magistrates in the country;

(iv) The Central Government shall, within two weeks, formulate a national policy on admissions to hospitals which shall be followed by all State Governments. Till the formulation of such a policy by the Central Government, no patient shall be denied hospitalization or essential drugs in any State/UT for lack of local residential proof of that State/UT or even in the absence of identity proof;

(v) The Central Government shall revisit its initiatives and protocols, including on the availability of oxygen, availability and pricing of vaccines, availability

of essential drugs at affordable prices and respond on all the other issues highlighted in this order before the next date of the hearing, that is, 10 May 2021. Copies of all affidavits to be served upon the *Amici* in advance; and

(vi) Several other suggestions have been made before this Court in IAs and writ petitions filed by diverse parties. In order to streamline the further course of hearing, we have requested the *Amici* to collate and compile these suggestions which would be taken up later. The present order has focused on certain critical issues in view of the urgency of the situation.

…….....J.
[Dr Dhananjaya Y Chandrachud]

…….....J.
[L Nageswara Rao]

…….....J.
[S Ravindra Bhat]

New Delhi;
April 30, 2021

ANNEXURE - 2

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* **IN THE HIGH COURT OF DELHI AT NEW DELHI**

\+ W.P.(C) 3031/2020

RAKESH MALHOTRA ..... Petitioner

Through: Petitioner in person.

versus

GOVERNMENT OF NATIONAL CAPITAL TERRITORY OF INDIA AND ORS ..... Respondents

Through: Mr. Rahul Mehra, Sr. Advocate with Mr. Satyakam, ASC, and Mr. Chaitanya Gosain and, Advocate for GNCTD.
Mr. Chetan Sharma, ASG with Ms. Monika Arora, CGSC and Mr. Shriram Tiwary, Advocate for R-3.

CORAM:
HON'BLE MR. JUSTICE VIPIN SANGHI
HON'BLE MS. JUSTICE REKHA PALLI

O R D E R

% 20.04.2021

1. At the outset, it is pointed out that the appearance of Mr. Rahul Mehra, learned senior counsel representing the GNCTD and Mr. Satyakam, ASC has not been correctly recorded in our last order dated 19.04.2021.

2. The correct position may be recorded. Mr. Satyakam, ASC states that he is instructing. Mr. Rahul Mehra, learned senior counsel on behalf of the GNCTD.

3. We have heard the learned Additional Solicitor General, Mr. Chetan

Sharma, petitioner-in-person, Mr. Rakesh Malhotra, Mr. Rahul Mehra, Learned Senior Counsel appears alongwith Mr. Satyakam on behalf of respondent Nos. 1 & 2 as well as two senior officers of the Central Government, namely, Ms. Roli Khare, Director and Mr. Nipun Vinayak, Joint Secretary, Ministry of Health and Family Welfare at substantial length.

4. In terms of our order passed yesterday, the Central Government has filed an affidavit. Mr. Mehra states that though all efforts were made to file the affidavit on behalf of the GNCTD, the same could not be completed and, therefore, the same has not been filed today. Let the affidavit be filed by the GNCTD by 1:00 PM on 22.04.2021. The same shall be circulated to all the others present in the proceedings.

5. We have perused the affidavit filed on behalf of the Central Government, filed by Mr. Rajender Kumar, Under Secretary, Ministry of Health and Family Welfare. The affidavit has, firstly, dealt with the aspect of availability of COVID beds, as made available by the Central Government in the NCT of Delhi. It discloses that in a meeting held on 09.04.2021, it was decided that 500 ICU bedded DRDO COVID Care Hospital be established in Delhi Cantt. It is stated that 250 ICU beds have been operationalised by DRDO and another 250 beds shall be operationalised by 22.04.2021. It has been further decided to provide 25 medical officers and 75 paramedics to this COVID care centre from Central Armed Paramilitary Forces.

6. The Central Government has also called upon the States and Union Territories to provide their requirements for Ventilators in the States, so as to consider the supply of Ventilators as per the availability at the earliest. It

is further stated that as per the demand of the GNCTD, 763 ventilators have been supplied by the Government of India. In addition to that, Safdarjung Hospital has been provided with 105 ventilators, Ram Manohar Lohia Hospital with 5 ventilators, LHMC with 5 ventilators, Ayush Hospital with 2 ventilators, ESIC Hospital with 10 ventilators and the DRDO facility has been provided with 500 ventilators.

7. The availability of beds for COVID patients, as on 19.04.2021 in the named Central Government run hospitals has also been provided in paragraph 8 of the affidavit. The same add up to 1432 beds. These are apart from 250 beds that the DRDO would make available, 250 beds in LHMC and 36 in Safdarjung Hospital, which are also being planned. She points out that in other hospitals and facilities – other than thos detailed in the affidavit, 2105 beds have been made available by the Central Government in the NCT of Delhi, and with the addition of these beds, the current COVID beds allocated stand at about 4091 bed. The complete break up of these COVID beds, should be indicated in the affidavit to be filed by the Central Government on 22.04.2021 by 01:00 p.m. The same should contain details of ICU/ Non ICU beds, and beds with/ without oxygen, and with/ without ventilator.

8. Mr. Mehra has submitted that last year, when the pandemic was raging, the Central Government had made 4,112 beds available for COVID patients in its hospitals and facilities at Delhi. He states that the number of COVID positive patients are four times presently than the peak figures of last year. He submits that the Central Government should allocate more beds in its hospitals and facilities for COVID patients.

9. Ms.Roli Khare, Director, Ministry of Health and Family Welfare has stated that the Central Government is endeavoring to make more beds available. She states that presently the hospitals of the Central Government are occupied by non-covid patients in need of critical care, such as patients who require dialysis, or suffering from cancer and other serious disease. Considering the fact that the number of COVID patients, who are now needing hospitals if for greater than the numbers which were turning up last year – even during the peak of the pandemic, the Central Government should urgently look to allocate more beds among their hospitals for COVID patients. We direct the Central Government to look into the aspect of bed allocation for COVID patients keeping in view the prevailing circumstances, and report in this regard on the next date of hearing i.e. 22.04.2021.

10. The other aspect on which we have heard submissions, is the aspect of availability of medical Oxygen in the NCT of Delhi. On this front, the situation is rather alarming. We have been informed during the course of hearing that the availability of Oxygen – as we pass this order, has dropped dramatically in Hospitals. The situation is such, that the Oxygen pressure has been reduced, to keep it going longer, with the result that serious patients, who are in need of Oxygen have suffered drastic fall in their Oxygen levels, which is turning out to be one of the major causes of fatality of COVID patients.

11. Dr.Nipun Vinayak, Joint Secretary, Ministry of Health and Family Welfare has explained to us that the Department for Promotion of Industries and Internal Trade(DPIIT) is looking into the aspect of diversion of Oxygen from industrial use for medical use in view of the urgent need of Oxygen. He submits that allocations of Oxygen have been made on the basis of the

demands made by the States, and on the basis of the formula evolved by the experts about the requirement of Oxygen for patients suffering from COVID. He states that the allocation for Delhi is 378 MT per day.

12. On the other hand, Mr.Mehra submits that there is grave dearth of medical Oxygen in Delhi's hospitals, and the requirement according to him is 700 MT of medical Oxygen per day. He submits that there is non-compliance of the order passed by us yesterday, whereby we required M/s INOX to honor its contract with the GNCTD and Delhi hospital and to supply 140 MT of Oxygen to Delhi. He states that the reason for non-compliance is stated to be the possible law and order situation that may be created, in case the M/s INOX were to transport the Oxygen from Uttar Pradesh to Delhi, where the manufacturing unit of INOX is situated.

13. Mr. Vinayak has also informed us of the industries, which are permitted to continue with the use of Oxygen. He submits that apart from those industries, all others have been directed not to use Oxygen, so that the same could be made available for medical use in the country. Amongst the permitted industries, we find that the Steel and Petro-Chemical industries are also included.

14. Looking to the serious and emergent situation, we call upon the Central Government to seriously consider issuing appropriate orders in respect of the Steel and Petro-Chemical industries, so that a balance can be maintained between the needs of the people at large – who are suffering from COVID and are serious, and the needs of the industries. After all, if more and more people are going to suffer seriously from COVID – which in turn may result in extended lockdown and closures, the purpose of full production of Steel and Petroleum products would also be of no avail, as

their consumption is bound to fall in that scenario. We, therefore, expect the Central Government to urgently hold a meeting with all stakeholders including from the Steel and Petro-Chemical industries, so that sufficient portion of the Oxygen produced by these industries could be diverted for medical needs for the period required to tide over the prevailing medical emergency.

15. Mr.Vinayak has also pointed out that the Central Government had sanctioned funds in December, 2020 to set up Pressure Swing Adsorption(PSA) plants for production of oxygen throughout the country. For the NCT of Delhi, eight such plants were sanctioned. He states that only one has become operational till date, and two of the hospitals, namely, Satyawadi Raja Harish Chandra Hospital and Vardhaman Mahavir Medical College & Safdarjung Hospital have not yet provided the site clearance where the PSA plant could be installed. Two of the hospitals have now provided the site clearance and the equipment would be installed by 30.04.2021. We direct the respondents to ensure that the remaining hospitals – who have not acted in response to the said scheme of the Central Government, act immediately. Compliance be reported on the next date.

16. Looking to the number of COVID positive patients all over the country, and the pattern which is emerging with regard to the spread of the viral infection and the severity with which it is impacting people in different States and regions, we direct the Central Government to review the allocation of Oxygen on a dynamic basis i.e. on a day to day basis, so that its utilization is achieved in the most efficient manner.

17. Another aspect highlighted by Mr.Vinayak is with regard to the efficient usage of Oxygen. He points out that the State of Kerala has led by

example in this regard, and the use of Oxygen by Kerala is most efficient, which should be followed by all.

18. As we pass this order, we are informed that the Oxygen supplies in various Covid hospitals in Delhi, including Sir Ganga Ram Hospital, and Max Hospital are about to get exhausted in the next about 4-8 hours. The decision taken by the Central Government to divert supplies from industrial use for medical use, for some obscure reason, has been sought to be implemented only from 22.04.2021.

19. We do not find any justification for the same. The need for oxygen is now. Any delay in this regard would lead to loss of precious lives. We, therefore, direct the Central Government to implement the said decision forthwith, and make available oxygen to hospitals which are running out of their supplies, lest there is grave loss of life suffered by patients being treated thereat.

20. Since M/s INOX has not complied with our last order dated 19.04.2021, we direct issuance of Notice of Contempt to M/s INOX returnable on 22.04.2021. Notice be served through email. We direct the Managing Director/ Owner of M/s INOX to personally remain present during the hearing on the next date of hearing. The State of UP, through the Chief Secretary should also remain present during the hearing. Notice shall also be issued to him.

21. On the aspect of ramping up of the testing facilities for Covid-19 through the RT-PCR test, there are certain aspects which need to be addressed by the Central Government, and its instrumentalities. We are informed that the equipment for setting up RT-PCR test labs are imported, and medical equipment/ machines for which import orders have been placed,

are being dealt with routinely at Customs Ports. It is essential that all such medical machines/ equipments, medicines, etc. which are imported should be handled and cleared at top priority by the Customs. We direct the Central Government to issue necessary directions in this regard forthwith.

22. For the purpose of setting up of Covid testing facilities, the entrepreneurs/ doctors have to obtain clearance from the Indian Council for Medical Research (ICMR). It has been brought to our notice that the procedure for such clearances is also highly time consuming. We do not wish to, in any way, impinge on the authority of ICMR, and we do not expect the ICMR to relax its standards in the matter of granting its permissions and clearances. However, looking to the present day situation, we direct the ICMR to give top priority for such clearances so that the RT-PCR Labs could be set up or expanded without any delay.

23. Another aspect that has been brought to our notice, which is also resulting in delay in preparation of RT-PCR Test Reports, is the Software deviced for uploading of the Test results on the website. The patients who undergo the RT-PCR test,s are required to provide their Aadhar Cards. Despite that being the position, the testing agencies are required to fill up detailed forms online, which take up to 15 minutes per form. We, therefore, direct the Central Government, and the ICMR, to review the form in which the information is required to be uploaded by the testing agencies, so as to reduce their burden and wastage of time, as this appears to be acting as a bottleneck in the matter of preparation of reports.

24. We have also noticed reports in newspapers about the critical medicines required for the treatment of serious Covid-19 patients falling in short supply, and also being sold at a premium in the black market. It

appears that the requisite drugs are being hoarded by some unscrupulous persons/ dealers or retailers. We direct the Central Government, and its agencies, particularly the Drug Controller of India, to issue necessary directions in this regard to all the licensees, and the Government should undertake checking on a regular basis to unearth all such cases of hoarding which is leading to scarcity of drugs in the marked for the needy patients. Strict penal action should be taken against those indulging in such practices.

25. The affidavit filed by the Central Government discloses that – so far as Remedesivir Drug is concerned, the Central Government has supplied 10.40 lakh vials to all the States and Union Territories during the last 9 days (between 11th and 19th April), out of which 40,132 vials have been supplied to Delhi. Meanwhile, DGCI has granted immediate permission to license holders for manufacture of the Remedesivir at 20 additional sites, adding production capacity of 35.3 vials/ month. It is stated that this would ramp up the production capacity for manufacturing this drug to around 74.10 lakh vials/ month.

26. The Central Government should dynamically review the distribution of Remedesivir in the States and Union Territories on a daily basis, on the basis of the need, assessed on the basis of the serious active Covid patients, who need to be administered the said Drug. This is essential to maximise the efficient use of the said Drug.

27. There are a number of other drugs which are being used for treatment Covid-19 patients, such as *Tocilizumab, Favipiravir, Ivermectin, Dexamathasone, Methylprednisolone, Dalteparin, Enoxaparin, HCQ and Baricitinib*. As per news reports, there are shortages of some, if not all, of the aforesaid drugs. Looking to the emergent situation, we direct the Central

Government to immediately reach out to the manufacturers/ patent holders/ licensees so as to forthwith ramp up the production capacities of the above, and all such other medications, as are essential for treatment of Covid positive patients. We may take note of the fact that the Patents Act provides for Compulsory Licenses under Section 84, and Special Provision for Compulsory Licenses or Notifications by the Central Government, under Section 92. Section 100 provides the power of the Central Government to use inventions for purposes of the Government.

28. Looking to the present day situation, there can be no doubt that a case is made out for exercise of its power by the Central Government/ Controller under the aforesaid provisions of law. At the same time, the interests of the Patent holders/ licensees should be kept in mind, since it on account of their investments, inventions and hard work that such like medicines are made available to the public at large. The best course would be encourage the existing manufacturers to ramp up their production on a war footing. They should also be encouraged to grant voluntary licenses to other entities to manufacture the requisite drugs. However, if such efforts do not fructify soon enough, the Government/ Controller should not hesitate to invoke their jurisdiction and powers under the aforesaid provisions of the Patents Act, since the lives of thousands of people are being lost each day in the country due to COVID. The lives of the people take priority over everything else. Even if such like powers are exercised, the patent holders/ manufacturers can be adequately compensated by fixation of fair license fee. The Central Government should swing into action in terms of this order in this regard without any delay, and report progress on the next date of hearing.

29. Another aspect that we may take note of is that as per one of the

reports, as many as about 44 lakhs vaccines have been wasted out of the 10 crores vaccines allocated to different States. This is because of the restriction with regard to the age, or category of people who are entitled to take the vaccine. According to the present dispensation, people who are above 45 years of age are entitled to take the vaccine. The Government has recently announced that from 01.05.2021, all above the age of 18 years would be entitled to take the vaccine. In our view, wastage of even a single dose of vaccine, when the same is proving to be life–saving, would be a criminal waste. We are informed that each vial of the vaccine has 10 doses. Once the vial is opened, it has to be either fully consumed, or the remainder goes waste. It should be possible for the Government(s) to devise ways and means so as to register volunteers who may be below the age group of 45 years, and above the age of 18 years – who could be called upon to take the residual doses of vaccine, in case, there are doses left unutilised after, say, 05.00 P.M on each day. That would ensure that all the doses are fully utilised, and not wasted. We may observe that this flexibility is available in other countries such as United States of America. For this purpose, the Government should modify their mobile COVIN application appropriately, urgently. We direct the Government to look into this aspect forthwith and report status on the next date.

30. List on 22.04.2021.

VIPIN SANGHI, J

REKHA PALLI, J

APRIL 20, 2021
N.Khanna/ K.D.

ANNEXURE - 3

X-11026/07/2020-PRO

Government of India
Directorate General of Health Services
Central Drugs Standard Control Organization
(Public Relation Office)

FDA Bhawan, Kotla Road
New Delhi-110002
Date: 19/3/2020

NOTICE

Novel Corona-virus Disease (COVID-19) has spread over 118 countries with now more than 191,127 cases and 7807 people have lost their lives as on 18.03.2020. World Health Organization (WHO) has declared it as pandemic. At present there is no current evidence from randomized clinical trials to recommend any specific treatment for suspected or confirmed patients with COVID-19.

In order to encourage research & development of drug or vaccine for prevention or treatment of COVID-19, any application submitted to CDSCO will be processed on high priority. CDSCO will also provide guidance on regulatory pathway on such matter.

The details are as under -

1. Any firm having a Drug/Vaccine under development for COVID-19 can directly approach DCG(I) through Public Relations Office for seeking guidance for regulatory pathway.
2. Any firm or research institute having protocol for repurposing of existing drugs/vaccines for treatment of COVID-19 will also be given priority for review and approval.
3. Applications for Clinical Trial permission and applications to import or manufacture Drug/Vaccine for sale and distribution would be processed on priority though expedited review/accelerated approval.
4. Any firm having Drug/Vaccine already approved for COVID-19 in any other country can directly approach DCG(I) through Public Relations Office regarding expedited review/accelerated approval for marketing in India.
5. Data requirement for animal toxicity study, clinical study, stability study etc. may be abbreviated, deferred, or waived on case to case basis depending upon the type of vaccine, nature of drug, plant from which the drug is extracted & its experience in case of Phyto-pharmaceuticals.
6. Applications to manufacture or import Drug/Vaccine for test, analysis and further use BA/BE or Clinical Trial may be processed within 7 days.
7. In case of emergency, Import license (Form 10) would be granted without Registration Certificate (Form 41) subject to approval of Central Government.

For any additional information kindly contact Public Relations Office through toll free number **1800 11 1454** & write to **startupinnov@cdsco.nic.in** .

(Dr. V. G. Somani)
Drugs Controller General (India)

To,

All Stakeholders through CDSCO web site

Copy for Information,

PS to JS(R), Ministry of Health and Family Welfare, Nirman Bhawan, New Delhi

ANNEXURE - 4 Colly

NATCO



Withstanding Challenges, Focused on Future

2019-20
37TH Annual Report
NATCO PHARMA LIMITED

Key highlights of the year

₹20,224 million
Total revenue

₹4,608* million
Profit After Tax

₹6,900 million
EBITDA

*attributable to owners of the company

Disclaimer

In this Annual Report, we have disclosed forward-looking information to enable investors to comprehend our prospects and take investment decisions. This report and other statements—written and oral—that we periodically make contain forward-looking statements that set out anticipated results based on the management's plans and assumptions. We have tried, wherever possible, to identify such statements by using words such as 'anticipate', 'estimate', 'expects', 'projects', 'intends', 'plans', 'believes', and words of similar substance in connection with any discussion of future performance. We cannot guarantee that these forward-looking statements will be realised, although we believe we have been prudent in our assumptions. The achievements of results are subject to risks, uncertainties and even inaccurate assumptions. Should known or unknown risks or uncertainties materialise, or should underlying assumptions prove inaccurate, actual results could vary materially from those anticipated, estimated or projected. Readers should keep this in mind. We undertake no obligation to publicly update any forward-looking statement, whether as a result of new information, future events or otherwise. Revenue splits for different geographies used in the Corporate Overview and Management Discussion & Analysis sections are based on management assessments.

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Withstanding challenges, focused on future

At NATCO, we manufacture niche pharmaceutical products, enabling patients to access medicines used to treat complex conditions as well as chronic diseases. We have charted a unique journey of innovation and business growth of over 30 years that showcases our ability to take risks and execute them successfully.

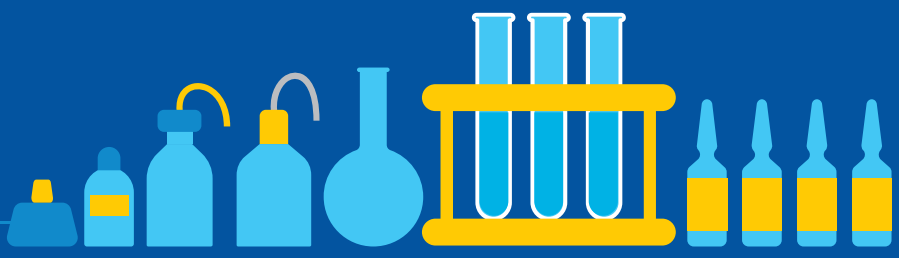


We have done this by being flexible and determined to overcome obstacles. During the mid-90s and early 2000s, our Company faced significant business challenges. We overcame them by repositioning ourselves and successfully foraying into the oncology segment in India. There was no looking back since then in terms of sustainable growth. Over the past decade, our Company has continued to grow in the international markets, especially the US, despite being new to the region. All along, the Company has shown resilience and an ability to withstand challenges while being strategically focused on future.

It is not new for NATCO to face unique challenges. During the year under review, as we faced difficulties in the form of regulatory and pricing issues we have successfully mitigated the impact to our prospects. In spite of macro headwinds, we stayed on course: by remaining a leading player in oncology, in meeting our target launches and by delivering continued growth in our key products in the US.

During the last quarter of the year under review, COVID-19 sprung new barriers to our business. We saw most cancer patients postponing their elective procedures, affecting the sales of our oncology medicines. This was an unprecedented situation, which was compounded by supply chain issues, leading to a decline in domestic sales. We dug in our heels and ensured that business priorities - be it continuity of operations, inventory and stock management or employee safety were not hindered. We intensified our efforts in research and development, maintained high level of regulatory standards in our plants, kept on track with new product filings and continued building new capacities at our manufacturing facilities.

We remain focused on future.



NATCO Pharma Ltd. at a Glance

Creating value, poised to grow

NATCO Pharma Limited (NATCO) is a vertically integrated, research and development focused pharmaceutical company engaged in developing, manufacturing, and marketing of complex products for niche therapeutic areas.

Focused research runs deep in our DNA and quality is a true marker of our products - the reasons for our success in key regulated markets worldwide.

Our products comprise Finished Dosage Formulations (FDF), sold in India, the US, and the Rest of the World (RoW) as well as Active Pharmaceutical Ingredients (APIs) that are primarily used for captive consumption in the manufacturing of FDF. Our APIs are also sold to customers for various international markets such as Brazil, Europe and the US. Our API manufacturing capabilities include multi-step synthesis, semi-synthetic fusion technologies, high-potency APIs and peptides.

We cater to pharmaceutical companies under select contracts to manufacture and supply pharmaceutical products. Leveraging our skills and expertise in organic chemistry, we are diversifying into the business of crop health sciences.

We market and distribute our products in more than 40 countries; we have operations in certain key geographies through our subsidiaries.

Key achievements of FY 2019-20

Filings

4 ANDAs

4 USDMFs

Patents Applications

221 Indian patents filed

90 Indian patents granted

239 International patents filed

160 International patents granted

Manufacturing Assets

Pharma

6 Formulations

2 Active ingredients

Crop Health Sciences

1 Formulations

1 Active ingredients

2 Research centres

Our mission

Making specialty medicines accessible to all

35 years+

Of rich experience in the ever-evolving pharma industry

Our values

Integrity
Respect
Openness
Collaborative
Quality



Our business segments#

Domestic FDF

We have 50+ products in our Oncology and non-oncology business segments.

Revenue for FY 2019-20

₹5,405 million

Revenue contribution for FY 2019-20

27%

API (Domestic and exports)

We have 39 active DMFs across therapies such as Central Nervous System, pain management and Cardiovascular care.

Revenue for FY 2019-20

₹3,552 million

Revenue contribution for FY 2019-20

18%

International FDF

We have our business in over 40 countries, some of these are through our subsidiaries such as NATCOFARMA DO BRASIL (since 2011), NATCO PHARMA CANADA INC. (since 2012), NATCO PHARMA Asia Pte. Ltd. (since 2012) and NATCO Pharma Australia PTY Ltd. (since 2014). We have collectively over 30 products across these geographies.

Revenue for FY 2019-20

₹9,334 million

Revenue contribution for FY 2019-20

46%

Other operating and non-operating income

This income includes job works, export incentives, budgetary support, interest income.

Revenue for FY 2019-20

₹1,933 million

Revenue contribution for FY 2019-20

9%

Our manufacturing facilities

FDF

Location/Capability	Key product categories	Major approvals
Kothur, Telangana Oral solid dosages, including Cytotoxic Orals and Cytotoxic Injectables	Oncology, Gastroenterology, Central Nervous System, Antiviral and Cardiology	USFDA, GMP (DCA), German Health Authority, Australia TGA, ANVISA (Brazil)
Nagarjunasagar, Telangana Lyophilised Injectables, Liquid Injectables, Dry Powder Injectables and Large Volume Parenterals	Oncology, Antibiotics and Antiviral	WHO GMP and Kenya MOH
Pharma City, Dehradun, Uttarakhand Oral solid dosages including Cytotoxic Orals Cytotoxic Injectables	Oncology and Antiviral	WHO GMP
UPSIDC Industrial Area, Dehradun, Uttarakhand Oncology Oral Solid Dosages	Oncology	WHO GMP and EU GMP
Guwahati, Assam Oral Solid Dosages	Gastroenterology	GMP
Visakhapatnam, Andhra Pradesh Oral solid dosages	Oncology, Gastroenterology and Antivirals	USFDA

APIs

Location/Capability	Key product categories	Major approvals
Mekaguda, Telangana Active Pharmaceutical Ingredients (APIs) & API Intermediaries	Antineoplastic, Hepatitis C, Antiemetic, Antidepressant, Antimigraine, Antiulcerative, Immunomodulator, Multiple sclerosis and Hyperphosphatemia	USFDA PMDA (Japan) COFEPRIS (Mexico) EDQM (Europe) MFDS (Korea) TGA (Australia) EU GMP (Germany) WHO GMP (CDSCO)
Manali, Chennai, Tamil Nadu APIs & API Intermediaries	Oncology, Immunosuppressants and High potent Antivirals	USFDA and WHO GMP (CDSCO)

R&D centres

Location	Team size	Capability
Hyderabad, Telangana	350+	API
Kothur, Telangana	150+	FDF

Two units are under construction under Crop Health Sciences: Technical and Formulation units at Attivaram, Andhra Pradesh

#
- Figures regrouped wherever necessary
- The revenues includes certain operating and non-operating incomes not related to major segments mentioned above
- Percentages calculated based on total consolidated revenues

Key Performance Indicators

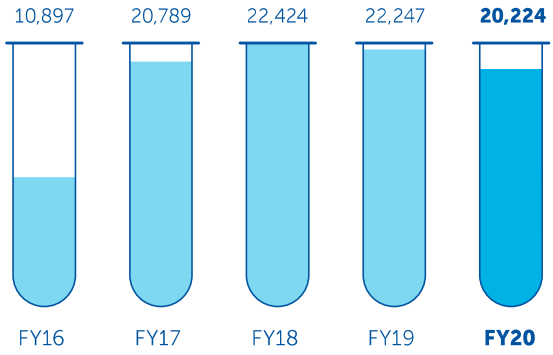
Leading with resilience and confidence



Revenue

(₹ in million)

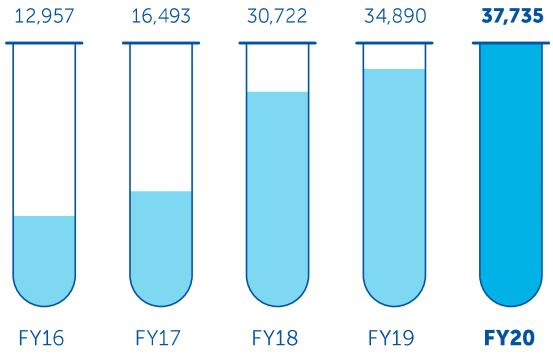
16.7% (4-year CAGR)



Net worth

(₹ in million)

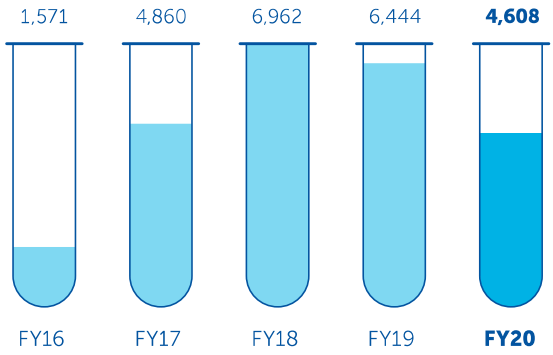
31% (4-year CAGR)



PAT

(₹ in million)

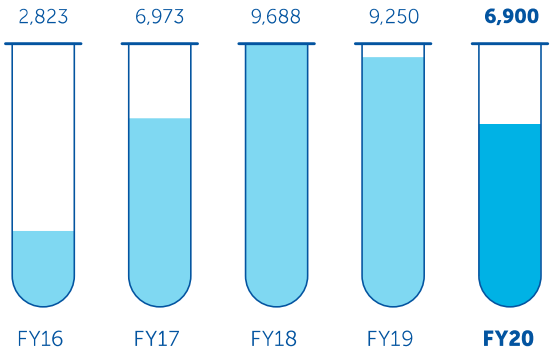
30.9% (4-year CAGR)



EBITDA

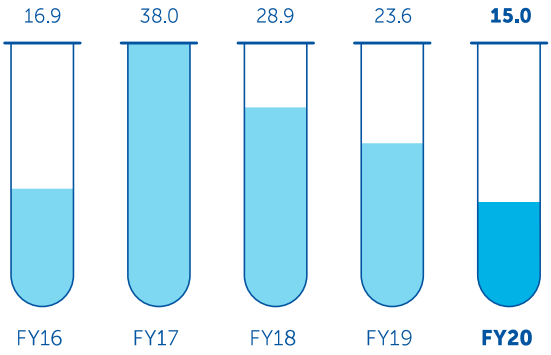
(₹ in million)

25.04% (4-year CAGR)

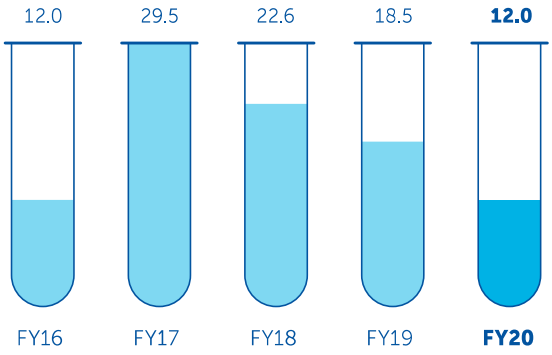




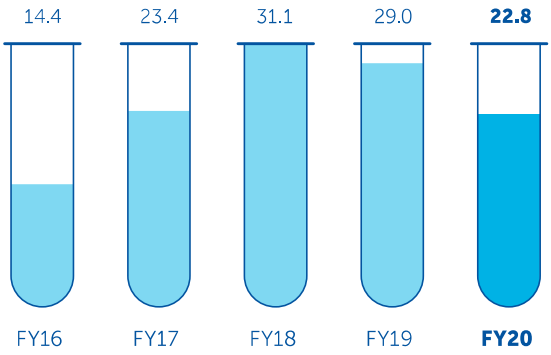
ROCE (%)



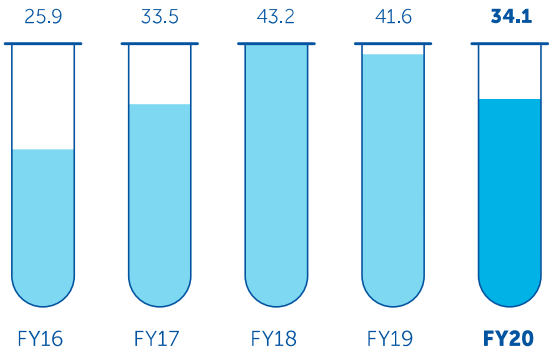
ROE (%)



PAT Margin (%)



EBITDA Margin (%)



Management Message

Believing in our vision, committed to our growth

Dear Shareholders,

We are in continuous pursuit of increasing access to medicines at affordable prices to serve the needy. We have achieved this mission yet again during the year under review by launching several products at competitive rates in the Indian and international markets.

FY 2019-20 started with macroeconomic challenges and ended with the Covid-19 outbreak that had the world facing a massive threat to lives and livelihoods. In such a year, we can say with confidence that what mattered most to NATCO was employee safety, fiscal discipline, and securing our business.

During FY 2019-20, the Company faced intense competition, pricing pressures, and delays in product launches in international markets. In spite of such headwinds, we kept the top line of the Company stable. While our PAT dropped during the year, we remain upbeat about our performance for the coming years due to several high-value launches across our business segments.

At NATCO, we understand the pathology of fear and uncertainty that COVID-19 poses. We took utmost care to steer our employees to follow safer work practices and minimise exposure to health hazards while conducting business in a sustainable manner. We ensured to conduct tests for our people when necessary, provided them an additional insurance cover as well as a safe working environment. We prioritised the safety and lives of employees, even as we incurred additional expenses to meet their medical requirement.



V.C. NANNAPANENI
Chairman and Managing Director



RAJEEV NANNAPANENI
Vice-Chairman and CEO

Our contribution to the fight against COVID-19

As a responsible corporate, we played our part in the nation's fight against COVID-19 by contributing to the relief and response efforts made by the governments of Andhra Pradesh and Telangana.



The road was tough: Domestic Market

It was a hard year for NATCO on a few fronts of the domestic business. Our oncology segment suffered due to pricing controls from the government and our Hepatitis-C business continued to decline due to reduction in market size. On top of this, during Q4, COVID-19 outbreak resulted in cancer patients postponing their hospital visits and chemotherapy procedures. All these factors collectively pushed the business to decline during the year. Growth witnessed in C&D segment could not offset the losses made in our core products.

In spite of these factors that caused the domestic business downturn, we launched eight products during the year and continued to retain our market position in key segments. The last quarter of the year witnessed the outbreak of COVID-19; we acted decisively to mitigate the impact on our supply chain by securing our supplies of Key Starting Materials (KSM) from China well in advance. Thus, we made sure operations could continue.

We are planning for new product launches in the non-Oncology segment to mitigate the impact of Hep-C market decline.

On the domestic business front, the Company is cautiously optimistic on its commercial foray of the Crop Health Sciences division in the near future.

Business was strong: International markets

During the year under consideration, our US-based business remained strong despite pricing pressures and competition for our antiviral flu medicine, Oseltamivir. Revenue contribution from Glatiramer acetate and Liposomal doxorubicin continued to grow in the year, aided by a strong exchange rate. We did not see any compliance issues for our facilities, which cater to international markets. NATCO continued to file ANDAs, some of which we believe to be First to File (FTF). We also observed a more stabilised pricing scenario in the US market.

We are excited about our product pipeline for launch over the next few years, including our blockbuster product Lenalidomide for the US that would catapult us to the next trajectory of growth. Our business in Canada has done well during the year while our efforts in Brazil show potential for growth. We continue to lay good foundation for business growth in the Asia-Pacific region.

We have also made it a strategic priority to concentrate more of our efforts in 'Rest of the World' market to improve our revenues and profitability. We see good growth potential in Canada and Brazil going forward, among other markets.

Overcoming hurdles to grow sustainably

Sustainability comes from putting our mission first, consistently doing what we do best, learning to manage resources prudently, and building trusting relationships with key stakeholders.

During 2019-20, the Company faced business challenges along with the pandemic pressures towards the last phase of the year. Despite these, the Company moved with agility to re-prioritise activities and opportunities. Additionally, the Company filed four niche ANDAs and DMFs each in the US.

On the domestic business front, we met patient needs with eight product launches, out of which four were first-to-launch branded generic products across oncology, cardiology, and diabetology therapeutic segments in India.

As constraints due to the pandemic continue, we are focused on employee health, reenergising the practice of keeping the work environment cleaner and safer.

Management Message

In the midst of COVID-19 we were able to enable USFDA inspections at our Kothur and Visakhapatnam facilities which is a testimony of our effective and safe operational management.

Learning to adapt to the new environment reminds us of the essence of being flexible and agile, which is core to our DNA. Year after year, we deepen sustainability in the business as we bring more drugs at an affordable price to meet unmet needs of the patient. To make this happen, we navigate around patent limitations, improve our product development capabilities and partnership strengths.

We remain optimistic that we will continue to focus and act upon sustainability initiatives, creating value and developing opportunities for our stakeholders

Investing in future

Our strategy remains intact as we invest prudently in our research, manufacturing plants and enriching of skill sets. We are on track on our goal to launch 8-10 new products every year across our business segments in India. We also have some interesting filings and high-value launches in our International markets in the coming years.

In line with our business approach of picking molecules that have high entry barriers, the Company has further increased focus on R&D catering to requirements in both pharma and agri sectors.

We continue to expand our skill sets in agrichemicals sector. We continue to place emphasis on chemistry and niche molecule development for pest management.

During the year, we incurred capital expenditure of ₹ 3,492.85 million, a majority of which was used to enhance our capabilities in our manufacturing facilities. A significant portion of this capex was done at our Vizag facility. The remaining part was primarily used in our formulation facilities across the country. We also spent 8.65% of our standalone revenue towards R&D, which is one of the core pillars of the Company's growth.

The Vizag facility, which is certified by USFDA is a part of the Special Economic Zone (SEZ) and is intended to cater to the US and other international markets. From capability perspective, this facility will focus mostly on oral solid dosages (tablets and capsules), including a cytotoxic block for products in the oncology segment.



An overview of our Vizag formulations facility

With diversification and sustainability in mind, the Company has invested in Crop Health Sciences division to launch niche high-value products. The greenfield project in Nellore district of Andhra Pradesh is close to completion and expected to be commissioned in FY 2020-21. We have disclosed one key product, Chlorantraniliprole (CTPR) and plan to launch other unique products which will be a part of the Integrated Pest Management (IPM) solutions. We are building a strong team of personnel in product development, manufacturing, sales and marketing to bring NATCO's products to farmers in the country and other growers across the world.

Reiterating our commitment

At NATCO, we built a strong portfolio of products at high quality and affordable pricing over the past several decades. We are steadfast in our commitment to our end-user and our customer, as well as our partners and associates, especially our investors, towards creating value. Our innovation and our quality are the strengths of our brand, serving to fulfil our mission, which is to make specialty medicines available to all.

The use of renewable energy is an area of sustainable operations which we pivot to meet energy requirements in an environmentally responsible manner. We are continuing to source Renewable Energy (RE) from our captive projects and third-party providers. Our continued effort to enhance renewable energy would be tied to limitations in government policies and our own internal energy consumption requirements.

During FY 2019-20, we have installed 0.80 MW capacity rooftop solar power plant at our Kothur facility. Installation of an additional 0.80 MW capacity solar power plant at Nagarjunasagar unit and 0.50 MW capacity solar power plant is in progress at Visakhapatnam unit. As of March 31, 2020, NATCO's total renewable energy (RE) capacity is 4.2 MW in wind and 5.2 MW in solar onsite in addition to renewable power through third party purchase agreements.

During the year, we gave four interim dividends amounting to ₹1,229 million and dividend distribution tax amounted to ₹215 million. The interim dividend resulted in total pay-out of 25.9% of the standalone profit after tax of Company for the year under review .

Making a difference

Our tradition of empowering our people, living our values, and building trustful relationships holds us in good stead as we navigate challenging times.

The work with the communities, ranging from education, health, and livelihoods showcase our commitment to the society. Schools run by NATCO Trust are a significant value-add in the communities. We see tangible benefits of investing in infrastructure upgradation in our schools and government schools and simultaneously upgrading the facilities.

Our healthcare service programmes and farm-based livelihood programme have gained community trust and confidence.

This year NATCO High School, Kothur has completed 25 years of existence while we helped the ZP High School, Indiranagar, Siddipet in Telangana to build a block named, 'NATCO Trust block'. The facilities which were developed with the help of the Trust include additional classrooms, renovation of the existing building, roof water tanks, borewell and CCTV surveillance system among others.

In July, 2020, Comprehensive NATCO Cancer Centre was inaugurated at the Guntur General Hospital. Spread over 80,000 sq ft it is a state-of-the-art facility in the city.



An overview of the Comprehensive NATCO Cancer Centre

Being thankful

It is heartening to see that we are succeeding in our mission each day as we touch millions of lives through our medicines. This has been possible primarily due to the efforts of our employees, partners, and other key stakeholders. Together, we make one strong team. We are grateful to our investors for their continued trust and support.

V.C. NANNAPANENI
Chairman and Managing Director

RAJEEV NANNAPANENI
Vice-Chairman and CEO

Business Model

How we create value

Among our stakeholders, it is the patient who is our priority. We are committed to ensuring that people have easy access to drugs that are crucial in their fight against several complex illnesses and diseases. In making these drugs available, we ensure world-class quality and efficacy.

Business Segments



Pharmaceuticals

APIs

India
Europe
Canada
USA
South America
Middle East

FDFs

India
USA
Canada
South East Asia
South America

Agrochemicals

Target India and international markets

Resources



Experienced and capable management



Cutting-edge R&D department headed by an expert team, supported by diverse and well-trained workforce



Strong balance sheet and liquidity



Established network of suppliers and distributors



State-of-the-art and backward integrated manufacturing facilities with capabilities to make active ingredients and intermediaries



Strong brand recognition for oncology in India

Strategy

Partnership-based business model for most international markets

Conducting business through foreign subsidiaries

Targeting niche therapeutic areas

Global portfolio for product filings

Building localised presence across the globe

Focus on government tenders and institutional business in emerging markets

Expanding manufacturing and R&D capabilities

The success of our business model can be seen in the way that we have grown our business. From starting as a pharmaceutical concern in Hyderabad, we now have a global presence with a wide range of essential products. We are set to grow next year, despite the concerns that the pandemic poses. We have developed meaningful relationships and a strong supply network that will ensure our products reach the desired end-consumers.

Growth drivers

Recognition for quality and delivery, backed by strong technical and operational expertise

Export demand for niche and high-value APIs and formulations

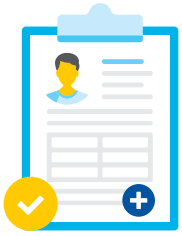
Superior product quality with affordable pricing

Reputation established with over three decades of expertise in pharma industry

Increasing spectrum of new diseases and demand for unique and affordable solutions

Increasing demand for pest management solutions and food security

Value we create



Patients

Access to potentially life-saving medicines

World-class medicines at affordable price



Partners

Essential products

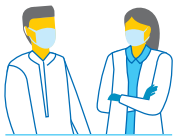
Industry expertise

Proven track record



Government

Crucial medicinal aid that governments can purchase directly from NATCO



Society

Promoting health

Increasing life expectancies



Shareholders

Strong business

Sustainable growth

Impacted fields of study

Orthopaedics and Gastro hepatology

Cardiology and Diabetology

Oncology

Other therapeutic areas

Agricultural Pest Management

Megatrends

Waking up to a world focused on better health outcomes

The past decade has witnessed an increase in the consumption of medicines globally. Research in healthcare is improving every day, making medicine increasingly efficient in treating a variety of conditions and diseases. The pharmaceutical industry has responded with a faster pace of innovation and shorter time to market. This growth is set to accelerate with the extensive use of intelligent technologies and breakthrough therapies.

World over, governments are invested in providing their people with greater access to therapies that are innovative, effective and affordable. They are working towards policies that supplement the growth of pharmaceuticals as a means to enable the healthcare industry to improve health outcomes for patients.

Global spending has steadily increased from 2009–2019 at a CAGR of 4.2% and spending reaching $955 billion in 2019. This reflects a 23% jump from $777 billion in 2014. Over the near and the long - term, patients can expect better access to medicines, in particular specialty medicines. Costs may remain a barrier to access in some cases, however. NATCO's growth and success are centered on being able to deliver on three key aspects of price, access, and availability.



At NATCO, this means that the market for generics, which is our key offering, is set to expand consistently. Moreover, the disease burden of Non-Communicable Diseases is growing (NCDs). In 2018, priority NCDs represented 35% of global Defined Daily Doses (DDD) volume, growing at 4.7% CAGR since 2008. Therapy areas comprising most of the use include diabetes, respiratory, cardiovascular, Losses Of Exclusivity (LOE) and cancer treatments and account for 71% of deaths due to NCDs worldwide.

NATCO has established expertise in these therapies, which points to positive outlook for future growth. We are closely monitoring new trends in medicine usage that are due to impact the future of this industry.

Developed markets

Developed countries, while expected to witness growth in spending on medicines, will witness greater brand Losses of Exclusivity (LOE) in specialty medicine. The impact of brand LOEs on sales is expected to touch US$139 billion between 2020 and 2024. Consequently, competition in the generics space is set to grow. At NATCO, we are aggressively pursuing strategies of localisation and geographical diversification to grow profitably.

US

Focus on generics to continue, pressure on margins is increasing

The US spending on the pharmaceutical sector for 2019 was $510.3 billion and is expected to grow at a CAGR of 3-6% for the period from 2020 to 2024. Due to the sheer size of the market, pharmaceutical concerns of all proportions are looking to establish a presence here.

As a result, pricing pressure on manufacturers is set to intensify as products face increasingly greater scrutiny over production costs, and increase in competition. Thus, margins are set to decline across the board.

Our revenue growth in the US market for the year primarily came from the sale of Glatiramer Acetate and Liposomal Doxorubicin. We believe that the products that the Company has in the pipeline for the near future will command a premium

(Souce: Evaluate Pharma: World Preview 2019, Outlook to 2024 - June 2019 Edition)

in the market due to either exclusivity or limited competition. In addition to this, most of our manufacturing facilities have the approval of the USFDA and other global agencies.

Canada

Growing demand for generics but pricing pressure from policies

In terms of value, Canada has grown to become the world's ninth largest market for generic drugs. This is because of massive growth in the generics segment over the past few decades led by factors such as constant expiration of patents and an increasingly ageing population. Chronic diseases are on the rise as well with governments and healthcare providers looking for cheaper alternatives.

However, even as the generic use in Canada is increasing, the share of sales is showing a downward trend on account of provincial pricing policies. Generic prices in Canada have decreased by ~60% over the decade between 2007 and 2018.

For us at NATCO, having a local presence through our subsidiary is key to growth in this market. We have developed front-end capabilities and are working to demonstrate greater efficiency in filings. Through our subsidiary, we have a total of 12 active products and 18 approvals.

Pharmerging markets

Markets in developing economies have witnessed higher GDP growth, along with the growth in population. These comprise emerging markets, which have seen the highest growth over the past decade: 12.2% CAGR from 2009 to 2014 before dropping to 7.7% CAGR between 2014 and 2019. In 2019, pharmerging markets comprised 26% of global spending, which is expected to rise to ~30% of spending in 2024. Global growth, however, is expected to moderate to 2–5% through 2019 to 2024, as the dynamics in both the markets are comparable.

At NATCO, we are targeting several pharmerging markets backed by innovative capabilities and attractive pricing proposition, supported by local presence. We are steadily growing its presence in markets across South East Asia, including Thailand, Vietnam, the Philippines, Indonesia, Singapore and Malaysia.

Brazil

Access to breakthrough medicines

The largest healthcare market in Latin America, Brazil spends 9.1% of its GDP on healthcare. It accounts for more than a 3.5% share of the world market for pharmaceutical drugs. Healthcare is a constitutional right in Brazil, which puts the government in complete control.

(Souce: Scrip Informa - Drug Pricing Update: Strategies and Trends)

We have established a robust presence in Brazil through our step-down subsidiary NATCO FARMA DO BRASIL. Most of our sales in the country come from the government and regional tenders. We have a total of nine product filings with good business growth prospects. Brazil is one of the markets where we are looking towards expansion and growth in the coming years. We are looking to provide high-quality products at competitive pricing.

India

Opportunities continue to grow

India happens to be the largest producer of drugs globally, supplying over 50% of the world's demand for vaccines. While the country's pharmaceutical exports stood at $20.7 billion during FY 2019-20, there was a cumulative FDI inflow of $16.5 billion into India's drugs and pharmaceutical industry. Of this, branded generics make up ~80% of the retail market.

The Government of India, through Ayushman Bharat-Pradhan Mantri Jan Aarogya Yojana (AB-PMJAY), has accelerated its efforts to improve healthcare delivery in the country through various schemes. It is now looking at digital interventions for the same. This will improve health awareness and access to medicines.

NATCO stands out in this market on the basis of specialty medicines in the fields of oncology, cardiology, and diabetics, among the biggest killer diseases affecting the population. Our established R&D centres and manufacturing facilities enable us to cater to pan-India demand.

The market in India will continue to grow. At NATCO, we are focused on bringing several products across different therapies ahead of competition.

China

Demand growth set to continue

China is the second-largest pharmaceutical market in the world and is estimated to reach $161.8 billion by 2023. Growth has slowed from a 19% CAGR during 2008–2013 to an 8% CAGR during 2013–2018, the trend is set to continue.

This growth has largely been supported by favourable government policies. Recent trends indicate increased efforts towards ensuring better governance and quality control measures, which presents an opportunity for Indian players. At NATCO, we are watching this market closely and have already initiated filing of products in cancer therapy.

The NATCO advantage

NATCO has earned a reputation for its products' quality and reliability. We have pioneered several key products into the Indian market by focusing on our mission to make specialty medicines available to all.
Thus, we offer, quality, efficacy, and value.



NATCO stands for several attributes, that lend an edge in the regulated and highly competitive markets that we operate in.

1. **Strategic portfolio selection criteria**

   We select molecules that are difficult to manufacture, have unique chemistries, or have to navigate through several patent restrictions. Thus, we take up product lines that pose high entry barriers, giving us a distinct edge over competition.

2. **Assurance of quality**

   We compete on the back of our product quality. We have consistently invested in backward integration and strategic partnership with third-party manufacturers, which gives us strong control over the quality and supply.

3. **R&D as an attitude**

   We have been successful in breaking through several complex chemistries and processes. This is thanks to our innovation culture and an entrepreneurial attitude with leadership commitment.

4. **Adoption of new technologies**

   We have been able to increase our efficiency while tackling environmental concerns, which is a direct result of adopting new technologies. We are constantly evaluating cutting edge technologies to reduce costs and expand our portfolio with difficult formulations.

5. **Diversification**

   NATCO diversifies its risk through different business verticals, geographies, and varied portfolio of products. Our recent foray into Crop Health Sciences is an example, as is our presence across markets with a diverse product range in the oncology, cardiology, diabetology and hepatology segments.



Domestic Business

Growing amidst challenges

This has been a challenging year for NATCO on the domestic front. While our oncology and Hep-C segments are leaders in the domestic market, the business suffered due to contraction in the market for Hep-C drugs, as well as pricing pressures in the oncology sector. Despite this, we met our target launches and are well positioned for growth.

Oncology

Oncology continues to be our most important segment in the Indian market. At present, we have 33 products in the oncology segment. We've also been more aggressive in introducing novel medicines for cancer patients. Competition and price erosion were the two biggest factors impacting business.

We have an attractive pipeline of products covering most of the unmet therapy needs in the field of Oncology. Most of these products fall in a segment where NATCO is already present with a basket of products. This is expected to insulate us from price erosion and also to consolidate in the segments where we are already present.

We have a portfolio of 33 brands across two segments: hematology (14 brands) and solid tumors (19 brands). We intend to build a full-fledged Bone Marrow Transplant (BMT) portfolio in India and have already launched Thiotepa, India's first generic BMT product.

Our portfolio's existing products continue to support patients by reducing the cost burden considerably.

Increasing focus on treatment for Multiple Myeloma

Our focus on oncology is evident from the robust portfolio of more than half a dozen products for Multiple Myeloma treatment. Multiple Myeloma (MM) is a cancer of the plasma cells, accounting for 15% of all hematological malignancies. MM poses a significant healthcare challenge from the perspective of both the cost and quality of care. The Age Standardized Rate (ASR) for MM's incidence as per the GLOBOCAN/IARC in India is 0.7/100,000 population amounting to about 6,800 new cases a year.

There has been a remarkable improvement in the survival rate of MM patients over the past few decades. This clinical progress is attributed to the availability of novel and target specific approaches to treatment. Our strong brands of generic alternatives of immunomodulatory drugs and proteasome inhibitors for the treatment of MM meets the unmet needs of cancer patients by increasing access and contributing to improved survival rate.

Non-Oncology

Specialty pharma

These are products related to orthopaedics and gastroenterology, including virology, Osteo & ICU, and neurology.

- The orthopaedics range covers all the important Bisphosphonates, including oral and injectables. All of them are segment-first introductions.
- The Gastroenterology range deals with the products of Hepatitis-B and Hepatitis-C, which has the complete range for both the therapies.

During FY 2019-20, at NATCO we had eight launches in the domestic market, five in cardiology and diabetology segment, and three in the oncology segment. We follow guidelines for pricing the drugs affordably, enabling us to reach more patients who need these therapies.



Cardiology and diabetology

Our Cardiology and Diabetology division (CnD) has performed well this year and is growing rapidly. The segment is set to become a major domestic sales contributor in the years to come.

Apigat (Generic Apixaban) is a drug used in the prevention and treatment of blood clots. The pool of patients served is vast as the medication is prescribed across specialties of cardiology, neurology, pulmonary, orthopedic, haematology, including antithrombotic therapy in COVID-19. The drug is safer than other anticoagulants without the side effect of gastric bleeding. Our goal of creating access for a large patient base at a third of the innovator's price fulfils our mission.

We launched a combination drug Vildanat M (Vildagliptin and Metformin) for diabetes, which has considerable potential to achieve better blood glucose control and improve therapy compliance. Despite being a new entrant in this segment in the domestic market, we were the first to launch the combination drug.

DDD: Diabetes Detection Drive

Diabetes currently affects more than 70 million people in India which is more than 7.2% of the adult population. Nearly 98 million people in India may have Type-II diabetes by 2030. We are also actively conducting patient education through Diabetes Detection Drive (DDD) programme across the country, covering ~25,000 patients every year promoting HbA1c testing as a useful longer-term gauge of blood glucose control.



₹5,405 million
Domestic formulation sales

₹100 MILLION BRANDS IN FY 2019-20

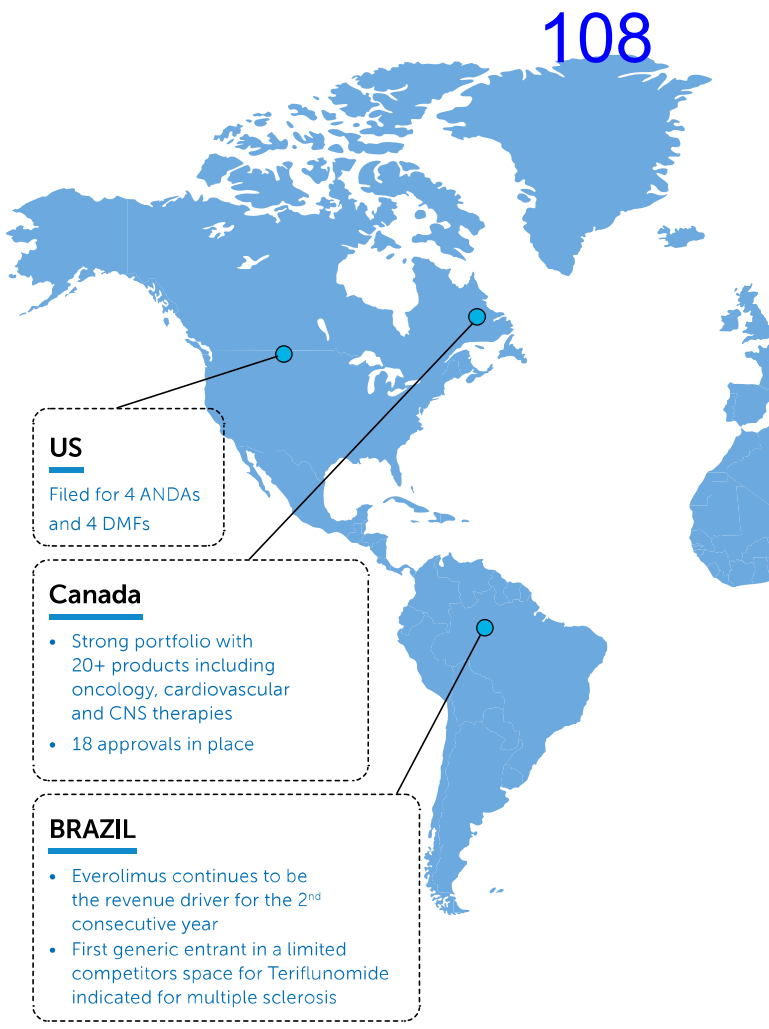
Indication	Molecule	Innovator Brand	NATCO Brand*
Chronic Myeloid Leukemia	Imatinib Mesylate	Gleevec	Veenat
Multiple Myeloma	Lenalidomide	Revlimid	Lenalid
Multiple Myeloma	Carfilzomib	Kyprolis	Carfilnat
Lung & Pancreatic Cancer	Erlotinib	Tarceva	Erlonat
Liver & Kidney Cancer	Sorafenib	Nexavar	Sorafenat
Lung Cancer	Gefitinib	Iressa	Geftinat
Chronic Hepatitis	Sofosbuvir/Velpatasvir	Epclusa	Velpanat
Chronic Hepatitis	Sofosbuvir/Daclatasvir	-	Hepcinat Plus

*Brands in litigation are not part of this list

International Business

Market-driven diversification

When it comes to international business, we continue to focus on enhancing our market reach and manufacturing capabilities. We are rapidly expanding into newer markets worldwide based on a partnership-driven approach.



As a globally recognised pharmaceutical conglomerate, NATCO has made a foothold in almost a fifth of the total countries in the world. Our operational presence is predominant in North America, Latin America and the South East Asian regions.

During the year, NATCO continued its growth trajectory in Canada, expanded the number approvals in Brazil and progressed well towards the approval of oncology products in China. We believe we have positioned ourselves to grow in all of these regions in the near future.

To expand our operations, we have partnered with corporations across the globe. For instance, for the US markets, we handle the development and manufacturing of products while our partners take care of the marketing. This not only allows us to conserve our resources but gain from the advantage of working with a regional partner that has a pre-established presence and market knowledge. In this regard, we work with both multinational and local players on a case by case basis.

A differentiated strategy for customising product portfolios

NATCO has witnessed several changes in the pharmaceuticals market over the past few years, including growing competition and pricing pressures. These also pose challenges to our ability to grow. Taking these into account we have arrived at the following priorities in terms of our international business:

Presence in the US

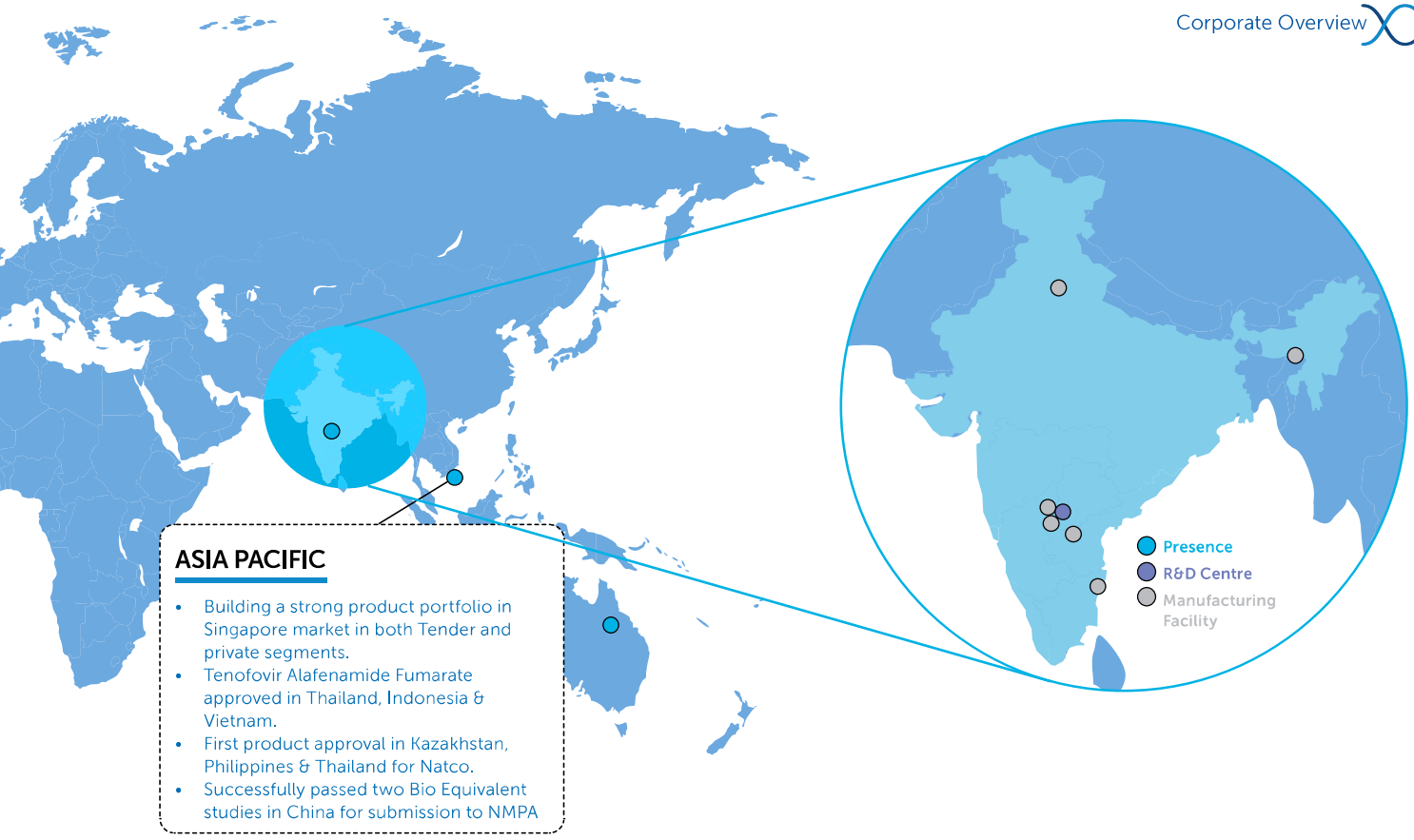
At present, our filings in the US are for intricate and niche products (either on our own or in collaboration with global pharmaceutical companies). Our FDF business is primarily focused on high-entry-barrier products that are either difficult to formulate and/or manufacture, typically resulting in limited competition in the market. In addition to having a strong supply from our manufacturing base in India, we associate with strong partners in the US, some of them with local manufacturing presence, which positions us well for expanding our business.

Focusing on other geographies

In the recent past, we have been increasingly turning our focus to non-US markets. In the US, profitability is a growing concern for pharma players due to the rising demand for generics, a space which witnesses extreme competition. The highest number of FDA-approved facilities are in India. This means that pharmaceutical concerns of all sizes are aiming to build a presence in the US. Hence, we have chosen to expand into other markets across the world. To do this successfully, we are partnering with local players. We are also building our marketing presence and filing for products with greater frequency, while we navigate localized regulatory processes and nuances of business.

Leveraging positive performance in Brazil and Canada

Brazil and Canada are two markets that have a very positive outlook based on NATCO's performance in these countries. Both countries offer significant sales opportunities for us. In Brazil, majority of sales are institutional or government sales. We are constantly looking at building strategies and local partnerships to access the market with our competitively priced products.



ASIA PACIFIC

- Building a strong product portfolio in Singapore market in both Tender and private segments.
- Tenofovir Alafenamide Fumarate approved in Thailand, Indonesia & Vietnam.
- First product approval in Kazakhstan, Philippines & Thailand for Natco.
- Successfully passed two Bio Equivalent studies in China for submission to NMPA

We are one of the leading generic oncology medicine suppliers in Canada. In addition to this, we're planning to bring affordable products through innovative ways around intellectual property constraints. We have a strong pipeline of products for the coming years. Our local presence in both these countries has grown, providing us with a stronger base for our operations. Essentially, we're positioning ourselves for future growth.

Intensifying efforts in pharmerging markets

We've been sharpening our focus on pharmerging markets through aggressive filings. We have improved our quality and efficiency of filings and have seen faster approval times thus, enabling reduced time to market. Our focused approach has helped us grow into markets such as Thailand, Vietnam, the Philippines, Indonesia, and more. Having positioned ourselves in the generics space, we're now an established entity in Singapore, both in government procurement and procurement by private hospitals.

A global approach to filings

We are ensuring make the most of opportunities available in various markets around the world. We have changed our approach from sequential filing to simultaneous filing in US and other pharmerging markets. We are increasingly working to tap the market potential of China and Australia. We are optimizing our ways to create a global dossier to spontaneously file in several territories across the globe.

₹9,334 million

Revenue from formulation exports, including subsidiary and profit share revenue

RoW

Our reach into the RoW markets is done through the following key channels - our subsidiaries and direct collaboration with local partners.

Partnerships

We have several strategic partners across the supply chain who are either API suppliers, or collaborations for co-development and marketing. One such partnership that is strategic to business growth and mission-led for us is with Alvogen.

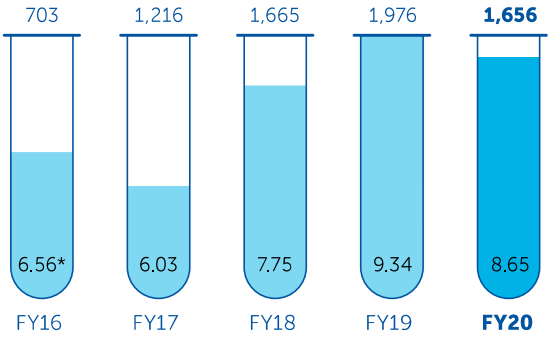
> "Natco and Alvogen share a true partnership in every sense as we complement and supplement each other's capabilities. One of our key flagship product launches, Oseltamivir, in the US market resulted in blockbuster revenues for both companies. We continue to share a strong and strategic partnership that spans over several high value products in the pipeline. Alvogen is very glad to have NATCO as a strong supply partner for niche products that are valued highly in the US market."
>
> - Alvogen

Research and Innovation

Solving problems of the future, today

Our business operates in a highly regulated space; therefore, quality is paramount. We have over 40 R&D laboratories in two research and development facilities with a talent pool of over 500 scientists. Our capabilities span synthetic chemistry of small molecules, peptide chemistry, oligonucleotides, nanopharmaceuticals and new drug discovery.

Expenditure on R&D (₹ in million)



* Total R&D expenditure as a percentage of standalone revenue



A culture of innovation

The reason behind the success of our R&D department is the ability and willingness of NATCO to take up new challenges. We constantly adopt new technologies and processes even as we focus on minimizing their environmental impact. We have enhanced our capabilities with technologies like liposomal, that are not only complex processes but also cater to therapeutic segments that generally require adherance to strict containment standards of manufacturing.

With the environment in mind, we have improved our capability in solid dispersion technology and built efficient processes that use less solvent. Our manufacturing with hot-melt extrusion is one such example.

Managing complex processes and supplier network

Our core strength is in identifying unique products where the API may not be easily available, where the formulation is challenging or where the clinical data may need several patient studies.

NATCO focuses on vaulting higher with every success using such criteria. This naturally reduces competition as we focus on growth. We generally start development for highly regulated markets and expand it to other potential opportunities.

Over the past few years, we have placed more emphasis on increasing our network of third-party suppliers in addition to our own backward integration. This has enabled us to target more complex processes with significantly greater number of steps to manufacture.

Technology focus

Technology is a barrier to developing and producing complex drug products. We consistently invest in systematic evaluation, thorough experimentation, IP study, and on time regulatory submission. We also address challenges to scaling up as well as product variability, which helps to make our technology more robust.



APIs

For over two decades, we have demonstrated technical and operational expertise in developing and commercialising more than 40 niche APIs. We continue to add complex molecules to this list, which serves as a testament to our research and development, and manufacturing capabilities.

We have a successful track record of regulatory inspections by the USFDA; Therapeutic Goods Administration (TGA), Australia; Hamburg Health Agency; Pharmaceuticals and Medical Devices (PMDA), Japan; Ministry of Food and Drug Safety, South Korea, Federal Commission for the Protection against Sanitary Risk (Cofepris), Mexico; and European Directorate for the Quality of Medicines (EDQM), EU.

Our key therapeutic domain is oncology and we are extending our expertise to include CNS and pain management.

49
Cumulative DMFs filed

39
Active DMFs

Key technology breakthroughs for manufacturing complex drugs

We present four examples of our flagship complex drug products that exemplify how we persist with technology-based solutions, both at the level of complex API development and drug delivery mechanisms.

Glatiramer acetate

A complex peptide used in the treatment of multiple sclerosis is manufactured with specific controls of critical process parameters, enabling us to produce quality product effectively.

The finished dosage, sold in pre-filled syringes, is an example of developing a complex API, tying up with manufacturing partner and drug delivery device provider.

Liposomal doxorubicin

The liposomal-based product delivers the medicine in a targeted manner. Liposome drug products are complex formulations where physical and chemical stability is vital, including the need for sophisticated physicochemical testing and very narrow particle size management.

Hepatitis-C portfolio of products

The Hepatitis franchise of molecules require to be made suitable for dissolution for increased bioavailability, which is achieved through our our internally optimized solid dispersion process. The bioavailability ofAPIs depends on its solubility in water. Making water-insoluble drugs more soluble presents a significant challenge in drug development. Hot-melt technology is a proven method for bioavailability enhancement of poorly soluble APIs.

Lanthanum carbonate

We are the only generic player for this product. The novelty is in the API development of a stable dihydrate form of an inorganic salt for use by patients with end-stage renal disease. The technology breakthrough and IP together have made it possible for us to launch this molecule, accessed mainly by geriatric patients.

Crop Health Sciences

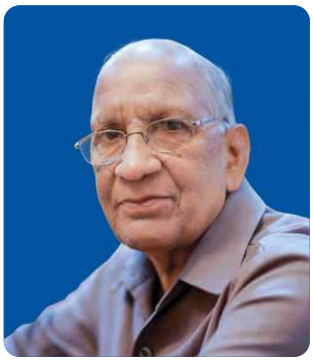
We are leveraging our expertise in organic chemistry to expand into the agrichemicals space. We have identified unique set of molecules for the Indian market, aimed at crop protection. We believe our agribusiness will be a key area of growth in the coming years as we target molecules that carry immense business potential in both domestic and foreign markets. Our key products in the pipeline include Chlorantraniliprole (CTPR) as well as other niche molecules.

Board of Directors

Guiding our way



V.C. NANNAPANENI
Chairman & Managing Director



G.S. MURTHY
Independent Director



T.V. RAO
Independent Director



RAJEEV NANNAPANENI
Vice Chairman & CEO



D.G. PRASAD
Independent Director



DR. LEELA DIGUMARTI
Independent Director



P.S.R.K. PRASAD
Director and Executive Vice President Corp Engineering Services



DR. M.U.R. NAIDU
Independent Director



DR. LINGA RAO DONTHINENI
Director and President - Technical Affairs



SRIDHAR SANKARARAMAN
Non-Executive and Non-Independent Director

Key Management Team

Leading us through

ADINARAYANA M.
Company Secretary & Vice President - Legal & Corporate Affairs

APPA RAO S.V.V.N.
Chief Financial Officer

DR S.S APTE
Vice President - R&D, NDDS

DR. GOPALAKRISHNAN VAIDYANATHAN
Vice President - Analytical R&D

DR. K.DURGA PRASAD
Vice President - R&D, Chemical Synthesis

DR. K SATYANARAYANA
Vice President - R. & D.

LAKSHMINARAYANA ARE
Vice President - HR & OD

DR. M. PULLA REDDY
Executive Vice President - R. & D.

DR. PAVAN BHAT GANAPATI
Executive Vice President - Technical Operations

RAJESH CHEBIYAM
Vice President - Acquisitions, Institutional Investment Management and Corporate Communications

RAMAKRISHNA SRIDHAR REDDY
Vice President - Q. A

DR. RAMESH DANDALA
Executive Vice President - Technology Transfer, Intellectual Property Rights and Regulatory Affairs (API)

DR. RAMI REDDY BHIMAVARAPU
Director - FDF

SADASIVA RAO N.
Vice President - Corporate Affairs, Legal & Secretarial, Estate Management

DR. SHANKAR REDDY BUDIDETI
Vice President - R&D, Chemical Synthesis

SRINIVAS CH.
Vice President - Demand and Supply Planning

SRIVATSAVA K.
Vice President - Marketing & Sales, Domestic

SUBBA RAO MENTE
Vice President - Global Generics

SUNIL KOTARU
Vice President -Supply Chain Management

SURESH PRABHAKAR KAMATH
Vice President - Operations (Visakhapatnam Unit)

VENKATA RAO TUMMALA
Vice President - Manufacturing, Chemical Division

Risk Mitigation Framework

Foresight, the key to effective risk management

At NATCO, we maintain an entrepreneurial mindset towards developing new products and marketing them. Our success depends on our ability to realise our goals. Our top leadership has consistently provided direction and decision-making to guide us into the market-leading position we enjoy today.

While we have been facing several challenges, these have only served to strengthen our focus on solving them and emerging from them greater and stronger. We are constantly in touch with key players in our ecosystem to help us understand the evolving scenario, including direct engagement with the end-users of our products. We are being foresighted in tailoring our strategies to manage risks and to achieve our goals.





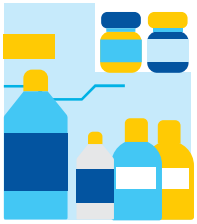
Nature of risk

COVID-19

The COVID-19 pandemic has caused disruptions to employee safety, supply chain, operations and patient readiness to undergo non-COVID-19 treatment.

Control and action

We undertook quick and aggressive action to prioritise employee safety. A task force was formed to address outbreak of the disease and treatment of those affected. Operations were prioritised and organised with strict social-distancing norms. Inventory management and supply chain actions were quickly taken to avoid major customer requirement disruptions. Non-critical civil construction work and capital expenditures were postponed. Strict controls over cash management and expenditure were instituted.



Nature of risk

Regulatory risk

An unfavourable facility inspection from USFDA or other major regulatory body can lead to a significant delay in product exports.

Control and action

We ensured that all our facilities were in good standing for approvals. During the year, our Kothur and Vizag facilities were reinspected by USFDA.



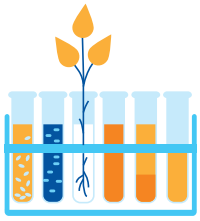
Nature of risk

Currency volatility risk

Fluctuations in foreign currency could result in variations in margins for NATCO.

Control and action

During the year, we gained due to strong dollar exchange rate.



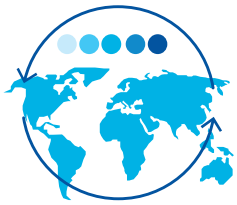
Nature of risk

Business portfolio risk

NATCO is exposed to the risk of revenue generation from limited therapeutic segments. This could have an impact on our financial viability.

Control and action

NATCO's pharma business is diversified into multiple therapeutic segments which include oncology, hepatology, cardiology and diabetology. During the year under review, eight products were launched across the segments to minimise product concentration risk. In the Crop Health Sciences division, we are working on a portfolio of diverse products. We have been aggressively launching products across these segments. In the US and many other markets, we have chosen molecules independent of therapy segment.



Nature of risk

Geographical risk

Being excessively dependent on the domestic and US markets could affect sustainability in the long run.

Control and action

As of FY 2019-20, our products reach a fifth of the countries across the globe. We have expanded beyond our dominant focus in India and the US with business growth in Canada, South America, the Middle-East and the Asia Pacific.



Nature of risk

Human capital risk

Our success depends on our ability to retain and attract key qualified personnel, and if we are not able to retain them or recruit additional qualified personnel, we may be unable to successfully develop our business.

Control and action

FY 2019-20 was an attestation to our policy and care towards employees and human capital. There was no compromise on employee compensation in spite of the difficult business environment.



Nature of risk

Health, safety and environment risk

Being in the business of healthcare, it is imperative for NATCO to ensure 'no risk' in regard to the health and safety of our stakeholder fraternity. Non-compliance with domestic and international regulations may lead to business disruptions.

Control and action

In addition to providing a well-balanced working environment, we instituted flexible policies during the pandemic and enhanced the coverage of healthcare benefits of every employee.



Nature of risk

Price control risk

Increased adoption of tender systems and other forms of price controls in the market could reduce revenue/ profit realisation for our products.

Control and action

We usually set our prices at competitive levels. Any impact of price control would be felt to a similar extent by our competitors, thereby making us indifferent to the situation.



Nature of risk

Patent risk

Our inability to defend patent challenges could prevent NATCO from selling products or may result in financial liabilities.

Control and action

We enter strategic partnerships for product launches with major distributors and renowned pharma companies, wherein the downside risks (legal costs) are shared. For domestic markets, certain products entail risks but we carefully assess them before any launch.

Corporate Social Responsibility

Empowering communities, improving lives

The NATCO Trust is the Corporate Social Responsibility (CSR) arm of NATCO Pharma Limited. A non-profit organisation, it was founded in 1995, and is based in Hyderabad. It serves communities in Hyderabad, Nalgonda, Jogulamba Gadwal, Siddipet and Rangareddy in Telangana as well as in Guntur and Vishakapatnam districts of Andhra Pradesh. It also conducts various activities in Tamil Nadu.

NATCO Trust believes that living and learning must go hand in hand if true development is to actualise. It concentrates on programmes under three key focus areas of education, healthcare and livelihood.

Our Belief

NATCO Trust strongly believes that a true society can be built by strong minds and committed hearts

Our Vision

To facilitate self-sustained development in the communities being served

Our Mission

To provide such support and service to the society which would have long-standing impact on improving the lives of individuals benefiting thereof.

CSR policy

CSR has been an integral part of the way we have been doing our business since inception. For more than 20 years, our CSR initiatives have played a pivotal role in improving the lives of the communities and society at large and in and around our manufacturing sites. Our efforts are aimed at facilitating self-sustained development among the communities being served.

The CSR policy clearly states NATCO's responsibilities towards each of our key stakeholder groups. The policy is governed by the CSR Committee of Board of Directors, which also maintains a keen oversight on NATCO's activities thus undertaken.

The main objectives of NATCO's CSR policy are:

- To lay down guidelines to make CSR a key business process for sustainable development of the society
- To directly/indirectly implement projects/programmes, which will enhance the socio-economic wellbeing of the communities surrounding our manufacturing sites and society at large.
- To generate goodwill and recognition among all stakeholders of NATCO

Community-driven engagement

NATCO Trust has a strong history of working with communities. We listen to our stakeholders and engage with them for a two-way conversation. The Trust takes forward critical actions in the areas of Education, Health, and Livelihoods. Our work keeps us connected to grassroot realities, across three states, seven districts, 48 villages, and one urban slum. Thereby, we work to address the fundamental challenges faced by the community through timely actions and the provision of adequate infrastructural and skilled human resources.

Education



35+
Schools

45+
Anganwadis

~9,000
Children reached

Outreach healthcare

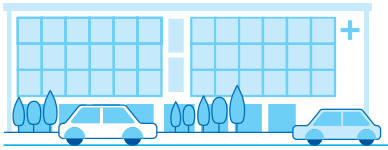
100+
Villages



~50,000
Beneficiaries

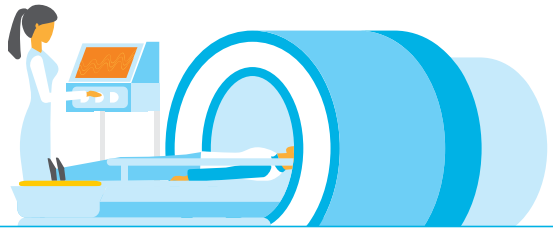
Institutional

5
Hospitals



~7,75,000
Beneficiaries

Cancer screening



300+
Women beneficiaries across 25 villages

Livelihoods

~475
Beneficiaries trained

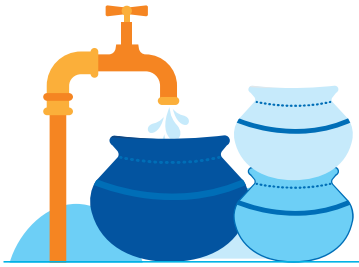
Nutritional and backyard kitchen garden



30+
Centres with nearly 500 beneficiaries

600+
Families benefited

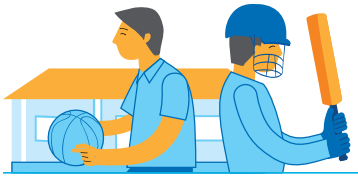
Potable water



2
Villages

1,300+
Families benefited

Rural sports



950+
Sportspersons took part in different games

Veterinary



4,500+
Animals benefited

Corporate Social Responsibility

EDUCATION

Education to empower communities

Our Education programme includes independent ventures comprising NATCO High School, established in 1995 at Rangapur Village, Ranga Reddy district, Telangana and NATCO School of Learning, established in 2011 at Gollamudipadu, Guntur District, Andhra Pradesh. Our schools mainly serve the communities in the neighborhood of our manufacturing sites. It is a long-term commitment that we are living by for over 25 years now. There are also collaborative programmes with government-run institutions and Integrated Child Development Services (ICDS) project. With government-run programmes, our value addition is in generating community dialogue, enhancing the services with creative solutions, and making these places for children at-par with similar privately-run institutions.

HEALTH

A holistic view of nutrition and health

Our programmes in this area include community-based and institutional healthcare services. Our community outreach programmes emphasise prevention, early screening, and primary medical care. The services include health education, basic health investigations, the doctor at the door-step, NCD investigation, cancer screening and referral through mobile units, and digital primary health centre. The NATCO Trust also runs nutrition centers in villages, providing much-needed counseling support to pregnant women and young parents. We focus on installing facilities for the provision of clean drinking water in the vicinity of our manufacturing sites and donate water treatment units to villages where we undertake other developmental activities.

Making formal education inspirational

Aksharabhyasam is a Sanskrit word meaning initiation of a child into the world of learning by his parents and teacher inspirational for the children of government Anganwadis which are run by the ICDS. The programme was held in the presence of the parents, panchayat representatives, key leaders, and ICDS functionaries. Around 800 people and the children witnessed the programme, enabling us to promote formal education and develop their pride and participation.



Making a difference where it matters most

The digital primary health centre at Kothur, Telangana is a community asset, supporting ~100 patients every day, mostly geriatric, offering a host of free services — diagnostic tests, medicines, and doctor consultation over videoconference. Operating for the past three years, the centre has built trust in its services by being a reliable partner in meeting rural communities' healthcare needs. Besides providing medical services, the centre has automated patient records, making the patient's experience seamless and secure.

Our work in healthcare institutions is toward offering counselling assistance to patients who go to government hospitals and need timely help with accessing medical facilities while they are in the hospital.

~9,000

Children benefited across 35 schools and 45 anganwadis including day-care and pre-primary centres

~7,75,000

Patients serviced across five hospitals and over 50,000 people within the communities

Providing timely support to improve health outcomes

The Comprehensive NATCO Cancer Centre at Guntur General Hospital, Andhra Pradesh, is a state-of the-art facility built in a spacious area of 80,000 sq. ft. The Cancer Centre started in July 2020, has 10 Outpatient Consultation Rooms, Comprehensive Laboratory, Pathology Lab, a large library and a conference hall with a capacity to host 200 people. It comes with Brachy Therapy Facility, CT Simulator Facility and two bunkers which can accommodate the first medical linear accelerator (LINAC) facility among Government Hospitals in the state. It provides medical, surgical and radiation oncology services free of cost.



Rambabu Dondapati, chose to opt for a government hospital for his baby's birth - an unconventional choice. Moreover, Rambabu and his wife, Vijayalakshmi, wanted to ensure a normal delivery as much as possible, while the private hospitals were more inclined to do a surgery due to a few minor complications.

The NATCO Trust patient counseling team took the parents-to-be in confidence, and offered them end-to-end support, even as Rambabu's wife was in the eighth month of her pregnancy. Initially, she had to spend a week in the hospital, during which, Rambabu's concerns were laid to rest, by the quality of care, treatment and supervision she received from NATCO's representatives at Niloufer Hospital in Hyderabad.

Later, the couple went on to have a healthy and happy girl child (weighing 2.6 kg) born on July 18, 2019, through normal delivery.

LIVELIHOODS

Enabling livelihoods with sustainable agriculture

Our primary focus in the farm segment is Zero Budget Natural Farming (ZBNF) and Non-Pesticide Management (NPM). We have trained over 300 farmers on Zero Budget Natural Farming (ZBNF) and Non-Pesticide Management (NPM). Over 100 farmers are practicing ZBNF and NPM farming, covering 8.75 acres and 29.6 acres, respectively.

Making way for sustainable agriculture

Anantha Reddy, a farmer with 16 acres of land in Nellihal village in Nagarjunasagar, Telangana, grows chili, cotton, and paddy, but struggled to make a substantial livelihood because of the high input costs and low yields. His farmland was completely dependent on rains as groundwater is not available all year round. Our team at NATCO Trust helped him understand the importance of chemical-free agriculture.

Soon after, he started getting better yields from the farm, which is now profitable. Today, he has successfully implemented NPM with the help of NATCO Trust by practicing the use of botanical extracts for pest protection and bio-based plant growth promoter, reducing input costs and increasing yield. He is also an active member participating in all meetings, training programmes and exposure visits to learn more about NPM practices and has organised Farmer Field Schools too at his own plant supported by NATCO Trust.



Strengthening sustainable operations and employee engagement

NATCO is moving in the direction of increasing activity on the sustainability front. We believe in taking a holistic view of our operations and work in being efficient and increasing the use of renewable energy. We are committed to increasing the green cover at all our facilities.

Resource conservation

Our sustainable operations philosophy includes the way we minimize waste conserve water and electricity, with a special focus on renewable energy use. We completed an energy audit in all our manufacturing sites and have identified critical measures for its conservation.



Japanese Garden at our Mekaguda facility

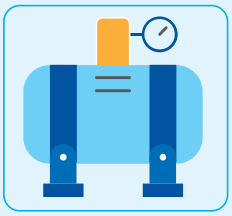
Energy audit

The energy audit has identified a range of energy-saving schemes in all the manufacturing sites encompassing no-cost, low-cost and medium-cost measures and the payback period can be categorised into immediate-term, short-term, medium-term and long-term measures.



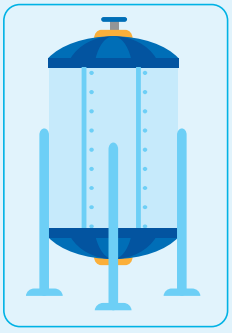
Pumps

- Replacement of inefficient pumps with energy-efficient smart pumps
- Change of impellers for pumps



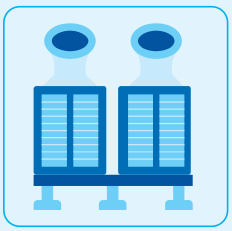
Compressors

- Arresting of compressed air leakages
- Optimum pressure set points for air compressors



Steam-related

- Optimisation of combustion air supply for boilers and hot water generators
- Change of steam traps
- Arresting steam leakages
- Waste heat recovery
- Condensate recovery enhancement



Others

- Cooling tower fan optimisation
- Cold and hot insulation improvement
- Power factor improvement



Aerial view of the solar power plant at our Mekaguda facility

Special attention has been paid in the energy audits to the Heating Ventilation and air conditioning (HVAC) area for identifying energy conservation schemes, as it accounts for over two-thirds of total energy consumption by utilities.

Similarly, we have piloted a water audit in one of our manufacturing facilities, which has given us valuable insights about points of use where water consumption can be reduced in operations. For example, reuse of reject water from fresh water RO plant for toilet flushing etc instead of draining to effluent treatment plant (ETP). We are also integrating our work with water savings and energy savings by standardising the implementation of ISO 14001 and ISO 45001 in the manufacturing facilities.

Renewable Energy*

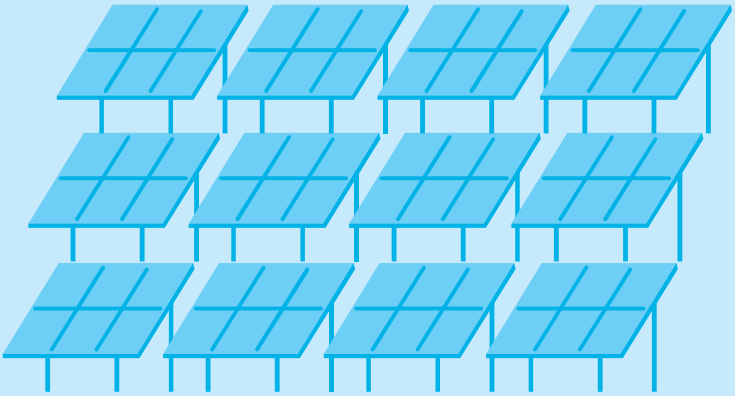
4.2MW
Wind power

5.2MW
Solar power



Facilities added during the year

1. Installed 0.80 MW (0.5 MW + 0.3 MW) capacity rooftop solar power plant at Kothur unit and is in operation since October 2019.
2. Installation of 0.5 MW capacity solar power plant is in progress at Visakhapatnam unit
3. Installation of additional 0.80 MW capacity solar power plant is in progress at Nagarjunasagar unit



*Installed capacity as of March 31, 2020

Sustainable Growth

Continual improvement

Continual improvement is a management philosophy to create step-change in specific operational requirements that are a keystone in making us sustainable. Here are our key continual improvement projects:

Preventive Maintenance (PM)

An essential element of our continual improvement programme is instituting a maintenance process that ensures equipment availability, reliability, and safety. Our PM programme, which we continually improve for execution rigour, targets higher equipment efficiency, reduction in energy consumption and positive environmental impact.

In one of the APIs divisions, we maintain over 4,000 equipment. The selection of equipment is based on the criticality of the operation and safety aspect of the reaction process undertaken in the equipment. Our keen focus on preventive maintenance allows us to sustain rigour in operations and, at the same time, contribute to a culture of safety.

Process equipment	Utility equipment	ETP equipment
2,845	**1,064**	**277**

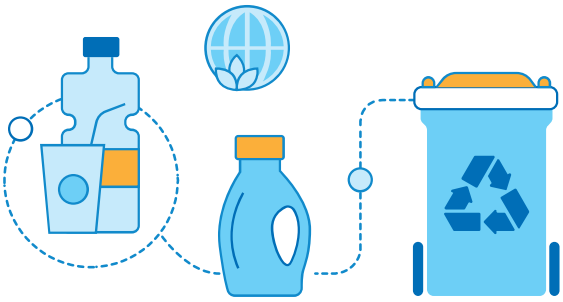
Area Total number of equipment

We monitor the PM programme's effectiveness and have ensured incidence reporting of process breakdown due to equipment failure, which has substantially reduced. Further, by adapting the predictive maintenance on MCC panel using thermography, we have eliminated the electrical system's sudden breakdown.

Fugitive emissions control

The continual improvement emphasis is directed towards identification and control of fugitive emissions in our API manufacturing sites. We have identified the sources of fugitive emissions in the process area and storage area. The approach involves periodical monitoring of workplaces for Volatile Organic Chemicals (VOC) concentrations in the process area and storage areas.

The implementation step has achieved the following changes in the workplace: closed transfer of solvents, vent condensers followed by two stage scrubbers, Local Exhaust Ventilation (LEV) connected to two stage scrubbers, nitrogen blanketing with breather valve arrangement for all solvent storage tanks, vent condensers with chilled water circulation system to eliminate/minimise the fugitive emission from the workplace.



Waste management

At one of our API manufacturing sites, we have sent 232 Tons of solid waste only to secured landfill in FY 2019-20, achieving a reduction of 57%, by installing paddle dryer for sludge cake drying. We have also obtained regulatory approval to dispose of solid waste to cement industries as supplemental fuel safely.

Green cover

We have embarked on an initiative – Eco Green Cover, a project using the Miyawaki concept invented and named after Japanese botanist Akira Miyawaki a unique technique to grow multi-layered dense green cover with native species. The Eco Green Cover is developed in ~3,000 sq mt with 7,600 plants of 45 native species and another 500 sq mt area with 1,800 plants with 45 native species along the boundary of the manufacturing site. In this practice, several native species are planted close to each other (at 60 cm distance). The plant growth is ten times faster, and the resulting plantation is 30 times denser than usual.

Safety culture

Our focus on proactive action for safety is supported by strengthening the near-miss reporting process. We have rooted the process in three areas: designing a simple process that people can implement, periodic communication, and campaigning to promote prompt near-miss reporting and recognising people who speak-up regarding near misses. These steps and a regular review of reported near-miss for corrective and preventive action by the plant head give us early heads-up on safety matters.



Safety Day Celebration at our Mekaguda Facility

Employee engagement

In developing our ability to withstand challenges, while generating hope for the future, our people are essential pillars. In strengthening our relationship with our people, we listen and actively create a culture of learning.

Stakeholder connect

We set up a platform NATCONNECT for leaders, functional heads, and teams across the manufacturing sites to connect and discuss sustainability dimensions, drawing from our inaugural sustainability report titled ***Making complex simple, Responsibly***, published for FY 2018-19.

Creating a culture of learning

Inculcating a culture of learning is about enabling our people to develop new competencies, unleash their potential, and become partners in creating value. In this process, we have stabilised functional and leadership training and learning platforms that offer courses in cGMP, quality management, EHS management, personal effectiveness and language learning.

Safety training

For safety, across all our manufacturing sites, we offer safety training in topics ranging from chemical reaction hazards, behaviour-based safety, hazard identification and control, emergency preparedness, health and hygiene, and first aid.

One of our flagship programmes Safety in Pharmaceutical Industry prepares our team members to incorporate safety in the manufacture of FDFs. The programme has learning materials ranging from videos, case studies about incidents, and in-house Standard Operating Procedures (SOP).

Quality management training

Another significant training emphasis is on cGMP and quality management. We continue to build the foundation and knowledge about new trends with sessions on ICH guidelines, CAPA management, audit and compliance, quality metrics, and regulatory guidelines.

Personal effectiveness and leadership

On the personal effectiveness dimension, which is an essential factor of leadership, both in the front-line and the middle, we have invested in a unique programme 'Unleash your potential'. The programme introduces building blocks of leading a team, unleashing team members' discretionary effort, and focus on their own physical and mental vitality. The mindset to appreciate, recognise, involve, and give importance to team members is shared with powerful metaphors and role-plays. A safe space of empathy is created so that the leaders can be vulnerable and, therefore, more willing to challenge the conventional mindset with a more empowering one.

Field-force training

We introduced Virtual Classroom Training (VCT) for the field force. The VCT is used for skill training supported with engaging polls, chat, break out rooms, and whiteboard activity. The field force underwent 199 hours, 218 hours, and 252 hours of brand and skills training in oncology, cardiology and diabetology, and pharma specialties divisions, respectively. For field coaching, managers undertook 240 days of collaborative work, including observation of doctor calls and feedback for improvement.



Training in progress

Average hours of training*

24
Workmen

30
Middle management
(Executive to Deputy Managers)

30
Supervisors

42
Managers and above

*Specific to manufacturing locations and R&D centres

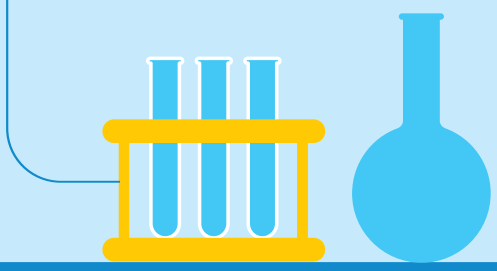


Management Discussion and Analysis

Economic overview

Global economy

The year under review witnessed rising trade tensions across several major economies and imbalances caused by geopolitical forces. It also faced unrestrained deficit spending in the developed world as well as low rates of growth in all the major economies. As a result, the second-half of the year moved steadily towards a slowdown.



In this scenario, the COVID-19 outbreak and pandemic dealt a major blow to the system, affecting populations around the world. Markets and economies came to a standstill as countries were forced to respond with lockdowns over extended periods of time in order to flatten the infection curve and reduce the risk of transmission, while grappling with the fallout of overburdened health infrastructure. Thus, economic growth for 2020 and 2021 has come under severe risk as nations try to recover from the impact of the pandemic.

The lockdown has hit discretionary spending. It has also resulted in loss of work opportunities which has impacted consumer confidence and overall stability.

The demand for goods and services continues to drop globally, the impact of which has been felt across almost all sectors. China, which is a key link in the global supply chains and heavily impacted by the pandemic is making efforts to revive its manufacturing. Simultaneously, major economies are trying to review the current situation, with a view to de-risk these supply chains from being localised in one single country.

GDP growth rates

	Projections (%)		
Region	2019	2020	2021
World output	2.9	-3.0	5.8
United States	2.3	-5.9	4.7
China	6.1	1.2	9.2
India	4.2	1.9	7.4
Japan	0.7	-5.2	3.0
Europe region (includes Germany, France, Italy, Spain)	1.2	-7.5	4.7

(Source – World Economic Outlook, April 2020 by International Monetary Fund (IMF))

The global economy is projected to contract sharply by 3% in 2020, majorly an after-effect of the COVID-19 pandemic. If the forecasts turn out to be true, the scenario would be more concerning than during the 2008–09 financial crisis.

As per IMF's World Economic Outlook revision post COVID-19 pandemic in April, 2020, the projected world output growth of 5.8% in 2021 would be possible if industrial operations resume with gradual normalisation of economic activities, along with policy support aided further by international, multi-lateral cooperation by governments across the globe.

(Source – KPMG, March 19, 2020; Franklin Templeton – Global Investment Outlook; IMF report on global economy)

Indian economy

During FY 2019-20, the Indian economy went through a downturn largely due to low rate of growth of rural income, a fall in domestic demand and the unavailability of affordable credit from Non-Bank Financial Companies (NBFCs).

While the government took steps to support the underperforming sectors, particularly NBFC and manufacturing, the drop in private investment could not be compensated for. As a result, the economy witnessed a stark fall in manufacturing and construction and private investment slackened. Thus, GDP continued to fall. However, signs of recovery marked the beginning of the fourth quarter after the government led with some bold fiscal measures. That is when the COVID-19 outbreak took place and the pandemic gripped the Indian economy.

India declared nationwide lockdown on 25th March, 2020, which while necessary to control the transmission of the virus and prepare systems for providing support to citizens, also brought to a halt 70% of industrial activity and discretionary consumption. This has severely impacted cashflows across sectors while plunging smaller businesses into a fight for survival.

Adding to these existing problems, there has been a continued weakness in the rupee amid negative consequence of lower remittances from the Middle East, a result of the fall in crude oil prices. The IMF, as a result in April 2020, slashed India's expected growth rate for FY 2020-21 to 1.9% as against 5.6% earlier. Simultaneously, rising healthcare costs and concerns will have to be factored into any planning for recovery. With a spotlight shone on the global pharma industry due to the pandemic, the unique positioning and inherent strengths of the Indian pharma industry have also been brought to light. (Source: KPMG, Potential impact of COVID-19 on the Indian economy, ET, Business Line).

Global pharmaceutical market review

Global spending on medicine has increased steadily at a 10-year CAGR of 4.2% from 2009 to 2019, reaching $955 billion in 2019. This growth is expected to exceed $1.1 trillion by 2024, driven by the increased use of specialty and innovative drugs and formulations reaching the market.

Specialty medicines account for 36% of global spending, with projections to touch 40% by 2024. New product growth too is projected to contribute $165 billion over the next five years, up from $126 billion. The rise in global pharmaceutical spending would be due to increased usage and because of changes in the specialty and innovative product composition of new brands coming up in the market. However, factors countering this growth may include, to an extent, overall pricing pressures and patent expiry in the developed markets.

While the developed markets currently include 10 countries with pharmaceutical spending greater than $10 billion, namely the US, Japan, Germany, France, Italy, Spain, the UK, Canada, South Korea and Australia, pharmerging markets include countries with per capita income below $30,000 per year and five-year absolute growth in pharmaceutical spending greater than $1 billion. India, China, Russia, South Africa, Saudi Arabia, Thailand, Turkey and Vietnam are key phamerging markets, among others.

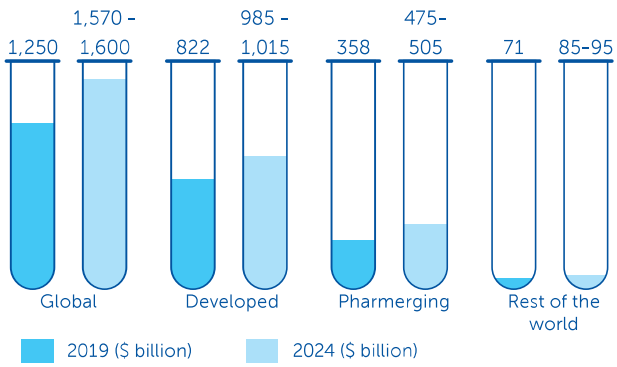
The pharmerging market is expected to reach $345 billion by 2024, and this would be majorly driven by expansion in market accessibility, leading to usage in greater volumes and adoption of more specialty medicines. The developed markets are likely to reach a market size of $695 billion by 2024, supported by pricing and market access controls.

Markets	2014-2019 CAGR	2020-2024 CAGR
Global	4.7%	3-6%
Developed	3.8%	2-5%
Pharmerging	7.0%	5-8%
Rest of the world	4.8%	2-5%

(Source: IQVIA Institute, Mar 2020 - Global Medicine Spending and Usage Trends)



Global pharmaceutical market growth

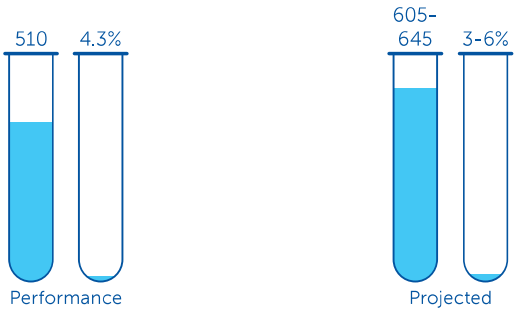


US

The US continues to be the largest pharmaceutical market, capturing ~41% of global pharmaceutical spending. It also dominates pharmaceutical trends, both in consumption and development. During the period from 2014 to 2019, the US has recorded CAGR of ~4% in its spending on medicines. According to estimates, prescription drug spending stood at $500 billion in 2019. The probability of this touching $600 billion by 2023 is high. Despite it being a mature market for years, the US pharmaceutical industry is still ranked fourth in the overall growth potential, trailing high-growth emerging markets like China, India and Germany.



Growth of US pharmaceutical industry ($ billion)



(Source: IQVIA Market Prognosis, September 2019; IQVIA Institute, December 2019)

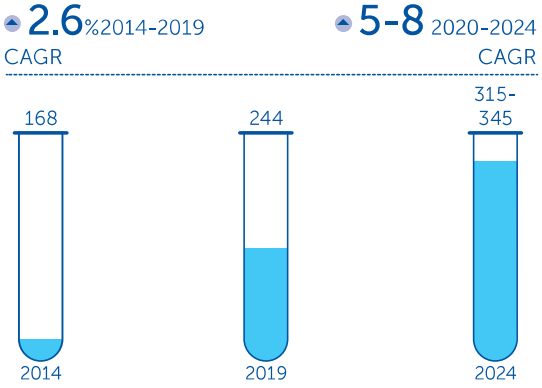
Outlook

The US pharmaceutical market is expected to touch $645 billion by the end of 2024, growing at a CAGR of 3-6%. The development and launch of new innovative specialty drugs for oncology and some other niche treatments are being considered as the major drivers of growth, some of which might be offset by the expiry of a few major patents.

Pharmerging markets

Pharmerging markets have seen the greatest growth, with a 12.2% CAGR between 2009 and 2014 and 7.7% CAGR between 2014 and 2019. In 2019, pharmerging markets comprised 26% of spending, which is expected to rise to 28-30% of that in 2024. Most of this growth has been driven by expansion of access to drugs and healthcare, leading to greater volume use and increasing adoption of novel therapies. This is expected to lead to rise in consumption of specialty medicines.

Growth of pharmerging market ($ billion)



(Source: IQVIA Market Prognosis, Sep 2019; IQVIA Institute, Dec 2019)

Outlook

Among the different sections of pharmaceutical industry, pharmerging seems to be the most promising because of the expected growth rate of 5-8% CAGR till 2024, much higher than the developed markets. By 2024, ~31% of global pharmaceutical spending is expected to come from these markets.

A major driver of demand will be the consumption of branded generics and pure generic medicines. Higher volumes will aid this growth. Positive trends include acceptance of newly introduced medicines even as high costs may restrict growth in volumes.

Countries like India, China and Brazil have huge pharma spending. With all three nations focusing on improving their healthcare facilities, pharmerging markets will continue to witness increased spending.

India

India commands a strong position in the global pharmaceuticals sector. Being the largest manufacturer of generic drugs globally, catering to ~40% of the demand for generic medicines in the US and 25% of all medicinal requirements in the UK. Indian pharmaceutical sector meets more than 50% of the world's demand for vaccines.

Indian pharmaceuticals domestic market sales reached $20.03 billion in 2019, from $18.12 billion in 2018, a growth of 9.8%. India's pharmaceutical exports stood at $13.69 billion in FY 2019-20 (up to January 2020). By 2020, these are expected to touch $100 billion, whereas the medical device market is expected to be valued at $25 billion.

The Indian government has been proactive in encouraging the pharmaceuticals sector. It accounted for allocation of ₹650.12 billion under the Union Budget 2020-21 by the Ministry of Health and Family Welfare, boosting the confidence of the industry. The government also unveiled the 'Pharma Vision 2020' aimed at making India a global leader in end-to-end drug manufacturing.

Focus is on the speedy introduction of generic drugs into the market, which will greatly benefit the Indian pharmaceutical companies. Also, the time required for approval of new facilities stands reduced, which will help to boost investments. Pharmaceutical companies are also encouraged by the strong focus on rural health programmes, life-saving drugs and preventive vaccines. Medicine spending in India is projected to grow 9-12% over the next five years, which would make India count among the top 10 countries in terms of medicine spending.

(Source: IBEF)

Business overview

NATCO Pharma Ltd. is a vertically integrated and R&D focused enterprise, engaged in developing, manufacturing and marketing FDF and active pharmaceutical ingredients (APIs) and intermediates. The Company has also initiated plans to diversify into niche agrichemical business.

The Company focuses on niche therapeutics areas and complex products, which gives it a unique positioning in the market, spread over 40 countries. It sells FDF products in the US, India, Europe and Rest of the World (RoW); with substantial clientele in Canada and Brazil as well. It holds a leading market share in the domestic oncology segment.

In India, NATCO sells its products through its own salesforce and branding whereas, in the US and RoW markets, business is done through local partnerships or subsidiaries. The Company's pharma segment has eight manufacturing facilities, which include six FDF and two API facilities that offer several advantages and help to optimise costs.



₹20,224 million
Total revenue

₹4,608 million*
Profit after tax

*Attributable to owners of the company

FY 2019-20 has witnessed significant improvement in the cardiology and diabetology product segments with sales doubling against those recorded in FY 2018-19. Regarding RoW markets, Canada and Brazil, the Company has done much better than expected and has higher growth prospects going forward. It is also looking at further expansion in markets like Singapore, Vietnam, Thailand, Taiwan, and more.

The Company is applying its technical expertise and scientific knowhow in organic chemistry into agrichemicals business. It has been aggressively investing in setting up the technical as well as the formulation facilities and operations are expected to begin from the second half of FY 2020-21.

NATCO's growth is backed by strong fundamentals. Despite a challenging year in FY 2019-20, the Company is confident of growing well in FY 2020-21 and beyond.

Business segments

NATCO operates in two business categories, FDF and APIs. Its formulations business caters to international markets, with key focus on the US and Europe while increasing foothold in Brazil and Canada, and domestic markets, with products in oncology, pharma specialties and cardiology and diabetology (CnD). NATCO's API business leverages its unique capabilities that include multi-step synthesis, semi-synthetic fusion technologies, high-potency APIs and peptides. NATCO is also into contract manufacturing. The Company is leveraging its expertise in organic chemistry to drive its foray into agrichemicals to help improve crop health.

Domestic formulations

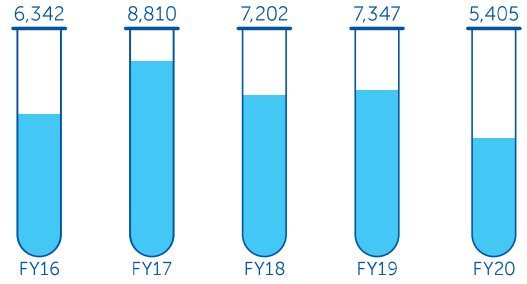
NATCO has a strong domestic formulations business led by its presence in the oncology segment and a strong portfolio of products in its non-Oncology segment including Hepatitis C portfolio products. The Company made significant progress in its cardiology and diabetology segment through the launch of five niche products during the year. Overall, during FY 2019-20, the Company launched eight products across the three key business segments. Oncology as well as the pharma speciality business faced downward revenue trends in FY 2019-20 on account of tepid demand. Despite the challenges, the Company was able to launch products catering to different therapies and segments. NATCO has established its presence in all three business segments and is geared up to launch 8-10 products every year across all its segments in the near future.

During the year, NATCO's domestic business faced multiple macro headwinds, including channel pricing controls for the oncology products and continued decline in the patient pool for the acute disease caused by Hepatitis-C leading to a decline in our pharma specialty segment. Lastly, there was COVID-19-related business decline during the fourth quarter of the year.

Domestic FDF sales

(₹ in million)

(4)% (4-year CAGR)



Oncology

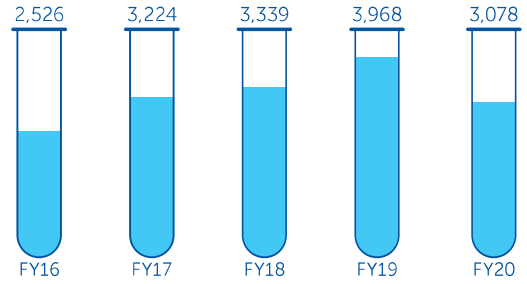
NATCO's product portfolio is among the most extensive in the Indian oncology market, with 33 active products as on 31st March, 2020, During the year, the Company launched three products with several more launches expected in the future. The company has 10 brands which have recorded sales over ₹100 million during FY 2019-20.

The oncology segment is core to NATCO's base business and is expected to continue its growth trajectory over the next several years. The Company's revenues from this business segment fell from ₹3,968 million in FY 2018-19 to ₹3,078 million in FY 2019-20, primarily due to certain macro pressures. These include new pricing controls by National Pharmaceutical Pricing Authority (NPPA), which impacted the margin along the sales channels and the pressures surrounding COVID-19 during the fourth quarter. We expect to regain growth momentum for the segment going forward.

Oncology sales

(₹ in million)

5% (4-year CAGR)



Non-Oncology business

This comprises of products from our pharma specialty and C&D divisions apart from third party manufactured products. The Company's revenues from the non-oncology business fell from ₹3,379 million in FY-2018-19 to ₹2,327 million in FY 2019-20.

Pharma Specialties

NATCO has 18 active products in its pharma specialities portfolio that caters largely to gastroenterology, hepatology, orthopaedics, neurology and critical care. The gastroenterology range deals with the novel drugs for chronic Hepatitis-B and Hepatitis-C and the orthopaedics range covers all the important bisphosphonates, including the oral and injectable ones.

Over 90% of the business in this segment is contributed by the Hep-C portfolio products. The primary reason for the decline in the Hep-C portfolio is the shrinkage of the market size as more patients got treated from this acute disease. We have an interesting list of gastro-hepatology products to be launched in the ensuing years.

Cardiology and diabetology

Since its launch in 2017, NATCO has gradually built the portfolio of products in the segment but FY 2019-20 was a defining year with the launch of five notable products. Of these, Vildagliptin was the first to launch after the innovator in spite of a plethora of competitors.

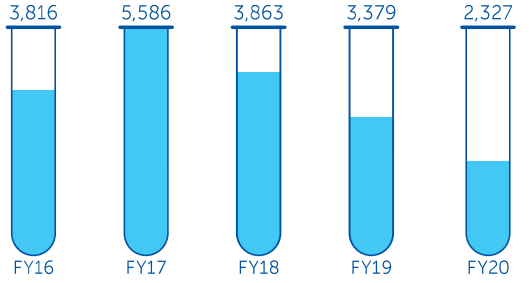
Third Party manufacturing

Contract manufacturing of products for third party companies is the revenue component for this segment.

Non-Oncology revenue*

(₹ in million)

(12)% (5-year CAGR)



*includes third party



The segment grew exponentially in revenue terms, garnering ₹150 million during FY 2019-20 as compared to ₹70 million during the previous year. NATCO is working to develop a pipeline of products, which will help to distinguish the Company's products from those of its competitors.

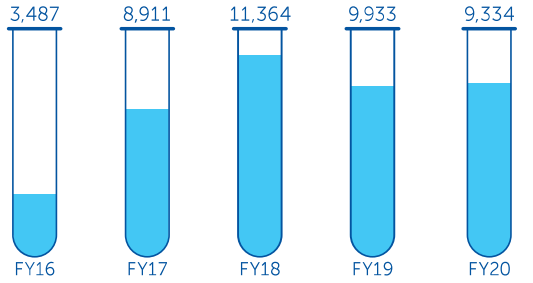
International formulations

It's been more than a decade that NATCO established a presence in the US and other international markets. In the US, it follows a partnership-driven business model, wherein, NATCO brings the manufacturing strength and know-how while its partner brings the marketing strength. In Canada, Singapore and Brazil, NATCO functions through its subsidiaries.

During FY 2019-20, the Company's revenue from international business stood at ₹9,334 million, as compared to ₹9,933 million in FY 2018-19. Of this, earnings from exports from India stood at ₹8,249 million, whereas subsidiaries contributed ₹1,085 million of net revenue.

International formulations (₹ in million)

28% (5-year CAGR)



US

The exports (including FDFs and APIs) to the US clocked revenue of ₹7,834 million in FY 2019-20. NATCO is positioned strongly in its business in the US, which is primarily driven by the continued growth of revenue coming from Glatiramer Acetate and Liposomal Doxorubicin. The revenues from Oseltamivir continue to be appreciable in spite of competition and the launch of the product over three years ago. During the year, the Company filed for four niche ANDAs with several others in the pipeline.

All NATCO's manufacturing facilities which cater for the US business continue to be in good standing from USFDA. NATCO's Vizag facility, which is part of an SEZ for the export market was also successfully inspected during the financial year by USFDA.

We continue to face pricing pressures for older drugs in the NATCO US portfolio. Despite these challenges, we have managed good revenue from the US markets.

Key Para-IV products in the pipeline

Key Brand	Molecule	Therapeutic Segment / Primary Indication
Nexavar	Sorafenib	Cancer/Kidney and Liver
Tykerb	LapatinibDitosylate	Cancer/Breast
Revlimid	Lenalidomide	Cancer/Multiple myeloma
Afinitor	Everolimus (higher strength)	Cancer/Breast
Zortress	Everolimus (lower strength)	ImmuneSupression/ OrganTransplant
Aubagio	Teriflunomide	CNS/Multiple sclerosis
Kyprolis	Carfilzomib	Cancer/Multiple myeloma
Pomalyst	Pomalidomide	Cancer/Multiple myeloma
Sovaldi	Sofosbuvir	Antiviral/Hep-C
Imbruvica	Ibrutinib	Cancer/Leukaemia
Lonsurf	Trifluridine/Tipiracil	Metastatic colorectal cancer
TracleerTFO	Bosentan	Pulmonary Arterial Hypertension

RoW markets

Canada

During FY 2019-20, NATCO Pharma Canada Inc. did a business of ₹1,283 million, as against ₹960 million in FY 2018-19. In spite of global headwinds, our subsidiary in Canada has shown resilience and growth. NATCO had total 12 active products with 18 approvals as of 31st March, 2020. As of Q1 FY21 Board meeting, the Company has disclosed a settlement with Celgene (now part of Bristol-Myers Squibb) for the product Lenalidomide Capsules in Canada. The Company is excited about its growth in the next few years in Canada.

Brazil

In Brazil, the government and regional tenders account for most of the medicine sales. NATCO services this market through its subsidiary NATCOFARMA Do Brasil. During the year, the Company witnessed four filings. As on 31st March 2020, NATCO had nine filings in Brazil. During FY 2019-20, it has registered a business of ₹390 million. Regulatory factors remain a key challenge in this market apart from the tender to sale conversion challenges. The Company expects incremental growth in the coming years.

	Total filed	Total number of approvals	Total number of active products
Brazil	9	3	3
Canada	28	18	12

Other RoW markets

NATCO is venturing into newer territories in RoW markets, apart from strengthening its presence in markets where it already operates.

The Company has gradually gained market in Singapore with its generic branded products in spite of the strong affiliation towards innovator brands prevalent in the market.

FY 2019-20, however, turned out to be the year of a breakthrough and NATCO won a major tender worth more than SGD$1 million.

The Company has been gradually increasing its presence in the Philippines, Thailand, Vietnam, China and Australia.

Active Pharmaceutical Ingredient (API)

NATCO enjoys a strong reputation for its API products. Generally, the Company focuses on the manufacture of niche APIs to support its formulation business.

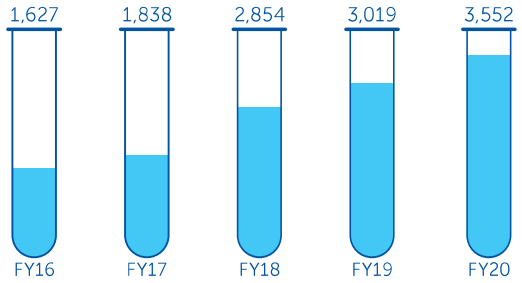
The Company's move to vertically integrate its API facility helps to ensure business sustainability both in periods of margin pressure as well as disruption in raw material supply.

Revenues from the API division during FY 2019-20 stood at ₹3,552 million as compared to ₹3,019 million in FY 2018-19. As of 31st March, 2020, NATCO has a total of 49 active DMFs with the USFDA for products in the areas of oncology, cardiology and orthopaedic therapies. We filed for four DMFs for the US market in FY 2019-20.

Gross API revenues

(₹ in million)

22% (5-year CAGR)



Segmental Breakdown

Revenue division	(₹ in million)*			
	FY 17	FY 18	FY 19	FY 20
API Revenue (total)	1,838	2,854	3,019	3,552
Formulations				
Domestic	8,810	7,202	7,347	5,405
International (including subsidiaries)	8,911	11,364	9,933	9,334
Other operating and non-operating incomes	1,230	1,004	1,948	1,933
Total revenue	20,789	22,424	22,247	20,224

*Figures regrouped wherever appropriate



Crop Health Sciences

NATCO has forayed into the agrichemical space through its Crop Health Sciences Division recently. Currently it is in the process to complete the manufacturing facilities for both technical (active ingredient) and formulations. NATCO is targeting the release of a key technical product from its CHS division for Chlorantraniliprole (CTPR), a broad-spectrum insecticide used in several crops, and is hoping to bring formulations based on this product with affordability and accessibility to farmers across the country. NATCO is awaiting regulatory approval for the CTPR product and litigation outcome.

The Company also has other niche products in the pipeline, to differentiate itself from other agrichemical companies.

Management Discussion and Analysis



Financial overview

During FY 2019-20, NATCO's consolidated revenue from operations stood at ₹20,224 million, growing at a CAGR of 16.7% over the last four years. The EBITDA for the year was ₹6,900 million, with an EBITDA margin of 34.1%. The Company's EBITDA has been growing steadily at a CAGR of 25% over the past four years. Profit After Tax (PAT) stood at ₹4,608 million, with the PAT margin being 22.8%. CAGR of NATCO's PAT over the past four comes to 30.9%.

The market capitalisation of the Company as on 31st March 2020 stood at ~₹92 billion. For the year ending March 31st 2020 NATCO has declared an equity dividend of 337.50%, amounting to ₹6.75 per share (face value of each share being ₹2). Altogether, dividends worth ₹1,536 million (including dividend distribution tax) have been paid to the shareholders in FY 2019-20, as compared to ₹1,108 million (including dividend distribution tax) in FY 2018-19.



Moreover, even in such tough and challenging market, the Company has been able to maintain its Return on Equity (ROE) at 12% and Return on Capital Employed (ROCE) at 15% for its shareholders during FY 2019-20. Based on the business prospects for the coming years, we expect both metrics to make appreciable improvements.

Threats, risks and concerns

Adverse assessment of a manufacturing facility by any key regulatory body has the potential to significantly change the business prospects of any pharmaceutical company.

Environment, health and safety

At NATCO, we recognise the importance of a clean environment and it is our constant endeavour to go beyond regulatory compliance to contribute to it. Compliance is our cornerstone. Every employee is encouraged to be an environment custodian.

This consciousness underpins our strategy and business model, which are focused not just on mitigating the environmental after-effects of business, but on containing them from the very start.



As we continually seek new and more effective ways of minimising our impact on the environment, we are keenly aware of the correlation between global warming and the incidence of infectious diseases.

In an effort towards continuous improvement in Safety, Health and Environment, we have reviewed and improved our various processes:

- Enhancement of Zero Liquid Discharge capacity at Mekaguda is completed, required permissions obtained and is ready for operation to handle additional loads and to produce more products to reach out the more unmet medical needs
- Upgradation of ETP is in progress at Nagarjuna Sagar and at Kothur unit
- Energy audits conducted across the group units to assess the energy efficiency and to identify the opportunities for improvement
- Monitoring the Scope-I and Scope-II GHG emissions to assess the performance of our carbon footprint and to roll out action plans for further mitigation
- Developed an Eco-Forest by using 'Miyawaki' concept along the boundary at Mekaguda unit
- Implemented the 'Behaviour Based Safety' management system to inculcate the safety culture among the employees at Kothur unit in association with Administrative Staff College of India

Board's Report

The Board takes pleasure in presenting the 37th Annual Report of the Company along with the Audited Financial Statements and other reports for the year ended March 31, 2020.

Company Overview

Your company is a vertically integrated pharmaceutical company having presence in multiple speciality therapeutic segments. Over the years, the Company has developed an innate ability to deliver molecules, which are complex and hard to manufacture. The Company has constantly innovated and manufactured speciality medicines and niche pharmaceutical products. The Company has its corporate headquarters at Hyderabad.

Financial Summary

A summary of the Company's financial results for the Financial Year 2019-20 is as under:

(₹ in Millions)

Particulars	Standalone		Consolidated	
	Year ended March 31, 2020	Year ended March 31, 2019	Year ended March 31, 2020	Year ended March 31, 2019
Net Revenue /Income	19140	21161	20224	22247
Gross profit before interest and depreciation	7018	9463	6900	9250
Finance Cost	206	188	215	193
Profit before depreciation and amortisation - (Cash Profit)	6812	9275	6685	9057
Depreciation and Amortisation	981	801	998	810
PBT before exceptional items	5831	8474	5687	8247
Exceptional items	-	-	-	-
Profit before Tax (PBT)	5831	8474	5687	8247
Provision for Tax –Current	1251	1863	1271	1883
Income Tax for earlier years	40	-	40	-
Provision for Tax –Deferred	(205)	(60)	(205)	(60)
Profit after Tax	4745	6671	4581	6424
Other comprehensive income (OCI)	(64)	(91)	(145)	(76)
Total Comprehensive income for the period	4681	6580	4436	6348

The details of the Company's operations have been further discussed in detail in the Management Discussion and Analysis Report.

Impact of Covid-19

In March, 2020, the World Health Organisation declared COVID-19 to be a pandemic. The Company has adopted measures to curb the spread of infection in order to protect the health of its employees and ensure business continuity with minimal disruption. The Company has considered internal and external information while finalising various estimates and recoverability of assets in relation to its financial statement captions up to the date of approval of the financial statements by the Board of Directors. Considering the Company is in the business of manufacturing and supplying of pharmaceutical products which is categorised under essential goods, there has been a minimal disruption with respect to operations including production and distribution activities. The actual impact of the global health pandemic may be different from that which has been estimated, as the COVID-19 situation evolves in India and globally. The Company will continue to closely monitor any material changes to the future economic conditions.

Dividend

The Company declared four interim dividends for the FY 2019-2020, the details of which are as follows:

S. No.	Date of Board Meeting	Date of payment	Interim Dividend Declared per equity share of face value ₹ 2/- each
1.	August 9,2019	August 27, 2019	1.25
2.	November 12, 2019	November 27, 2019	1.00
3.	February 12, 2020	February 27, 2020	3.50
4.	June 17, 2020	July 3, 2020	1.00
	TOTAL		6.75

The total dividend pay-out for the 1st, 2nd, 3rd & 4th Interim dividend amounted to ₹ 1,229 million and dividend distribution tax amounted to ₹ 215 million. Thus the 1st, 2nd, 3rd & 4th Interim dividend resulted in total pay-out of 25.9% of the standalone profit after tax of the Company for the year under review.

The three Interim Dividends have been paid to all eligible shareholders and the fourth interim dividend is declared on June 17, 2020 which is due for payment on or before

July 3, 2020. Accordingly your Directors recommend that the above four interim dividends be treated as the final dividend of the Company for the Financial Year 2019-20. The Dividend Distribution Policy of the company is annexed to this report as **"Annexure VIII"** and is also available on the Company's website www.natcopharma.co.in.

Transfer to Reserves

The Company has not transferred any amount to the general reserve for the financial year ended March 31, 2020.

Share Capital

During the year under review, 3,05,840 equity shares were issued and allotted under Employee Stock Option Schemes (ESOP- NATSOP 2015, NATSOP 2016 & NATSOP 2017) and a total of 9,84,344 shares were bought back by the Company through open market route under the SEBI (Buy-back of Securities) Regulations, 2018 and the same were extinguished. Accordingly, the issued and subscribed share capital of the Company as on March 31, 2020 stood at ₹ 364 million divided into 18,20,67,975 equity shares of ₹ 2/- each as against ₹ 365 million divided into 18,27,46,479 equity shares of ₹ 2/- each as on March 31, 2019.

Buyback

During the year ended March 31, 2020, the Company bought back and extinguished 984,344 equity shares of ₹ 2 each for an aggregate purchase value of ₹ 536 million at an average price of ₹ 544 per share, excluding transaction costs under the buy-back of equity shares plan approved by the Board of Directors on November 5, 2018

Deposits

During FY 2019-20, the Company did not accept any fixed deposit within the meaning of Sections 73 and 74 of the Companies Act, 2013 read together with the Companies (Acceptance of Deposits) Rules, 2014 and therefore no amount of principal or interest was outstanding, as on the date of balance sheet.

Change in the nature of Business, if any

During the year, there was no change in the nature of business of the Company or any of its subsidiaries.

Subsidiaries

The Company has seven (7) subsidiaries as on March 31, 2020. The consolidated financial statement of the Company and all its subsidiaries prepared under Indian Accounting Standards (Ind AS) specified under Section 133 of the Companies Act, 2013 form part of the annual report. Further, a statement containing the salient features of the financial statement of our subsidiaries in the prescribed Form AOC-1, is attached as **"Annexure I"** to the Board's Report. This statement also provides the details of the performance and financial position of each subsidiary. In accordance with Section 136 of the Companies Act, 2013, the audited financial statements and related information of the subsidiaries, where applicable, will be available for inspection during regular business hours i.e., from 9:00 AM to 5:30 PM at the Company's registered office in Hyderabad, Telangana, 21 days before the schedule date of Annual General Meeting.

Particulars of Loans, Guarantees and Investments

The Company provides investments, loans and guarantees to its subsidiaries for its business purpose. Details of investments, loans, and guarantees covered under Section 186 of the Companies Act, 2013, form part of the notes to the financial statements provided in this annual report.

Corporate Governance and additional Shareholders Information

Pursuant to the SEBI (Listing Obligation and Disclosure Requirements) Regulations, 2015 ("Listing Regulations"), a detailed report on the Corporate Governance systems and practices of the Company is given under Corporate Governance Report which is part of this Annual Report. Similarly, other detailed information for shareholders is provided in the chapter Additional Shareholders' Information.

A certificate from Mrs. D Renuka, Company Secretary in Practice (C.P. No. 3460) on the compliance with the conditions of Corporate Governance is part of the Corporate Governance Report. A certificate from her that none of the Directors on the Board of the Company are disqualified from being appointed or continuing as a Director(s) of Company by the Ministry of Corporate Affairs or any to the effect statutory authority is attached to this Annual Report.

Management Discussion and Analysis

A detailed report on the Management Discussion and Analysis is provided as a separate chapter in this annual report.

Board of Directors

In accordance with the provisions of the Companies Act, 2013, Sri Sridhar Sankararaman (DIN: 06794418) is liable to retire by rotation and being eligible offers himself for reappointment at the ensuing Annual General Meeting of the Company.

Board Evaluation

As per provisions of the Companies Act, 2013 and the Listing Regulations as amended from time to time, an evaluation of the performance of the Board was undertaken. The contribution and impact of individual Director(s) were reviewed through a peer evaluation on parameters such as level of engagement and participation in Board/ Committee meetings, flow of information, independence of judgment, conflicts resolution, managing relationships

within the Board and their contribution in enhancing the Board's overall effectiveness. The feedback obtained from the interventions was discussed in detail and, where required, independent and collective action points for improvement put in place.

Appointment of Directors and Remuneration Policy

The assessment and appointment of members to the Board is based on a combination of criterion that includes ethics, personal and professional stature, domain expertise, gender diversity and specific qualification required for the position. The Independent Board member is also assessed on the basis of independence criteria defined in Section 149(6) of the Companies Act, 2013 and Regulation 16(1)(b) of the Listing Regulations.

In accordance with Section 178(3) of the Companies Act, 2013, and on recommendations of Nomination and Remuneration Committee, the Board adopted a remuneration policy for Directors, Key Management Personnel (KMPs) and Senior Management which is available on the website of the Company www.natcopharma.co.in.

Upon recommendation of the Nomination and Remuneration Committee, the Board of Directors at their meeting held on February 12, 2020 approved the re-appointment of Dr. M.U.R. Naidu (DIN: 05111014), Independent Director for a further term of five (5) years i.e., up to 42nd Annual general Meeting to be held in the Calendar year 2025 in terms of the provisions of the Companies Act, 2013, subject to the consent of the Members of the Company at the ensuing Annual General Meeting.

The Board at its meeting held on June 17, 2020 has framed the Scheme for giving of Loan(s) to Non-Promoter Working Director(s), the same is subject to the consent of the Members of the Company at the ensuing Annual General Meeting.

Registration of Independent Directors in Independent Directors Databank

All the Independent Directors have been registered and are members of Independent Directors Databank maintained by Indian Institute of Corporate Affairs and whoever be required to qualify the Online Proficiency Self-Assessment Test will be complied in due course of time.

Confirmation from the Board

All the Independent Directors of the Company have given their respective declaration/disclosures under Section 149(7) of the Act and Regulation 25(8) of the Listing Regulations and have confirmed that they fulfill the independence criteria as specified under Section 149(6) of the Act and Regulation 16 of the Listing Regulations and have also confirmed that they are not aware of any circumstance or situation, which exist or may be reasonably anticipated, that could impair or impact their ability to discharge their duties with an objective independent judgment and without any external influence. Further, the Board after taking these declaration / disclosures on record and acknowledging the veracity of the same, concluded that the Independent Directors are persons of integrity and possess the relevant expertise and experience to qualify as Independent Directors of the Company and are Independent of the Management.

Opinion of the Board

The Board opines that all the Independent Directors of the Company strictly adhere to corporate integrity, possesses requisite expertise, experience and qualifications to discharge the assigned duties and responsibilities as mandated by the Companies Act, 2013 and Listing Regulations diligently.

Number of Meetings of the Board and its Committees and other Committees

The Board currently has nine Committees, namely, Audit Committee, Stakeholders Relationship Committee, Nomination and Remuneration Committee, Compensation Committee, Allotment Committee, Corporate Social Responsibility Committee, Risk Management Committee, Buyback Committee, Committee dealing with Land Property.

A detailed update on the Board, its composition, detailed charter including terms of reference of various Board Committees, number of Board and Committee meetings held during FY 2019-20 and attendance of the Directors is provided in the Corporate Governance Report, which forms part of the Annual report.

All the recommendations made by the Committees of Board including the Audit Committee were accepted and implemented by the Board.

Meeting of Independent Directors

A separate meeting of the Independent Directors was held on February 12, 2020, inter-alia, to discuss evaluation of the performance of Non-Independent Directors, the Board as a whole, evaluation of the performance of the Chairman, taking into account the views of the Executive and Non-Executive Directors and the evaluation of the quality, content and timeliness of flow of information between the management and the Board that is necessary for the Board to effectively and reasonably perform its duties.

The Independent Directors expressed satisfaction with the overall performance of the Directors and the Board as a whole.

Business Risk Management

The Company has a risk management mechanism in place to manage uncertainties through identification, analysis, assessment, implementing and monitoring to reduce the impact of risks to the business which was discussed in detail in the Management Discussion and Analysis section of this Annual Report.

Material changes and commitments affecting financial position between end of financial year and date of report

No material changes and commitments have occurred after the close of the financial year till the date of this report which may affect the financial position of the Company.

Business Responsibility Report

As mandated by the Securities and Exchange Board of India (SEBI), the Business Responsibility Report (BRR) forms part of this Annual Report. The BRR contains a detailed report on business responsibilities vis-à-vis the nine principles of the National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Business framed by the Ministry of Corporate Affairs.

Internal Financial Controls

The Company has in place adequate Internal Financial Controls commensurate with the business operations of the Company which are operating effectively. Your Company has adopted policies and procedures for ensuring the orderly and efficient conduct of its business, including adherence to the Company's policies, the safeguarding of its assets, prevention and detection of frauds and errors, accuracy and completeness of the accounting records, and timely preparation of reliable financial disclosure.

Insurance

The Company's plant, property, equipment and stocks are adequately insured against all major risks. The Company also has appropriate liability insurance covers particularly for public liability product liability and clinical trials. The Company has also taken Directors' and Officers' Liability Policy to provide coverage against the liabilities arising on them.

Directors Responsibility Statement

Pursuant to Section 134(3)(c) of the Companies Act, 2013 in relation to Financial Statements of the Company for the year ended March 31, 2020, the Board of Directors state that:

a) In the preparation of the annual accounts, the applicable accounting standards had been followed along with proper explanation relating to material departures;

b) The Directors had selected such accounting policies and applied them consistently and made judgments and estimates that are reasonable and prudent so as to give a true and fair view of the state of affairs of the Company at the end of the Financial Year and of the profit and loss of the Company for that period;

c) The Directors had taken proper and sufficient care for the maintenance of adequate accounting records in accordance with the provisions of the Companies Act, 2013 for safeguarding the assets of the Company and for preventing and detecting fraud and other irregularities;

d) The Directors had prepared the annual accounts on a going concern basis;

e) The Directors had laid down internal financial controls to be followed by the Company and that such internal financial controls are adequate and were operating effectively; and

f) The Directors had devised proper systems to ensure compliance with the provisions of all applicable laws and that such systems were adequate and operating effectively.

Related Party Transactions

In accordance with Section 134(3)(h) of the Companies Act, 2013 and Rule 8(2) of the Companies (Accounts) Rules, 2014, the particulars of contract(s) or arrangement(s) entered into by the Company with related parties referred to in Section 188(1) in Form AOC-2 is attached as **"Annexure II"** to this Board's Report.

The details of related party disclosures form part of the notes to the Financial Statements provided elsewhere in this Annual Report.

Vigil Mechanism/Whistle Blower Policy

The Company believes in upholding professional integrity and ethical behavior in the conduct of its business. To uphold and promote these standards, the Company has a Vigil Mechanism / Whistle Blower Policy which serves as a mechanism for its Directors and employees to report genuine concerns about unethical behavior, actual or suspected fraud or violation of the Code of Conduct without fear of reprisal. The policy also provides employee(s) access to the Chairperson of the Audit Committee under certain circumstances. The details of the procedures are also available on the website of the Company https://www.natcopharma.co.in/investors/shareholder-information/corporate-governance-policies/

A brief note on the Whistle Blower Policy is also provided in the Report on Corporate Governance, which forms part of this Annual Report.

Internal Complaints Committee

The Company has Internal Complaints Committees in place in all the units in line with the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013. A brief note on the same is provided in the Report on Corporate Governance, which forms part of this Annual Report.

Details are available in the principle 3 of the Business Responsibility Report forming a part of this Annual Report.

Auditors

Statutory Auditors

The members of the Company at their Annual General Meeting held on September 5, 2019 appointed M/s. B S R & Associates LLP (Firm Registration No. 116231W/W-100024) as the Statutory Auditors of the Company to act as such from the conclusion of 36th Annual General Meeting (AGM) held for the financial year 2018-19 till the conclusion of the AGM to be held for the FY 2023-24.

Secretarial Auditor

Pursuant to Section 204 of the Companies Act, 2013 read with Rule 9 of the Companies (Appointment & Remuneration of Managerial Personnel) Rules, 2014, CS B. Kiran Kumar with Certificate of Practice (CP) No. 15876, M/s. BK Associates, a Practicing Company Secretary conducted the Secretarial Audit of the Company for FY 2019-20. The Secretarial Audit Report in form No. MR-3 is attached as **"Annexure III"** to this Board's Report.

Upon recommendation of the Audit Committee, the Board has re-appointed CS B. Kiran Kumar (CP No. 15876), M/s. BK Associates, a Practicing Company Secretary as Secretarial Auditor of the Company for the FY 2020-21.

Cost Auditors

Pursuant to Section 148 of the Companies Act, 2013 read with the Companies (Audit and Auditors) Rules, 2014 and the Companies (Cost Records and Audit) Rules, 2014, the Company maintains the Cost Audit records in respect of its pharmaceutical business. The Board has, on the recommendation of the Audit Committee, appointed M/s. S.S. Zanwar & Associates (Firm Registration No.:100283) as Cost Auditors of the Company for FY 2020-21. The provisions also require that the remuneration of the Cost Auditors be ratified by the shareholders and accordingly the same is put forward to the shareholders for their ratification in the ensuing AGM. The Cost Audit report for the FY 2019-20 will be filed with the Central Government within the stipulated timeline and the relevant Cost Audit reports for FY 2018-19 were filed within the due date to the Central Government.

Auditors' Qualifications/ reservations/ adverse remarks/ Frauds reported

There are no Auditors' Qualifications or reservations or adverse remarks on the financial statements of the Company. The Auditors have not reported any frauds to the Audit Committee as prescribed under Section 143(12) of the Companies Act, 2013.

Significant and Material Orders Passed by the Courts/ Regulators

During FY 2019-20, there were no significant and/or material orders, passed by any Court or Regulator or Tribunal, which may impact the going concern status or the Company's operations in future.

Corporate Social Responsibility Initiatives

The Board formulated a Corporate Social Responsibility (CSR) Policy which is in full force and operation and is subject to monitoring by the CSR Committee of Directors from time to time.

The details about the CSR initiatives taken during the FY 2019-20 are discussed in a separate head which forms a part of this Annual Report.

The Annual Report on CSR activities of the Company is attached as **"Annexure IV"** to this Board's Report.

Transfer of unpaid and unclaimed dividend amounts to Investor Education and Protection Fund

Pursuant to the provisions of Section 124(5) of the Companies Act, 2013, the declared dividends which remained unpaid or unclaimed for a period of seven years, have been transferred by the Company to the Investor Education and Protection Fund (IEPF) established by the Central Government pursuant to Section 125 of the said Act, the details of which are disclosed in the notice of ensuing Annual General Meeting of the Company.

Employees Stock Option Scheme

Details pertaining to the Employee Stock Option Schemes is disclosed in the Corporate Governance Report which forms a part of this Annual Report.

Credit Rating

ICRA Limited has reaffirmed their rating **"AA"** (which means high degree of safety regarding timely servicing of financial obligations and has very low credit risk) for various banking facilities enabling your Company to avail facilities from banks at attractive interest rates indicating a very strong degree of safety for timely payment of financial obligations such as payment of interest and repayment of principal, if any.

Particulars of Employees

The information as required under Section 197 of the Act read with Rule 5(1) of the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014 are given in **"Annexure V"** which forms part of this report.

The information required under Rule 5(2) and (3) of the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014, is provided in an Annexure forming part of this Report. In terms of the second proviso to Section 136 of the Act, the Report and Accounts are being sent to the Members excluding the aforesaid Annexure. The said annexure is open for inspection at the Registered Office of the Company and any member interested in obtaining the same may write to the Company Secretary at the Registered Office of the Company.

Conservation of Energy, Research and Development, Technology Absorption, Foreign Exchange Earnings and Outgo

The details of Energy Conservation, Research and Development, Technology Absorption and Foreign Exchange Earnings and Outgo as required under Section 134(3)(m) of the Companies Act, 2013, read with Rule 8(3) of the Companies (Accounts) Rules, 2014 is annexed to this report as **"Annexure VI"**.

Extract of Annual Return

As required under Sections 92(3) and 134(3)(a) of the Companies Act, 2013 read with Rule 12 of Companies (Management and Administration) Rules, 2014, the extract of Annual Return in Form MGT-9 forms part of this report as **"Annexure VII"**.

Compliance with Secretarial Standards

The Company has complied with Secretarial Standards issued by the Institute of Company Secretaries of India.

Green Initiative

To preserve environment, the Company has undertaken number of green initiatives which not only reduce burden on environment but also ensure secured dissemination of information. Such initiatives include energy saving, water conservation and usage of electronic mode in internal processes and control, statutory and other requirement.

Acknowledgements

The Board wish to place on record their appreciation to shareholders, government authorities, banks, business partners, medical practitioners and other stakeholders for the assistance, co-operation and encouragement extended to the Company. The Board also commend the continuing commitment and dedication of the employees at all levels, which has been critical for the Company's success. The Board look forward to their continued unstinted support in future also.

For and on behalf of the Board of Directors

V.C. Nannapaneni
Chairman and Managing Director
DIN: 00183315

Place: Hyderabad
Date: June 17, 2020

Annexure-I to the Board's Report

Form No. AOC – 1

(Pursuant to first proviso to sub-section (3) of Section 129 read with Rule 5 of Companies (Accounts) Rules, 2014)

Statement containing salient features of the financial statement of subsidiaries:

	Natco Pharma Inc.	Natco Pharma (Canada) Inc	Time Cap Overseas Limited	Natcofarma Do Brasil Ltda	Natco Pharma Asia Pte.Ltd	Natco Pharma Australia Pty Ltd	Natco Lifesciences Philippines Inc
Share Capital	41.85	146.55	890.95	53.81	101.88	52.89	36.01
Reserves & Surplus	263.30	182.69	3.59	-99.32	-91.48	-51.65	-27.65
Total Assets	439.04	670.2	51.26	573.41	137.72	1.8	12.02
Total Liabilities	133.90	340.96	296.85	618.92	127.32	0.56	3.66
Investments	-	-	1140.13	-	-	-	-
Turnover	-	1283.22	-	389.98	25.81	-	-
Profit before taxation	1.15	75.11	-10.45	-290.11	-13.03	-2.28	-13.55
Provision for taxation	0.24	19.44	0	15.01	0	0	4.12
Profit after taxation	0.91	55.67	-10.45	-275.1	-13.03	-2.28	-9.43
Proposed Dividend							
Report Currency	USD	CAD	USD	BRL	SGD	AUD	PESO
Closing exchange rate	74.74	52.74	74.74	14.38	52.48	45.89	1.47
Average exchange rate	70.78	53.21	70.78	17.27	51.59	48.23	1.38
% of Shareholding	100%	99.04%	90.44%	90.89%*	99.76%	100%	100%**

* effective shareholding

** Includes the shares held by the nominee shareholders of the subsidiaries on behalf of the Company.

For and on behalf of the Board of Directors

V.C. Nannapaneni
Chairman and Managing Director
DIN: 00183315

Place: Hyderabad
Date: June 17, 2020

Annexure-II to the Board's Report

Form No. AOC – 2

(Pursuant to Clause (h) of sub-section (3) of Section 134 of the Act and Rule 8(2) of the Companies (Accounts) Rules, 2014)

Disclosure of particular of contracts/arrangements entered into by the Company with related parties referred to in sub-section (1) of Section 188 of the Companies Act, 2013 including certain arm's length transactions under third proviso thereto.

1. There are no contracts/arrangements/transactions entered into by the Company with related parties referred to in sub-section (1) of Section 188 of the Companies Act, 2013 which are not at arm's length basis.

2. The following are the contracts/arrangements/transactions entered into by the Company with related parties referred to in sub-section (1) of Section 188 of the Companies Act, 2013 which are at arm's length basis.

Sl. No.	Name(s) of the related party and nature of relationship	Nature of Contract / arrangements / transaction	Duration of the contracts / arrangements/ transactions	Salient terms of the contracts or arrangements or transactions including the value, if any in ₹ Million	Date(s) of approval by the Board if any:	Amount paid as advances, if any in ₹
1.	Mr. V.C. Nannapaneni, Chairman & Managing Director	Renewal of Lease Agreement	2 years	To locate Mumbai Administrative, Marketing and Distribution office of the Company. ₹ 2.4 million p.a.	12th February, 2019	Nil
2.	Mr. Rajeev Nannapaneni, Vice Chairman & CEO	Renewal of Lease Agreement	1 year	To locate Chennai Marketing and Distribution Office – Rent payable ₹ 2.4 million p.a.	27th May, 2019	Nil
3.	Mr. Rajeev Nannapaneni, Vice Chairman & CEO	Renewal of Lease Agreement	1 year	To locate Chemical Division, Chennai City Administrative office Rent payable ₹ 0.24 million p.a.	12th February, 2019	Nil
4.	M/s. Time Cap Pharma Labs Ltd Shareholding of Mr. V. C. Nannapaneni and Mr. Rajeev Nannapaneni	Renewal of Lease Agreement	2 years	To locate Delhi Administrative, Marketing and Distribution Office Rent payable ₹ 2.4 million p.a.	12th February, 2019	Nil
5.	M/s. Time Cap Pharma Labs Ltd Shareholding of Mr. V. C. Nannapaneni and Mr. Rajeev Nannapaneni	Renewal of Lease Agreement	1 year	To locate godown at Kothur Mandal, Rangareddy Dist. Rent payable - ₹ 1.5 million p.a.	27th May, 2019	Nil
6.	M/s. Time Cap Pharma Labs Ltd Shareholding of Mr. V. C. Nannapaneni and Mr. Rajeev Nannapaneni	Renewal of Lease Agreement	1 year	To locate Company's Solar Panel Production at Kothur, Rangareddy Dist. Rent payable - ₹ 1.5 million p.a.	27th May, 2019	Nil
7.	Natco Pharma (Canada) Inc. Subsidiary	Sales	1 year	To sell finished goods to Natco Pharma (Canada) Inc. ₹ 156.1 million p.a.	12th February, 2019	Nil

Sl. No.	Name(s) of the related party and nature of relationship	Nature of Contract / arrangements / transaction	Duration of the contracts / arrangements/ transactions	Salient terms of the contracts or arrangements or transactions including the value, if any in ₹ Million	Date(s) of approval by the Board if any:	Amount paid as advances, if any in ₹
8.	Natco Pharma Asia Pte. Ltd. Subsidiary	Sales	1 year	To sell finished goods to Natco Pharma Asia Pte Ltd. ₹ 13.5 million p.a.	12th February, 2019	Nil
9.	Natcofarma Do Brasil Ltda Step-down Subsidiary	Sales	1 year	To sell finished goods to Natco Pharma Do Brasil Ltda ₹ 281.1 million p.a.	12th February, 2019	Nil

Note:

All the above transactions were entered by the Company with Related Parties in the ordinary course of business at prevailing market rates.

For and on behalf of the Board of Directors

V.C. Nannapaneni
Chairman and Managing Director
(DIN: 00183315)

Place: Hyderabad
Date: 17th June, 2020

Annexure-III to the Board's Report

Form MR-3
SECRETARIAL AUDIT REPORT

(For the financial year ended 31st March, 2020)
[Pursuant to Section 204(1) of the Companies Act, 2013 and Rule No. 9 of the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014 read with Regulation 24A of SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015]

To
The Members
Natco Pharma Limited
Natco House, Road No.2
Banjara hills, Hyderabad.
Telangana – 500034.

I have conducted the secretarial audit of the compliance of applicable statutory provisions and the adherence to good corporate practices by **Natco Pharma Limited**, CIN: L24230TG1981PLC003201 (hereinafter called the Company). Secretarial Audit was conducted in a manner that provided me a reasonable basis for evaluating the corporate conducts/statutory compliances and expressing my opinion thereon.

Based on my verification of the Company's books, papers, minute books, forms and returns filed and other records maintained by the Company and also the information provided by the Company, its officers, agents and authorized representatives during the conduct of secretarial audit, I hereby report that in my opinion, the Company has, during the audit period covering the financial year ended on 31st March, 2020, complied with the statutory provisions listed hereunder and also that the Company has proper Board-processes and compliance-mechanism in place to the extent, in the manner and subject to the reporting made hereinafter:

I have examined the books, papers, minute books, forms and returns filed and other records maintained by the Company for the financial year ended on 31st March, 2020 according to the provisions of:

(i) The Companies Act, 2013 (the Act) and the rules made thereunder;

(ii) The Securities Contracts (Regulation) Act, 1956 ('SCRA') and the rules made thereunder;

(iii) The Depositories Act, 1996 and the Regulations and Bye-laws framed thereunder;

(iv) Foreign Exchange Management Act, 1999 and the rules and regulations made thereunder to the extent of Foreign Direct Investment, Overseas Direct Investment, Qualified Institutional Placement and External Commercial Borrowings;

(v) The following Regulations and Guidelines prescribed under the Securities and Exchange Board of India Act, 1992 ('SEBI Act') to the extent applicable to the Company:-

(a) The Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 2011 and amendments thereto;

(b) The Securities and Exchange Board of India (Prohibition of Insider Trading) Regulations, 2015 and amendments thereto;

(c) The Securities and Exchange Board of India (Share Based Employee Benefits) Regulations, 2014;

(d) The Securities and Exchange Board of India (Registrars to an Issue and Share Transfer Agents) Regulations, 1993 in relation to the Companies Act and dealing with client, and amendments thereto;

(e) The Securities and Exchange Board of India (Listing Obligations and Disclosure Requirements) Regulations, 2015 and amendments thereto;

(f) The Securities and Exchange Board of India (Issue of Capital and Disclosure Requirements) Regulations, 2018 and amendments thereto;

(g) The Securities and Exchange Board of India (Buy-back of securities) Regulations, 2018 and amendments thereto;

(h) The Securities and Exchange Board of India (Issue and Listing of Debt Securities) Regulations, 2008 and amendments thereto;

(i) The Securities and Exchange Board of India (Issue and Listing of Non-Convertible Redeemable Preference Shares) Regulations, 2013 and amendments thereto; and

(j) The Securities and Exchange Board of India (Delisting of Equity Shares) Regulations, 2009.

And the circulars/guidelines issued thereunder;

(vi) Other laws applicable specifically to the Company namely:

(a) The Drugs and Cosmetics Act, 1940 and The Drugs and Cosmetics Rules, 1945.

(b) The Narcotic Drugs and Psychotropic Substances Act, 1985 and the Narcotic Drugs and Psychotropic Substances Rules, 1985 and amendments thereof.

(c) The Drugs (Prices Control) Order, 2013 made under Essential Commodities Act, 1955.

(d) Drugs and Magic Remedies (Objectionable Advertisement) Act, 1954 and the rules made thereunder;

(e) The Air (Prevention and Control of Pollution) Act, 1981

(f) The Water (Prevention and Control of Pollution) Act, 1974

(g) The Environment Protection Act, 1986.

(h) The Harzardous and other wastes (Management, Handling and Transboundary Movement) Rules, 2016 and amendments thereof.

(i) The Public Liability Insurance Act, 1991.

(vii) Labour Laws applicable to the Company:

(a) The Factories Act, 1948

(b) The Code on Wages, 2019

(c) The Payment of Gratuity Act, 1972

(d) Employees Provident Fund and Miscellaneous Provisions Act 1952

(e) Employees State Insurance Act, 1948 and Employees State Insurance (General) Regulations, 1950.

(f) The Employees Exchanges (Compulsory notification of vacancies) Act, 1959 and Rules, 1960

(g) The Contract Labour (Regularisation and Abolition) Act, 1970

(h) The Maternity Benefit Act, 1961 and amendments thereto;

(i) Telangana Shops and Establishment Act, 1988.

(viii) The other General Laws applicable to the Company.

(a) The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 to be read with The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Rules, 2013

I have also examined compliance with the applicable clauses of the following:

(i) Secretarial Standards issued by the Institute of Company Secretaries of India.

(ii) The Listing Agreements entered into by the Company with the BSE Limited and National Stock Exchange of India Limited, including the compliances as specified under The Securities and Exchange Board of India (Listing Obligations and Disclosure Requirements) Regulations, 2015.

I report that, during the year under review, the Company has complied with all the provisions of the Acts, Rules, Regulations, Guidelines and Standards etc., mentioned above.

I further report that, there were no events/actions in pursuance of:

a) The Securities and Exchange Board of India (Delisting of Equity Shares) Regulations, 2009;

b) The Securities and Exchange Board of India (Issue and Listing of Debt Securities) Regulations, 2008

c) The Securities and Exchange Board of India (Issue and Listing of Non-Convertible Redeemable Preference Shares) Regulations, 2013.

I hereby report that:

(a) The Company has, in my opinion, complied with the provisions of the Companies Act, 2013 and the Rules made under the Act as notified by Ministry of Corporate Affairs and the Memorandum and Articles of Association of the Company in all respects.

(b) The Company has complied with the provisions of the Securities Contracts (Regulation) Act, 1956 and the Rules made under that Act, with regard to maintenance of minimum public shareholding.

(c) The Company has complied with the provisions of the Depositories Act, 1996 and the Byelaws framed thereunder by the Depositories with regard to dematerialisation / rematerialisation of securities and reconciliation of records of dematerialised securities with all securities issued by the Company.

(d) The Company has complied with the provisions of the FEMA, 1999 and the Rules and Regulations made under that Act, to the extent it is applicable.

(e) The Company has complied with the requirements under the Equity Listing Agreements entered into with BSE Limited, National Stock Exchange Limited and regulations of the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 and amended from time to time to the extent applicable.

(f) The Company has complied with the provisions of the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 and the Rules and Regulations made under the Act, to the extent it is applicable.

I further report that:

(a) The Company has complied with the provisions of the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 2011 including the provisions with regard to disclosures and maintenance of records required under the said Regulations;

(b) The Company has complied with the provisions of the Securities and Exchange Board of India (Prohibition of Insider Trading) Regulations, 2015 including the provisions with regard to disclosures and maintenance of records required under the said Regulations;

(c) The Company has complied with the provisions of the Securities and Exchange Board of India (Share Based Employee Benefits) Regulations, 2014including the provisions with regard to disclosures and maintenance of records required under the said Regulations;

I further report that:

(a) The Board of Directors of the Company is duly constituted with proper balance of Executive Directors, Non-Executive Directors, Independent Directors and Independent Woman Director. The changes in the composition of the Board of Directors that took place during the period under review were carried out in compliance with the provisions of the Act.

(b) Adequate notice is given to all the Directors about schedule of the Board Meetings, Agenda and detailed notes on agenda were sent at least seven days in advance, and a system exists for seeking and obtaining further information and clarifications on the agenda items before the meeting and for meaningful participation at the meeting.

(c) Decisions at the Board Meetings, as represented by the management, were duly approved and no dissenting views have been observed so as to record.

(d) The Company has obtained all necessary approvals under the various provisions of the Act;

(e) There was no prosecution initiated and no fines or penalties imposed during the year under review under the Act, SEBI Act, SCRA, Depositories Act, Listing Agreement and Rules, Regulations and Guidelines framed under these Acts against / on the Company, its Directors and Officers.

(f) The Directors have complied with the disclosure requirements in respect of their eligibility of appointment, their being independent and compliance with the Code of Business Conduct & Ethics for Directors and Management Personnel;

With reference to the compliance of Industry Specific Acts applicable to the Company, I relied upon Management Representation letter issued by the Compliance Officer of the Company. My report of compliance would be limited to their reporting and subject to the observations and comments made by them in their report, if any.

With reference to the compliance of the Labor and Financial Laws, I relied upon Management Representation Letter issued by the Compliance Officer, Chief Financial Officer, Head of Human Resources of the Company and also report of Statutory Auditors. My report of compliance would be limited to their reporting and subject to the observations and comments made by them in their report, if any.

Based on the information received and records maintained, there are adequate systems and processes in the Company commensurate with the size and operations of the Company to monitor and ensure compliance with applicable laws, rules, regulations and guidelines.

I further report that during the audit period:

i) The Buy Back Committee of the Board at its meeting held on 16th May 2019 considered closure of Buy Back

(approved by Board on 05th November, 2018) with effect from closing market hours on May 16, 2019 as the Company had utilized approximately 74.56% of the Maximum Buy-Back Size aggregating to approx. ₹ 1,864 Millions for buying back equity shares which exceeded minimum buy-back size (i.e., 50% of Maximum Buy-back size) pursuant to SEBI Buy-Back Regulations.

ii) The Board of Directors at its meeting held on 9th August, 2019, pursuant to Clause 18.2 of the Investment Agreement entered with CX Securities Limited on 28th November, 2013 recommended the shareholders for their approval for deletion of existing Part II of Articles of Association of the Company which were incorporated as per the Investment agreement and the same was approved by the Shareholders at their 36th Annual General Meeting of the Company held on 5th of September, 2019.

iii) The Compensation Committee of the Company at its meeting held on 28th September, 2019 pursuant to Natco Employees Stock Option Scheme 2015 (NATSOP 2015) approved the allotment of Fourth tranche of the options entitling 1,25,215 equity shares of ₹ 2/- (Rupees Two Only) to eligible employees, which was earlier approved by the Shareholders at the Extra Ordinary General Meeting held on 27th June, 2015.

iv) The Compensation Committee of the Company at its meeting held on 27th January, 2020 pursuant to Natco Employees Stock Option Scheme 2016 (NATSOP 2016) approved the allotment of third tranche of the options entitling 48,170 equity shares of ₹ 2/- (Rupees Two Only) to eligible employees, which was earlier approved by the Shareholders at the 33rd Annual General Meeting held on 30th September 2016.

v) The Compensation Committee of the Company at its meeting held on 27th January, 2020 pursuant to Natco Employees Stock Option Scheme 2017 (NATSOP 2017) approved the allotment of second tranche of the options entitling 1,32,455 Equity Shares of ₹ 2/- (Rupees Two Only) to eligible employees, which was earlier approved by the Shareholders at the 34th Annual General Meeting held on 28th September 2017. Also the Compensation Committee granted 7,200 Stock Options to the employees conferring a right to apply for one equity share of ₹ 2/- each of the Company in accordance with terms and conditions stipulated in the Natco Employees Stock Option Scheme 2017 (NATSOP 2017).

And there were no specific events /actions in pursuance of the above referred laws, rules, regulations, guidelines, etc., having a major bearing on the Company's affairs.

For BK & Associates
Company Secretaries

CS Kiran Kumar Bodla
Proprietor
ACS No.: 29116
C P No.: 15876
PR No.: 717/2020
UDIN: A029116B000349381

Place: Hyderabad
Date: 17.06.2020

Note: This report has to be read with my letter of even date which is annexed herewith and which forms an integral part of this report.

Annexure to Form MR-3
(For the financial year ended 31st March, 2020)

To,
The Members
NATCO PHARMA LIMITED

Our report of even date is to be read along with this letter.

1. Maintenance of Secretarial records is the responsibility of the management of the Company. Our responsibility is to express an opinion on these secretarial records based on our audit.

2. We have followed the audit practices and process as were appropriate to obtain reasonable assurance about the correctness of the contents of the Secretarial records. The verification was done on test basis to ensure that correct facts are reflected in Secretarial records. We believe that the process and practices, we followed provide a reasonable basis for our opinion.

3. We have not verified the correctness and appropriateness of financial records and Books of Accounts of the Company.

4. Wherever required, we have obtained the Management Representation Letter about the Compliance of laws, rules and regulations and happening of events etc.

5. The Compliance of the provisions of Corporate and other applicable laws, rules, regulations, standards is the responsibility of management. Our examination was limited to the verification of procedure on test basis.

6. The Secretarial Audit report is neither an assurance as to the future viability of the Company nor of the efficacy or effectiveness with which the management has conducted the affairs of the Company.

For BK & Associates
Company Secretaries

CS Kiran Kumar Bodla
Proprietor
ACS No.: 29116
C P No.: 15876
PR No.: 717/2020
UDIN: A029116B000349381

Place: Hyderabad
Date: 17.06.2020

Annexure-IV to the Board's Report

ANNUAL REPORT ON CORPORATE SOCIAL RESPONSIBILITY (CSR) ACTIVITIES FOR THE FINANCIAL YEAR ENDED MARCH 31, 2020

1. A brief outline of the Company's CSR policy, including overview of Projects or Programs undertaken with a reference to the web-link to the CSR policy and projects or programs are given under:

   Your company as a responsible corporate entity framed CSR policy as stipulated by the Companies Act, 2013 to undertake all or any of the objectives contained in Schedule VII of the Companies Act, 2013. Your company intends to actively contribute to the social and economic development of the communities in which it operate by participating actively in building a better, sustainable way of life for the weaker sections of society. The CSR Policy can be accessed on the Company's website at the link: www.natcopharma.co.in:

2. The Composition of CSR Committee:

   The CSR Committee comprises of the Directors namely Sri G.S. Murthy, Independent Director, Chairman, Sri V.C. Nannapaneni and Sri Rajeev Nannapaneni.

3. Average net profits of the Company for last three financial years: ₹ 7,823.91 Million.
4. Prescribed CSR Expenditure (two per cent of the amount as in item 3 above): ₹ 156.48 Million.
5. Details of CSR spent during the financial year:
   a) Total amount spent for the financial year 2019-20: ₹ 157.20 Million
   b) Amount unspent, if any: Not Applicable.
   c) Manner, in which the amount spent during the financial year is detailed below:

(₹ in Millions)

	CSR Project / Activity	Sector	Location of the project /Programme	Amount spent on the projects / programs	Amount spent direct / implementing agency
A.	**Expenditure on Projects / Programs**				
1	Natco Trust Managed School:				
	a. Natco High School	Education	Rangapur Village, Kothur Mandal, Ranga Reddy District, Telangana	19.00	Natco Trust
	b. Natco School of Learning	Education	Gollamudipadu Village, Ponnur Mandal, Guntur District, A.P.	6.00	Natco Trust
2	Support to Sports	Education	Sports authority of Telangana State, prize money distribution to the winners	0.60	Natco Trust
3	Infrastructure and manpower support to Anganwadi centres	Early childhood Education	Support to Anganwadi centres at Kothur and Nandigam mandals in Ranga Reddy, Nagarjuna Sagar, Nalgonda district in Telangana state and Andar Kuppam village, Manali, Chennai, Tamil Nadu	4.00	Natco Trust
4	After school Tuition Centres	Education	Pedavoora Mandal, Nalgonda District, Telangana, Govt Primary School, Borabanda, Hyderabad, kothur and nandigam mandals of Rangareddy Dist., Ponnur Mandal, Guntur district	0.30	Natco Trust
5	Construction and renovation of government schools and other required infrastructures like furniture, water, sanitation, computer / science lab, library, capacity building etc. .to government schools	Education	ZPHS, Mekaguda and Nandigama villages in Nandigama mandal, ZPHS Kothur village, Kothur mandal, in Ranga Reddy District and ZPHS, Indira Nagar, Siddipet, Siddipet districts in Telangana state and MPP School, Gollamudipadu village, Ponnur mandal, Guntur district, Andhra Pradesh, Government primary school, Andar Kuppam village, Manali, Chennai, Tamil Nadu	10.30	Natco Trust

(₹ in Millions)

	CSR Project / Activity	Sector	Location of the project /Programme	Amount spent on the projects / programs	Amount spent direct / implementing agency
6	Natco Mobile Health Clinics and community health camps	Health	Hyderabad, Ranga Reddy and Nalgonda Districts, Telangana State, Guntur district, Andhra Pradesh, and Manali , Chennai, Tamil Nadu	7.20	Natco Trust
7	Nutrition Centre	Health	Ranga Reddy and Nalgonda District, Telangana	1.65	Natco Trust
8	Patient Counselling	Health	Hyderabad & Rangareddy , Hyderabad District, Telangana	3.10	Natco Trust
9	Construction of cancer block at Govt General Hospital, Guntur	Health	Guntur district, Andhra Pradesh	89.93	Natco Trust
10	Digital PHC and consumables	Health	Mekaguda, Ranga Reddy District	4.10	Natco Trust
11	Natco Career Counselling and Guidance Centre	Livelihood	Ranga Reddy, District, Telangana,	1.60	Natco Trust
12	Potable water plants	Water and sanitation	Hyderabad, Ranga Reddy, Jogulambha Gadwal districts, Telangana State and Guntur district Andhra Pradesh	2.30	Natco Trust
13	Minerals and medicines support to Veterinary healthcare	Veterinary	Ranga Reddy district, Telangana state	0.80	Natco Trust
14	Infrastructure support to departments	Infra support to government	Creation of dining hall, washroom facilities at district Fire office, Visakhapatnam and public wash rooms for public at Ponnur, Guntur district	1.10	Natco Trust
15	Cameras support	World wild foundation	Cameras support to world wild foundation, Hyderabad (WWF)	0.02	Natco Trust
	Total (A)			**152.00**	
B.	**Administrative expenses**				
	Implementing expenses	Education		3.05	Natco Trust
	Implementing expenses	Health		1.75	Natco Trust
	Implementing expenses	Livelihoods		0.40	Natco Trust
	Total (B)			**5.20**	
	Total (A+B)			**157.20**	

6. In case the company has failed to spend the two per cent of the average net profit of the last three financial years or any part thereof, the company shall provide the reasons for not spending the amount in its Board report: Not Applicable.

7. A responsibility statement of the CSR Committee that the implementation and monitoring of CSR Policy, is in compliance with CSR objectives and Policy of the company:

   "The directors report that your company has complied with its CSR Policy along with the provisions of the Companies Act, 2013 and rules made there under and the implementation and monitoring of CSR Policy is in compliance with the CSR objectives and Policy of the Company".

For and on behalf of the Board of Directors

V.C. Nannapaneni
Chairman and Managing Director
(DIN: 00183315)

Place: Hyderabad
Date: 17th June, 2020

Annexure-V to the Board's Report

Information required under Section 197 (12) of the Companies Act, 2013 read with Rule 5 (1) of the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014)

(i) The ratio of the remuneration of each Director to the median remuneration of the employees of the Company, the percentage increase in remuneration of each Director, CEO, CFO and CS, for FY 2019-20 and comparison of the remuneration of each Key Managerial Personnel (KMP) against the performance of the Company:

Name	Designation	Ratio of Remuneration of each Director/KMP to the median remuneration of employees	% increase in remuneration during FY 2019-20
Sri V. C. Nannapaneni	Chairman and Managing Director	53	10.25
Sri Rajeev Nannapaneni	Vice Chairman and CEO	48	10.83
Sri P.S.R.K Prasad	Whole Time Director	49	28.88
Dr. D Linga Rao	Whole Time Director	49	28.88
Sri M. Adinarayana	Company Secretary	13	16.59
Sri S.V.V.N. Appa Rao	Chief Financial Officer	25	66.87

Median remuneration of employees for the FY 2019-20 is Rs.4,07,952/-

Sri G.S. Murthy, Sri T.V. Rao, Sri D.G. Prasad, Dr. Leela Digumarthi and Dr. M.U.R. Naidu, Independent Directors were paid only sitting fees for attending the Board/Committee Meetings.

(ii) The median remuneration of employees increased by 10.06% in FY2019-20.

(iii) The number of permanent employees on the rolls of Company as on March 31, 2020 is 5026.

(iv) The average increase in remuneration paid to employees is 10.03% for FY 2019-20 as compared to FY 2018-19. Compared to FY 2018-19 the standalone revenue in FY 2019-20 fell by 9.55% and profit before tax fell by 31.19 %

It is hereby affirmed that the remuneration paid during FY 2019-20 is as per the remuneration policy of the Company

Annexure-VI to the Board's Report

Conservation of Energy, Research and Development, Technology Absorption, Foreign Exchange Earnings and Outgo

Conservation of Energy, Technology Absorption

A) Conservation of Energy –

a) During the year, the Company has implemented energy conservation projects across its various business units. A few of the key initiatives include:

1) Installation of Energy efficient equipment & optimization of processes consuming energy:

a) Installed new high efficiency Utility equipment & Improvise the existing utility system during the last fiscal and achieved significant saving of INR 0.5 million in various utility areas.

b) Conversion of CFL based lighting to LED lighting has been taken up during FY 2019-20 and completed the replacement at continuous use area.

2) Identifying cheaper power sources both in-house and external and Utilizing the alternate sources of energy:

a) Installed 1.15 Mw Solar plant at Chemical Division, Mekaguda, which lead to savings of approximately INR 0.8 million for part of the year since installation. Expected saving per annum is approximately INR 10 million.

b) Steps in progress for increasing the utilization of alternate renewable sources of energy.

3) Steps in progress for increasing the utilization of alternate renewable sources of energy:

a) Propose to install 0.5 MW Solar plant at Vizag Plant. Expected saving per annum is approximately INR 3.5 million.

b) Propose to install 0.2 MW at Nagarjuna Sagar Plant. Expected saving per annum is approximately INR 1.5 million

c) Work under progress for Commissioning of waste energy plant at chemical division, Mekaguda. Expected saving is INR 6 Million

(B) Technology Absorption

Efforts made towards technology absorption: As part of the technology absorption, the Company engages in in-house development of bulk drugs & formulations, conducts pilot studies for potential scale-up so as to improve efficiency both in terms of time and productivity of products.

Disclosure of particulars with respect to conservation of energy.

A: Power and Fuel Consumption	Year ended March 31, 2020	Year ended March 31, 2019
1. Electricity		
a) Purchased Units	65212042	67600362
Total amount (₹ million)	419.26	401.12
Rate / Unit (₹)	6.43	5.93
b) Own Generation:		
i) Through Diesel		
Generator Units	1461409	1637558
Units / ltr. Of Diesel Oil	3.52	3.51
Cost / Unit (₹)	20.20	20.28
ii) Through Windmill		
Generator Units	4189923	4050102
Total Cost Per Year (₹ million)	7.04	7.03
Cost / per Unit (₹)	1.68	1.74

A: Power and Fuel Consumption	Year ended March 31, 2020	Year ended March 31, 2019
iii) Through Solar		
Generator Units	6285758	4940174
Total Cost Per Year (₹ million)	11.36	7.42
Cost / per Unit (₹)	1.81	1.50
2. Coal D/C grade		
Quantity (Tonnes)	4912	5368
Total amount (₹ million)	40.42	42.02
Average rate per tonne (₹)	8229	7828
3. Furnace Oil		
Quantity (Ltr)	2531730	2275037
Total amount (₹ million)	78.94	94.15
Average rate per Ltr (₹)	31.18	41.38

Amount (₹ in Million)

(C) Expenditure on R&D	Year ended March 31, 2020	Year ended March 31, 2019
R&D Expenditure	1656	1976
Total R&D Expenditure as percentage of standalone revenue	8.65%	9.34%

(D) Foreign Exchange Earnings and Outgo

The Company earned foreign exchange amounting to ₹ 8736.06 million and used foreign exchange amounting to ₹ 1817.76 million during the year ended 31st March, 2020

For and on behalf of the Board of Directors

V.C. Nannapaneni
Chairman and Managing Director
(DIN: 00183315)

Place: Hyderabad
Date: 17th June, 2020

Annexure-VII to the Board's Report

Form No.MGT-9
Extract of Annual Return

as on Financial year ended on 31.03.2020
[Pursuant to Section 92(3) of the Companies Act, 2013 and rule 12(1) of the Company (Management & Administration) Rules, 2014]

I. Registration & other Details

CIN	L24230TG1981PLC003201
Registration Date	19th September, 1981
Name of the Company	NATCO Pharma Limited
Category / Sub-category of the Company	Company Limited by Shares / Public Company
Address of the Registered Office & Contact details	NATCO House, Road # 2, Banjara Hills Hyderabad 500 034 Tel: 040-23547532
Whether Listed Company	Yes
Name, Address & Contact details of the Registrars and Share Transfer Agents	Venture Capital and Corporate Investments Pvt Ltd 12-10-167 Bharat Nagar Hyderabad 500016

II. Principal Business Activities of the Company

Sl. No.	Name and Description of Main Products / Services	NIC Code of the Product / Service	% of Total Turnover of the Company
1	Pharmaceuticals	21005	100%

III. Particulars of Holding, Subsidiary and Associate Companies

Sl. No.	Name and address of the Company	CIN/GLN	Holding / Subsidiary/ Associate	% of shares held	Applicable Section
1	Natco Pharma Inc., Address : C/o Save Mart, 241W, Roseville Road, Suite:6, Lancaster, PA 17601	SRV 060928109-4232479	Subsidiary	100.00	2(87)
2	Timecap Overseas Limited, Address: C/o IQ EQ Fund Services (Mauritius) Ltd, 33 Edith Cavell Street, Port Louis 11324 Mauritius.	098889-C2/GBL	Subsidiary	90.44	2(87)
3	Natco Pharma (Canada) Inc., Address: PLAZA 1, SUITE # 200, 2000 ARGENTIA RD, MISSISSAUGA, ON.L5N 1P7.	834474-4	Subsidiary	99.04	2(87)
4	Natco Pharma Asia Pte. Ltd, Address: 62, UBI Road 1, #03-21, Oxley Bizhub 2, Singapore 408734	201230076Z	Subsidiary	99.76	2(87)
5	Natco Pharma Australia Pty Ltd, Address: Level 1, 313 Burwood Road,Hawthron, VIC,Australia 3122	601 572 301	Subsidiary	100.00	2(87)
6	Natcofarma Do Brasil Ltda, Address: Av. Nossa Senhora dos Navegantes Nº 955 Edif. Global Tower sala 1702	08.157.293/0001-27 MATRIZ	Step down Subsidiary	90.89*	2(87)
7	NATCO Lifesciences Philippines Inc. Address: Unit-1-B Ground Floor, Manor Building 2629 Taft Avenue Brgy, 719 Zone 78 Malate Manila, Philippines	CS201803730	Subsidiary	99.99	2(87)

* effective shareholding

IV. Shareholding Pattern

(i) Category-wise Shareholding

Category of Shareholders	No. of Shares held at the beginning of the Financial year 1st, April, 2019)				No. of Shares held at the end of the Financial year (31st March, 2020)				% of Change during the year
	Demat	Physical	Total	% of Total Shares	Demat	Physical	Total	% of Total Shares	
A. Promoters									
(1) Indian									
a) Individual / HUF	4,89,25,885	-	4,89,25,885	26.75	4,89,25,885	-	4,89,25,885	26.87	*0.12
b) Central Govt.	-	-	-	-	-	-	-	-	-
c) State Govt.(s)	-	-	-	-	-	-	-	-	-
d) Bodies Corporate	3,30,34,470	-	3,30,34,470	18.06	3,30,34,470	-	3,30,34,470	18.14	0.08
e) Banks / FI	-	-	-	-	-	-	-	-	-
f) Trust	46,82,750	-	46,82,750	2.56	46,86,150	-	46,86,150	2.58	0.02
Sub-Total (A)(1):	**8,66,43,105**	**-**	**8,66,43,105**	**47.37**	**8,66,46,505**	**-**	**8,66,46,505**	**47.59**	**0.22**
(2) Foreign									
a) NRIs – Individuals	24,38,540	-	24,38,540	1.33	24,38,540	-	24,38,540	1.34	0.01
b) Other – Individuals	-	-	-	-	-	-	-	-	-
c) Bodies Corporate	-	-	-	-	-	-	-	-	-
d) Banks / FI	-	-	-	-	-	-	-	-	-
e) Any Other....	-	-	-	-	-	-	-	-	-
Sub-Total (A)(2):	**24,38,540**	**-**	**24,38,540**	**1.33**	**24,38,540**	**-**	**24,38,540**	**1.34**	**0.01**
Total Shareholding of Promoters (A) = (A)(1)+(A)(2)	**8,90,81,645**	**-**	**8,90,81,645**	**48.71**	**8,90,85,045**	**-**	**8,90,85,045**	**48.93**	**0.22**
(1) Institutions									
a) Mutual Funds / UTI	1,07,63,368	500	1,07,63,868	5.89	1,54,75,646	500	1,54,76,146	8.50	2.61
b) Venture Capital Funds	-	-	-	-	-	-	-	-	-
c) Alternate Investment funds	4,77,645	0	4,77,645	0.26	11,57,158	-	11,57,158	0.64	0.38
d) Foreign Portfolio Investors – Corporate (FPI)	3,91,12,525	0	3,91,12,525	21.39	3,94,48,676	-	3,94,48,676	21.66	0.27
e) Banks / FI	18,12,725	1,000	18,13,725	0.99	19,27,977	1,000	19,28,977	1.06	0.07
e) Venture Capital Funds	-	-	-	-	-	-	-	-	0
f) Insurance Companies	-	-	-	-	-	-	-	-	0
h) Foreign Venture Capital Funds	-	-	-	-	-	-	-	-	0
i) Foreign Nation	-	-	-	-	-	-	-	-	0
j) Qualified Institutional Buyers	-	-	-	-	6,89,645	-	6,89,645	0.03	0.03
Sub-Total (B)(1):	**5,21,66,272**	**1,500**	**5,21,67,763**	**28.52**	**5,86,99,102**	**1,500**	**5,87,00,602**	**32.24**	**3.72**
(2) Non-Institutions									
a) Bodies Corporate									
i) Indian	53,33,167	17,400	53,50,567	2.93	46,28,505	17,400	46,45,905	2.55	(0.38)
ii) Overseas	-	-	-	-	-	-	-	-	-
b) Individuals									
i) Individual Shareholders holding nominal share capital upto ₹ 2 lakh	2,14,73,120	8,97,108	2,23,70,228	12.23	2,07,35,968	7,30,978	2,14,66,946	11.79	(0.44)
ii) Individual Shareholders holding nominal share capital in excess of ₹2 lakh	1,13,80,477	-	1,13,80,477	6.22	57,78,092	-	57,78,092	3.17	(3.05)

Category of Shareholders	No. of Shares held at the beginning of the Financial year 1st, April, 2019)				No. of Shares held at the end of the Financial year (31st March, 2020)				% of Change during the year
	Demat	Physical	Total	% of Total Shares	Demat	Physical	Total	% of Total Shares	
c) Others (specify)									
i) Non-Resident Indians	15,25,270	11,600	15,36,870	0.84	16,83,538	11,600	16,95,138	0.93	0.09
ii) Clearing Members	3,66,836	-	3,66,836	0.20	82,546	-	82,546	0.04	(0.16)
iii) Trusts	5,108	-	5,108	0.00	100	-	100	0.00	(0.05)
iv) Investor Education Protection Fund	6,25,001	-	6,25,001	0.34	6,13,601	-	6,13,601	0.33	0.01
Sub-Total (B)(2):	4,07,08,979	9,26,108	4,16,35,087	22.77	3,35,22,350	7,59,978	3,42,82,328	18.83	(3.94)
Total Public Shareholding (B)=(B)(1)+(B)(2)	9,38,02,850	9,27,608	9,38,02,850	51.29	9,22,21,452	7,61,478	9,29,82,930	51.07	(0.21)
C. Shares held by Custodian for GDRs	-	-	-	-	-	-	-	-	-
Grand Total (A+B+C)	18,19,56,887	9,27,608	18,28,84,495	100.00	18,13,06,497	7,61,478	18,20,67,975	100.00	-

(ii) Shareholding of Promoters:

Sl. No.	Name of the Promoter	No. of Shares held at the beginning of the Financial year 1st, April, 2019)			No. of Shares held at the end of the Financial year (31st March, 2020)			% of change in shareholding during the year
		No of Shares	% of total Shares	% shares Pledged / encumbered to total shares	No of Shares	% of total Shares	% shares Pledged / encumbered to total shares	
A	Promoter							
1	V C NANNAPANENI	35311270	19.31	Nil	22587930	12.41	NIL	(7.00)**
2	VENKAIAH CHOWDARY NANNAPANENI HUF	5440045	2.97	Nil	5440045	2.99	Nil	0.02
3	DURGA DEVI NANNAPANENI	3539100	1.94	Nil	3539100	1.94	Nil	0.00
4	VISTARA ITC INDIA LTD A/c DURGA DEVI TRUST	600000	0.33	Nil	600000	0.33	Nil	0.00
5	RAJEEV NANNAPANENI	1128000	0.62	Nil	1128000	0.62	Nil	0.00
6	NEELIMA SITA NANNAPANENI	182960	0.10	Nil	182960	0.10	Nil	0.00
7	VISTARA ITC INDIA LTD A/c Neelima Nannapaneni Trust	4082750	2.23	Nil	4082750	2.24	Nil	0.01
8	SAU FAMILY TRUST	-	-	Nil	1700	0.00	Nil	0.00
9	Vistra ITCL India Limited A/C VCN Family Trust	-	-	Nil	1700	0.00	Nil	0.00
B	Promoter Group							
1	N RAMAKRISHNA RAO	746910	0.41	Nil	746910	0.41	Nil	0.00
2	T ANILA	629920	0.34	Nil	629920	0.34	Nil	0.00
3	T ANANDA BABU	473205	0.26	Nil	473205	0.26	Nil	0.00
4	VIDYADHARI TUMMALA	442200	0.24	Nil	442200	0.24	Nil	0.00
5	JHANSI TUMMALA	77100	0.04	Nil	77100	0.04	Nil	0.00
6	ALAPATI BAPANNA	18300	0.01	Nil	18300	0.01	Nil	0.00
7	DEVENDRNTH ALAPATI	15000	0.01	Nil	15000	0.01	Nil	0.00
8	VENKTA SATYA SWATHI KANTAMANI	3260000	1.78	Nil	15983340	8.78	Nil	7.00
9	T BAPINEEDU	415	0.00	Nil	415	0.00	Nil	0.00
10	KANTAMANI RATNAKUMAR	100000	0.05	Nil	100000	0.05	Nil	0.00
11	TIME CAP PHARMA LABS LTD	17157220	9.38	Nil	17157220	9.42	Nil	0.04
12	NATSOFT INFORMATION SYSTEMS PVT LTD	15767500	8.62	Nil	15767500	8.66	Nil	0.04
13	NATCO AQUA LTD	16000	0.01	Nil	16000	0.01	Nil	0.00
14	NDL INFRA TECH PVT LTD	93750	0.05	Nil	93750	0.05	Nil	0.00
	Total	89081645	48.70	Nil	89085045	48.93	Nil	0.23

**Interse transfer of shares between Promoters of the Company

(iii) Change in Promoters' shareholding:

Sl. No	Particulars	Shareholding at the beginning of the year		Cumulative Shareholding during the year	
		No of shares	% of Total Share of the company	No of shares	% of Total Share of the company
1	At the beginning of the year	8,90,81,645	48.71	0	0
Less:	Off Market Transfer by V C Nannapaneni			1,27,23,340	7.00
				7,63,58,305	41.71
Add:	Off Market Transfer to Mrs. Venkata Satya Swathi Kantamani	-	-	1,27,23,340	7.00
				8,90,81,645	48.71
Marekt purchse by SAU Family Trust		-	-	1,700	0.00
Marekt purchse by VCN Family Tust				1,700	0.00
2	At the ending of the year	-	-	8,90,85,045	48.93

(iv) Shareholding pattern of top ten shareholders (other than Directors, Promoters and Holders of GDRs & ADRs):

Sl. No	Particulars	Shareholding at the beginning of the year		Cumulative Shareholding during the year	
		No of shares	% of Total Share of the company	No of shares	% of Total Share of the company
1	DILIP.S.SHANGHVI	57,28,460	3.13	5,85,375	0.32
2	PLENTY PRIVATE EQUITY FII I LIMITED	31,66,178	1.73	31,66,178	1.74
3	NOMURA SINGAPORE LIMITED	30,87,500	1.69	30,87,500	1.70
4	MATTHEWS INDIA FUND	29,22,192	1.6	7,66,373	0.42
5	NOMURA INDIA INVESTMENT FUND MOTHER FUND	25,48,756	1.39	-	-
6	FRANKLIN TEMPLETON MUTUAL FUND A/C FRANKLIN INDIA FOCUSED EQUITY FUND	23,00,000	1.26	20,00,000	1.10
7	ADITYA BIRLA SUN LIFE TRUSTEE PRIVATE LIMITED A/C ADITYA BIRLA SUN LIFE EQUITY ADVANTAGE FUND	19,48,397	1.07	19,62,297	1.07
8	STICHTING DEPOSITARY APG EMERGING MARKETS EQUITY POOL	19,24,105	1.05	19,24,105	1.05
9	STEADVIEW CAPITAL MAURITIUS LIMITED	18,06,109	0.99	-	-
10	TATA AIA LIFE INSURANCE CO LTD-WHOLE LIFE MID CAP EQUITY FUND-ULIF 009 04/01/07 WLE 110	15,59,454	0.85	15,59,454	0.85
11	EAST BRIDGE CAPITAL MASTER FUND I LTD	-	-	63,79,272	3.50
	MIRAE ASSET EMERGING BLUECHIP FUND	-	-	18,31,729	1.01
	HYPNOS FUND LIMITED	-	-	16,56,658	0.91
	TEACHER RETIREMENT SYSTEM OF TEXAS - SELF MANAGED 4	-	-	18,81,470	1.07

Note: 1. The Shares of the Company are actively traded on a daily basis on the National Stock Exchange and Bombay Stock Exchange hence date wise increase / decrease shareholding is not provided.

2. The details of date-wise increase / decrease will be provided at the request of shareholder

V. Shareholding of Directors and Key Managerial Personnel:

Sl. No	For Each of the Directors	Shareholding at the beginning of the year		Cumulative Shareholding during the year	
		No of shares	% of Total Share of the company	No of shares	% of Total Share of the company
1	V C Nannapaneni (including HUF) Chairman & Managing Director				
	At the beginning of the year	4,07,51,315	22.29		
	At the end of the year			2,80,27,975	15.39
2	Rajeev Nannapaneni (including NRI) Vice Chairman & Chief Executive officer				
	At the beginning of the year	11,28,000	0.62		
	At the end of the year			11,28,000	0.62
3	P S R K Prasad Director & Executive Vice President (Corp. Engineering Services)				
	At the beginning of the year	48,650	0.03		
	At the end of the year			48,650	0.03
4	D Linga Rao Director & President (Technical Affairs)				
	At the beginning of the year	56,655	0.03		
	At the end of the year			56,655	0.03
5	Dr M U R Naidu Director - Independent				
	At the beginning of the year	15,000	0.01		
	At the end of the year			15,000	0.01
6	M Adinarayana Company Secretary & Vice president (Legal & Corp Affairs)				
	At the beginning of the year	33,250	0.02		
	At the end of the year			33,450	0.02
7	S V V N Appa Rao Chief Financial Officer	1,750	0.00		
	At the beginning of the year			1,750	0.00
	At the end of the year				

Note: Shareholding of only those Directors who hold shares in the Company is provided.

VI. Indebtedness:

Indebtedness of the Company including interest outstanding/ accrued but not due for payment*

(₹ in lakhs)

	Secured Loans excluding deposits	Unsecured Loans	Deposits	Total Indebtedness
Indebtedness at the beginning of the financial year				
i) Principal Amount	10,212	28,233	-	38,445
ii) Interest due but not paid	-	-	-	-
iii) Interest accrued but not due	-	60	-	60
Total (i+ii+iii)	**10,212**	**28,293**	**-**	**38,506**
Change in Indebtedness during the financial year				
Addition	3,192	-	-	3,192
Reduction	-	-10,465	-	-10,465
Net Change	3,192	-10,465	-	-7,273
Indebtedness at the end of the financial year				
i) Principal Amount	13,404	17,829	-	31,233
ii) Interest due but not paid	-	-	-	-
iii) Interest accrued but not due	-	-	-	-
Total (i+ii+iii)	**13,404**	**17,829**	**-**	**31,233**

* Doesn't include lease liability as per IND AS-116

VII. Remuneration of Directors and Managerial Personnel

A. Remuneration of Managing Director, Whole-time Directors and/or Manager:

(₹ In Lakhs)

S. No.	Particulars of Remuneration	Name of MD/WTD/Manager				Total Amount (₹ In Lakhs)
		Sri V C Nannapaneni	Sri Rajeev Nannapaneni	Sri P S R K Prasad	Dr. D Linga Rao	
1	Gross Salary	180.82	165.82	142.44	142.44	631.52
	a. Salary as per provisions contained in Section 17(1) of the IT Act, 1961	-	-	-	-	-
	b. Value of Perquisites U/s 17(2) of IT Act, 1961	-	-	-	-	-
	c. Profits in lieu of Salary under section 17(3) of It Act, 1961	-	-	-	-	-
2	Stock Options	-	-	-	-	-
3	Sweat Equity	-	-	-	-	-
4	Commission* -% of profits	-	-	-	-	-
5	Others, (PF + LTA)	21.26	19.39	18.32	18.32	77.29
6	Arrears	4.18	4.18	3.04	3.04	14.44
7	Incentive	-	-	32.76	32.76	65.52
8	El's Cash	8.86	8.08	4.50	4.50	25.94
	TOTAL (A)	**215.12**	**197.47**	**201.06**	**201.06**	**814.71**
	Ceiling as per the Act	₹ 5,005.68/- (being 10% of the net profits of the Company calculated as per Section 198 of the Companies Act, 2013)				

B. Remuneration to other Directors:

S. No.	Particulars of Remuneration	Name of the Independent directors					Total Amount (₹ In Lakhs)
		Sri G S Murthy	Sri T V Rao	Sri D G Prasad	Dr. Leela Digumarti	Dr M U R Naidu	
1	Fee for attending Board / Committee Meeting	4.60	2.80	2.10	1.00	3.10	13.60
2	Commission		-	-	-	-	-
3	Other, please specify (Incidental fees)	-	-	-	-	-	-
	TOTAL (B)	**4.60**	**2.80**	**2.10**	**1.00**	**3.10**	**13.60**
	Ceiling as per the Act	₹ 500.57/- (being 1% of the net profits of the Company calculated as per Section 198 of the Companies Act, 2013)					
	TOTAL MANAGERIAL REMUNERATION (A+B)						**828.31**
	OVERALL CEILING AS PER THE ACT	(being 11% of the net profits of the Company calculated as per Section 198 of the Companies Act, 2013)					**5,506.25**

* Total remuneration to Managing Director, Whole-Time Directors and other Directors (being the total of A and B).

Note: Sri Sridhar Sankararaman, Non-Executive and Non-Independent Director is not taking any Sitting fees.

C. Remuneration to Key Managerial Personnel

Sl. No.	Particulars of Remuneration	Name of KMP		Total Amount ₹ lakhs
		CS M Adinarayana	Mr. S V V N Appa Rao	
1	Gross Salary	44.08	56.04	100.12
	a. Salary as per provisions contained in Section 17(1) of the IT Act, 1961	-	-	-
	b. Value of Perquisites U/s 17(2) of IT Act, 1961	-	-	-
	c. Profits in lieu of Salary under section 17(3) of It Act, 1961	-	-	-
2	Stock Options	-	-	-
3	Sweat Equity	-	-	-
4	Commission	-	-	-
5	Others, Please Specify	8.73	7.87	16.60
6	Arrears	0.47	0.59	1.06
7	Incentive	-	33.68	33.68
8	El's Cash	1.52	1.94	3.46
	Total (A)	54.80	100.12	154.92

VIII. Penalties / Punishment / Compounding of Offences:

Type	Section of the Companies Act	Brief Description	Details of Penalty/ Punishment/ Compounding fees imposed	Authority (RD/ NCLT/COURT)	Appeal made, if any
A. COMPANY					
Penalty			None		
Punishment					
Compounding					
B. DIRECTORS					
Penalty			None		
Punishment					
Compounding					
C. OTHER OFFICERS IN DEFAULT					
Penalty			None		
Punishment					
Compounding					

Annexure-VIII to the Board's Report

NATCO Dividend Distribution Policy

The Board of Directors (the "Board") of NATCO Pharma Limited (the "Company") has adopted the NATCO Dividend Distribution Policy (the "Policy") of the Company as required in terms of Regulation 43A of the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 (the "Listing Regulations") in its meeting held on 11 November 2016.

Effective Date

The Policy shall become effective from the date of its adoption by the Board i.e. 11 November 2016.

Purpose

To help the investors in taking well informed investment decisions.

Definitions

Any term used in this policy shall have the meaning ascribed to it in the Companies Act, 2013 or Rules made thereunder, SEBI Act, 1992 or Rules and Regulations made thereunder or any other relevant legislation/law applicable to the Company

Statutory Provisions:

Chapter VIII of the Companies Act, 2013 and rules made there under contain the provisions pertaining to declaration and payment of dividend. The following points set out the statutory obligations of a Company with respect to declaration / payment of dividend:

- Company shall declare or pay dividend, for any financial year, only out of the profits of the Company for that financial year.
- Such profits shall be after providing for depreciation in accordance with the provisions of the law.
- In case of inadequacy or absence of profits in any year, a maximum of 10% of paid-up capital can be declared as dividend, subject to other provisions contained in the Companies (Declaration and Payment of Dividend) Rules, 2014.

The SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 also specify certain conditions as to declaration of dividend such as prior intimation to the stock exchanges, record date etc.

A. General Policy of the Company and other Considerations as Regards Dividend

The Board shall consider the following, while taking decisions of a dividend pay-out during a particular year–

1. Statutory requirements
   The Company shall observe the relevant statutory requirements which may be applicable to the Company at the time of taking decision with regard to dividend declaration or retention of profit.

2. Prudential requirements
   Prior to declaration / recommendation of any dividend as per this policy, the Company may consider any applicable covenants / conditions or restrictions imposed by any lenders, JV partners of the Company or its subsidiaries. The Company may decide to retain earnings in entirety for a particular year(s) for its growth / expansion, consequently resulting in shareholders' wealth creation.

3. Extent of realized profits as a part of the IND AS profits of the Company
   The extent of realized profits out of its profits calculated as per IND AS, affects the Board's decision of determination of dividend for a particular year. The Board is required to consider such factors before taking any dividend or retention decision.

4. Expectations of stakeholders, including small shareholders
   The Board, while considering the decision of dividend pay-out or retention of a certain amount or entire profits of the Company, shall, as far as possible, consider the expectations of the stakeholders including the small shareholders of the Company who generally expects for a regular dividend payout.

B. Other Financial Parameters

In addition to the aforesaid parameters such as realised profits and proposed major capital expenditures, the decision of dividend payout or retention of profits shall also be based the following-

1) Current earnings of the Company

2) Operating cash flow of the Company

3) Dividend History

4) Repayment/Pre-payment of Borrowings

5) Future Earnings Expectation

6) Capital Expenditure Requirements requiring ploughing back of profits i.e. future capital expenditure program including

- Market expansion plan;
- Product expansion plan;
- Increase in production capacity;
- Modernization plan;
- Diversification of business;
- Long-term strategic plans;
- Acquiring new businesses/products

7) Crystallization of contingent liabilities, if any

8) Exchange Risk

9) Sale of businesses

10) Economic / Geo-political factors / risks

11) Regulatory requirements

C. Interim/Final Dividend Payout

Pursuant to the provisions of applicable laws and the Policy, interim dividend approved by the Board of Directors will be confirmed by the shareholders and final dividend, if any, recommended by the Board of Directors, will be subject to shareholders approval, at the relevant Annual General Meeting of the Company. The Company shall ensure compliance of provisions of Applicable Laws and this Policy in relation to Dividend declared by the Company.

D. Classes of Shares

At present, the issued and paid-up share capital of the Company comprises only of equity shares. As and when the Company issues any other class(es) of shares, the Board of Directors may suitably declare dividend on such class(es) in accordance with the provisions of the Companies Act, 2013 and this policy.

E. Disclosures

Company is required to disclose this policy on its website and also in the Annual Report of the Company. The Company shall make other appropriate disclosures pertaining to declaration of dividend as required under the Companies Act, 2013 and the rules made thereunder, the SEBI Act, 1992 or the rules and regulations made thereunder and any other law applicable.

F. Amendment

The Board shall have the power to amend any of the provisions of this Policy, substitute any of the provisions with a new provision or replace this Policy entirely with a new Policy in conformity with the provisions of Companies Act, 2013 and the rules made thereunder, the SEBI Act, 1992 or the rules and regulations made thereunder and any other law applicable.

G. Declaration of Dividend on Parameters not Mentioned in the Policy

If the Company proposes to declare dividend on the basis of parameters in addition to those mentioned in the policy it shall disclose such changes along with the rationale for the same in its annual report and on its website.

H. Limitations

The Policy shall not apply to:

- Special dividend, if any, to be outside the scope of this policy but would be governed by the provisions under the Companies Act, 2013.
- Distribution of dividend in kind, i.e. by issue of fully or partly paid bonus shares or other securities, subject to applicable law.
- Buyback of equity shares.

Corporate Governance Report

Philosophy on Corporate Governance

NATCO Pharma Limited (Natco) believes that transparency in the form of disclosures, presence of strong Board with adequate composition of Independent Directors, compliance of law in letter and spirit, responsible corporate conduct and being accountable ensures good Corporate Governance and enhances the reputation of the Company globally without hindering with the shareholder's faith in the Company.

At Natco, we consider stakeholders as our partners in success, and we remain committed to maximising stakeholder value and their interest is taken into account before taking any business decision(s).

Your Company is a law abiding responsible corporate citizen and believes that to achieve success in business, highest standard of Corporate Governance behaviour is required. This is our road path to consistent, competitive, profitable and responsible growth which creates a long term value to our shareholders/stakeholders.

Board of Directors

The Board of your Company is a combination of ten (10) eminent personnel from varied fields having immense knowledge in the relevant subjects which provides strategic guidance to the Company in arriving at judicious decisions by exercising independent judgement.

(a) Board Meetings

Proper decision-making is vital for the success of any Company and we at Natco believes that the Board Meetings are of high significance to achieve this.

During the financial year 2019-20, four (4) Board Meetings were held on May 27, 2019, August 9, 2019, November 12, 2019 and February 12, 2020 within the time limits stipulated under the Companies Act, 2013 ("Act") and the SEBI (Listing Obligations and Disclosure Requirements), Regulations, 2015 ("Listing Regulations") as amended from time to time. However, proper care is being taken to see that adequate time is provided for the meetings for thorough discussions for arriving at consensus and better decision making. Prior intimation and outcome of Board Meeting is duly informed to the Board and statutory agencies in compliance with the Act and the Listing Regulations.

(b) Board Composition

The Composition of the Board is made keeping in view the growth of the Company and compliance with the statutory requirement under the Act and the rules made thereunder and the Listing Regulations.

Composition of the Board of Directors of Natco is as follows:

Sl. No.	Name of the Director	DIN	Category	Number of Board meetings during FY 2019-20		Attendance at the last AGM held on September 5, 2019	No. of Directorships in other Companies	Name of other listed entities holding directorship	Category of directorship in other listed entities	No. of Committee positions held in other listed entities	
				Held	Attended					Chairman	Member
1.	Sri V.C. Nannapaneni (a)	00183315	Executive Director	4	4	Yes	3	NIL	NIL	NIL	NIL
2.	Sri G.S. Murthy	00122454	Independent Director	4	4	Yes	NIL	NIL	NIL	NIL	NIL
3.	Sri T.V. Rao	05273533	Independent Director	4	4	Yes	8	Ladderup Finance Ltd.	Independent Director	2	5
4.	Sri Rajeev Nannapaneni(a)	00183872	Executive Director	4	4	No	2	NIL	NIL	NIL	NIL
5	Sri D.G. Prasad	00160408	Independent Director	4	3	Yes	3	Gokak Textiles Limited	Independent Director	1	NIL
								Moschip Technologies Limited	Independent Director	NIL	2
								Suven Pharmaceuticals Limited	Independent Director	2	NIL
6.	Dr. Mrs. Leela Digumarti	06980440	Independent Director	4	2	No	NIL	NIL	NIL	NIL	NIL
7.	Sri P.S.R.K. Prasad	07011140	Executive Director	4	3	Yes	NIL	NIL	NIL	NIL	NIL
8.	Dr. M.U.R. Naidu	05111014	Independent Director	4	3	No	NIL	NIL	NIL	NIL	NIL

Sl. No.	Name of the Director	DIN	Category	Number of Board meetings during FY 2019-20		Attendance at the last AGM held on September 5, 2019	No. of Directorships in other Companies	Name of other listed entities holding directorship	Category of directorship in other listed entities	No. of Committee positions held in other listed entities	
				Held	Attended					Chairman	Member
9.	Dr. D. Linga Rao	07088404	Executive Director	4	3	Yes	NIL	NIL	NIL	NIL	NIL
10.	Sri Sridhar Sankararaman	06794418	Non-Executive and Non-Independent Director	4	4	No	NIL	NIL	NIL	NIL	NIL

Note: (a) Sri V.C. Nannapaneni and Sri Rajeev Nannapaneni are related to each other.
(b) The Company doesn't have pecuniary relationship with any of the Non-Executive Director(s).

(c) Independent Directors

Natco is always of the belief that an independent eye makes a difference to the way the Board functions. The presence of Independent Directors on the Board ensures that decision making of the Board is unbiased and the interests of the stakeholders are best safeguarded. There is no instance of resignation of Independent Director(s) during the financial year before the expiry of their term. Your Company is in strict compliance of the several conditions in respect of Independent Directors prescribed under the Act and the Listing Regulations.

Separate Meeting for Independent Directors

The Independent Directors of your Company met on February 12, 2020 and considered those items of business as required under Schedule IV to the Act as well as the Listing Regulations. The Company Secretary of your Company facilitated the convening and holding of the meeting of Independent Directors.

Familiarisation Programme for Independent Directors

The Company has organised Familiarisation Programmes for the Independent Directors of the Company to familiarise them with the Company vis-a-vis their roles, rights, responsibilities in the Company, nature of the industry in which the Company operates, business model of the Company etc. The details regarding the programme is available on our website at https://www.natcopharma.co.in/wp-content/uploads/2020/05/FAMILIARIZATION-PROGRAM-FOR-INDEPENDENT-DIRECTORS.pdf

(d) Board Evaluation

A formal annual evaluation has been made by the Board of its own performance, Chairman of the Board, its Committees and individual Directors. The performance evaluation has been done by the entire Board of Directors, excluding the Director being evaluated. Various evaluation techniques are used to assess the performance of the Directors. The Directors have participated in this evaluation process. The Independent Directors in their separate meeting have also evaluated the performance of the Chairman of the Company, Non-Independent Directors and the Board as a whole.

(e) The following is the Criteria for evaluation of performance of Independent Director:

I. Participation at Board/ Committee Meetings:

a) Director comes well prepared and informed for the Board / committee meeting(s)

b) Director demonstrates a willingness to devote time and effort to understand the Company and its business and a readiness to participate in events outside the meeting room, such as site visits?

c) Director has ability to remain focused at a governance level in Board/ Committee meetings.

d) Director's contributions at Board / Committee meetings are of high quality and innovative.

e) Director's pro-actively contributes in to development of strategy and to risk management of the Company.

II. Managing Relationship:

a) Director's performance and behaviour promotes mutual trust and respect within the Board / Committee.

b) Director is effective and successful in managing relationships with fellow Board members and senior management?

III. Knowledge and Skill:

a) Director understands governance, regulatory, financial, fiduciary and ethical requirements of the Board / Committee.

b) Director actively and successfully refreshes his/ her knowledge and skills and up to date with the latest developments in areas such as corporate governance framework, financial reporting and the industry and market conditions.

c) Director is able to present his/ her views convincingly yet diplomatically.

d) Director listens and takes on Board the views of other members of Board.

e) Director exercises objective independent judgment in the best interest of Company.

f) Director has effectively assisted the Company is implementing best corporate governance practices and then monitors the same.

g) Director helps in bringing independent judgment during board deliberations on strategy, performance, risk management etc.

h) Director keeps himself/ herself well informed about the Company and external environment in which it operates.

i) Director acts within his/her authority and assists in protecting the legitimate interest of the Company, Shareholders and employees.

j) Director adheres to the applicable code of conduct for independent directors.

(f) Key skills/expertise/competence identified by the Board:

Leadership & Management	Leadership experience, strategic decision making, risk management. Skilled and expertise in driving change, planning succession and long term growth.
Finance/Accounting Knowledge	Knowledge on financial reporting, accounting principles, internal controls, auditing process and related considerations and issues.
Governance	Experience as a board member and aware of corporate governance principles.
Industry knowledge	Knowledge of one or more important business lines of the organisations in the same industry.
Legal/Regulatory knowledge	Experience in working in legal firms, regulatory organisations and Aware of legal matters relevant to the industry.
Sales, Distribution & Brand Marketing	Experience in developing strategies to grow sales, and market share, create distribution models and build brand awareness to enhance company's reputation.
International / Global Knowledge	Awareness about relevant markets at global level and diversification of Company's business, global trends.
Operations	Expertise in managing the operations of the Company
Technology	Experience with information technology systems and developments and recent trends in technology.

The key skills/expertise/competence stated above are adequate to function efficiently and effectively in managing the affairs of the Company.

Committees

(i) Committees of Board

In order to take decisions effectively and for better Corporate Governance the Board of your Company had constituted Seven (7) Committees viz. Audit Committee, Stakeholders Relationship Committee, Nomination and Remuneration Committee, Compensation Committee, Allotment Committee, Corporate Social Responsibility Committee and Risk Management Committee. The membership in Committees is decided based on the traits of the Directors keeping in view the statutory requirement of composition of Directors in the Committees. The brief description of terms of reference, composition, meetings and attendance of the Committee(s) during the financial year 2019-20 are provided below:

(a) Audit Committee

The Audit Committee is vested with the responsibility to review, inter alia, the financial reporting, internal control systems, risk management systems and the internal and external audit functions. The qualifications of the Directors, composition, quorum, frequency of meetings and the terms of reference of the Audit Committee are in line with the requirements under the Act and the Listing Regulations.

Details of Composition of the Audit Committee and attendance at the meetings held on May 27, 2019, August 9, 2019, November 12, 2019 and February 12, 2020 are given below:

Sl. No.	Name of the Director	Category	Audit Committee attendance	
			Held	Attended
1.	Sir G.S. Murthy (Chairman)	Independent Director	4	4
2.	Sri T.V. Rao	Independent Director	4	4
3.	Sri D.G. Prasad	Independent Director	4	3
4.	Sri V.C. Nannapaneni	Executive Director	4	4
5.	Dr. M.U.R. Naidu	Independent Director	4	3
6.	Sri Sridhar Sankararaman	Non-Executive and Non- Independent Director	4	4

(b) Stakeholders Relationship Committee

The Stakeholders Relationship Committee is constituted by the Board to consider and resolve the grievances of security holders of the Company. The qualifications of the Directors, composition, quorum, frequency of meetings and the terms of reference of the Stakeholders Relationship Committee are in line with the requirements under the Act and the Listing Regulations.

Details of composition of the Stakeholders Relationship Committee and attendance of the meetings held on May 27, 2019 and November 12, 2019 are as given below:

Name of the Director	Category	Stakeholders Relationship Committee Attendance	
		Held	Attended
Sri G.S.Murthy (Chairman)	Independent Director	2	2
Sri V.C. Nannapaneni	Executive Director	2	2
Sri Rajeev Nannapaneni	Executive Director	2	2
Dr. M.U.R. Naidu	Independent Director	2	2

(c) Nomination and Remuneration Committee

The Nomination and Remuneration Committee is empowered to oversee the Company's policies relating to the nomination and evaluation of every Director's performance and to determine the Company's policies relating to remuneration of the Directors, Senior Management of the Company who are one level below the Board of Directors. The qualifications of the Directors, composition, quorum, frequency of meetings and the terms of reference of the Nomination and Remuneration Committee are in line with the requirements under the Act and the Listing Regulations.

The details of composition of Nomination and Remuneration Committee and attendance of the meeting held on May 27, 2019 and February 12, 2020 are given below:

Name of the Director	Category	Nomination and Remuneration Committee Attendance	
		Held	Attended
Sri G.S.Murthy (Chairman)	Independent Director	2	2
Sri Sridhar Sankararaman	Non-Executive and Non-independent Director	2	2
Sri V.C. Nannapaneni	Executive Director (Chairman of the Board)	2	2
Dr. M.U.R. Naidu	Independent Director	2	2

(d) Compensation Committee

The Compensation Committee is constituted, inter alia, to consider recommendation of any share based employee benefit schemes for the approval of the Board and for grant of options / allotment of shares approved under such schemes.

The qualifications of the Directors, composition, quorum, frequency of meetings and the terms of reference of the Compensation Committee are in line with the requirements under the Act, the Listing Regulations and the SEBI (Share Based Employee Benefits) Regulations, 2014 and consists of Sri G.S. Murthy (Chairman), Sri V.C. Nannapaneni, Sri Rajeev Nannapaneni and Dr. M.U.R. Naidu as members of the Compensation Committee.

During the financial year 2019-20 the Compensation Committee meetings were held on September 28, 2019 and January 27, 2020.

Except Dr. M.U.R. Naidu for the meeting held on September 28, 2019 all the members had attended the meeting wherein it had allotted 1,25,215 equity shares to the eligible employees of the Company towards the fourth tranche of options under Natco Employee Stock Option Scheme, 2015 (NATSOP 2015). All the members had attended the meeting held on 27th January, 2020 wherein it had allotted 48,170 equity shares to the eligible employees of the Company towards third tranche of options under Natco Employee Stock Option Scheme, 2016 (NATSOP 2016) and 1,32,455 equity shares to the eligible employees of the Company towards second tranche of options under Natco Employee Stock Option Scheme 2017 (NATSOP 2017).

(e) Allotment Committee

The Allotment Committee is constituted to facilitate allotment of securities of the Company after obtaining requisite approvals, if any. There was no Allotment Committee meeting held during the financial year 2019-20. Sri V.C. Nannapaneni, Sri G. S. Murthy, Dr. M.U.R. Naidu and Sri Rajeev Nannapaneni are the members of the Allotment Committee.

(f) Corporate Social Responsibility Committee

The Corporate Social Responsibility Committee is vested with the responsibility to, inter alia, monitor the compliance of Corporate Social Responsibility Policy of the Company and to recommend any changes to the same.

The qualifications of the Directors, composition, quorum, frequency of meetings and the terms of reference of the Corporate Social Responsibility Committee are in line with the requirements under the Act and the Listing Regulations.

The details of composition of Corporate Social Responsibility Committee and attendance of the meetings that were held on May 27, 2019 and November 12, 2019are given below:

Name of the Director	Category	Corporate Social Responsibility Committee attendance	
		Held	Attended
Sri G.S. Murthy	Independent Director	2	2
Sri V.C. Nannapaneni	Executive Director	2	2
Sri Rajeev Nannapaneni	Executive Director	2	2

(g) Risk Management Committee

The Board has constituted Risk Management Committee in the Board meeting held on May 27, 2019 and reconstituted the Committee at the Board meeting held on August 9, 2019 according to Listing Regulations as amended from time to time. The terms of the reference, quorum, and frequency of the Committee meeting etc., are in line with the requirements of the Listing Regulations. The Risk Management Committee meeting was held on March 11, 2020 during the year. The composition of the Committee is as follows:

Directors

1) Sri V.C. Nannapaneni (DIN: 00183315), Chairman & Managing Director

2) Sri Rajeev Nannapaneni (DIN: 00183872), Vice Chairman &Chief Executive Officer

3) Sri P.S.R.K. Prasad (DIN:07011140), Director & Executive Vice President (Corporate Engineering Services)

4) Dr. D. Linga Rao (DIN: 07088404), Director & President (Technical Affairs)

5) Dr. M.U.R. Naidu (DIN: 05111014), Independent Director

Other Members

6) Sri A. Lakshminarayana, Vice President – HR & OD

7) Sri S.V.V.N. Appa Rao, Chief Financial Officer

8) Dr. B. Rami Reddy, Director – Formulations

9) Dr. M. Pulla Reddy, Executive Vice President – R&D

Company Secretary of the Company shall act as the Secretary to the Risk Management Committee to facilitate convening and conducting of the meetings of the Committee as per law Except Dr. M.U.R. Naidu and Dr. M. Pulla Reddy, all the members of Risk Management Committee were present at the meeting of the Committee held on March 11, 2020.

(ii) Other Committees

(a) Buyback Committee

Buyback Committee is constituted by the Board to deal with matters relating to the Buyback of equity shares of the Company. The Buyback Committee comprises of Sri V.C. Nannapaneni, Chairman and Managing Director, Sri Rajeev Nannapaneni, Vice Chairman and Chief Executive Officer, Sri M. Adinarayana, Company Secretary and Vice President (Legal & Corp. Affairs) and Sri S.V.V.N Appa Rao, Chief Financial Officer as its members. The details of the meetings of the Buy-back committee are as follows:

S. No.	Date of the Meeting	Purpose
1	16th May, 2019	Public Announcement for Closure of Buyback

(b) Committee dealing with Land Property

The Committee dealing with Land Property was constituted by the Board of Directors at their meeting held on May 27, 2019 with Sri V. C. Nannapaneni, Chairman and Managing Director, Sri Rajeev Nannapaneni, Vice Chairman and Chief Executive Officer, Sri M. Adinarayana, Company Secretary & Vice President (Legal & Corp. Affairs) and Sri S.V.V.N. Appa Rao, Chief Financial Officer as members of the Committee.

The Board of Directors at their meeting held on August 9, 2019 had reconstituted the Committee dealing with Land Property with Sri V. C. Nannapaneni, Chairman and Managing Director, Sri Rajeev Nannapaneni, Vice Chairman and Chief Executive Officer and Sri G.S. Murthy, Independent Director as members of the Committee. The Committee dealing with Land Property is constituted by the Board of Directors of the Company in order to do the following transactions not involving related parties:

1. To approve purchase / sale of land property for / by the Company.
2. To approve mortgage of land property owned by the Company.
3. To approve execution of Agreement of Sale, Memorandum of Understanding, Sale Deed, Exchange Deed, Gift Settlement Deed, Mortgage Deed and such other documents as may be required and necessary.
4. To do all such things that are necessary and incidental thereto.

The details of composition of Committee dealing with Land Property and attendance of the meetings that were held on June 11, 2019 and October 21, 2019 are given below:

Name of the Director	Category	Committee dealing with Land Property Meeting attendance	
		Held	Attended
Sri G.S. Murthy	Independent Director	2	1
Sri V.C. Nannapaneni	Executive Director	2	2
Sri Rajeev Nannapaneni	Executive Director	2	2
Sri M. Adinarayana	Company Secretary & Vice President (Legal & Corp. Affairs)	2	1
Sri S.V.V.N. Appa Rao	Chief Financial Officer	2	1

(c) Share Transfer Committee

The transfer/transmission of equity shares of the Company are approved by the Share Transfer Committee, the power of which has been delegated to the Share Transfer Agents/Registrars of the Company. The Company Secretary approves share transfers/ transmissions and related matters. As SEBI has banned the transfer of physical shares, the Company accepts transfer of physical shares lodged for transfer in special circumstances either at Company's Registered Office or at the Company's Registrars are processed within 15 days from the date of lodgement, if the documents are valid/ proper in all respects. All requests for dematerialisation of shares are processed and the confirmation(s) thereto are given to depositories within 15 days of the receipt of request.

During the financial year 2019-20, 3 (Three only) instruments of transfer for 800 (Eight hundred equity shares only and 16 (Sixteen only) instruments of transmission for 6560 (Six thousand five hundred sixty only) equity shares were received and the same were duly effected.

(d) Internal Complaints Committee – Committee constituted under Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013

Your Company has in place Internal Complaints Committee at each of its offices and units /factories to resolve any issues related to Sexual Harassment of Women at Workplace. The composition of the Committees are strictly as per the statutory requirement in the Sexual Harassment of Women at

Workplace (Prevention, Prohibition and Redressal) Act, 2013. During the financial year 2019-20, there were no complaints received.

The Committee comprises of one Presiding Officer who is a woman employed at a Senior Level, two members from amongst the employees and one member from a non-governmental organisation at each place of work. It was ensured that the Committee constitutes with at least half of the total members are women.

General Meetings

(a) Annual General Meetings

The following are the details of the previous three Annual General Meetings of your Company:

Year	Date of the AGM	Venue	Time	Special Resolution(s) passed, if any
2018-19	5th September, 2019	Daspalla Hotel, Road No.37, Jubilee Hills, Hyderabad - 500 033	10.30 A.M.	10
2017-18	15th September, 2018	Daspalla Hotel, Road No.37, Jubilee Hills, Hyderabad - 500 033	10.30 A.M.	4
2016-17	28th September, 2017	Daspalla Hotel, Road No.37, Jubilee Hills, Hyderabad - 500 033	10.30 A.M.	7

(b) Postal ballot

No resolution was passed through postal ballot for the financial year 2019-20.

Remuneration of Directors

Executive Directors

The remuneration of Executive Directors of the Company is fixed based on the Remuneration Policy of the Company and as recommended by Nomination and Remuneration Committee and the remuneration paid to them for the financial year 2019-20 is as below and are in line with the applicable provisions of the Act, Rules and Listing Regulations made thereunder as amended from time to time:

Sl. No.	Name	Designation	Total amount (₹ in Lakhs per annum)
1	Sri V. C. Nannapaneni	Chairman & Managing Director	₹ 215.12
2	Sri Rajeev Nannapaneni	Vice Chairman & CEO	₹ 197.47
3	Sri P.S.R.K. Prasad	Director & Executive Vice President (Corp. Engg. Services)	₹ 201.06
4	Dr. D. Linga Rao	Director & President (Tech. Affairs)	₹ 201.06
	Total		**₹ 814.71**

Non-Executive Directors

Sitting fees are paid to the Non-Executive Directors for attending the Board Meetings and the Committee Meetings and such amounts are paid within the ceiling limits under Act. The details of the sitting fees paid to Non-Executive Directors of the Company for the Financial Year 2019-20 is given below:

Sl. No.	Name	Designation	Sitting Fee (in ₹)
1.	Sri G.S. Murthy	Independent Director	4,60,000
2.	Sri T.V. Rao	Independent Director	2,80,000
3.	Sri D.G. Prasad	Independent Director	2,10,000
4.	Dr. Mrs. Leela Digumarti	Independent Director	1,00,000
5.	Dr. M.U.R. Naidu	Independent Director	3,10,000
6.	Sri Sridhar Sankararaman*	Non-Executive Non-independent Director	Nil
	Total		**13,60,000**

* Sri Sridhar Sankararaman has voluntarily opted not to take any sitting fee.

Shareholding of Non-Executive Directors

Dr. M.U.R Naidu, Independent Director is holding 15,000 equity shares of ₹ 2/-each which amounts to 0.008% of equity shares of the Company as on March 31, 2020. None of the other Non-Executive Directors are holding any shares of the Company.

Prevention of Insider Trading

Your Company has in place Code of Conduct to Regulate, Monitor and Report Trading by Designated Persons and Code of Practices and Procedures for Fair Disclosure of Unpublished Price Sensitive Information which is in adherence to the SEBI (Prohibition of Insider Trading) Regulations, 2015 as amended from time to time. The policy on Insider trading was amended during the Financial Year 2019-20 in line with SEBI (Prohibition of Insider Trading) (Amendment) Regulations, 2018. The disclosures received pursuant to this Code and the regulations are disseminated to the Stock Exchanges within the prescribed time limit. Report of Compliance Officer was duly placed before the Board meetings. The Code is available on the Company's website at the following link:

https://www.natcopharma.co.in/wp-content/uploads/2019/04/Code-of-Conduct-_PIT-2015-Natco.pdf

Compliances

a. Reconciliation of Share Capital Audit Report

The Reconciliation of Share Capital Audit Report was prepared on a quarterly basis by Mrs. P. Renuka, Practising Company Secretary (ACS No. 11963; CP No. 3460) as required under Regulation 76 of SEBI (Depositories and Participants) Regulations, 2018 and the same were filed with the Stock Exchanges within the statutory time limits.

b. Compliance Report on Corporate Governance

Your Company submits compliance report on Corporate Governance to the Stock Exchanges on quarterly, half-yearly and annual basis within the statutory time limits.

c. Secretarial Standards

Your Company's practices and procedures meet with the Secretarial Standards issued by the Institute of Company Secretaries of India (ICSI).

Legal Compliance

The Company follows a formal management policy and system of legal compliance and reporting to facilitate periodical review by the Board of the Compliance of laws applicable to the Company and steps taken to rectify non-compliance, if any. There were no instances of material non-compliance and strictures imposed on the Company either by SEBI, Stock Exchange or any statutory authority, on any matter related to capital markets, tax / excise / customs matters, and such other related matters during the last three years.

Whistle Blower Policy

The Company has a Whistle Blower Policy to deal with instances of fraud and mismanagement, if any. The policy ensures that strict confidentiality is maintained whilst dealing with concerns and also that no discrimination will be meted out to any person for a genuinely raised concern. Pursuant thereto, anyone can directly approach the Chairman of the Audit Committee or through Company Secretary to report any suspected or confirmed incident of fraud / misconduct. It is affirmed that no personnel has been denied access to the Audit Committee.

Environmental Policy

Your Company complies with all the applicable environmental legislations and regulations, by incorporating suitable modern techniques for combating the environmental pollutants and to ensure the compliance. We have adopted state of the art technologies for treatment and recycling of effluents, recycling of wastes, converting wastes to by-products and energy, conservation of natural resources, energy efficiency, rain water harvesting, etc. A number of initiatives and programs conducted to create awareness among our employees & all our stakeholders. Our well defined EHS policy over the year built a frame work for setting and reviewing of environmental objectives and targets for continual improvement.

Renewable Energy:

We are continuing our efforts to utilize the renewable energy in our operations. During the year FY2019-20, our overall renewable energy contribution reached to 28.60% (i.e. 5.13% increase from the previous FY2018-19 (23.47%)).

During the year FY2019-20:

- Enhanced the onsite solar power plant capacity to 3.25MW at Mekaguda unit. During the year FY2019-20, about 39.80% of energy requirement for Mekaguda unit is met from renewable energy sources.
- Installed and commissioned the 0.80MW Roof top solar power plant at Kothur unit.
- Continuing the usage of solar energy for boiler feed water preheating by using a parabolic Solar Dish concentrator at the Sagar unit. Continued the usage of solar power from onsite solar power plant. During the year FY2019-20, about 15.49% of energy requirement for Nagarjunasagar unit is met from renewable energy sources.
- Installed wind power plants at Tamilanadu & Andhra Pradesh with a total capacity 4.2MW. During the year FY2019-20, about 33,153GJ of green energy generated from wind power plants.
- Proposed to install 0.80MW solar power plant at Nagarjunasagar unit and 0.5MW Roof top solar power plant at Vizag unit.

Non-Mandatory Requirements

- **Separate posts of Chairperson and Chief Executive Officer**

The Chairman of the Board and the Chief Executive Officer are two different persons

Related Party Transactions

All related party transactions with related parties during the financial year 2019-20 were done in accordance with the provisions of the Act and the Listing Regulations. No materially significant transactions with related parties were entered during the financial year which was in conflict with the interest of the Company. None of the Non-Working Directors have any pecuniary material relationship or material transactions with the Company for the year ended March 31, 2020. The Company had formulated a Related Party Transactions Policy which is available on the Company's Website at the following link:

http://natcopharma.co.in/wp-content/uploads/2015/03/RPT-Policy.pdf)

Employee Stock Option Schemes

Based on the recommendation of the Compensation Committee, the Board and members of the Company approved the following Employee Stock Option Schemes, which are currently in force, for which your company had received in-principle approval from both the stock exchanges (NSE and BSE) to list the shares issued pursuant to the schemes:

Scheme	Particulars	No of Options
NATSOP2015	Opening Balance as on April 1, 2019	2,97,980
	Options vested and Exercised during the year	1,25,215
	Closing Balance of Options as at March 31, 2020	**1,72,765***
NATSOP2016	Opening Balance as on April 1, 2019	1,47,280
	Options vested and Exercised during the year	48,170
	Closing Balance of Options as at March 31, 2020	**1,00,560**
NATSOP2017	Opening Balance as on April 1, 2019	4,89,730
	Options vested and Exercised during the year	1,32,455
	Closing balance of Options as at March 31, 2020	**3,57,275**

* includes forfeited shares

Unclaimed Dividend

Section 124 of the Companies Act, 2013 read with Investor Education and Protection Fund Authority (Accounting, Audit, Transfer and Refund) Rules, 2016 ("the Rules"), mandates that Companies transfer dividend that has remained unclaimed for a period of seven years from the unpaid dividend account to the Investor Education and Protection Fund (IEPF). Further, the Rules mandate that the shares on which dividend has not been paid or claimed for seven consecutive years or more also be transferred to the IEPF.

The following table provides list of years for which unclaimed dividends would become eligible to be transferred to the IEPF on the dates mentioned below:

Year	Type of Dividend	Dividend per share(₹)	Date of declaration	Due date of transfer	Balance Amount (₹) as on 31-3-2020**
2013-14	Interim	5.00*	February 13, 2014	March 22, 2021	1346135.00
2014-15	Interim	5.00*	February 11, 2015	March 20, 2022	1193430.00
2015-16	Interim	1.25	February 11, 2016	March 19, 2023	1558940.00
2016-17	1st Interim	0.75	August 9, 2016	September 15, 2023	936376.00
	2nd Interim	6.00	February 14, 2017	March 23, 2024	5462718.00
2017-18	1st Interim	1.25	August 7, 2017	September 13, 2024	1502908.75
	2nd Interim	7.00	February 6,2018	March 15, 2025	4382924.00
2018-19	1st Interim	1.50	August 8, 2018	September 14, 2025	1082584.50
	2nd Interim	3.50	February 12, 2019	March 15, 2026	2424793.00
	3rd Interim	1.25	May 27, 2019	July 6, 2026	963266.25
2019-20	1st Interim	1.25	August 9, 2019	September 7, 2026	886073.75
	2nd Interim	1.00	November 12, 2019	December 11, 2026	737835.00
	3rd Interim	3.50	February 12, 2020	March 12, 2027	2270775.50

*On Equity share of ₹ 10/- each

**The amount does not include the Unclaimed dividend amount of shares held in Unclaimed Suspense Account of the Company

The Company sends intimation to the shareholder(s) concerned, advising them to lodge their claims with respect to unclaimed dividends. Shareholder(s) may note that both the unclaimed dividend and corresponding shares transferred to IEPF, including all benefits accruing on such shares, if any, can be claimed from IEPF by following the procedure prescribed in the Rules which were available in the website of the Company at https://www.natcopharma.co.in/investors/shareholder-information/iepf/. No claim (s) of whatsoever nature shall lie in respect thereof with the Company.

Dividend Remitted to IEPF During the Last Five Years

Year	Dividend declared on	Amount transferred to IEPF (₹)	Date of Transfer
2008-2009	May 25, 2009	5,79,399.00	June 21, 2016
2009-2010	January 27, 2010	9,18,554.00	February 28, 2017
2010-2011	February 14,2011	7,80,368.00	March 9, 2018
2011-2012	February 9, 2012	10,68,983.00	March 14, 2019
2012-2013	February 13, 2013	15,71,108.00	March 20, 2020

Transfer of Shares to IEPF

Pursuant to Section 124(6) all shares in respect of which dividend has not been paid or claimed for seven consecutive years or more shall be transferred by the Company in the name of Investor Education and Protection Fund (IEPF). During the year ended March 31, 2020, there is no transfer of equity shares to IEPF made by the Company.

Means of Communication

At NATCO, dissemination of information is considered crucial since many stakeholders are interested in the state of affairs of the Company. The Company is in strict compliance of the Listing Regulations pertaining to disclosure of Audited/Unaudited quarterly, half-yearly and annual financial results of the Company both on stand-alone and consolidated basis within thirty (30) minutes of the conclusion of the Board Meeting to the Stock Exchanges and publication of the same in both Vernacular and National newspapers and disclosure of presentations on Financial Results made to Institutional investors / analysts to the Stock Exchanges. The same disclosures are also published on the website of the Company (www.natcopharma.co.in).

It is ensured that any material information under Regulation 30 of the Listing Regulations is promptly intimated to the Stock Exchanges and updated on the Company's website (www.natcopharma.co.in) as well as made part of press releases. Any price sensitive information is brought to the notice of both the Stock Exchanges (NSE and BSE), Press and Electronic Media in order to avoid any possible insider trading practices with such information.

The following table provides the details regarding the publishing of quarterly results in the newspapers:

For Quarter ended	Date of Board meeting	Date of Publication	Name of the English Daily	Name of the Regional Daily
June 30, 2019	August 9, 2019	August 10, 2019	• Business Line	• Eenadu
September 30, 2019	November 12, 2019	November 13, 2019	• Business Standard • Financial Express	• Eenadu
December 31, 2019	February 12, 2020	February 13, 2020	• Business line	• Eenadu
March 31, 2020	June 17, 2020	NA	Not required as per SEBI Circular No. SEBI/HO/CFD/CMD1/CIR/P/2020/79 dated May 12, 2020	

General Shareholder Information

(a) Details regarding Annual General Meeting

Date	October 15, 2020
Time	11.00 a.m.
Venue	Annual General Meeting through Video Conferencing / Other Audio Visual Means facility [Deemed Venue for Meeting: Registered Office: NATCO House, Road No. 2, Banjara Hills, Hyderabad - 500034, Telangana, India.]
Book Closure Dates	October 13, 2020 to October 15, 2020, (both days inclusive)

(b) Financial Year

The Company adopted the financial year beginning on April 1 of every year and ending on March 31 of the following year. Accordingly, all the quarterly, half yearly and annual compliance are taken care of in accordance with the Act, Listing Regulations and other applicable Acts, rules and regulations.

(c) Listing on Stock Exchanges

The ISIN of the Company is INE987B01026. Details of the Stock Exchanges in which the equity shares of the Company are listed are as below:

Name of the Stock Exchange	Address	Scrip Code
BSE Limited	Phiroze Jeejeebhoy Towers, Dalal Street, Mumbai - 400001	524816
National Stock Exchange of India Limited	Exchange Plaza, C-1, Block G, Bandra-Kurla Complex, Bandra (E), Mumbai – 400051	NATCOPHARM

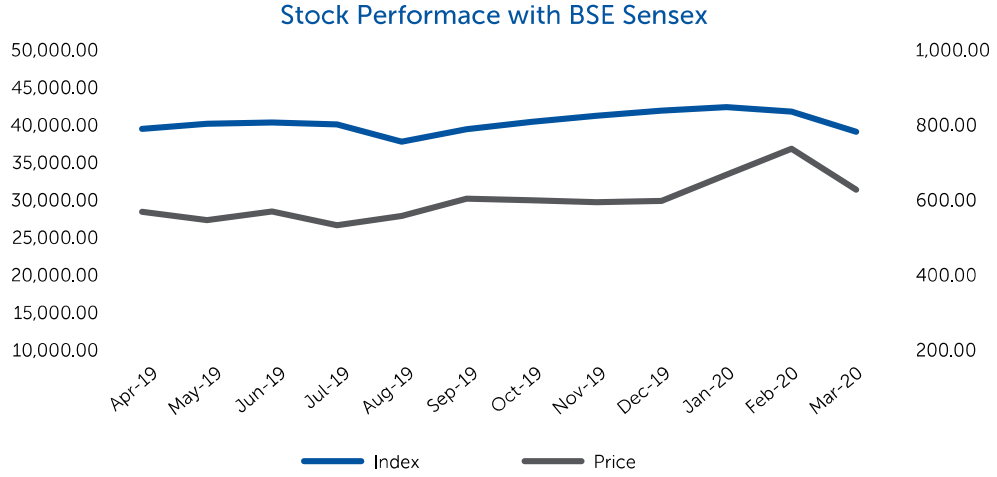
The Company confirms that it has duly paid the annual listing fee for the year 2019-20 to the above mentioned Stock Exchanges and the custodial fee for the year 2019-20 to both the Depositories, namely National Securities Depository Limited (NSDL) and the Central Depository Services (India) Limited (CDSL).

(d) Market Price Data

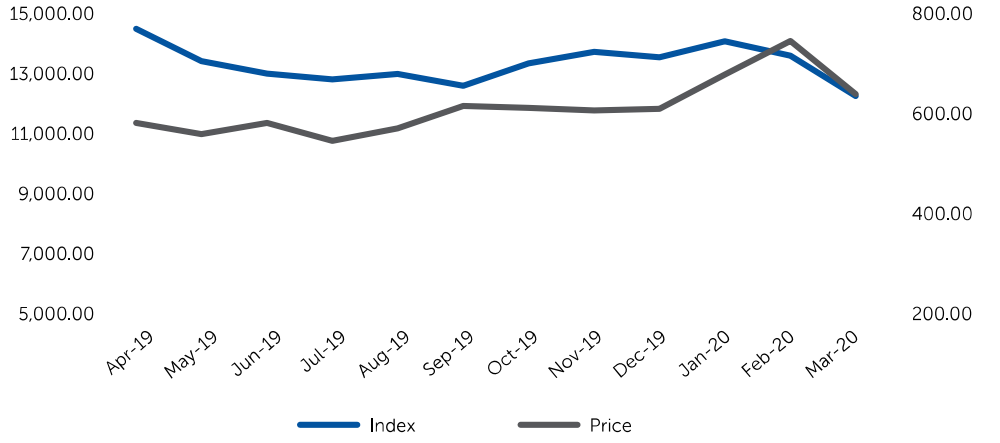
The market price data (high and low closing prices during each month) for the financial year 2019 -20 is as below:

Month	Bombay Stock Exchange		National Stock Exchange	
	High ₹	Low ₹	High ₹	Low ₹
April, 2019	575.55	520.00	577.90	520.20
May, 2019	553.95	482.00	553.75	480.00
June, 2019	576.05	503.00	555.00	501.60
July, 2019	540.50	492.00	541.55	490.00
August, 2019	565.00	504.05	561.95	503.10
September, 2019	609.35	538.60	610.00	535.00
October, 2019	605.55	535.00	606.00	548.00
November, 2019	600.45	541.50	601.00	547.00
December, 2019	604.00	568.00	603.95	560.00
January, 2020	671.50	594.00	671.80	592.00
February, 2020	737.80	587.65	738.10	586.45
March, 2020	632.70	450.00	633.15	402.55

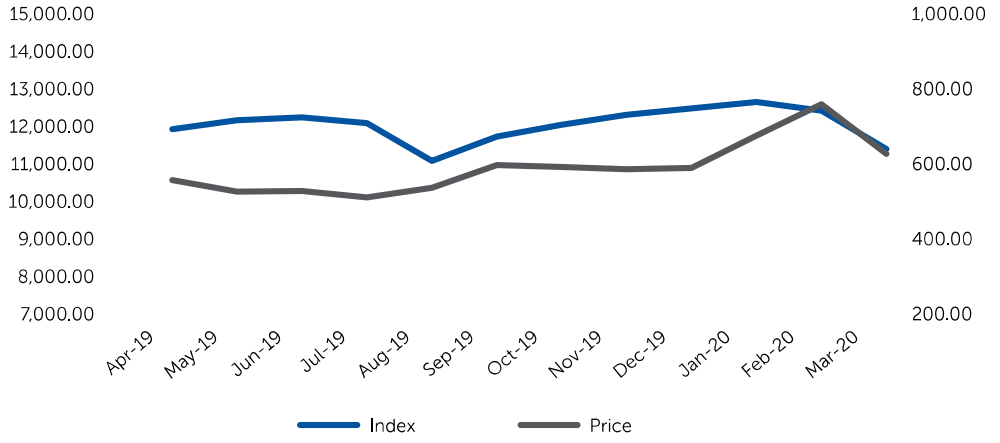
(e) Performance in comparison to broad-based indices



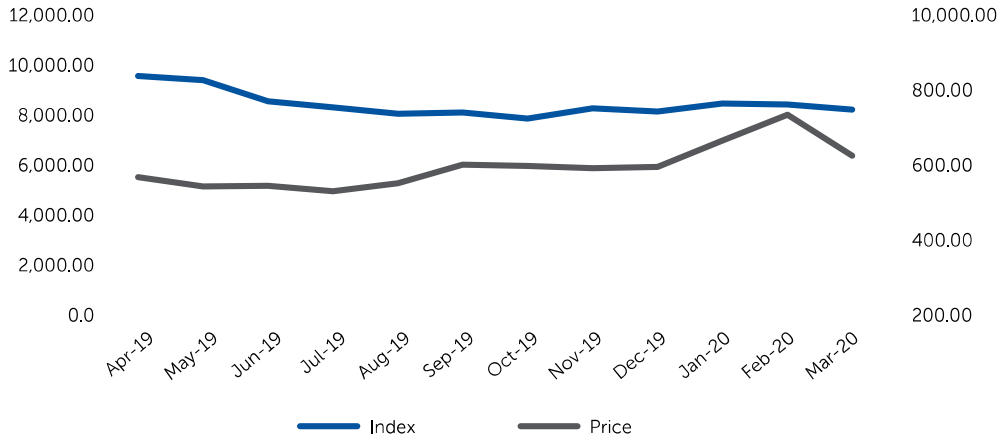
Stock Performance with BSE Health Care Index



Stock Performance with BSE Health Care Index



NATCO stock performance with Nifty 50



(f) Registrar and share transfer agent and share transfer system

Venture Capital and Corporate Investments Pvt. Ltd. (VCCIPL) is the Registrar and Share Transfer Agent of the Company which undertakes the Share Transfer related Work for both physical and electronic forms.

Address: 12-10-167, Bharat Nagar, Hyderabad - 500 018, Telangana, India
Tel Nos.: 040-23818475/23818476/23868023
Fax No.: 040-23868024
Contact Person: Mr. P V Srinivas / Mr. E V S N Murthy
Email: info@vccilindia.com

(g) Dematerialisation of shares and liquidity

As on March 31, 2020, 99.58% of the shares of your Company were dematerialised. As the trading of your Company's shares are being conducted only in electronic form all other members holding physical shares are requested to convert their shareholdings to electronic form at the earliest.

(h) Distribution of Shareholding as on 31-03-2020

Nominal Value ₹	Shareholders		Amount ₹	
	Number	% to Total	In ₹	% to Total
Upto - 5000	69864	97.58	23391936	6.42
5001 - 10000	798	1.11	6029996	1.66
10001 - 20000	410	0.57	5899244	1.62
20001 - 30000	120	0.17	2991560	0.82
30001 - 40000	72	0.1	2527674	0.69
40001 - 50000	46	0.06	2093784	0.58
50001 - 100000	95	0.13	6636380	1.82
100001 and above	189	0.26	314565376	86.39
Total	**71594**	**100.00**	**364135950**	**100.00**

(i) Unclaimed Shares

The status of unclaimed shares of the Company transferred to a demat account "Natco Pharma Limited – Unclaimed Suspense Account", in accordance with Listing Regulations, are given below:

Particulars	No of Shareholders	No of Shares
Aggregate number of shareholders and outstanding shares held in the Unclaimed Suspense Account as on April 1, 2019	1,713	2,45,900
Number of shareholder and shares transferred to IEPF	0	0
Number of shareholders / legal heirs to whom the shares were transferred from the unclaimed suspense account upon receipt of and verification of necessary documents during the year 2019-20	53	22,600
Aggregate number of shareholders and outstanding shares held in the Unclaimed Suspense Account as on March 31, 2020	1,660	2,23,300

(k) Plant Locations

i) **Pharma Division** Kothur Post & Mandal, Rangareddy District -509 228 Telangana, India	ii) **Pharma Division - Parenterals** Vijayapuri North, Nagarjunasagar, Peddavura Mandal, Nalgonda Dist.-508 202 Telangana, India
iii) **Chemical Division** Mekaguda, Nandigama Mandal Rangareddy District - 509 228 Telangana, India	iv) **R & D Division (Natco Research Centre)** B-11, B-13 & B-14, Industrial Estate, Sanathnagar, Hyderabad - 500 018, Telangana, India.
v) **Formulations Division** Plot No.19, Pharma City Selaqui Industrial Area Vikas Nagar, Dehradun 248 197 Uttarakhand, India	vi) **Formulations Division** Plot No. A3, UPSIDC, Selaqui Industrial Area Dehradun 248 197. Uttarakhand, India

vii) **Chemical Division, Chennai** No.74/7B, Vaikkadu TPP Salai, Manali Chennai - 600 103, Tamilnadu, India.	viii) **Pharma Division** DAG No.749, 750 Kokjhar Village, Revenue Circle - Mirza Kamrup (Rural), Guwahati Dist. 781 125, Assam, India.
ix) **Formulations Division** UNIT-10, Parawada, JNPC, Ramky SEZ Visakapatnam-531 019, Andhra Pradesh, India	x) **Crop Health Science (CHS) – Chemical Unit** No. 29, Industial Park-Attivaram,Ozili Mandalam, SPSR Nellore DT, Andhra Pradesh -524421, India
xi) Crop Health Science (CHS) – Formulations Unit No. 3,8/1, Industial Park-Attivaram, Ozili, Mandalam, SPSR Nellore DT, Andhra Pradesh – 524421, India	

(l) Compliance Officer
CS M. Adinarayana, (FCS 3808)
Company Secretary & Vice President (Legal & Corp. Affairs)
Email: man@natcopharma.co.in

(m) Address for correspondence at Registered Office:
Mr. S. Dasaradhi, Sr. Manager – Legal & Secretarial
NATCO House, Road No. 2, Banjara Hills,
Hyderabad - 500034, Telangana
Tel. No.: 040-23547532, Fax No.: 040-23548243
Email: investors@natcopharma.co.in / dasaradhi@natcopharma.co.in
Website: www.natcopharma.co.in

(n) Credit Ratings
The Company's credit ratings from ICRA on long term borrowings is "AA" and on short term borrowings is "A1+"

(o) Qualified Institute Placement (QIP) utilisation:
Your Company had raised a sum of ₹915 crores by allotment of 100,00,000 (One Core only) equity shares of ₹ 2/- each at a premium of ₹ 913 per share through Qualified Institutional Placement (QIP) pursuant to approval accorded by the shareholders in their Extra-ordinary Meeting held on November 29, 2017. Following are the details of the utilisation of funds raised through QIP as on March 31, 2020:

Particulars	Amount in Crores (₹)
Amount received on allotment of 1,00,00,000 (One Crore Only) equity shares through QIP (A)	₹ 915
Utilisation of Funds:	
Amount paid to lead Bankers including TDS	(18.50)
Loans Repaid to Bankers	(209.07)
Payments made legal advisors, NSE, BSE etc. including TDS	(2.73)
Total (B)	**(230.30)**
(C) Balance left (A - B)	684.70
(D) Capital expenditure incurred up to FY 18-19	(452.43)
(E) Capital expenditure incurred up to FY 19-20	(232.27)
(F) Balance of funds	----

(p) Details of the fees paid to Statutory Auditors
The details of the total fees for all services paid by the Company and its subsidiaries, on a consolidated basis, to the Statutory Auditor for the financial year ended March 31, 2020 as follows:

Particulars	Amount (₹)
Audit Fees	₹ 47,00,000
Out of pocket expenses	₹ 97,837
Total	₹ 47,97,837

(q) The Company has complied with Corporate Governance requirements specified in Regulation 17 to 27 and clauses (b) to (i) of sub-regulation (2) of Regulation 46 of SBIE (Listing Obligations and Disclosure Requirement) Regulations, 2015.

Corporate Governance Report

CERTIFICATE ON COMPLIANCE WITH CODE OF CONDUCT

The Members of
NATCO Pharma Limited

As required under SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015, I hereby confirm that the Company has adopted a Code of Conduct for all Board Members and Senior Management and the same has been placed on the Company's Website at https://www.natcopharma.co.in/investors/shareholder-information/corporate-governance-policies/. All Board Members and Senior Management personnel have affirmed compliance with the Code of Conduct in respect for the Financial Year ended March 31, 2020.

For NATCO Pharma Limited

V.C. Nannapaneni
Chairman and Managing Director
DIN: 00183315

Place: Hyderabad
Date: June 17, 2020

CEO / CFO CERTIFICATION TO THE BOARD

(as per 17(8) of Listing Regulations)

The Board of Directors,
NATCO Pharma Limited

A. We have reviewed the Financial Statements and the Cash Flow Statement for the year ended March 31, 2020 and that to the best of our knowledge and belief:

   i. these statements do not contain any materially untrue statement or omit any material fact or contain statements that might be misleading;

   ii. these statements together present a true and fair view of the Company's affairs and are in compliance with existing accounting standards, applicable laws and regulations.

B. There are, to the best of our knowledge and belief, no transactions entered into by the Company during the year which are fraudulent, illegal or violate the Company's code of conduct.

C. We accept responsibility for establishing and maintaining internal controls for financial reporting and that we have evaluated the effectiveness of internal control systems of the Company pertaining to financial reporting and we have disclosed to the auditors and the Audit Committee, deficiencies in the design or operation of such internal controls, if any, of which we are aware and the steps we have taken or propose to take to rectify these deficiencies.

D. We have indicated to the auditors and the Audit Committee

   i. significant changes in internal control over financial reporting during the year;

   ii. significant changes in accounting policies during the year and that the same have been disclosed in the notes to the financial statements; and

   iii. instances of significant fraud of which we have become aware and the involvement therein, if any, of the management or an employee having a significant role in the Company's internal control system over financial reporting.

Rajeev Nannapaneni
Vice Chairman & CEO
DIN: 00183872

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: June 17, 2020

Corporate Governance Report

CERTIFICATE OF COMPLIANCE

The Members of
NATCO Pharma Limited

I have examined the compliance of conditions of Corporate Governance by M/s. NATCO Pharma Limited, for the year ended March 31, 2020 as per the relevant provisions of Securities and Exchange Board of India (Listing Obligations and Disclosure Requirements) Regulations, 2015 ('Listing Regulations').

The Compliance of conditions of Corporate Governance is the responsibility of the management. My examination has been limited to review of the procedure and implementation thereof adopted by the Company for ensuring compliance with the conditions of Corporate Governance as stipulated in the Listing Regulations. It is neither an audit nor an expression of opinion on the financial statements of the Company.

No Investor grievance(s) are pending for a period exceeding one month against the Company as per the records maintained by the Company.

In my opinion and to the best of my information and according to the explanations given to me, I certify that the Company has complied with conditions of Corporate Governance as stipulated in the Listing Regulations, as applicable.

I further state that such compliance is neither an assurance as to the further viability of the Company nor of the efficiency or effectiveness with which the management has conducted the affairs of the Company.

D. Renuka
Company Secretary in Practice
C P No.3460
UDIN: A011963B000348112

Place: Hyderabad
Date: June 17, 2020

CERTIFICATE OF NON-DISQUALIFICATION OF DIRECTORS

(pursuant to Regulation 34(3) and Schedule V Para C clause (10)(i) of the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015)

To
The Members of
M/s. NATCO Pharma Limited
NATCO HOUSE, ROAD # 2
Banjara Hills, Hyderabad 500 034

I had examined the relevant registers, records, forms, returns and disclosures received from the Directors of M/s. NATCO Pharma Limited having CIN: L24230TG1981PLC003201 and having registered office at NATCO House, Road # 2, Banjara Hills, Hyderabad 500 034and (hereinafter referred to as 'the Company'), produced before me by the Company for the purpose of issuing this Certificate, in accordance with Regulation 34(3) read with Schedule V Para-C Sub clause 10(i) of the Securities Exchange Board of India (Listing Obligations and Disclosure Requirements) Regulations, 2015.

In my opinion and to the best of my information and according to the verifications (including Directors Identification Number (DIN) status at the portal www.mca.gov.in as considered necessary and explanations furnished to me by the Company & its officers, I hereby certify that none of the Directors on the Board of the Company as stated below for the Financial Year ended on March 31, 2020 have been debarred or disqualified from being appointed or continuing as Directors of Companies by the Securities and Exchange Board of India, Ministry of Corporate Affairs, or any such other Statutory Authority

Sl No.	Name of Director	DIN	Date of Appointment in Company
1	VENKAIAH CHOWDARY NANNAPANENI	00183315	September 19, 1981
2	SREERAMA MURTHY GUBBALA	00122454	January 31, 2000
3	GOVINDA PRASAD DASU	00160408	February 14, 2014
4	VENKATESWARA RAO THALLAPAKA	05273533	April 18, 2014
5	UMAMAHESHWARRAO NAIDU MADIREDDI	05111014	February 11, 2015
6	RAJEEV NANNAPANENI	00183872	November 30, 2005
7	LEELA DIGUMARTI	06980440	September 22, 2014
8	POTLURI PRASAD SIVARAMAKRISHNA	07011140	November 12, 2014
9	LINGARAO DONTHINENI	07088404	February 11, 2015
10	SRIDHAR SANKARARAMAN	06794418	May 23, 2018

Ensuring the eligibility of for the appointment / continuity of every Director on the Board is the responsibility of the management of the Company. My responsibility is to express an opinion on these based on my verification. This certificate is neither an assurance as to the future viability of the Company nor of the efficiency or effectiveness with which the management has conducted the affairs of the Company.

D. Renuka
Company Secretary in Practice
C P No.3460
UDIN: A011963B000348112

Place: Hyderabad
Date: June 17, 2020

Business Responsibility Report

Section – A: General Information about the Company

1.	Corporate Identity Number (CIN) of the Company	L24230TG1981PLC003201
2.	Name of the Company	NATCO Pharma Limited
3.	Registered Address	NATCO House Road # 2, Banjara Hills, Hyderabad - 500034, Telangana, India
4.	Website	www.natcopharma.co.in
5.	E-mail id Financial Year Reported	sustainability.report@natcopharma.co.in 1st April, 2019 to 31st March, 2020
6.	Sector(s) that the Company is engaged in (industrial activity code-wise)	NIC Code of product/service: 210 Description: Pharmaceuticals
7.	List three key products/services that the Company manufactures/provides (as in balance sheet)	Imatinib, Oseltamivir, Liposomal doxorubicin
8.	Total number of locations, where business activity is undertaken by the Company	Our business activity spreads over 40 countries through either sales or alliances. Our major products include Finished Dosage Formulations (FDF) and Active Pharmaceutical Ingredients (API). Number of locations in India (National) - eight manufacturing units, two R&D centres in addition to several distribution/ warehouse locations across India. International locations - The Company has 6 subsidiaries and one Step-down subsidiary
9.	Markets served by the Company – Local/ State/ National/ International	The Company sells its products in India, USA, Europe and several other emerging countries, totalling over 40 countries.

Section – B: Financial Details of the Company

1.	Paid-up Capital (INR)	₹ 364 million (As on 31st March, 2020).
2.	Total Turnover (INR)	Gross turnover of ₹ 20,224 million on a consolidated basis (as on 31st March 2020).
3.	Total profit after Taxes (INR)	₹ 4,608 million on a consolidated basis (as on 31st March 2020).
4.	Total Spending on Corporate Social Responsibility (CSR) as percentage of profit after tax (%)	Total percentage on CSR as a percentage of Profit after Tax of FY 2019-2020 is 3.31% on standalone basis. The Company spent over 2% of its average Profit before Tax of preceding 3 financial years. Additionally, the Company also made donations for CSR activities.
5.	List of activities in which the above expenditure has been incurred	The Company has undertaken several CSR Projects / Programmes during FY 2019-20: majority of the focus being in Education and Healthcare sectors. The detailed list of activities where the CSR expenditure was incurred is included in the Board's Report which forms a part of this Annual Report.

Section – C: Other Details

1. Does the Company have any Subsidiary Company/ Companies?
   Yes, the Company has six subsidiaries and one step-down subsidiary, all are located overseas.

2. Does the Subsidiary Company/ Companies participate in the Business Responsibility (BR) initiatives of the parent Company? If yes, then indicate the number of such subsidiary Company(s):
   The parent company undertakes majority of the BR initiatives.

3. Do any other entity/entities (e.g. suppliers, distributors etc.) that the Company does business with, participate in the BR initiatives of the Company? If yes, then indicate the percentage of such entity/ entities? [Less than 30%, 30%-60%, More than 60%]:
   Entities like suppliers, distributors did not participate in the Company's BR initiatives in the reporting period.

Section – C: Other Details

1. Details of Director/Directors responsible for BR

(a) Details of the Director responsible for the implementation of BR policy/policies

- DIN Number: 00183872
- Name: Mr. Rajeev Nannapaneni
- Designation: Vice-Chairman and Chief Executive Officer

(b) Details of the BR Head

Sr. No.	Particulars	Details	
1	DIN Number (if applicable)	07011140	-
2	Name	Mr. P. S. R. K. Prasad	Mr. Rajesh Chebiyam
3	Designation Director	Director and Executive VP, Corporate Engineering Services	VP-Acquisitions, Institutional Investor Management and Corporate Communications
4	Telephone number	+91 8542 226611	+91 40 23547532
5	E-mail ID	psrk@natcopharma.co.in	rajesh.chebiyam@natcopharma.co.in

2. Disclosures on the nine principles as charted by the Ministry of Corporate Affairs in the "National Voluntary Guidelines (NVG) on Social, Environmental and Economic Responsibilities of Business".

01 Principle

Ethics,Transparency & Accountability
Businesses should conduct and govern themselves with Ethics, Transparency and Accountability

02 Principle

Product Life Cycle Sustainability
Businesses should provide goods and services that are safe and contribute to sustainability throughout their lifecycle

03 Principle

Employee Well–Being
Businesses should promote the well-being of all employees

04 Principle

Stakeholder Management
Businesses should respect the interests of and be responsive towards all stakeholders, especially those who are disadvantaged, vulnerable and marginalised

05 Principle

Human Rights
Businesses should respect and promote human rights

06 Principle

Environment
Businesses should respect, protect and make efforts to restore the environment

07 Principle

Policy Advocacy
Businesses, when engaged in influencing public regulatory policy, should do so in a responsible manner

08 Principle

Equitable Development
Businesses should support inclusive growth and equitable development

09 Principle

Customer Value
Businesses should engage with and provide value to their customers and consumers in a responsible manner

Business Responsibility Report

Table: Principle-wise (as per NVGs) BR Policy/policies (Reply in Y/N)

S. No.	Questions	P1	P2	P3	P4	P5	P6	P7	P8	P9
1.	Do you have a policy/policies for....	Y	Y	Y	Y	Y	Y	NA	Y	Y
2.	Has the policy being formulated in consultation with the relevant stakeholders?	Y	Y	Y	Y	Y	Y	NA	Y	Y
3.	Does the policy conform to any national/ international standards? If yes, specify? (50 words)	The Company is abiding by the various laws while framing the policies, the best practices are taken into account. (P7 Not applicable)								
4.	Has the policy being approved by the Board? If yes, has it being signed by the MD/Owner/CEO/ appropriate Board Director?	The policies have been approved by the CEO (P7 not applicable)								
5.	Does the Company have a specified committee of the Board/ Director/ Official to oversee the implementation of the policy?	Y	Y	Y	Y	Y	NA	Y	Y	Y
6.	Indicate the link for the policy to be viewed online?	Policies are available on the website of the Company www. natcopharma.co.in and the policies which are internal to the Company are available on the Intranet of the Company. (P7 not applicable)								
7.	Has the policy been formally communicated to all relevant internal and external stakeholders?	Y	Y	Y	Y	Y	Y	NA	Y	Y
8.	Does the Company have in-house structure to implement the policy/policies?	Y	Y	Y	Y	Y	Y	NA	Y	Y
9.	Does the Company have a grievance redressal mechanism related to the policy/policies to address stakeholders' grievances related to the policy/ policies?	Y	Y	Y	Y	Y	Y	NA	Y	Y
10.	Has the Company carried out independent audit/ evaluation of the working of this policy by an internal or external agency?	Y	Y	Y	Y	Y	Y	NA	Y	Y

2(a) If answer to S. No. 1 against any principle, is 'No', please explain why: (Tick up to 2 options)
NA

3. Governance related to BR
   - Indicate the frequency with which the Board of Directors, Committees of the Board or CEO to assess the BR performance of the Company.

     Half yearly

   - Does the Company publish a BR or a Sustainability Report? What is the hyperlink for viewing this report? How frequently it is published?

     The Company's Annual Report includes a Business Responsibility Report which is available on the website. Last year, we brought out our first Sustainability Report. The copy of the same is available on the website of the Company at www.natcopharma.co.in

Principle 1 Ethics, Transparency and Accountability

1. Does the policy relating to ethics, bribery and corruption cover only the Company? Yes/No. Does it extend to the Group/ Joint Ventures/ Suppliers/ Contractors/ NGOs/ Others?
   Yes. The Company firmly believes and adheres to transparent, fair and ethical governance practices to foster professionalism, honesty, integrity and ethical behavior. The company extends the policy with respect to ethics, bribery and corruption to the Subsidiaries, Associates.

2. How many stakeholder complaints have been received in the past financial year and what percentage was satisfactorily resolved by the management?
   The company encourages all its stakeholders to freely share their concerns and grievances. The Company has received 10 complaints from various stakeholders during the FY 2019-20, which were 100% promptly resolved.

Principle 2 Products Life Cycle Sustainability

1. List up to 3 of your products or services whose design has incorporated social or environmental concerns, risks and/or opportunities.
   1. Doxorubicin Liposomal Injection
   2. Lanthanum Carbonate Tablets
   3. Letrozole Tablets

   For all the above mentioned products, NATCO has done continuous improvement programs which has resulted in yield improvement without compromising on compliance requirements.

   For each such product, provide the following details in respect of resource use (energy, water, raw material, etc.) per unit of product (optional):
   (i) Reduction during sourcing/production/distribution achieved since the previous throughout the value chain?

   (ii) Reduction during usage by consumers (energy, water) has been achieved since the previous year?

   The company strives to improve its energy and water footprints by reducing the power and fuel consumption

   1. At formulation units, increased the batch size of Lanthanum carbonate tablets and Letrozole tablets in existing equipment for enhancing productivity, reducing analysis and frequency of change over. Thereby utilities consumption per unit reduced.
   2. Automised filter cleaning machine installed, which reduced water consumption for filter cleaning.
   3. Improved the yield and reduced consumption of primary packaging materials of Doxorubicin liposomal injection, which reduced the consumption of utilities per unit.
   4. New water cooled chiller, air compressor and APFC panel installed at one of the formulation unit and resulting in reduction in power consumption.

2. Does the Company have procedures in place for sustainable sourcing (including transportation)?
   Sustainable sourcing, production and distribution practices are followed ensuring quality and safety of raw materials and packaging materials procured from suppliers as well as of products manufactured, stored and distributed throughout the value chain. The Company has in place a robust vendor selection and vendor evaluation mechanism and promotes local suppliers, where adequate. The Company lays emphasis on safe transportation, optimisation of logistics, lowering of transportation costs, and reduction of vehicular air emission.

3. **Has the Company taken any steps to procure goods and services from local and small producers, including communities surrounding their place of work? If yes, what steps have been taken to improve their capacity and capability of local and small vendors?**
   The Company consciously endeavours to source its procurement of goods and services from medium and small vendors from local areas where feasible and if it meets the quality standards of the Company. For example, Local vendors were developed and vendor qualification activities are initiated for development of suitable cost effective materials of primary, secondary and tertiary packing material.

4. **Does the Company have a mechanism to recycle products and wastes? If yes, what is the percentage of recycling the products and waste (separately as 10%). Also, provide details thereof, in about 50 words or so.**
   The company is committed to recycle wastes - both process and non-process. The initiatives around recycling are:

   1. At API units, the waste water is treated in an elaborate treatment system, including the Reverse Osmosis (RO) system and the permeate is reused. This resulted in less requirement of fresh water consumption

   2. Made arrangements for recycling of dry waste such as shippers, cartons, bottles with M/s ITC Limited and sent 18585 kgs and return got bundles of A4 paper used for photocopying, resulting in reduced consumption of fresh paper at NRC Unit

   3. Installed solar dish heating system to Boiler Feed water, resulting reduced fuel consumption at Sagar Unit

   In the pharmaceutical business, it is not recommended to recycle products and therefore, we responsibly destroy products that do not meet quality requirements.

Principle 3 Employee Well-Being

1. **Please indicate the total number of employees.**
   The total number of employees is 5026 as on 31st March, 2020.

2. **Please indicate the total number of employees hired on temporary/contractual/casual basis.**
   The total number of employees hired on temporary/ contractual/casual basis is 429 as on 31st March, 2020.

3. **Please indicate the number of permanent women employees.**
   The total number of permanent women employees is 551 as on 31st March, 2020.

4. **Please indicate the number of permanent employees with disabilities.**
   The total number of permanent employees with disabilities is 5 as on 31st March, 2020.

5. **Do you have an employee association that is recognised by management?**
   Yes. The Company does have employee associations at certain manufacturing locations, which encourage the employees to participate freely in constructive dialogue with the management. Moreover, workers' wages are decided through Collective Bargaining System.

6. **What percentage of your permanent employees are members of this recognised employee association?**
   32% of permanent employees at our manufacturing locations are members of employee associations.

7. **Please indicate the number of complaints relating to child labor, forced labor, involuntary labor, sexual harassment in the last financial year and pending, as on the end of the financial year.**
   The Company does not employ any child labor. No case of sexual harassment at work place was reported during the year 2019-20 and we have an Internal Complaints Committee at all our locations under SHWW Act, 2013.

8. **What percentage of your under mentioned employees were given safety & skill up-gradation training in the last year?**
   We continue to devote resources and efforts to continuously upgrade the skills of employees and they are given regular safety training. All Employees including casuals working in manufacturing facilities are given regular safety training, conflict management and Learning Development programs.

Principle 4 Stakeholder Management

1. Has the Company mapped its internal and external stakeholders? Yes/No.
   Yes, we recognise stakeholders relevant to the Company's operations.

2. Out of the above, has the Company identified the disadvantaged, vulnerable & marginalised stakeholders?
   Yes.

3. Are there any special initiatives taken by the Company to engage with the disadvantaged, vulnerable and marginalized stakeholders. If so, provide details thereof, in about 50 words or so.
   Various initiatives have been taken by the Company to engage with marginalised stakeholders at locations in and around its operations in the areas of: Community Health Care, Sanitation and Hygiene, Education and Knowledge Enhancement. For details of projects undertaken during the FY 2019-20, please refer the 'Annual Report on CSR Activities' titled 'Empowering communities, improving lives'

Principle 5 Human Rights

1. Does the policy of the Company on human rights cover only the Company or extend to the Group/Joint Ventures/ Suppliers/Contractors/NGOs/Others?
   The Company's policy is extended only to the Group.

2. How many stakeholder complaints have been received in the past financial year and what percent was satisfactorily resolved by the management?
   No complaints were received during the year in this regard.

Principle 6 Environment

1. Does the policy related to Principle 6 cover only the Company or extends to the Group/Joint Ventures/Suppliers/ Contractors/NGOs/others.
   NATCO's EHS policy is applicable to all subsidiaries and manufacturing locations within the group. For suppliers and contractors, we include EHS requirements as part of the contract and service agreement. We also ensure that contractor staff deployed on our premises are part of safety training and safety pep talks. While sourcing critical raw materials, we select suppliers keeping in perspective their environmental compliance.

2. Does the Company have strategies/ initiatives to address global environmental issues such as climate change, global warming, etc.? Y/N. If yes, please give hyperlink for webpage etc.
   The company is proactive in addressing greenhouse gas emissions. We have installed solar energy facility in 3 of our manufacturing facilities with a total capacity of 5.2 MW and have also invested in a 4.2 MW wind energy facility in Tamil Nadu & Andhra Pradesh

3. Does the Company identify and assess potential environmental risks? Y/N
   We continually identify and assess potential environmental risks in our manufacturing process. We ensure that the risks are addressed through environment management programs and continual improvement initiatives. In two of our API facilities, we have instituted the Environment Management Systems which periodically have a mechanism to identify and address environmental risks

4. Does the Company have any project related to Clean Development Mechanism? If so, provide details thereof, in about 50 words or so. Also, if Yes, whether any environmental compliance report is filed?
   Yes. We have invested in renewable energy capacities in the past few years. Currently two of the API facilities and three of the Formulation facilities have renewable energy plants (solar/ wind). A solar roof top facility was commissioned at a formulations facility in the current year. However, we have not applied these project as per CDM.

5. **Has the Company undertaken any other initiatives on – clean technology, energy efficiency, renewable energy, etc. Y/N. If yes, please give hyperlink for web page etc.**
   The following are efforts taken towards renewable energy:

   1. 3.25MW solar power plant at our API Mekaguda facility
   2. 1.15 MW solar power plant at our Formulation Nagarjuna Sagar facility
   3. 0.80MW roof top solar power facility at our formulation's facility at Kothur
   4. 2.1MWwind power plant at Tamil Nadu
   5. 2.1 MW wind power plant at Anantapur, Andhra Pradesh

   In addition, we have initiatives driving the message on energy conservation through all our facilities:

   1. At Dehrudun facility, installed new water cooled chiller, air compressor and APFC panel towards energy saving initiatives.
   2. At Sagar facility the 11 KV line was upgraded to 33 KV, resulting in the reduction of line losses
   3. LED based lighting instead of CFL based lighting.

6. **Are the Emissions/Waste generated by the Company within the permissible limits given by CPCB/SPCB for the financial year being reported?**
   Yes, All the emissions or waste generated by the company are within the permissible limits given by CPCB/SPCB and we have made all the mandatory submissions in this regard.

7. **Number of show cause/legal notices received from CPCB/SPCB which are pending (i.e. not resolved to satisfaction) as on end of Financial Year.**
   During the FY 2019-20, the Company has not received any show cause/ legal notices from CPCB / SPCB.

Principle 7 Policy Advocacy

1. **Is your Company a member of any trade and chamber or association? If Yes, Name only those major ones that your business deals with:**
   Yes. The Company is a member of various trade/industry associations like Federation of Indian Chambers of Commerce & Industry (FICCI), Federation of Telangana Chambers of Commerce and Industry (FTCCI), Bulk Drug Manufacturers Association (India) (BDMA), Indian Pharmaceutical Alliance (IPA), Indian Drug Manufacturing Association (IDMA), Confederation of Indian Industry (CII), Pharmaceuticals Export Promotion Council of India (PHARMEXCIL), Hyderabad Management Association (HMA), etc.

2. **Have you advocated/lobbied through above associations for the advancement or improvement of public good?**
   Yes, we have advocated for reforms through these associations for the advancement of public good.

Principle 8 Equitable Development

1. **Does the Company have specified programmes/ initiatives/projects in pursuit of the policy related to Principle 8? If yes details thereof.**
   Yes, the Company has identified specified programmes / projects in the pursuit of the policy related to Principle 8. For details of projects undertaken during the FY 2019-20, please refer the 'Annual Report on CSR Activities' under "Strengthening our community connect".

2. Are the programmes/projects undertaken through in-house team/own foundation/external NGO/ government structures/any other organisation?
   NATCO Pharma Ltd., is implementing the CSR programmes through NATCO Trust, a non-profit entity registered under Trust Act. NATCO Trust is based in Hyderabad and employs coordinators, executives, doctors, nurses, pharmacists & volunteers to implement & supervise day to day activities. The team at corporate office is involved in design & development of programmes, monitoring progress & supporting the field teams for progressive implementation of the activities

3. Have you done any impact assessment of your initiative?
   Yes, the Company undertakes timely impact assessments of projects under implementation for ensuring their desired impact and continued sustenance. The impact assessment is also presented to the CSR committee.

4. What is your Company's direct contribution to community development projects- Amount in INR and the details of the projects undertaken?
   During the year under review the Company had contributed ₹ 157 million to various community development programmes / projects as part of its CSR initiatives. The details of projects undertaken are mentioned in the Annexure IV of the Board's Report.

5. Have you taken steps to ensure that this community development initiative is successfully adopted by the community? Please explain in 50 words or so,
   All the community development initiatives are planned based on need assessment studies done with target communities to make sure projects are successfully adopted by the community. We involve stakeholders right from identifying a project until implementation and monitoring.

Principle 9 Customer Value

1. What percentage of customer complaints / consumer cases are pending as on the end of financial year?
   No significant complaints are pending as on the end of the financial year.

2. Does the Company display product information on the product label, over and above what is mandated as per local laws? Yes/No/N.A./Remarks (additional information).
   The Company displays all the product information on the product label, which is mandatory. Besides, the Company also displays general information for patients in order to guide them with respect to usage of the certain products.

3. Is there any case filed by any stakeholder against the Company regarding unfair trade practices, irresponsible advertising and/or anti-competitive behaviour during the last five years and pending as on end of financial year. If so, provide details thereof, in about 50 words or so.
   No.

4. Did your Company carry out any consumer survey/ consumer satisfaction trends?
   The marketing and sales team of the Company regularly interacts with doctors and other Healthcare professionals, usually on a quarterly basis and takes their feedback on the Company's products.

Sustainability Performance

Disclosures as per GRI	UNIT	2019-20
ECONOMIC PERFORMANCE[1]		
Revenue	Rs. Million	20224
Operating cost	Rs. Million	10396
Employee compensation	Rs. Million	3750
Payments to provider of capital	Rs. Million	215
Payments to Govt. (Tax)	Rs. Million	1106
Community investments	Rs. Million	176
Economic Value retained (PAT)*	Rs. Million	4581
Financial assistance received from Govt.	Rs. Million	279
Payments to provider of capital (Dividend)	Rs. Million	1274
Payments to Govt. (Dividend Tax)	Rs. Million	262
ENVIRONMENT PERFORMANCE[2]		
Materials		
Raw materials used in API[3]	Tonnes	1078
Raw materials used in formulations[4]	Tonnes	215
Energy		
Total fuel consumption from non-renewable sources	GJ	341925
Total fuel consumption from renewable sources	GJ	70669
Percentage of Renewable Energy Contribution	%	28.60%
GHG emissions[5]		
Direct (Scope 1) emissions	t CO2 eq.	12931
Water		
Total water withdrawal	KL	163292
Total volume of planned discharges	KL	75623
Waste		
Hazardous waste		
Recovery[6]	Tonnes	189
Landfill	Tonnes	958
Incineration	Tonnes	47
Recycle	Tonnes	546
Non-hazardous waste		
Composting[7]	Tonnes	85
EMPLOYEE DATA[8]		
Total workforce-gender wise		
Male	%	89.08
Female	%	10.92
Total workforce - age wise		
<30	%	24.31
30-50	%	67.81
>50	%	7.88
Total workforce - employee type		
Managerial	%	27.54
Supervisory	%	35.54
Workmen	%	19.62
Contract workers	%	17.3
New employee hire - gender wise		
Male	%	9.07
Female	%	0.97
New employee hire - age wise		

Disclosures as per GRI	UNIT	2019-20
< 30	%	6.23
30-50	%	3.70
>50		0.12
Employee turnover rate %	%	9.05
Average hours of training		
Workmen	Hours	24
Supervisory	Hours	30
Middle management (Executive to Deputy Manager)	Hours	30
Managers and above	Hours	42
Individuals within the organization's governance bodies		
Gender		
Male		9
Female		1
Individuals within the organization's governance bodies		
< 30		0
30-50		2
>50		8
SAFETY PERFORMANCE		
For all employees & contractors[9]		
Number of fatalities		0
Rate of fatalities		0
Rate of recordable work-related injuries		0
Reportable Incidents – Employees & Contractors (Fatalities/LTI[10]/Dangerous occurrences)		1
RWC[11]/LWC[12]		1
MTC[13]		11
First Aid Cases		193
All data as of 31st March for the respective financial year		

1 Economic performance data covers all geographies and contains consolidated figures
2 Environment data - comprises 7 Manufacturing Facilities; 2 Active Pharmaceutical Ingredient Facilities and 5 Finished Dosage Formulation Facilities
3 All raw materials consumed for API manufacturing are being considered
4 All the APIs and excipients consumed for formulations are being considered
5 Emission factors provided in the IPCC Guideline for National Greenhouse Gas Inventories of 2006 were used to calculate GHG emissions from stationary combustion sources. Emission factors for purchased electricity are calculated as per Central Electricity Authority's CO_2 Baseline Database for the Indian Power Sector, User Guide Version 13 June 2018
6 The recovered gypsum is upcycled and sent to cement industry for consumption. Spent Catalyst, Spent Aluminum Chloride, Spent Formic Acid sent back to manufacturers for recovery.
7 The non-process organic waste is converted into compostable material and used onsite for gardening. The organic waste converter was installed and is in operation since 2018-19
8 Employee data covers India operations
9 The safety performance data is reported combined for the employees and contractors
10 LTI - Lost Time Injury
11 RWC - Restricted Workday Case - Post incident, the injured person(s) unable to perform the full range of normally assigned duties and reassigned to other duties.
12 LWC - Lost Workday Case-Post incident, the injuries are sufficiently severe to require the injured person to miss at least one full day of work, not including the day of injury occurred. The injured person returns to normal work within 48hrs from date of incident.
13 MTC - Medical Treatment Case - Post incident the person(s) injury is sufficiently severe requiring medical care beyond first aid. Requiring treatment and/ or prescription medication by medical professional but does not prevent the injured person from performing his or her normal function.

* Before OCI(Other Comprehensive income) and NCI (Non Controlling Interest)

Independent Auditors' Report

To the Members of
NATCO Pharma Limited

Report on the Audit of the Standalone Financial Statements

Opinion

We have audited the standalone financial statements of NATCO Pharma Limited ("the Company"), which comprise the standalone balance sheet as at 31 March 2020, and the standalone statement of profit and loss (including other comprehensive income), standalone statement of changes in equity and standalone statement of cash flows for the year then ended, and notes to the standalone financial statements, including a summary of the significant accounting policies and other explanatory information.

In our opinion and to the best of our information and according to the explanations given to us, the aforesaid standalone financial statements give the information required by the Companies Act, 2013 ("Act") in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India, of the state of affairs of the Company as at 31 March 2020, and profit and other comprehensive income, changes in equity and its cash flows for the year ended on that date.

Basis for Opinion

We conducted our audit in accordance with the Standards on Auditing (SAs) specified under Section 143(10) of the Act. Our responsibilities under those SAs are further described in the Auditor's Responsibilities for the Audit of the Standalone Financial Statements section of our report. We are independent of the Company in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India together with the ethical requirements that are relevant to our audit of the standalone financial statements under the provisions of the Act and the Rules thereunder, and we have fulfilled our other ethical responsibilities in accordance with these requirements and the Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion on the Standalone financial statements.

Key Audit Matters

Key audit matters are those matters that, in our professional judgement, were of most significance in our audit of the standalone financial statements of the current period. These matters were addressed in the context of our audit of the standalone financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters.

The key audit matter	How the matter was addressed in our audit
Revenue recognition: Refer to Note 3(d) of the summary of significant accounting policies to the standalone financial statements. Revenue is recognised when the control of the products being sold has transferred to the customer. The Company has a large number of customers operating in various geographies and sale contracts with customers have a variety of different terms relating to the recognition of revenue. Control is usually transferred upon shipment/ delivery to/ upon receipt of goods by the customer, in accordance with the delivery and acceptance terms agreed with the customers. We identified the recognition of revenue from sale of products as a key audit matter because the Company and its external stakeholders focus on revenue as a key performance indicator. There could be a risk that revenue is recognised in the incorrect period or before the control has been transferred to the customer.	In view of the significance of the matter we applied the following audit procedures in this area, among others to obtain sufficient and appropriate audit evidence: 1. Evaluated the appropriateness of the revenue recognition accounting policies by comparing with applicable accounting standards. 2. Tested design, implementation and operating effectiveness of the Company's controls over measurement and recognition of revenue in accordance with customer contracts which includes control over transaction pricing, including discounts and correct timing of revenue recognition. 3. Performed substantive testing (including year-end cut-off testing) by selecting samples of revenue transactions recorded during the year (and before and after the financial year end), including one off sales to customers, by verifying the underlying documents, which included sales invoices/ contracts and shipping documents. 4. Performed testing by selecting samples relating to revenue transactions, recorded during the year with relevant underlying documents and we read, analysed and identified the distinct performance obligations in these contracts. 5. We scrutinised manual journals posted to revenue to identify unusual items.

The key audit matter	How the matter was addressed in our audit
Assessment of recoverability of the carrying value of investment in a subsidiary: Refer note 7 to the standalone financial statements for carrying value of investments in the subsidiaries as at 31 March 2020. The Company through its subsidiary Timecap Overseas Limited ("Timecap") has made investments in NATCO farma Do Brasil Ltda. ('NATCO Brazil'), which is engaged in marketing of pharmaceutical products in Brazil. The Company holds 90.89% stake in NATCO Brazil as at 31 March 2020. The Company through Timecap has invested ₹ 647 million in NATCO Brazil. NATCO Brazil has reported loss of ₹ 275 million for the year ended 31 March 2020 and as at that date its accumulated losses aggregating ₹ 1,172 million have significantly eroded its equity. We identified assessing potential impairment of investment in the subsidiary as a key audit matter because of the significance of carrying value of investment in NATCO Brazil through Timecap to the financial statements and because of the degree of judgement exercised by Company in determining whether there was objective evidence of impairment of investment.	In view of the significance of the matter, we applied the following audit procedures in this area, among others to obtain sufficient and appropriate audit evidence: 1. Tested operating effectiveness of controls over Company's review of the impairment analysis. Evaluated the accuracy of prior period cash flow forecasts of the Company by reference to actual performance. 2. Using our knowledge of the Company and industry, challenged significant assumptions and judgements incorporated in valuation report of the subsidiary by an independent valuer, specifically in relation to forecast revenue, margins, terminal growth and discount rates with the assistance of our valuations specialists. Valuation specialists also compared significant assumptions to externally derived data in relation to key inputs such as projected economic growth, cost inflation and discount rates. 3. Performed sensitivity analysis of the key assumptions, such as revenue growth rates, gross margins and the discount rate applied by the Company in determining value in use and considered the resulting impact on the impairment testing and whether there were any indicators of management bias in the selection of these key assumptions. 4. Evaluated the adequacy of disclosures, including disclosures of key assumptions, judgements and sensitivities.

The key audit matter	How the matter was addressed in our audit
Deferred tax asset: The Company operates in a complex tax jurisdiction in India with various tax exemptions available. The Company has paid minimum alternate tax (MAT) under Section 115JB of the Income-tax Act, 1961. The MAT paid would be available as offset over a period of 15 years. The MAT credit is recognised as a deferred tax asset that will be available for offset when the Company pays regular taxes under the provisions of Income-tax Act, 1961. Refer note 29(E) to the standalone financial statements for unrecognised deferred tax asset amounting to ₹ 1,237 million as at 31 March 2020. In assessing whether the deferred tax assets will be realised, Company considers whether some portion or all of the deferred tax assets will not be realised. The ultimate realisation of the deferred tax assets is dependent upon the generation of future taxable income during the periods in which the temporary differences become deductible. The extent of recognition of deferred tax asset on account of MAT credit requires significant judgment regarding the Company's future taxable income which will result in utilisation of the MAT credit within the time limits available under the applicable Income tax laws.	In view of the significance of the matter, we applied the following audit procedures in this area, among others to obtain sufficient appropriate audit evidence: 1. Tested the operating effectiveness of controls over Company's review of deferred tax asset recognition. 2. We analysed origination of MAT credit entitlement and reviewed Company's assessment and conclusion in relation to its utilisation within the period allowed for carry forward and set off against foreseeable forecast taxable income streams. 3. We evaluated appropriateness of taxation disclosures in note 29 to the standalone financial statements, including the enhanced disclosures made in respect of the utilisation period of deferred tax assets in relation to MAT credit entitlement.

Other Information

The Company's management and the Board of Directors are responsible for the other information. The other information comprises the information included in the Company's annual report, but does not include the standalone financial statements and our auditors' report thereon. The Annual report is expected to be made available to us after the date of this auditor's report.

Our opinion on the standalone financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the standalone financial statements, our responsibility is to read the other information identified above when it becomes available and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated.

When we read the Annual report, if we conclude that there is a material misstatement therein, we are required to communicate the matter to those charged with governance and take actions as per applicable laws and regulations.

Management's and the Board of Directors' Responsibility for the Standalone Financial Statements

The Company's Management and the Board of Directors are responsible for the matters stated in Section 134(5) of the Act with respect to the preparation of these standalone financial statements that give a true and fair view of the state of affairs, profit/loss and other comprehensive income, changes in equity and cash flows of the Company in accordance with the accounting principles generally accepted in India, including the Indian Accounting Standards (Ind AS) specified under Section 133 of the Act. This responsibility also includes maintenance of adequate accounting records in accordance with the provisions of the Act for safeguarding of the assets of the Company and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies; making judgments and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls that were operating effectively for ensuring accuracy and completeness of the accounting records, relevant to the preparation and presentation of the standalone financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

In preparing the standalone financial statements, the Management and the Board of Directors are responsible for assessing the Company's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the Board of Directors either intends to liquidate the Company or to cease operations, or has no realistic alternative but to do so.

The Board of Directors is also responsible for overseeing the Company's financial reporting process.

Auditor's Responsibilities for the Audit of the Standalone Financial Statements

Our objectives are to obtain reasonable assurance about whether the standalone financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these standalone financial statements.

As part of an audit in accordance with SAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the standalone financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances. Under Section 143(3)(i) of the Act, we are also responsible for expressing our opinion on whether the Company has adequate internal financial controls with reference to financial statements in place and the operating effectiveness of such controls.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures in the standalone financial statements made by the Management and the Board of Directors.
- Conclude on the appropriateness of the Management and the Board of Directors use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Company's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the standalone financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's

report. However, future events or conditions may cause the Company to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the standalone financial statements, including the disclosures, and whether the standalone financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the standalone financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditors' report unless law or regulation precludes public disclosure about the matter or when, in extremely rare circumstances, we determine that a matter should not be communicated in our report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.

Other Matter

The comparative financial information of the Company for the year ended 31 March 2019 included in these standalone financial statements are based on the previously issued statutory financial statements audited by the predecessor auditor whose report for the year ended 31 March 2019 dated 27 May 2019 expressed an unmodified opinion on those financial statements.

Our opinion is not modified in respect of this matter.

Report on Other Legal and Regulatory Requirements

1. As required by the Companies (Auditors' Report) Order, 2016 ("the Order") issued by the Central Government in terms of Section 143(11) of the Act, we give in the "Annexure A" a statement on the matters specified in paragraphs 3 and 4 of the Order, to the extent applicable.

2. As required by Section 143(3) of the Act, we report that:

   a) We have sought and obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit.

   b) In our opinion, proper books of account as required by law have been kept by the Company so far as it appears from our examination of those books.

   c) The standalone balance sheet, the standalone statement of profit and loss (including other comprehensive income), the standalone statement of changes in equity and the standalone statement of cash flows dealt with by this Report are in agreement with the books of account.

   d) In our opinion, the aforesaid standalone financial statements comply with the Ind AS specified under Section 133 of the Act.

   e) On the basis of the written representations received from the directors as on 31 March 2020 taken on record by the Board of Directors, none of the directors is disqualified as on 31 March 2020 from being appointed as a director in terms of Section 164(2) of the Act.

   f) With respect to the adequacy of the internal financial controls with reference to financial statements of the Company and the operating effectiveness of such controls, refer to our separate Report in "Annexure B".

3. With respect to the other matters to be included in the Auditors' Report in accordance with Rule 11 of the Companies (Audit and Auditors) Rules, 2014, in our opinion and to the best of our information and according to the explanations given to us:

   i. The Company has disclosed the impact of pending litigations as at 31 March 2020 on its financial position in its standalone financial statements - Refer Note 37(b) to the standalone financial statements;

   ii. The Company did not have any long-term contracts including derivative contracts for which there were any material foreseeable losses.

iii. There has been no delay in transferring amounts, required to be transferred, to the Investor Education and Protection Fund by the Company.

iv. The disclosures in the standalone financial statements regarding holdings as well as dealings in specified bank notes during the period from 8 November 2016 to 30 December 2016 have not been made in these financial statements since they do not pertain to the financial year ended 31 March 2020.

4. With respect to the matter to be included in the Auditors' Report under Section 197(16):

In our opinion and according to the information and explanations given to us, the remuneration paid by the Company to its directors during the current year is in accordance with the provisions of Section 197 of the Act. The remuneration paid to any director is not in excess of the limit laid down under Section 197 of the Act. The Ministry of Corporate Affairs has not prescribed other details under Section 197(16) which are required to be commented upon by us.

for **B S R & Associates LLP**
Chartered Accountants
ICAI Firm Registration No.: 116231W/ W-100024

Vikash Somani
Partner
Membership No.: 061272
UDIN: 20061272AAAABC2605

Place: Hyderabad
Date: 17 June 2020

Annexure A to the Independent Auditors' Report on the standalone financial statements of NATCO Pharma Limited for the year ended 31 March 2020

With reference to the Annexure A referred to in Paragraph 1 in Report on Other Legal and Regulatory Requirements of the Independent Auditors' Report of even date to the Members of NATCO Pharma Limited ("the Company") on the standalone financial statements for the year ended 31 March 2020, we report that:

i. a) The Company has maintained proper records showing full particulars, including quantitative details and situation of its fixed assets.

b) The Company has a regular programme of physical verification of its fixed assets by which all fixed assets are verified in a phased manner over a period of three years. In our opinion, the periodicity of physical verification is reasonable having regard to the size of the Company and the nature of its assets. Pursuant to the programme, certain fixed assets were physically verified during the year and no material discrepancies were noticed on such verification.

c) According to the information and explanations given by the Management, the title deeds of immovable properties included in fixed assets are held in the name of the Company except as for the following:

Nature of property	Total number of cases	Whether leasehold or freehold	Gross block	Net block	Remarks
Land	One	Freehold	66	66	According to the information and explanation given to us, this land parcel shall be registered in the name of the Company subsequent to fulfilment of certain conditions laid out by the Andhra Pradesh Industrial Infrastructure Corporation Limited. Also, refer Note 5 to the standalone financial statements.

In respect of immovable properties been taken on lease and disclosed as a part of Right-of-use of assets under property, plant and equipment in the standalone financial statements, the lease agreements are in the name of the Company.

ii. The inventory, except goods-in-transit and stocks lying with third parties, have been physically verified by the Management during the year. In our opinion, the frequency of such verification is reasonable. The discrepancies noticed on verification between the physical stock and the book records were not material and have been appropriately dealt with in the books of account. For stocks lying with third parties at the year-end, written confirmations have been obtained by the Management.

iii. According to the information and explanations given to us, the Company has granted unsecured loans to parties (foreign subsidiaries) covered in the Register maintained under Section 189 of the Companies Act, 2013 ("the Act"). The Company has not granted any other loans, secured or unsecured to companies, firms or limited liability partnerships covered in the Register maintained under Section 189 of the Act.

a) In our opinion and according to the information and explanations given to us, the terms and conditions on which the loans had been granted to the parties listed in the Register maintained under Section 189 of the Act were not, prima facie, prejudicial to the interest of the Company.

b) In the case of the loans granted to the parties listed in the Register maintained under Section 189 of the Act, the borrowers have been regular in the repayment of the principal and payment of interest, wherever stipulated.

c) There are no overdue amounts in respect of loans granted to parties listed in the Register maintained under Section 189 of the Act.

iv. In our opinion and according to the information and explanations given to us, the Company has complied with the provisions of Sections 185 and 186 of the Act, with respect to the loans given and investments made. Further, the Company has not given any guarantees or provided any security to the parties covered under Section 185 and 186 of the Act.

v. The Company has not accepted any deposits from the public within the meaning of the directives issued by the Reserve Bank of India, provisions of Section 73 to 76 of the Act, any other relevant provisions of the Act and the relevant rules framed thereunder. Accordingly, the provisions of clause 3(v) of the said Order is not applicable to the Company.

vi. We have broadly reviewed the books of account maintained by the Company pursuant to the rules prescribed by the Central Government for maintenance of cost records under Section 148 of the Act and are of the opinion that, prima facie, the prescribed accounts and records have been made and maintained. However, we have not made a detailed examination of the records with a view to determine whether they are accurate or complete.

vii. (a) According to the information and explanations given to us and on the basis of our examination of the records of the Company, amounts deducted/ accrued in the books of account in respect of undisputed statutory dues including Provident Fund, Employees' State Insurance, Income-tax, Duty of Customs, Goods and Service Tax and other material statutory dues have generally been regularly deposited during the year by the Company with the appropriate authorities. As explained to us, the Company did not have any dues on account of Sales tax, Service tax, Duty of excise, value added tax and Cess.

According to the information and explanations given to us, no undisputed amounts payable in respect of Provident Fund, Employees' State Insurance, Income-tax, Duty of Customs, Goods and Service Tax and other material statutory dues were in arrears, as at 31 March 2020, for a period of more than six months from the date they became payable.

(b) According to the information and explanations given to us, there are no dues in respect of Income-tax or Sales tax or Service tax or Duty of Customs or Duty of Excise or Value Ddded Tax which have not been deposited by the Company on account of disputes, except for the following:

Statute/ Nature of dues	Amount in Rupees millions	Period to which the amount relates	Forum where dispute is pending
Central Sales Tax Act, 1956 – Central Sales Tax	9 (3)*	Financial year 1997-98	The High Court of Telangana
The Customs Act, 1962 – Customs duty	2	July 2006 to June 2010	The Customs Excise and Service Tax Appellate Tribunal

*Represent amounts paid under protest.

viii. In our opinion and according to the information and explanations given to us, the Company has not defaulted in repayment of loans or borrowings to banks. The Company did not have any outstanding loans or borrowings from financial institutions or government and there are no dues to debenture holders during the year.

ix. In our opinion and according to the information and explanations given to us, the Company did not raise any money by way of initial public offer or further public offer (including debt instrument) and terms loans during the year. Accordingly, the provisions of clause 3(ix) of the said Order is not applicable to the Company.

x. During the course of our examination of the books and records of the Company, carried out in accordance with the generally accepted auditing practices in India, and according to the information and explanations given to us, we have neither come across any instance of material fraud by the Company or on the Company by its officers or employees, noticed or reported during the year, nor have we been informed of any such case by the Management.

xi. According to the information and explanations given to us and based on our examination of the records of the Company, the Company has paid/ provided for managerial remuneration in accordance with the requisite approvals mandated by the provisions of Section 197 read with Schedule V to the Act.

xii. According to the information and explanations given to us and based on our examination of the records of the Company, the Company is not a Nidhi Company prescribed under Section 406 of the Act. Accordingly, the provisions of clause 3(xii) of the said Order is not applicable to the Company.

xiii. According to the information and explanations given to us and based on our examination of the records of the Company, all transactions with the related parties are in compliance with Sections 177 and 188 of the Act, where applicable, and details of such transactions, have been disclosed in the standalone

financial statements as required by the applicable accounting standards.

xiv. According to the information and explanations given to us and based on our examination of the records of the Company, the Company has not made any preferential allotment or private placement of shares or fully or partly convertible debentures during the year. Accordingly, the provisions of clause 3(xiv) of the said Order is not applicable to the Company.

xv. According to the information and explanations given to us and based on our examination of the records of the Company, the Company has not entered into any non-cash transactions with directors or persons connected with them as referred to in Section 192 of the Act. Accordingly, the provisions of clause 3(xv) of the said Order is not applicable to the Company.

xvi. According to the information and explanations given to us and based on our examination of the records of the Company, the Company is not required to be registered under Section 45-IA of the Reserve Bank of India Act, 1934. Accordingly, the provisions of clause 3(xvi) of the said Order is not applicable to the Company.

for **B S R & Associates LLP**
Chartered Accountants
ICAI Firm Registration No.: 116231W/ W-100024

Vikash Somani
Partner
Membership No.: 061272
UDIN: 20061272AAAABC2605

Place: Hyderabad
Date: 17 June 2020

Annexure B to the Independent Auditors' Report on the standalone financial statements of NATCO Pharma Limited for the period ended 31 March 2020

Report on the internal financial controls with reference to the aforesaid standalone financial statements under Clause (i) of Sub-section 3 of Section 143 of the Companies Act, 2013

(Referred to in paragraph 2(f) under 'Report on Other Legal and Regulatory Requirements' section of our report of even date)

Opinion

We have audited the internal financial controls with reference to financial statements of NATCO Pharma Limited ("the Company") as of 31 March 2020 in conjunction with our audit of the standalone financial statements of the Company for the year ended on that date.

In our opinion, the Company has, in all material respects, adequate internal financial controls with reference to financial statements and such internal financial controls were operating effectively as at 31 March 2020, based on the internal financial controls with reference to financial statements criteria established by the Company considering the essential components of internal control stated in the Guidance Note on Audit of Internal Financial Controls Over Financial Reporting issued by the Institute of Chartered Accountants of India (the "Guidance Note").

Management's Responsibility for Internal Financial Controls

The Company's management and the Board of Directors are responsible for establishing and maintaining internal financial controls based on the internal financial controls with reference to financial statements criteria established by the Company considering the essential components of internal control stated in the Guidance Note. These responsibilities include the design, implementation and maintenance of adequate internal financial controls that were operating effectively for ensuring the orderly and efficient conduct of its business, including adherence to company's policies, the safeguarding of its assets, the prevention and detection of frauds and errors, the accuracy and completeness of the accounting records, and the timely preparation of reliable financial information, as required under the Companies Act, 2013 (hereinafter referred to as "the Act").

Auditors' Responsibility

Our responsibility is to express an opinion on the Company's internal financial controls with reference to financial statements based on our audit. We conducted our audit in accordance with the Guidance Note and the Standards on Auditing, prescribed under section 143(10) of the Act, to the extent applicable to an audit of internal financial controls with reference to financial statements. Those Standards and the Guidance Note require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether adequate internal financial controls with reference to financial statements were established and maintained and whether such controls operated effectively in all material respects.

Our audit involves performing procedures to obtain audit evidence about the adequacy of the internal financial controls with reference to financial statements and their operating effectiveness. Our audit of internal financial controls with reference to financial statements included obtaining an understanding of such internal financial controls, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the standalone financial statements, whether due to fraud or error.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion on the Company's internal financial controls with reference to financial statements.

Meaning of Internal Financial controls with Reference to Financial Statements

A company's internal financial controls with reference to financial statements is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal financial controls with reference to financial statements include those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorisations of management and directors of the company; and (3)

provide reasonable assurance regarding prevention or timely detection of unauthorised acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Inherent Limitations of Internal Financial controls with Reference to Financial Statements

Because of the inherent limitations of internal financial controls with reference to financial statements, including the possibility of collusion or improper management override of controls, material misstatements due to error or fraud may occur and not be detected. Also, projections of any evaluation of the internal financial controls with reference to financial statements to future periods are subject to the risk that the internal financial controls with reference to financial statements may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

for **B S R & Associates LLP**
Chartered Accountants
ICAI Firm Registration No.: 116231W/ W-100024

Vikash Somani
Partner
Membership No.: 061272
UDIN: 20061272AAAABC2605

Place: Hyderabad
Date: 17 June 2020

Standalone Balance Sheet

as at 31st March, 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	Notes	As at 31 March 2020	As at 31 March 2019
I. Assets			
(1) Non-current assets			
(a) Property, plant and equipment	5	15,657	12,067
(b) Capital work-in-progress	39	5,178	6,375
(c) Intangible assets	6	88	82
(d) Investments in subsidiaries	7	1,025	977
(e) Financial assets			
(i) Investments	8	836	199
(ii) Loans	9	684	595
(iii) Other financial assets	10	41	65
(f) Other non-current assets	11	559	527
Total non-current assets		24,068	20,887
(2) Current assets			
(a) Inventories	12	5,244	5,084
(b) Financial assets			
(i) Investments	8	50	1,268
(ii) Trade receivables	13	5,367	4,916
(iii) Cash and cash equivalents	14	79	115
(iv) Bank balances other than (iii) above	14	462	2,512
(v) Loans	9	81	70
(vi) Other financial assets	10	8,612	6,959
(c) Other current assets	11	2,504	1,750
Total current assets		22,399	22,674
Total assets		46,467	43,561
II. Equity and Liabilities			
(1) Equity			
(a) Equity share capital	15	364	365
(b) Other equity	16	38,331	35,267
Total of equity		38,695	35,632
(2) Liabilities			
(A) Non-current liabilities			
(a) Financial liabilities			
(i) Borrowings	17	9	-
(ii) Other financial liabilities	18	8	8
(b) Provisions	19	902	710
(c) Deferred tax liabilities, (net)	29	256	113
Total non-current liabilities		1,175	831
(B) Current liabilities			
(a) Financial liabilities			
(i) Borrowings	17	3,131	3,845
(ii) Trade payables	21		
- Dues of micro and small enterprises		21	79
- Dues of creditors other than micro and small enterprises		2,321	1,939
(iii) Other financial liabilities	18	812	771
(b) Other current liabilities	20	122	314
(c) Provisions	19	105	90
(d) Current tax liabilities, (net)		85	60
Total current liabilities		6,597	7,098
Total liabilities		7,772	7,929
Total equity and liabilities		46,467	43,561
Significant accounting policies	3 and 4		

The accompanying notes form an integral part of the standalone financial statements.
As per our report of even date attached

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No. 116231W/ W-100024

Vikash Somani
Partner
Membership Number: 061272

Place: Hyderabad
Date: 17 June 2020

for and on behalf of the Board of Directors
NATCO Pharma Limited
CIN: L24230TG1981PLC003201

V C Nannapaneni
Chairman and Managing Director
DIN: 00183315

M. Adinarayana
Company Secretary

Rajeev Nannapaneni
Vice Chairman and CEO
DIN: 00183872

S V V N Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 17 June 2020

Standalone Statement of Profit and Loss

for the year ended 31st March, 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	Notes	For the year ended 31 March 2020	For the year ended 31 March 2019
1. Income			
(a) Revenue from operations	22	17,902	19,863
(b) Other income	23	1,238	1,298
Total income		**19,140**	**21,161**
2. Expenses			
(a) Cost of materials consumed	24	3,290	3,331
(b) Purchases of stock-in-trade		1,239	315
(c) Changes in inventories of finished goods, work-in-progress and stock-in -trade	25	(559)	(255)
(d) Employee benefits expense	26	3,561	3,402
(e) Finance costs	27	206	188
(f) Depreciation and amortisation expense	5 and 6	981	801
(g) Other expenses	28	4,591	4,905
Total expenses		**13,309**	**12,687**
3. Profit before tax (1-2)		5,831	8,474
4. Tax expense:	29		
(a) Current tax		1,251	1,863
(b) Income-tax for earlier years		40	-
(c) Deferred tax		(205)	(60)
Total tax expenses		**1,086**	**1,803**
5. Profit for the year (3-4)		4,745	6,671
6. Other comprehensive income			
(a) Items that will not be reclassified subsequently to profit and loss			
(i) Remeasurement of defined benefit plans		(79)	(108)
Tax on remeasurement of defined benefit plans		27	23
(ii) Net gain from investments in equity instruments designated at FVTOCI		(19)	(7)
Tax impact benefit/ (expense) on equity instruments designated at FVTOCI		7	1
Other comprehensive income, net of tax		**(64)**	**(91)**
7. Total comprehensive income for the year (5+6)		4,681	6,580
8. Earnings per equity share (Face value of ₹ 2 each)	30		
Basic (in ₹)		26.08	36.22
Diluted (in ₹)		26.01	36.10
Significant accounting policies	3 and 4		

The accompanying notes form an integral part of the standalone financial statements.
As per our report of even date attached

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No. 116231W/ W-100024

Vikash Somani
Partner
Membership Number: 061272

Place: Hyderabad
Date: 17 June 2020

for and on behalf of the Board of Directors
NATCO Pharma Limited
CIN: L24230TG1981PLC003201

V C Nannapaneni
Chairman and Managing Director
DIN: 00183315

Rajeev Nannapaneni
Vice Chairman and CEO
DIN: 00183872

M. Adinarayana
Company Secretary

S V V N Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 17 June 2020

Standalone Statement of Cash Flows

for the year ended 31st March, 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	For the year ended 31 March 2020	For the year ended 31 March 2019
Cash flows from operating activities		
Profit before tax	5,831	8,474
Adjustments :		
Depreciation and amortisation expense	981	801
Finance costs	206	188
Share based payment expense	144	253
Interest income	(816)	(911)
Allowance for credit losses	175	-
Bad debts written off	55	20
Liabilities written back	(29)	-
Profit on sale of property, plant and equipment, net	(163)	(135)
Unrealised foreign exchange loss, net	(101)	(95)
Operating profit before working capital changes	**6,283**	**8,595**
Working capital adjustments:		
Inventories	(160)	(825)
Trade receivables	(538)	1,212
Loans	(51)	(25)
Other financial assets	72	(73)
Other assets	(732)	85
Trade payables	352	(429)
Provisions	128	254
Other financial liabilities	115	(63)
Other liabilities	(193)	6
Cash generated from operating activities	**5,276**	**8,737**
Income taxes paid, net of refund	(1,051)	(1,749)
Net cash generated from operating activities (A)	**4,225**	**6,988**
Cash flows from investing activities		
Acquisition of property, plant and equipment (Refer note b below)	(3,524)	(4,470)
Proceeds from sale of property, plant and equipment	222	178
Acquisition of intangible assets	(29)	(48)
Investments in subsidiaries	(47)	(45)
Loans given to subsidiary companies	(11)	(398)
Loans given to others	-	(20)
Proceeds from sale of investments	1,203	200
Purchase of investments	(642)	(1,108)
Movement in other bank balances, net	2,086	(892)
Interest received	888	525
Deposits made with financial institutions	(1,796)	(374)
Net cash used in investing activities (B)	**(1,650)**	**(6,452)**
Cash flows from financing activities		
Proceeds from issue of shares	1	0
Payment on buy-back of shares, including transaction costs	(536)	(1,347)
Contribution from shareholders	474	-
Net proceeds from short-term borrowings (refer note c below)	(801)	2,115
Dividends paid (including corporate dividend tax)	(1,536)	(1,108)
Interest paid	(205)	(182)
Payment of lease liability including interest (refer note c below)	(8)	-
Net cash used in financing activities (C)	**(2,611)**	**(522)**

Standalone Statement of Cash Flows (Contd.)

for the year ended 31st March, 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	For the year ended 31 March 2020	For the year ended 31 March 2019
Net increase/(decrease) in cash and cash equivalents (A+B+C)	(36)	14
Cash and cash equivalents as at the beginning of the year	115	101
Cash and cash equivalents as at the end of the year	79	115
Components of cash and cash equivalents		
Cash and cash equivalents:		
Cash on hand	11	19
Balance with Banks:		
- Current accounts	68	96
	79	115

Notes:

a) The above Cash Flow Statement has been prepared under the "Indirect Method" as set out in the Indian Accounting Standard (Ind AS-7) - "Statement of Cash Flows".

b) Acquisition of Property, Plant and Equipment includes movements of capital work-in-progress, capital advances and capital creditors.

c) Debt reconciliation in accordance with Ind AS 7:

Particulars		For the year ended 31 March 2020	For the year ended 31 March 2019
Borrowings from banks:			
Opening balance		3,845	1,730
(Repayment) of / proceeds from borrowings, net		(801)	2,115
Non-cash items (Foreign exchange changes)		79	-
Closing balance		3,123	3,845
Lease liability:			
Opening balance		-	-
Recognised as at 1 April 2019		20	-
Additions and interest accrued during the year		5	-
Payment of lease liability		(8)	-
Closing balance		17	-
Significant accounting policies	3 and 4		

The accompanying notes form an integral part of the standalone financial statements.
As per our report of even date attached

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No. 116231W/ W-100024

Vikash Somani
Partner
Membership Number: 061272

Place: Hyderabad
Date: 17 June 2020

for and on behalf of the Board of Directors
NATCO Pharma Limited
CIN: L24230TG1981PLC003201

V C Nannapaneni
Chairman and Managing Director
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Company Secretary

Rajeev Nannapaneni
Vice Chairman and CEO
DIN: 00183872

S V V N Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 17 June 2020

Standalone Statement of Changes in Equity

for the year ended 31st March, 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	Equity share capital	Other equity								
		Reserves and Surplus						Other comprehensive income	Total of other equity	Total equity
		Securities premium	Capital reserve	Capital redemption reserve	General reserve	Share options outstanding account	Retained earnings	Gain/(loss) on FVTOCI equity securities		
As at 1 April 2018	369	15,209	207	5	595	242	14,590	37	30,885	31,254
Profit for the year	-	-	-	-	-	-	6,671	-	6,671	6,671
Other comprehensive income (net of taxes)	-	-	-	-	-	-	(85)	(6)	(91)	(91)
Buyback of shares	(4)	(1,325)	-	-	-	-	-	-	(1,325)	(1,329)
Share buyback expenses	-	(18)	-	-	-	-	-	-	(18)	(18)
Employee stock option expense	-	-	-	-	-	253	-	-	253	253
Dividend paid	-	-	-	-	-	-	(919)	-	(919)	(919)
Tax on distributed profits	-	-	-	-	-	-	(189)	-	(189)	(189)
Share options exercised	0	186	-	-	-	(186)	-	-	-	-
Transfer from securities premium on account of buyback of equity shares	-	(4)	-	4	-	-	-	-	-	-

Standalone Statement of Changes in Equity (Contd.)

for the year ended 31st March, 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	Equity share capital	Other equity								
		Reserves and Surplus						Other comprehensive income	Total of other equity	Total equity
		Securities premium	Capital reserve	Capital redemption reserve	General reserve	Share options outstanding account	Retained earnings	Gain/(loss) on FVTOCI equity securities		
As at 31 March 2019	365	14,048	207	9	595	309	20,068	31	35,267	35,632
Profit for the year	-	-	-	-	-	-	4,745	-	4,745	4,745
Other comprehensive income (net of taxes)	-	-	-	-	-	-	(52)	(12)	(64)	(64)
Buyback of shares	(2)	(534)	-	-	-	-	-	-	(534)	(536)
Transactions with shareholders (net of tax)	-	-	309	-	-	-	-	-	309	309
Employee stock option expense	-	-	-	-	-	144	-	-	144	144
Dividend paid	-	-	-	-	-	-	(1,274)	-	(1,274)	(1,274)
Tax on distributed profits	-	-	-	-	-	-	(262)	-	(262)	(262)
Share options exercised	1	217	-	-	-	(217)	-	-	-	1
Transfer from securities premium on account of buyback of equity shares	-	(2)	-	2	-	-	-	-	-	-
As at 31 March 2020	364	13,729	516	11	595	236	23,225	19	38,331	38,695

The accompanying notes form an integral part of the standalone financial statements.
As per our report of even date attached

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No. 116231W/ W-100024

Vikash Somani
Partner
Membership Number: 061272

Place: Hyderabad
Date: 17 June 2020

for and on behalf of the Board of Directors
NATCO Pharma Limited
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M. Adinarayana
Company Secretary

S V V N Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 17 June 2020

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

1. Reporting entity information

NATCO Pharma Limited ("the Company") is a public limited company domiciled and incorporated in with its registered office situated at NATCO House, Road No. 2, Banjara Hills, Hyderabad – 500034. The equity shares of the Company are listed on the National Stock Exchange (NSE) and Bombay Stock Exchange in India (BSE).

The Company is engaged in the business of pharmaceuticals which comprises research and development, manufacturing and selling of bulk drugs and finished dosage formulations. The Company has manufacturing facilities in India which caters to both domestic and international markets including regulated markets like United States of America and Europe.

2. Basis of preparation

A. Statement of Compliance

These standalone financial statements of the Company have been prepared in accordance with Indian Accounting Standards (Ind AS) as per the Companies (Indian Accounting Standards) Rules 2015, as amended, notified under Section 133 of Companies Act, 2013, (the 'Act') and other relevant provisions of the Act.

The standalone financial statements for the year ended 31 March 2020 were authorized and approved for issue by the Company's Board of Directors on 17 June 2020.

New and amended standards adopted by the Company

Effective 1 April 2019, the Company has applied Ind AS 116 Leases. On transition to Ind AS 116, Right-of-use of assets at 1 April 2019 for leases previously classified as operating leases were recognised and measured at an amount equal to lease liability (adjusted for related prepayments/ accruals). As a result, the comparative information has not been restated and there is no impact on retained earnings as at 1 April 2019. Overall, the application of this standard did not have any material impact on the financial statements. Refer note 40 for further details.

Details of the Company's accounting policies are included in Note 3.

B. Functional and presentation currency

The standalone financial statements are presented in Indian Rupee ('INR' or '₹') which is also the Company's functional currency. All amounts have been rounded-off to the nearest million, unless otherwise indicated. Transactions and balances with values below the rounding off norm adopted by the Company have been reflected as '0' in relevant notes in the standalone financial statements.

C. Operating cycle

The Company has ascertained its operating cycle as 12 months that is the time between the acquisition of assets for processing and their realisation in cash or cash equivalents.

D. Basis of Measurement

These standalone financial statements have been prepared on the historical cost basis except for the following items:

Items	Measurement basis
Certain financial assets and liabilities	Fair value
Net defined benefit asset/ (liability)	Fair value of plan assets less present value of defined benefit obligations

E. Use of estimates and judgements

The preparation of the financial statements in conformity with Ind AS requires management to make estimates, judgements and assumptions. These estimates, judgements and assumptions affect the application of accounting policies and the reported amounts of assets and liabilities, the disclosures of contingent assets and liabilities at the date of the financial statements and reported amounts of revenues and expenses during the period. Accounting estimates could change from period to period. Actual results could differ from those estimates. Appropriate changes in estimates are made as and when management becomes aware of changes in circumstances surrounding the estimates. Changes in estimates are reflected in the financial statements in the period in which changes are made and, if material, such effects are disclosed in the notes to the financial statements.

F. Measurement of fair values

Certain accounting policies and disclosures of the Company require the measurement of fair values, for both financial and non-financial assets and liabilities.

The Company has an established control framework with respect to the measurement of fair values.

The finance team regularly reviews significant unobservable inputs and valuation adjustments.

Fair values are categorised into different levels in a fair value hierarchy based on the inputs used in the valuation techniques as follows:

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

- Level 1: quoted prices (unadjusted) in active markets for identical assets or liabilities.

- Level 2: inputs other than quoted prices included in Level 1 that are observable for the asset or liability, either directly (i.e. as prices) or indirectly (i.e. derived from prices).

- Level 3: inputs for the asset or liability that are not based on observable market data (unobservable inputs).

When measuring the fair value of an asset or a liability, the Company uses observable market data as far as possible. If the inputs used to measure the fair value of an asset or a liability fall into different levels of the fair value hierarchy, then the fair value measurement is categorised in its entirety in the same level of the fair value hierarchy as the lowest level input that is significant to the entire measurement.

The Company recognises transfers between levels of the fair value hierarchy at the end of reporting period during which the change has occurred.

3. Significant accounting policies

a. Property, plant and equipment (PPE)

Recognition and initial measurement

Items of property, plant and equipment, are measured at cost (which includes capitalised borrowing costs, if any) less accumulated depreciation and accumulated impairment losses, if any. Cost of an item of property, plant and equipment includes its purchase price, duties, taxes, after deducting trade discounts and rebates, any directly attributable cost of bringing the item to its working condition for its intended use and estimated costs of dismantling and removing the item and restoring the site on which it is located.

The cost of a self-constructed item of property, plant and equipment comprises the cost of materials, direct labour and any other costs directly attributable to bringing the item to its intended working condition and estimated costs of dismantling, removing and restoring the site on which it is located, wherever applicable.

If significant parts of an item of property, plant and equipment have different useful lives, then they are accounted for as separate items (major components) of property, plant and equipment. Any gain or loss on disposal of an item of property, plant and equipment is recognised in profit or loss.

Subsequent expenditure

Subsequent expenditure is capitalised only if it is probable that the future economic benefits associated with the expenditure will flow to the Company.

Depreciation

Depreciation is calculated on cost of items of property, plant and equipment less their estimated residual value using straight line method over the useful lives of assets estimated by the Company. Depreciation rates followed by the Company coincides with rates prescribed in Schedule II to the Companies Act, 2013. Depreciation amount is recognised in the Statement of Profit and Loss. Depreciation for assets purchased / sold during the period is proportionately charged.

The estimated useful lives of items of property, plant and equipment are as follows:

Tangible assets	Estimated useful life (in years)	Companies Act life (in years)
Buildings	5 to 60	5 to 60
Plant and machinery	5 to 20	5 to 20
Computers	3 to 6	3 to 6
Vehicles	8 to 10	8 to 10
Office equipment	5	5
Furniture and fixtures	10	10

Freehold land is not depreciated.

The residual values, useful lives and methods of depreciation of property, plant and equipment are reviewed at each financial year-end and adjusted prospectively, if appropriate.

De-recognition

An item of property, plant and equipment and any significant part initially recognised is derecognised upon disposal or when no future economic benefits are expected from its use or disposal. Any gain or loss arising on de-recognition of the asset (calculated as the difference between the net disposal proceeds and the carrying amount of the asset) is included in the Statement of profit and loss, when the asset is derecognised.

Capital work-in-progress

Capital work-in-progress includes cost of property, plant and equipment under installation / under development as at the balance sheet date.

b. Intangible assets

Recognition and initial measurement

Intangible assets (software) are stated at their cost of acquisition. The cost comprises purchase price, borrowing cost if capitalization criteria are met and directly attributable cost of bringing the asset to its working condition for the intended use. Any trade discount and rebates are deducted in arriving at the purchase price.

Subsequent measurement (amortisation)
The cost of capitalised software is amortised over a period of 6 years, on a straight-line basis. Amortisation on the addition/disposals is charged on pro-rata basis from/until the date of such addition/disposal.

c. Foreign currencies
Transactions in foreign currencies are initially recorded by the Company at its functional currency spot rates at the date of the transaction. Monetary assets and liabilities denominated in foreign currency are translated at the functional currency spot rates of exchange at the reporting date. Exchange differences that arise on settlement of monetary items or on reporting at each balance sheet date are recognised as income or expenses in the period in which they arise. Non-monetary items which are carried at historical cost denominated in a foreign currency are reported using the exchange rates at the date of transaction. Non-monetary items measured at fair value in a foreign currency are translated using the exchange rates at the date when the fair value is determined.

d. Revenue recognition
The Company derives revenues primarily from sale of finished dosage formulations, active pharmaceutical ingredients (APIs), including niche and technically complex molecules.

The specific recognition criteria described below must also be met before revenue is recognised:

Sale of goods:
Revenue from sale of goods is recognised when a promise in a customer contract (performance obligation) has been satisfied by transferring control over the promised goods to the customer. Control is usually transferred upon shipment, delivery to, upon receipt of goods by the customer, in accordance with the delivery and acceptance terms agreed with the customers. The amount of revenue to be recognised is based on the consideration expected to be received in exchange for goods, excluding trade discounts, volume discounts, sales returns, chargeback, medicaid payments, rebates, shelf stock adjustments, where applicable and any taxes or duties collected on behalf of the government which are levied on sales such as goods and services tax, etc., where applicable. Revenue is only recognised to the extent that it is highly probable a significant reversal will not occur.

The Company from time to time enters into marketing arrangements with certain business partners for the sale of its products in certain markets. Under such arrangements, the Company sells its products to the business partners at a non-refundable base purchase price agreed upon in the arrangement and is also entitled to a profit share which is over and above the base purchase price. The profit share is typically dependent on the business partner's ultimate net sale proceeds or net profits, subject to any reductions or adjustments that are required by the terms of the arrangement. Such arrangements typically require the business partner to provide confirmation of units sold and net sales or net profit computations for the products covered under the arrangement.

Revenue in an amount equal to the base purchase price is recognised in these transactions upon delivery of products to the business partners. An additional amount representing the profit share component is recognised as revenue only to the extent that it is highly probable that a significant reversal will not occur.

At the end of each reporting period, the Company updates the estimated transaction price (including updating its assessment of whether an estimate of variable consideration is constrained) to represent faithfully the circumstances present at the end of the reporting period and the changes in circumstances during the reporting period.

Sale of services:
Revenue from sale of dossiers/ licenses/services, includes in certain instances, certain performance obligations and based on evaluation of whether or not these obligations are in consequential or perfunctory, revenue is recognised in accordance with the terms of the contracts with the customers when the related performance obligation is completed at point in time or spread over a period of time, as applicable.

The Company does not expect to have any contracts where the period between the transfer of the promised goods or services to the customer and payment by the customer exceeds one year. As a consequence, it does not require to adjust any of the transaction prices for the time value of money.

e. Borrowing costs
Borrowing costs directly attributable to the acquisition or construction of those property, plant and equipment which necessarily takes a substantial period of time to get ready for their intended use are capitalised. All other borrowing costs are expensed in the period in which they are incurred in the Statement of Profit and Loss.

f. Government grants
Government grants are recognised where there is reasonable assurance that the grant will be received and all attached conditions will be complied with.

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

When the grant relates to revenue, it is recognised in the Statement of Profit and Loss on a systematic basis over the periods to which they relate. When the grant relates to an asset, it is presented as a reduction to the carrying value of the related asset.

Export benefits available under prevalent schemes are accrued in the year in which the goods are exported and no significant uncertainty exist regarding its ultimate collection.

g. **Impairment of non-financial assets (Intangible assets and property, plant and equipment)**

At each reporting date, the Company reviews the carrying amounts of its non-financial assets (other than inventories and deferred tax assets) to determine whether there is any indication of impairment. If any such indication exists, then the asset's recoverable amount is estimated. Intangible assets with indefinite useful life are tested annually for impairment. For the purpose of impairment testing, the recoverable amount (i.e. the higher of the fair value less cost to sell and the value-in-use) is determined on an individual asset basis unless the asset does not generate cash flows that are largely independent of those from other assets. In such cases, the recoverable amount is determined for the cash generating unit to which the asset belongs. If such assets are considered to be impaired, the impairment to be recognised in the Statement of Profit and Loss is measured by the amount by which the carrying value of the assets exceeds the estimated recoverable amount of the asset. Value in use is based on the estimated future cash flows, discounted to their present value using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset or cash generating unit. An impairment loss is reversed in the Statement of Profit and Loss if there has been a change in the estimates used to determine the recoverable amount. The carrying amount of the asset is increased to its revised recoverable amount, provided that this amount does not exceed the carrying amount that would have been determined (net of any accumulated amortization or depreciation) had no impairment loss been recognised for the asset in prior years.

h. **Financial instruments**

i. Initial recognition and measurement

Trade receivables and debt securities issued are initially recognised when they are originated. All other assets and financial liabilities are initially recognised when the Company becomes a party to the contractual provisions of the instrument. Transaction costs that are directly attributable to the acquisition or issue of financial assets and financial liabilities, that are not at fair value through profit or loss, are added to the fair value on initial recognition.

ii. Classification and subsequent measurement

Financial assets

The Company classifies financial assets as subsequently measured at amortised cost, fair value through other comprehensive income ("FVOCI") or fair value through profit or loss ("FVTPL") on the basis of following:

- the entity's business model for managing the financial assets and
- the contractual cash flow characteristics of the financial asset.

Amortised Cost:

A financial asset shall be classified and measured at amortised cost if both of the following conditions are met:

- the financial asset is held within a business model whose objective is to hold financial assets in order to collect contractual cash flows; and
- the contractual terms of the financial asset give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding.

Fair Value through OCI:

A financial asset shall be classified and measured at fair value through OCI if both of the following conditions are met:

- the financial asset is held within a business model whose objective is achieved by both collecting contractual cash flows and selling financial assets; and
- the contractual terms of the financial asset give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding.

Fair Value through Profit or Loss:

A financial asset shall be classified and measured at fair value through profit or loss unless it is measured at amortised cost or at fair value through OCI.

All recognised financial assets are subsequently measured in their entirety at either amortised cost or fair value, depending on the classification of the financial assets.

(All amounts in ₹ millions, except share data and where otherwise stated)

Classification of investments:

a. **Debt instruments at amortised cost** – A 'debt instrument' is measured at the amortised cost if both the following conditions are met:

   - The asset is held within a business model whose objective is to hold assets for collecting contractual cash flows, and
   - Contractual terms of the asset give rise on specified dates to cash flows that are solely payments of principal and interest (SPPI) on the principal amount outstanding.

   After initial measurement, such financial assets are subsequently measured at amortised cost using the effective interest rate (EIR) method.

b. **Equity investments** – All equity investments in scope of Ind-AS 109 are measured at fair value. Equity instruments which are held for trading are classified at fair value through profit and loss (FVTPL). For all other equity instruments, the Company decides to classify the same either as at fair value through other comprehensive income (FVOCI) or fair value through profit and loss (FVTPL). The Company makes such election on an instrument by instrument basis. The classification is made on initial recognition and is irrevocable.

c. **Mutual funds** – All mutual funds in scope of Ind-AS 109 are measured at fair value through profit and loss (FVTPL).

Interest income and dividend income:

For all financial instruments measured at amortised cost, interest income is recorded using the effective interest rate (EIR), which is the rate that exactly discounts the estimated future cash payments or receipts over the expected life of the financial instrument or a shorter period, where appropriate, to the net carrying amount of the financial asset. Interest income is included in other income in the Statement of Profit and Loss.

Dividend income is recognised when the Company's right to receive the payment is established, which is generally when shareholders approve the dividend.

Financial liabilities

Financial liabilities are subsequently carried at amortised cost using the effective interest method. For trade and other payables maturing within one year from the balance sheet date, the carrying amounts approximate fair value due to the short maturity of these instruments.

iii. De-recognition

Financial assets

The Company derecognises a financial asset when the contractual rights to the cash flows from the financial asset expire, or it transfers the right to receive the contractual cash flows in a transaction in which substantially all of the risks and rewards of ownership of the financial assets are transferred or in which the Company neither transfers nor retains substantially all of the risks and rewards of ownership and does not retain control of the financial asset.

If the Company enters into transactions whereby it transfers assets recognised on its balance sheet, but retains either all or substantially all of the risks and rewards of the transferred assets, the transferred assets are not derecognised.

Financial liabilities

The Company derecognises a financial liability when its contractual obligations are discharged or cancelled, or expire.

The Company also derecognises a financial liability when its terms are modified and the cash flows under the modified terms are substantially different. In this case, a new financial liability based on the modified terms is recognised at fair value. The difference between the carrying amount of the financial liability extinguished and a new financial liability with modified terms is recognised in the Statement of Profit and Loss.

iv. Offsetting

Financial assets and financial liabilities are offset and the net amount presented in the balance sheet when, and only when, the Company currently has a legally enforceable right to set off the amounts and it intends either to settle them on a net basis or realise the asset and settle the liabilities simultaneously.

v. Financial guarantee contracts

Financial guarantee contracts are those contracts that require a payment to be made to reimburse the holder for a loss it incurs because the specified party fails to make a payment when due in accordance with the terms of a debt instrument. Financial guarantee contracts are recognised initially as a liability at fair value, adjusted for transaction costs that are directly attributable to the issuance of the guarantee. Subsequently, the liability is measured at the higher of the amount of expected loss allowance determined as per impairment requirements of Ind-AS 109 and the amount recognised less cumulative amortisation.

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

i. **Impairment of financial assets**

The Company recognises loss allowances using the expected credit loss (ECL) model for the financial assets which are not fair valued through profit or loss. Loss allowance for trade receivables with no significant financing component is measured at an amount equal to lifetime ECL. For all other financial assets, expected credit losses are measured at an amount equal to the 12-month ECL, unless there has been a significant increase in credit risk from initial recognition in which case those are measured at lifetime ECL. The amount of expected credit losses (or reversal) that is required to adjust the loss allowance at the reporting date to the amount that is required to be recognised is recognised as an impairment gain or loss in statement of profit or loss.

j. **Inventories**

Inventories are valued at the lower of cost (including prime cost, non-refundable taxes and duties and other costs incurred in bringing the inventories to their present location and condition) and estimated net realisable value, after providing for obsolescence, where appropriate. The comparison of cost and net realisable value is made on an item-by-item basis. The net realisable value of materials in process is determined with reference to the selling prices less estimated cost of completion or selling expenses of related finished goods. Cost of inventories is determined using the weighted average cost method. Raw materials, packing materials and other supplies held for use in production of inventories are not written down below cost except in cases where material prices have declined, and it is estimated that the cost of the finished products will exceed their net realisable value.

The provision for inventory obsolescence is assessed regularly based on estimated usage and shelf life of products.

Work-in-progress is valued at input material cost plus conversion cost as applicable.

Finished goods, work-in-progress and stock-in-trade are valued at the lower of net realisable value and cost (including prime cost, non-refundable taxes and duties and other costs incurred in bringing the inventories to their present location and condition), computed on a weighted average basis.

k. **Income taxes**

Income tax comprises current and deferred tax. It is recognised in profit or loss except to the extent that it relates to an item recognised directly in equity or in other comprehensive income.

i. Current tax

Current tax comprises the expected tax payable or receivable on the taxable income or loss for the year and any adjustment to the tax payable or receivable in respect of previous years. The amount of current tax reflects the best estimate of the tax amount expected to be paid or received after considering the uncertainty, if any related to income taxes. It is measured using tax rates (and tax laws) enacted or substantively enacted by the reporting date.

ii. Deferred tax

Deferred tax is recognised in respect of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the corresponding amounts used for taxation purposes.

Deferred tax is not recognised for:

- temporary differences arising on the initial recognition of assets or liabilities in a transaction that is not a business combination and that affects neither accounting nor taxable profit or loss at the time of transaction.

- temporary differences related to investments in subsidiaries when the timing of the reversal of the temporary differences can be controlled and it is probable that the temporary differences will not reverse in the foreseeable future.

Deferred tax assets are recognised to the extent that it is probable that future taxable profits will be available against which they can be used. This is assessed based on the Company's forecast of future operating results, adjusted for significant non-taxable income and expenses and specific limits on the use of any unused tax loss or credit.

Deferred tax assets recognised or unrecognised are reviewed at each reporting date and are recognised / reduced to the extent that it is probable / no longer probable respectively that the related tax benefit will be realised.

Deferred tax is measured at the tax rates that are expected to apply to the period when the asset is realised or the liability is settled, based on the laws that have been enacted or substantively enacted by the reporting date.

The measurement of deferred tax reflects the tax consequences that would follow from the manner in which the Company expects, at the reporting date, to recover or settle the carrying amount of its assets and liabilities.

The Company offsets, the current tax assets and liabilities (on a year on year basis) and deferred tax assets and liabilities, where it has a legally enforceable right and where it intends to settle such assets and liabilities on a net basis. Deferred tax relating to items recognised outside profit or loss is recognised outside profit or loss (either in other comprehensive income or in equity).

l. **Cash and cash equivalents**

Cash and cash equivalents includes cash on hand, demand deposits with banks, other short-term highly liquid investments with original maturities of three months or less that are readily convertible into known amounts of cash and which are subject to an insignificant risk of changes in value.

m. **Post-employment, long-term and short-term employee benefits**

Defined contribution plan

A defined contribution plan is a post-employment benefit under which an entity pays a specific contribution to a separate entity and has no obligation to pay any further amounts. The Company's contribution to provident fund and employee state insurance schemes is charged to the Statement of profit and loss during the period in which the employee renders the related service. The Company's contributions towards Provident Fund are deposited with the Regional Provident Fund Commissioner under a defined contribution plan. The Company has no obligation, other than the contribution payable to these funds.

Defined benefit plan

The Company has gratuity as defined benefit plan where the amount that an employee will receive on retirement is defined by reference to the employee's length of service and final salary. The liability recognised in the balance sheet for defined benefit plans is the present value of the defined benefit obligation (DBO) at the reporting date net of fair value of plan assets. Management estimates the DBO annually with the assistance of independent actuaries, by adopting the projected unit credit method. Actuarial gains and losses resulting from re-measurements of the liability are included in other comprehensive income.

The Company has subscribed to a group gratuity scheme of Life Insurance Corporation of India (LIC). Under the said policy, the eligible employees are entitled for gratuity upon their resignation, retirement or in the event of death in lumpsum after deduction of necessary taxes upto a maximum limit of ₹ 2 million. Liabilities in respect of the Gratuity Plan are determined by an actuarial valuation, based upon which the Company makes contributions to the Gratuity Fund.

Other long-term employee benefits

The Company also provides benefit of compensated absences to its employees which are in the nature of long-term benefit plan. Liability in respect of compensated absences becoming due and expected to be availed more than one year after the balance sheet date is estimated on the basis of an actuarial valuation performed by an independent actuary using the projected unit credit method as on the reporting date. Actuarial gains and losses arising from experience adjustments and changes in actuarial assumptions are recorded in the Statement of profit or loss in the year in which such gains or losses arise.

Short-term employee benefits

Short-term employee benefits comprise of employee costs such as salaries, bonus etc. is recognized on the basis of the amount paid or payable for the period during which services are rendered by the employee.

n. **Share-based payments**

Certain employees of the Company are entitled to remuneration in the form of equity settled instruments, for rendering services over a defined vesting period. Equity instruments granted are measured by reference to the fair value of the instrument at the date of grant. The fair value determined at the grant date is expensed over the vesting period of the respective tranches of such grants. The stock compensation expense is determined based on the Company's estimate of equity instruments that will eventually vest using fair value in accordance with Ind AS 102, Share based payment.

The employee benefits expense is measured using the fair value of the employee stock options and is recognised over vesting period with a corresponding increase in equity. The vesting period is the period over which all the specified vesting conditions are to be satisfied.

o. **Provisions, contingent liabilities and contingent assets**

General

Provisions are recognised when the Company has a present obligation (legal or constructive) as a result of a past event, it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation and a reliable estimate can be made of the amount of the obligation. When the Company expects some or all of a provision to be reimbursed, the expense relating to a provision is presented in the Statement of Profit and Loss, net of any reimbursement.

If the effect of the time value of money is material, provisions are discounted using a current pre-tax rate

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(All amounts in ₹ millions, except share data and where otherwise stated)

that reflects, when appropriate, the risks specific to the liability. When discounting is used, the increase in the provision due to the passage of time is recognised as a finance cost.

Contingent liabilities and Contingent assets

A disclosure for contingent liabilities is made where there is a possible obligation or a present obligation that may probably not require an outflow of resources. When there is a possible or a present obligation where the likelihood of outflow of resources is remote, no provision or disclosure is made.

Contingent assets are neither recognised nor disclosed. However, when realisation of income is virtually certain, related asset is recognised.

Onerous contracts

Provision for onerous contracts. i.e. contracts where the expected unavoidable cost of meeting the obligations under the contract exceed the economic benefits expected to be received under it, are recognised when it is probable that an outflow of resources embodying economic benefits will be required to settle a present obligation as a result of an obligating event based on a reliable estimate of such obligation.

p. Earnings per share

Basic Earnings Per Share ('EPS') is computed by dividing the net profit attributable to the equity shareholders by the weighted average number of equity shares outstanding during the year. Diluted earnings per share is computed by dividing the net profit by the weighted average number of equity shares considered for deriving basic earnings per share and also the weighted average number of equity shares that could have been issued upon conversion of all dilutive potential equity shares. Dilutive potential equity shares are deemed converted as of the beginning of the year, unless issued at a later date. In computing diluted earnings per share, only potential equity shares that are dilutive and that either reduces earnings per share or increases loss per share are included. The number of shares and potentially dilutive equity shares are adjusted retrospectively for all periods presented in case of share splits.

q. Cash flow statement

Cash flows are reported using indirect method, whereby net profits before tax is adjusted for the effects of transactions of a non-cash nature and any deferrals or accruals of past or future cash receipts or payments and items of income or expenses associated with investing or financing cash flows. The cash flows from regular revenue generating (operating activities), investing and financing activities of the Company are segregated.

r. Research and development

Expenditure on research activities are expensed as and when incurred. Development expenses which meet defined criteria for capitalisation are capitalised if its ability to generate future economic benefits is reasonably certain. All other development costs are expensed as and when incurred. Capital expenditure incurred on research and development is capitalised as property, plant and equipment and depreciated in accordance with the depreciation policy of the Company.

s. Investments in subsidiaries

The Company's investment in its subsidiaries are carried at cost as per Ind AS 27 - Separate Financial Statements.

t. Ind AS 116, Leases:

Accounting as lessee

A contract is, or contains, a lease if the contract conveys the right to control the use of an identified asset for a period of time in exchange for consideration.

The Company recognises right-of-use asset representing its right to use the underlying asset for the lease term at the lease commencement date. The cost of the right-of-use asset measured at inception shall comprise of the amount of the initial measurement of the lease liability adjusted for any lease payments made at or before the commencement date less any lease incentives received, plus any initial direct costs incurred and an estimate of costs to be incurred by the lessee in dismantling and removing the underlying asset or restoring the underlying asset or site on which it is located. The right-of-use assets is subsequently measured at cost less any accumulated depreciation, accumulated impairment losses, if any and adjusted for any remeasurement of the lease liability. The right-of-use assets is depreciated using the straight-line method from the commencement date over the shorter of lease term or useful life of right-of-use asset. The estimated useful lives of right-of use assets are determined on the same basis as those of property, plant and equipment. Right-of-use assets are tested for impairment whenever there is any indication that their carrying amounts may not be recoverable. Impairment loss, if any, is recognised in the Statement of profit and loss.

The Company measures the lease liability at the present value of the lease payments that are not paid at the commencement date of the lease. The lease payments are discounted using the interest

rate implicit in the lease, if that rate can be readily determined. If that rate cannot be readily determined, the Company uses incremental borrowing rate. For leases with reasonably similar characteristics, the Company, on a lease by lease basis, may adopt either the incremental borrowing rate specific to the lease or the incremental borrowing rate for the portfolio as a whole. The lease payments shall include fixed payments, variable lease payments, residual value guarantees, exercise price of a purchase option where the Company is reasonably certain to exercise that option and payments of penalties for terminating the lease, if the lease term reflects the lessee exercising an option to terminate the lease. The lease liability is subsequently remeasured by increasing the carrying amount to reflect interest on the lease liability, reducing the carrying amount to reflect the lease payments made and remeasuring the carrying amount to reflect any reassessment or lease modifications or to reflect revised in-substance fixed lease payments. The Company recognises the amount of the re-measurement of lease liability due to modification as an adjustment to the right-of use asset and Statement of profit and loss depending upon the nature of modification. Where the carrying amount of the right-of-use asset is reduced to zero and there is a further reduction in the measurement of the lease liability, the Company recognises any remaining amount of the re-measurement in Statement of profit and loss.

The Company has elected not to apply the requirements of Ind AS 116 Leases to short-term leases of all assets that have a lease term of 12 months or less and leases for which the underlying asset is of low value. The lease payments associated with these leases are recognized as an expense on a straight-line basis over the lease term.

Refer note 40 "Leases" of the financial statements for transition related disclosures.

4. Key accounting estimates and judgements

The preparation of financial statements in conformity with the Ind AS requires judgements, estimates and assumptions to be made that affect the reported amounts of assets and liabilities on the date of the financial statements, the reported amounts of revenues and expenses during the reporting period and the disclosures relating to contingent liabilities as of the date of the financial statements. Although these estimates are based on the management's best knowledge of current events and actions, uncertainty about these assumptions and estimates could result in outcomes different from the estimates. Difference between actual results and estimates are recognised in the period in which the results are known or materialise. Estimates and underlying assumptions are reviewed on an ongoing basis. Any revision to accounting estimates is recognised prospectively in the current and future periods.

Management considers the accounting estimates and assumptions discussed below to be its critical accounting estimates and, accordingly, provide an explanation of each below. The discussion below should also be read in conjunction with the Company's disclosure of significant accounting policies which are provided in Note 3 to the standalone financial statements, 'Significant accounting policies'.

Critical judgments:

Taxes on income:

Significant judgments are involved in determining the provision for income taxes, including possibility of utilization of Minimum Alternate Tax (MAT) credit in future.

Impairment of investments:

Significant judgment is involved in determining the estimated future cash flows from the investments to determine their value in use to assess whether there is any impairment in their carrying amounts as reflected in the consolidated financial statements.

Critical estimates:

Recognition of deferred tax assets – The extent to which deferred tax assets can be recognised is based on an assessment of the probability of the Company's future taxable income against which the deferred tax assets can be utilised. In addition, significant judgement is required in assessing the impact of any legal or economic limits.

Evaluation of indicators for impairment of assets: The evaluation of applicability of indicators of impairment of assets requires assessment of several external and internal factors which could result in deterioration of recoverable amount of the assets.

Useful lives of depreciable/amortisable assets: Management reviews its estimate of the useful lives of depreciable/amortisable assets at each reporting date, based on the expected utility of the assets. Uncertainties in these estimates relate to technical and economic obsolescence that may change the utility of certain software, IT equipment and other plant and equipment.

Defined benefit obligation (DBO): Management's estimate of the DBO is based on a number of critical underlying assumptions such as standard rates of inflation, mortality, discount rate and anticipation of

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(All amounts in ₹ millions, except share data and where otherwise stated)

future salary increases. Variation in these assumptions may significantly impact the DBO amount and the annual defined benefit expenses.

Fair value measurements: Management applies valuation techniques to determine the fair value of financial instruments (where active market quotes are not available) and non-financial assets. This involves developing estimates and assumptions consistent with how market participants would price the instrument. Management uses the best information available. Estimated fair values may vary from the actual prices that would be achieved in an arm's length transaction at the reporting date.

Provisions: The Company exercises judgement in measuring and recognising provisions and the exposures to contingent liabilities related to pending litigation or other outstanding claims subject to negotiated settlement, mediation, arbitration or government regulation, as well as other contingent liabilities. Judgement is necessary in assessing the likelihood that a pending claim will succeed, or a liability will arise, and to quantify the possible range of the financial settlement. Because of the inherent uncertainty in this evaluation process, actual losses may be different from the originally estimated provision.

5. Property, plant and equipment

Property, plant and equipment	Freehold land	Leasehold land	Buildings	Plant and equipment	Office equipment	Furniture	Vehicles	Computers	Right-of-use (Leasehold lands)	Total
Gross carrying amount										
As at 1 April 2018	1,769	262	3,583	7,692	35	150	199	160	-	**13,850**
Additions	363	-	789	1,547	1	39	35	18	-	**2,792**
Disposals	(41)	-	-	(3)	-	0	(10)	-	-	**(54)**
Balance as at 31 March 2019	**2,091**	**262**	**4,372**	**9,236**	**36**	**189**	**224**	**178**	**-**	**16,588**
Recognised on adoption of Ind AS 116 (Refer Note 40)	-	-	-	-	-	-	-	-	38	**38**
Reclassified on adoption of Ind AS 116 (Refer Note 40)	-	(262)	-	-	-	-	-	-	262	**-**
Additions	429	-	1,798	2,109	2	148	22	59	2	**4,569**
Disposals	(33)	-	-	(40)	-	-	(8)	-	-	**(81)**
Balance as at 31 March 2020	**2,487**	**-**	**6,170**	**11,305**	**38**	**337**	**238**	**237**	**302**	**21,114**
Accumulated depreciation										
As at 1 April 2018	-	8	723	2,715	29	52	99	128	-	**3,754**
Charge for the year	-	3	126	588	2	16	24	19	-	**778**
Disposals	-	-	-	(2)	-	-	(9)	-	-	**(11)**
Balance as at 31 March 2019	**-**	**11**	**849**	**3,301**	**31**	**68**	**114**	**147**	**-**	**4,521**
Reclassified on adoption of Ind AS 116 (Refer Note 40)	-	(11)	-	-	-	-	-	-	11	**-**
Charge for the year	-	-	171	714	2	25	18	20	8	**958**
Disposals	-	-	-	(21)	-	-	(1)	-	-	**(22)**
Balance as at 31 March 2020	**-**	**-**	**1,020**	**3,994**	**33**	**93**	**131**	**167**	**19**	**5,457**
Net book value as at 31 March 2019	2,091	251	3,523	5,935	5	121	110	31	-	**12,067**
Net book value as at 31 March 2020	2,487	-	5,150	7,311	5	244	107	70	283	**15,657**

(i) **Contractual obligations**

Refer to note 37(a) for disclosure of contractual commitments for the acquisition of property, plant and equipment.

(ii) Right-of-use assets consists of leasehold land from the State Industrial Development Corporation of Uttarakhand Limited for a period of 90 years, Uttar Pradesh State Industrial Development Corporation Limited for a period of 87 years and Ramky Pharma City (India) Limited for a period of 33 years which is renewable for a further period of 2 terms of 33 years each at the option of the Company.

(iii) Land parcels with an aggregate carrying amount of ₹ 4 (31 March 2019: ₹ 4) are under dispute pending in a court as to the ownership of the property. The management, based on available information and advice of legal counsel, is confident of favourable outcome in this case and hence, no adjustments are made in these financial statements.

(iv) The following lands have come into the books of the Company pursuant to the merger of Natco Organics Limited and Karanth Pharma Chemical Labs Private Limited (transferor companies) with the Company in the earlier years. Hence, the name of the transferor companies are appearing in the title deeds of these lands.

i) Freehold land at Sanathnagar Industrial estate, Hyderabad.

ii) Freehold land at No. 74/7B, Vaikkadu TPP Salai, Manali, Chennai."

(v) The Company was provisionally allotted a parcel of land from Andhra Pradesh Industrial Infrastructure Corporation Limited ('APIIC') in Attivaram, Nellore District, Andhra Pradesh for a consideration of ₹ 66 which shall be registered in the name of the Company based on fulfilment of certain conditions laid down by APIIC.

(vi) Refer to note 40 for disclosure of leases under Ind AS 116.

(vii) Refer to note 17 for disclosure of security against borrowings.

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(All amounts in ₹ millions, except share data and where otherwise stated)

6. Intangible assets

	Computer Software	Total
Gross carrying amount		
As at 1 April 2018	146	146
Additions	48	48
As at 31 March 2019	194	194
Additions	29	29
As at 31 March 2020	223	223
Accumulated amortisation		
As at 1 April 2018	89	89
Amortisation for the year	23	23
As at 31 March 2019	112	112
Amortisation for the year	23	23
As at 31 March 2020	135	135
Net carrying amount		
As at 31 March 2019	82	82
As at 31 March 2020	88	88

7. Investments in subsidiaries

	As at 31 March 2020	As at 31 March 2019
Non-current		
Investment in equity instruments (fully paid-up)		
At cost less provision for other than temporary impairment		
Unquoted		
1,000 (31 March 2019: 1,000) common shares of US$1,000 each, in Natco Pharma Inc	42	42
1,078,065 (31 March 2019: 1,061,612) equity shares of US$10 each, in Time Cap Overseas Limited*	647	638
Share application money pending allotment in Time Cap Overseas Limited	-	2
2,783,813 (31 March 2019: 2,783,813) equity shares of Canadian Dollar 1 each, in NATCO Pharma (Canada) Inc	145	145
2,095,000 (31 March 2019: 1,845,000) equity shares of Singapore Dollar 1 each, in NATCO Pharma Asia Pte. Ltd	102	89
1,058,572 (31 March 2019: 978,572) equity shares of Australian Dollar 1 each, in NATCO Pharma Australia PTY Ltd	53	49
271,406 (31 March 2019: 103,995) equity shares of 100 PHP each, in NATCO Lifesciences Philippines Inc.	36	12
	1,025	977
Aggregate book value of unquoted investments	1,025	977
Aggregate amount of impairment in the value of investments	-	-

*The Company through its subsidiary Time Cap Overseas Limited ("Timecap") has made investments in Natcofarma Do Brasil Ltda. ('Natco Brazil'), which is engaged in marketing of pharmaceutical products in Brazil. The Company indirectly holds 90.89% of Natco Brazil through Timecap and Natco Pharma Inc. During the year ended 31 March 2020, Natco Brazil reported a loss of ₹ 275 and as at that date its accumulated losses aggregating ₹ 1,172 have substantially eroded its net worth which indicates a possible impairment in the carrying value of the investment. Accordingly, the management with the help of a valuation specialist, has carried out an impairment assessment and concluded that the estimated recoverable amount computed using value-in-use method, is higher than the carrying value of the investment in Natco Brazil and accordingly, there is no impairment. Determination of recoverable amount using Discounted Cash Flow (DCF) valuation method by the independent valuer involved consideration of key assumptions including, but are not limited to, projections of future cash flows, growth rates, discounts rates, estimated future operating expenditure. The planning horizon reflects the assumptions for short-to-mid term market developments which are based on key assumptions such as margins, expected growth rates based on past experience and management's expectations / extrapolation of normal increase / steady terminal growth rate. Discount rate reflects the current market assessment of the risks. The discount rate is estimated based on the weighted average cost of capital for Natco Brazil. The management based on sensitivity analysis performed believes that any reasonable possible change in the key assumptions would not cause the aggregate carrying amount to exceed the aggregate recoverable amount of the investment.

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(All amounts in ₹ millions, except share data and where otherwise stated)

8. Investments

		As at 31 March 2020	As at 31 March 2019
I.	Non-current		
a)	**Investment in equity instruments of others (fully paid-up)**		
	At fair value through other comprehensive income		
	Unquoted		
	139,451 (31 March 2019: 139,451) equity shares of ₹ 10 each, in OMRV Hospital Private Limited	105	105
	21,769 (31 March 2019: 21,769) equity shares of ₹ 10 each, in Veda Seedsciences Private Limited	79	79
	8,000 (31 March 2019: Nil) equity shares of ₹ 10 each, in Cipher Oncology Private limited	10	-
	978 (31 March 2019: Nil) equity shares of ₹ 10 each, in Medplus Health Services Private Limited	75	-
	4,054 (31 March 2019: 4,054) equity shares of 1USD NATIVITA Joint Limited Liability Company	0	0
	30 (31 March 2019: 30) equity shares of Euro 0.5 per share of Pharnasanta B.V	0	0
	750 (31 March 2019: 750) equity shares of ₹ 100 each, in Jeedimetla Effluent Treatment Limited	0	0
	34,400 (31 March 2019: 34,400) equity shares of ₹ 10 each, in Pattancheru Enviro-Tech Limited	0	0
	27,000 (31 March 2019: 27,000) equity shares of ₹ 10 each, in Jayalakshmi Spinning Mills Limited	0	0
	Less: Provision for diminution in value of investments	0	0
		269	185
b)	**Other investments**		
	At fair value through other comprehensive income		
	Unquoted		
	1,624 (31 March 2019: 1,060) units of ₹ 10,000 each, in Endiya Trust	16	11
	500,000 (31 March 2019: Nil) 0.05% compulsorily convertible preference shares (CCPS) of ₹ 100 each, in OMRV Hospitals Private Limited	50	-
		66	11
	At amortised cost		
	Unquoted		
	National savings certificates	0	0
	Application money for investment in Kotak Alternate Investment Plan	-	3
	Quoted		
	250,000 (31 March 2019: Nil) 9.25% non-convertible debentures (NCD) of ₹ 1,000 each, in Muthoot Finance limited	250	-
	250 (31 March 2019: Nil) 8.39% Series III Perpetual Bonds of ₹ 1,000,000 each, issued by State Bank of India	251	-
		501	3
	Total non-current investments	836	199
	Aggregate book value of unquoted investments	335	199
	Aggregate book value of quoted investments	501	-
	Aggregate market value of quoted investments	512	-
	Aggregate amount of impairment in the value of investments	0	0
II.	Current		
a)	**Investments in equity instruments of others (fully paid-up)**		
	Quoted		
	At fair value through other comprehensive income		
	10,000 (31 March 2019: 10,000) equity shares of ₹ 10 each, in Neuland Laboratories Limited	3	7

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(All amounts in ₹ millions, except share data and where otherwise stated)

	As at 31 March 2020	As at 31 March 2019
5,500 (31 March 2019: 5,500) equity shares of ₹ 1 each, in Sun Pharmaceuticals Industries Limited	2	3
778 (31 March 2019: 778) equity shares of ₹ 2 each, in Alkem Laboratories Limited	2	1
15,000 (31 March 2019: 15,000) equity shares of ₹ 1 each, in Cadila Healthcare Limited	4	5
100,000 (31 March 2019: 100,000) equity shares of ₹ 10 each, in Laurus Labs Limited	32	40
150,000(31 March 2019: 150,000) equity shares of ₹ 1 each, in Lanco Infratech Limited	0	0
22,700 (31 March 2019: 22,700) equity shares of ₹ 1 each, in GMR Infrastructure Limited	0	0
50,400 (31 March 2019: 50,400) equity shares of ₹ 1 each, in GVK Power & Infrastructure Limited	0	0
50,000 (31 March 2019: 50,000) equity shares of ₹ 1 each, in Panacea Biotech Limited	6	10
3,176 (31 March 2019: 3,176) equity shares of ₹ 1 each, in ICICI Prudential Life Insurance Company Limited	1	1
	50	68
b) Other investments (fully paid-up)		
Unquoted		
At amortised cost		
Nil (31 March 2019: 12,000) non-convertible debentures of ₹ 100,000 in Citicorp Finance India Limited	-	1,200
Total current investments	50	1,268
Aggregate book value of unquoted investments	-	1,200
Aggregate book value of quoted investments	60	60
Aggregate market value of quoted investments	50	68

9. Loans

	As at 31 March 2020	As at 31 March 2019
(Unsecured, considered good)		
Non-current		
Loans to related parties (Refer note 35)	524	476
Loans to others	20	20
Security deposits	140	99
Total non-current loans	684	595
Current		
Loans to employees	81	70
Total current loans	81	70

(All amounts in ₹ millions, except share data and where otherwise stated)

10. Other financial assets

	As at 31 March 2020	As at 31 March 2019
(Unsecured, considered good)		
Non-current		
Deposits classified at amortised cost:		
- Bank deposits with maturity beyond 12 months*	35	60
- Interest on deposits, accrued but not due	6	5
	41	**65**
*Bank deposits are given as margin money against bank guarantees/performance guarantees issued by banks.		
Current		
Deposits classified at amortised cost:		
- Deposits with financial institutions	8,112	6,316
- Interest on deposits, accrued but not due	470	553
Interest on loans to related party, accrued but not due (Refer note 35)	23	12
Other receivables	7	78
	8,612	**6,959**

11. Other assets

	As at 31 March 2020	As at 31 March 2019
(Unsecured, considered good)		
Non-current		
(i) Capital advances	547	492
(ii) Advances other than capital advances		
- Prepaid rent (Refer note 40)	-	18
- Balance with statutory authorities	12	17
	559	**527**
Current		
Advances other than capital advances		
- Advance to material/service providers	1,378	564
- Prepaid expenses	178	137
- Export incentives receivable	260	304
- Balance with statutory authorities	688	745
	2,504	**1,750**

12. Inventories

	As at 31 March 2020	As at 31 March 2019
Raw materials [including goods-in-transit of ₹ 26 (31 March 2019: ₹ 4)]	1,627	2,111
Work-in-progress	1,566	1,405
Finished goods	1,140	735
Stock-in-trade	6	13
Stores and spares [including goods-in-transit of ₹ 5 (31 March 2019: ₹ 44)]	640	562
Packing materials [including goods-in-transit of ₹ 1 (31 March 2019: ₹ Nil)]	265	258
	5,244	**5,084**

The write-down of inventories to net realisable value during the year amounted to ₹ 31 (March 2019, ₹ 2)

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(All amounts in ₹ millions, except share data and where otherwise stated)

13. Trade receivables

	As at 31 March 2020	As at 31 March 2019
(Unsecured)		
Trade receivables, gross		
- Considered good	5,542	4,916
- Credit impaired	-	-
	5,542	4,916
Less: Allowance for credit losses	175	-
	5,367	4,916

14. Cash and bank balances

	As at 31 March 2020	As at 31 March 2019
Cash and cash equivalents		
Cash on hand	11	19
Balance with banks:		
- Current accounts	68	96
	79	115
Bank balances other than cash and cash equivalents:		
Bank deposits with maturity within 12 months	428	2,490
Unpaid dividend account	34	22
	462	2,512
	541	2,627

15. Equity share capital

i. Authorised share capital

	As at 31 March 2020		As at 31 March 2019	
	Number	Amount	Number	Amount
Equity shares of ₹ 2 each	200,000,000	400	200,000,000	400

ii. Issued, subscribed and fully paid up

	As at 31 March 2020		As at 31 March 2019	
	Number	Amount	Number	Amount
Equity shares of ₹ 2 each	182,067,975	364	182,746,479	365
	182,067,975	364	182,746,479	365

iii. Reconciliation of number of equity shares outstanding at the beginning and at the end of the year

	As at 31 March 2020		As at 31 March 2019	
	Number	Amount	Number	Amount
Equity shares				
Balance at the beginning of the year	182,746,479	365	184,493,400	369
Add: Equity shares issued pursuant to employee stock option plan (Refer note 15 (viii))	305,840	1	268,735	0
Less: Bought back during the year and extinguished before balance sheet date (Refer notes given below)	(984,344)	(2)	(1,877,640)	(4)
	182,067,975	364	182,884,495	365
Less: Bought back during the year and extinguished after the balance sheet date (Refer notes given below)	-	-	(138,016)	(0)
Balance at the end of the year	182,067,975	364	182,746,479	365

(All amounts in ₹ millions, except share data and where otherwise stated)

Notes:

(a) During the year ended 31 March 2020, the Company bought back and extinguished 984,344 equity shares of ₹ 2 each for an aggregate purchase value of ₹ 536 at an average price of ₹ 544 per share, excluding transaction costs under the buy-back of equity shares plan approved by the Board of directors on 05 November 2018.

(b) During the year ended 31 March 2019, the Company bought back 2,015,656 equity shares of ₹ 2 each for an aggregate purchase value of ₹ 1,329 at an average price of ₹ 659 per share, excluding transaction costs under the buy-back of equity shares plan approved by the Board of directors on 05 November 2018. Out of the total shares bought back, 1,877,640 equity shares of ₹ 2 each were extinguished before 31 March 2019 and the balance 138,016 equity shares were extinguished in two tranches on 5 April 2019 and 22 April 2019.

iv. Rights, preferences and restrictions attached to equity shares

The Company has only one class of equity shares having a par value of ₹ 2 per share. Each holder of equity shares is entitled to one vote per share. The dividend proposed by the Board of Directors is subject to the approval of the shareholders in the ensuing general meeting. In the event of liquidation of the Company, the holders of equity shares will be entitled to receive the remaining assets of the Company, after distribution of all preferential amounts in proportion of their shareholding.

v. Details of shareholder holding more than 5% share capital

Name of the equity shareholder	As at 31 March 2020		As at 31 March 2019	
	Number	% holding	Number	% holding
V C Nannapaneni*	28,027,975	15.39%	40,751,315	22.30%
Time Cap Pharma Labs Limited	17,157,220	9.42%	17,157,220	9.39%
Natsoft Information Systems Private Limited	15,767,500	8.66%	15,767,500	8.63%
V S Swathi Kantamani	15,983,340	8.78%	3,260,000	1.78%

*including shares held in the capacity of Karta of Hindu Undivided Family (HUF) aggregating 5,440,045 (31 March 2019: 5,440,045).

vi. Shares reserved for issuance under Stock Option Plans of the Company

	As at 31 March 2020		As at 31 March 2019	
	Number	% holding	Number	% holding
NATCO Employee Stock Option Plan:				
ESOP 2015	74,810	0.04%	215,800	0.12%
ESOP 2016	87,310	0.05%	147,280	0.08%
ESOP 2017	370,525	0.20%	485,235	0.27%
	532,645		848,315	

vii. Aggregate number of bonus shares issued, shares issued for consideration other than cash and shares bought back during the period of five years immediately preceding the reporting date:

	2019-20	2018-19	2017-18	2016-17	2015-16
Equity Shares issued under Stock Option Plans of the Company	305,840	268,735	185,600	133,555	-
Equity shares bought-back (Refer note 15(iii))	984,344	2,015,656	-	-	-

viii. Share based payments

(a) The Company has instituted the NATCO Employee Stock Option Plan 'ESOP-2015', NATCO Employee Stock Option Plan 'ESOP-2016' and NATCO Employee Stock Option Plan 'ESOP-2017' ("the ESOP Schemes"). The ESOP Schemes were formulated in accordance with the Securities Exchange Board of India (Share Based Employee Benefits) Regulations, 2014 issued by the Securities and Exchange Board of India ("SEBI"). Pursuant to the terms of the ESOP Schemes, the Board of Directors of the Company have granted 750,000 options (post split), 174,330 options and 600,000 options to eligible employees on 12 August 2015, 11 November 2016 and 2 November 2017, respectively. The terms of the ESOP Schemes provide that each option entitles the holder to one equity share of

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(All amounts in ₹ millions, except share data and where otherwise stated)

₹ 2 each (post split) and that the options can be settled only by way of issue of equity shares. The options vest in a phased manner ranging from 1 to 5 years from the date of grant and the options are entirely time-based with no performance conditions.

(b) During the year ended 31 March 2020, the Company had accrued stock compensation cost of ₹ 144 (31 March 2019: ₹ 253) in respect of the ESOP Schemes.

(c) **The details of options are as follows :**

ESOP 2015, ESOP 2016 and ESOP 2017	As at 31 March 2020		As at 31 March 2019	
	Number of options	Weighted average exercise price	Number of options	Weighted average exercise price
Outstanding at the beginning of the year	848,315	2	1,144,380	2
Granted during the year	-	2	-	2
Forfeited during the year	-	2	-	2
Vested during the year	358,675	2	296,065	2
Exercised during the year	305,840	2	268,735	2
Expired during the year	15,775	2	27,330	2
Outstanding at the end of the year	526,700	2	848,315	2
Exercisable at the end of the year	43,005	2	-	-

The weighted average remaining contractual life of unvested options is 12.35 months (31 March 2019: 16.83 months).

The weighted average share price on the date of exercise of options during the years ended 31 March 2020 and 31 March 2019 was ₹ 567 and ₹ 732 per share, respectively.

There were no stock options granted by the Company for the years ended 31 March 2020 and 31 March 2019. The fair value of stock options granted in earlier years had been measured using the Black–Scholes option pricing model at the date of the grant. The Black-Scholes option pricing model includes assumptions regarding dividend yields, expected volatility, expected terms and risk free interest rates.

ix. Dividend paid and proposed

Dividends on equity shares were declared and paid by the Company during the year:

	2019-20		2018-19	
	Dividend per Equity share (₹)	Amount	Dividend per Equity share (₹)	Amount
First interim dividend	1.25	227	1.50	277
Second interim dividend	1.00	182	3.50	642
Third interim dividend	3.50	638	-	-
Dividend distribution tax on above		215		189
Total		**1,262**		**1,108**

After the reporting dates the following dividend was proposed by the directors subject to the approval at the annual general meeting; the dividends have not been recognised as liabilities. Payment of dividends would be subject to deduction of tax at source when declared or paid.

	Year ended 31 March 2020		Year ended 31 March 2019	
	Dividend per Equity share (₹)	Amount	Dividend per Equity share (₹)	Amount
Fourth interim dividend	1	182	-	-
Final dividend on equity shares		-	1.25	227
Dividend distribution tax on above		-		47
Total		**182**		**274**

(All amounts in ₹ millions, except share data and where otherwise stated)

16. Other equity

A. Reserve and surplus

	As at 31 March 2020	As at 31 March 2019
Reserves and surplus		
Securities premium	13,729	14,048
Capital reserve	516	207
Capital redemption reserve	11	9
General reserve	595	595
Share options outstanding account	236	309
Retained earnings	23,225	20,068
Total reserves and surplus	38,312	35,236
Other comprehensive income		
Gain on FVTOCI equity securities	19	31
Total other items of OCI	19	31
Total other equity	38,331	35,267

B. Nature and purpose of other reserves

Securities premium

Securities premium is used to record the premium on issue of shares. The reserve is utilised in accordance with provisions of the Companies Act, 2013.

Capital reserve

Capital reserve was created on amalgamation of certain entities into the Company in the earlier years and the transactions with Shareholders. The Company uses capital reserve for transactions in accordance with the provisions of the Companies Act, 2013.

Capital redemption reserve

The Company had purchased its own shares and as per the provision of the applicable laws, a sum equal to the nominal value of the shares so purchased is required to be transferred to the capital redemption reserve. The Company uses capital redemption reserve for transactions in accordance with the provisions of the Companies Act, 2013.

General reserve

The Company generally appropriates a portion of its earnings to the general reserve to be used for contingencies. These reserves are freely available for use by the Company.

Share options outstanding account

This reserve represents the excess of the fair value of the options on the grant date over the strike price which is accumulated by the Company in respect of all options that have been granted. The Company transfers the proportionate amounts, outstanding in this account, in relation to options exercised to securities premium on the date of exercise of such options.

Fair value through other comprehensive income (FVTOCI) equity securities

The Company has elected to recognise the change in fair value of certain investments in equity shares in other comprehensive income. These changes are accumulated within the FVTOCI equity instruments reserve within equity. The Company transfers amounts from this reserve to retained earnings when the relevant equity instruments are derecognised.

Retained earnings

Retained earnings mainly represent all current and prior year profits as disclosed in the statement of profit and loss and other comprehensive income pertaining to remeasurement gains/(losses) arising from the actuarial valuation of the defined benefit plan less dividend distribution.

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(All amounts in ₹ millions, except share data and where otherwise stated)

17. Borrowings

	As at 31 March 2020	As at 31 March 2019
Non-current		
Lease liabilities (refer note 40)	9	-
	9	-
Current		
Lease liabilities (refer note 40)	8	-
Loan repayable on demand from banks:		
Working capital loans (secured)	1,340	1,038
Working capital loans (unsecured)	1,783	2,807
	3,131	3,845

Notes:

(i) Working capital loans (secured) represents cash credit, bills purchased and discounted with various banks. These working capital loans are secured by joint pari-passu first charge on all the current assets and property, plant and equipment of:

i) Land admeasuring 17.19 acres comprised in survey no. 70 of village Nandikonda, Mandal Peddavoora, District Nalgonda in the State of Telangana together with all buildings and structures thereon and all plant and equipment attached to the earth.

ii) House/premise bearing municipal no. 8-2-120/112/A/33 and 8-2-120/112/A/32 in plot no. 100 admeasuring 1166 sq. yards with all its building and fixed assets situated at Road No.2, Banjara Hills, Hyderabad - 500033.

(ii) Working capital loans (unsecured) represents overdraft facility, bills purchased and discounted with various banks.

(iii) The rate of interest applicable was in the range of 2.40% to 8.70%.

18. Other financial liabilities

	As at 31 March 2020	As at 31 March 2019
Non-current		
Deposits from customers	8	8
	8	8
Current		
Interest accrued but not due	-	6
Book overdraft	135	-
Capital creditors	403	483
Unpaid dividend *	34	22
Payroll related liabilities	240	258
Other payables	-	2
	812	771

* Investor Education and Protection Fund shall be credited when due.

(All amounts in ₹ millions, except share data and where otherwise stated)

19. Provisions

	As at 31 March 2020	As at 31 March 2019
Non-current		
Provision for employee benefits:		
Provision for gratuity (refer note (a))	564	439
Provision for compensated absences (refer note (b))	338	271
	902	710
Current		
Provision for employee benefits:		
Provision for gratuity (refer note (a))	52	47
Provision for compensated absences (refer note (b))	53	43
	105	90

(a) Gratuity

The Company has subscribed to a group gratuity scheme of Life Insurance Corporation of India (LIC). Under the said policy, the eligible employees are entitled for gratuity upon their resignation, retirement or in the event of death in lumpsum after deduction of necessary taxes upto a maximum limit of ₹ 2. Liabilities in respect of the Gratuity Plan are determined by an actuarial valuation, based upon which the Company makes contributions to the Gratuity Fund.

The following tables sets out the status of the gratuity plan and the reconciliation of opening and closing balances of the present value and defined benefit obligation.

(i) Reconciliation of the present value of defined benefit obligation

	As at 31 March 2020	As at 31 March 2019
Opening balance	554	370
Current service cost	65	69
Interest cost	43	29
Benefits paid	(14)	(21)
Actuarial loss recognised in the other comprehensive income:		
Experience adjustment	30	196
Change in demographic assumptions	-	(15)
Change in financial assumptions	48	(74)
Closing balance	726	554

(ii) Reconciliations of present value of plan asset

	As at 31 March 2020	As at 31 March 2019
Opening balance	68	83
Interest income	5	7
Employer contribution	52	-
Benefits paid	(14)	(21)
Actuarial losses recognised in the other comprehensive income:		
Return on plan assets, excluding interest income	(1)	(1)
Closing balance	110	68

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(All amounts in ₹ millions, except share data and where otherwise stated)

(iii) Reconciliation of net defined benefit obligation

	As at 31 March 2020	As at 31 March 2019
Present value of funded obligation	726	554
Fair value of plan assets	(110)	(68)
Amount recognised in the balance sheet	**616**	**486**

(iv) Expense recognised in the statement of profit and loss under employee benefit expense:

	Year ended 31 March 2020	Year ended 31 March 2019
Current service cost	65	69
Interest cost	43	29
Interest income	(5)	(7)
Net cost	**103**	**91**

(v) Remeasurements recognised in the statement of other comprehensive income

	Year ended 31 March 2020	Year ended 31 March 2019
Experience adjustment on funded obligation	78	107
Return on plan assets, excluding interest income	1	1
Net gratuity costs in other comprehensive income	**79**	**108**

(vi) Plan assets comprises of the following:

	Year ended 31 March 2020	Year ended 31 March 2019
Group gratuity fund with LIC	**110**	**68**

(vii) Summary of actuarial assumptions:

	Year ended 31 March 2020	Year ended 31 March 2019
Discount rate	6.85%	7.70%
Estimates rate of return on plan assets	6.85%	7.70%
Salary escalation rate	7.00%	1-2yaers 10% thereafter 7%
Mortality rate	Indian Assured Lives Mortality (2012-14)	Indian Assured Lives Mortality (2006-08)

The estimates of future salary increase considered in actuarial valuation takes account of inflation, seniority, promotion and other relevant factors such as supply and demand in the employment market.

(viii) Sensitivity analysis:

The significant actuarial assumptions for the determination of the defined benefit obligation are the discount rate and the salary growth rate. The calculation of the net defined benefit liability is sensitive to these assumptions. However, the impact of these changes is not ascertained to be material by the management.

The sensitivity analysis of significant actuarial assumptions as at the end of the period is shown below.

	Year ended 31 March 2020	Year ended 31 March 2019
A. Defined benefit obligation without effect of projected salary growth	726	554
B. Salary escalation rate		
Salary rate +100 basis points	78	58
Salary rate -100 basis points	(68)	(50)
C. Discount rate		
Discount rate +100 basis points	(73)	(55)
Discount rate -100 basis points	88	64

As at 31 March 2020, the weighted-average duration of the defined benefit obligation was 11 years (31 March 2019: 11 years).

(ix) The weighted average duration of the defined benefit plan obligation at the end of the reporting period is 11 years (Previous year: 11 years).

(x) Expected contribution

The expected contributions for defined benefit plan for the next financial year will be in line with the contribution for the period and is expected by the Management to be ₹ 60 (31 March 2019: ₹ 47).

(xi) Maturity profile of defined benefit obligation (valued on undiscounted basis):

	Year ended 31 March 2020	Year ended 31 March 2019
Within 1 year	66	47
2 to 5 years	162	142
6 to 10 years	300	274
More than 10 years	1,333	1,188

(b) Compensated absences:

The accrual for unutilised leave is determined for the entire available leave balance standing to the credit of the employees at the year-end. The value of such leave balances that are eligible for carry forward, is determined by an actuarial valuation as at the end of the year and is charged to the statement of profit and loss. The actual liability towards leave obligations as at 31 March 2020 is ₹ 391 (31 March 2019: ₹ 314). Expense recognised in the statemet of profit and loss under employee benefit expense is ₹ 99 (31 March 2019: ₹ 143).

20. Other liabilities

	As at 31 March 2020	As at 31 March 2019
Current		
Statutory liabilities	82	92
Advance from customers	4	189
Others	36	33
	122	**314**

21. Trade payables

	As at 31 March 2020	As at 31 March 2019
Current		
Total outstanding dues of micro enterprises and small enterprises [Refer note below]	21	79
Total outstanding dues of creditors other than micro enterprises and small enterprises	2,321	1,939
	2,342	**2,018**

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(All amounts in ₹ millions, except share data and where otherwise stated)

Note:
Under the Micro, Small and Medium Enterprises Development Act, 2006, (MSMED) which came into force from 2 October 2006, certain disclosures are required to be made relating to Micro and Small enterprises. On the basis of the information and records available with the Management, the outstanding dues to the Micro and Small enterprises as defined in the MSMED as set out in following disclosure.

Particulars	As at 31 March 2020	As at 31 March 2019
(i) the principal amount and the interest due thereon remaining unpaid to any supplier as at the end of each accounting year;	21	79
(ii) the amount of interest paid by the buyer in terms of Section 16 of MSMED Act, 2006 along with the amounts of the payment made to the supplier beyond the appointed day during each accounting year;	-	-
(iii) the amount of interest due and payable for the period of delay in making payment (which have been paid but beyond the appointed day during the year) but without adding the interest specified under MEMED Act, 2006;	-	-
(iv) the amount of interest accrued and remaining unpaid at the end of each accounting year; and	-	1
(v) the amount of further interest remaining due and payable even in the succeeding years, until such date when the interest dues as above are actually paid to the small enterprise, for the purpose of disallowance as a deductible expenditure under the MSMED Act, 2006.	-	-

The above information regarding Micro, Small and Medium Enterprises has been determined to the extent such parties have been identified on the basis of information available with the Company. This has been relied upon by the auditors.

22. Revenue from operations

	For the year ended 31 March 2020	For the year ended 31 March 2019
Revenue from contracts with customers:		
Sale of goods	15,877	19,317
Sale of services	1,451	68
Job work income	302	150
Total (a)	**17,630**	**19,535**
Other operating revenues		
Export incentives	224	235
Budgetary support	31	62
Scrap sales	17	31
Total (b)	**272**	**328**
Total revenue from operations (a+b)	**17,902**	**19,863**
Disaggregation of revenue		
Revenue based on Geography (product destination):		
India	7,218	7,928
USA	8,230	8,741
Rest of the world	2,182	2,866
	17,630	**19,535**
Timing of revenue recognition		
Goods transferred at a point in time	15,877	19,317
Services transferred over time	1,753	218
	17,630	**19,535**

(All amounts in ₹ millions, except share data and where otherwise stated)

	For the year ended 31 March 2020	For the year ended 31 March 2019
Reconciliation of revenue from operations with contract price:		
Revenue as per contracted price	18,612	21,436
Adjusted for:		
Sales returns	(322)	(257)
Trade discounts and rebates	(660)	(1,644)
Total Revenue from operations	17,630	19,535

Contract liabilities resulting from advance payments by customers for delivery of goods are predominantly recognised as sales within one year. The aggregate amount of the transaction price allocated to the performance obligations that are unsatisfied as on 31 March 2020 is ₹ 4 (31 March 2019: ₹ 189) resulting from advance payments and shown under other current liabilities.

23. Other income

	For the year ended 31 March 2020	For the year ended 31 March 2019
Provisions no longer required written back	29	-
Interest income from financial assets carried at amortised cost	816	911
Profit on sale of property, plant and equipment, net	163	135
Foreign exchange gain, net	207	250
Other receipts	23	2
	1,238	1,298

24. Cost of material consumed

	For the year ended 31 March 2020	For the year ended 31 March 2019
Raw material consumed	3,018	3,116
Packing material consumed	272	215
	3,290	3,331

25. Changes in inventories of finished goods, work-in-progress and stock-in-trade

	For the year ended 31 March 2020	For the year ended 31 March 2019
Opening stock:		
- Finished goods	735	621
- Work-in-progress	1,405	1,239
- Stock-in-trade	13	38
	2,153	1,898
Closing stock:		
- Finished goods	1,140	735
- Work-in-progress	1,566	1,405
- Stock-in-trade	6	13
	2,712	2,153
	(559)	(255)

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(All amounts in ₹ millions, except share data and where otherwise stated)

26. Employee benefits expense

	For the year ended 31 March 2020	For the year ended 31 March 2019
Salaries, wages and bonus	2,940	2,717
Contribution to provident fund and other funds	223	199
Gratuity expense (Refer note 19)	103	91
Share based payment expense (Refer note 15(viii))	144	253
Staff welfare expenses	151	142
	3,561	3,402

Defined contribution plan:
The Company makes contributions, determined as a specified percentage of employee salaries, in respect of qualifying employees towards provident fund and employee state insurance schemes which are defined contribution plans. The Company has no obligations other than to make the specified contributions. The contribution to provident fund charged to the statement of profit and loss is ₹ 223 (31 March 2019: ₹ 199).

27. Finance costs

	For the year ended 31 March 2020	For the year ended 31 March 2019
Interest expense on liabilities at amortised cost:		
- Bank overdraft and others	177	162
Other borrowing cost	29	26
	206	188

28. Other expenses

	For the year ended 31 March 2020	For the year ended 31 March 2019
Consumption of stores and spares	290	372
Power and fuel	624	596
Rental charges (Refer note 40)	7	13
Repairs and maintenance		
- Buildings	55	50
- Plant and equipment	163	192
- Others	26	33
Insurance	146	101
Rates and taxes	267	233
Factory maintenance expenses	266	196
Clinical and analytical charges	469	283
Carriage and freight outward	39	46
Donations*	42	287
Corporate social responsibility (CSR) expenses (Refer note 34)	157	116
Corporate environment responsibility (CER) expenses	2	-
Communication expenses	73	65
Office maintenance	78	71
Travelling and conveyance	236	246
Legal and professional fees	299	305
Payment to auditors		
- Audit fees	5	4
- Expenses reimbursed	0	0
Directors sitting fee	1	1
Allowance for credit losses	175	-

(All amounts in ₹ millions, except share data and where otherwise stated)

	For the year ended 31 March 2020	For the year ended 31 March 2019
Bad debts written off	55	20
Royalty expense	259	698
Sales promotion expenses	187	289
Research and development expenses (refer note 38)	504	536
Miscellaneous expenses	166	152
	4,591	4,905

* Includes political contributions of ₹ 23 (31st March 2019: ₹ 233) made in accordance with Section 182 of the Companies Act, 2013.

29. Income-tax

(A) Components of Income-tax expenses

	For the year ended 31 March 2020	For the year ended 31 March 2019
(i) Tax expense recognised in profit and loss		
Current tax:		
Current year tax	1,251	1,863
Income-tax for earlier years	40	-
	1,291	1,863
Deferred tax charge/(credit) (net):		
Minimum Alternate Tax (MAT) credit utilisation (Refer note 29(E))	(382)	(60)
Origination and reversal of temporary differences	177	-
	(205)	(60)
Tax expense for the year	1,086	1,803
(ii) Tax recognised in other comprehensive income		
Items that will not be reclassified to profit and loss		
- Remeasurement of defined benefit plans	27	23
- Net gains / (losses) from investments in equity instruments designated at FVTOCI	7	1
	34	24

(B) Reconciliation of effective tax rate

The major components of income-tax expense and the reconciliation of expected tax expense based on the domestic effective tax rate of the Company at 34.944% (31 March 2019: 34.944%) and the reported tax expense in the statement of profit or loss are as follows:

	For the year ended 31 March 2020	For the year ended 31 March 2019
Profit before tax	5,831	8,474
Enacted tax rate applicable to the Company in India*	34.944%	34.944%
Tax using the Company's domestic tax rate	2,038	2,961
Tax effect of:		
Expense not deductible for tax purposes	74	50
Additional deduction allowed under Income-tax Act	(431)	(446)
Additional allowances under Income-tax Act	(378)	(685)
Utilisation of previously unutilised MAT credit**	(382)	(60)
Capital gain tax	(25)	(17)
Other timing differences	150	-
Tax pertaining to earlier years	40	-
Income-tax expense	1,086	1,803

*The Taxation Laws (Amendment) Ordinance, 2019 ('Ordinance') was promulgated by the President of India on 20 September 2019. The Ordinance has amended the Income-tax Act, 1961 and Finance Act, 2019 to inter-alia provide an option to a domestic company to pay

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income-tax at reduced rate of 22% plus applicable surcharge and cess subject to certain conditions. The Company has made an assessment of the impact of the Ordinance and decided to continue with the existing tax structure until utilisation of accumulated minimum alternative tax (MAT) credit.

**Also refer note 41

(C) Deferred tax assets and liabilities

The tax effects of significant temporary differences that resulted in deferred tax assets and liabilities and a description of the items that created these differences is given below:

	For the year ended 31 March 2020	For the year ended 31 March 2019
Deferred tax assets/(liabilities):		
Minimum Alternate Tax*	40	-
Trade receivables	61	-
Property , plant and equipment	(711)	(403)
Provision for employee benefits	351	279
Investments	3	11
	(256)	(113)

* As per Indian tax laws, companies are liable for a Minimum Alternate Tax ("MAT" tax) when current tax, as computed under the provisions of the Income-tax Act, 1961 ("Tax Act"), is determined to be below the MAT tax computed under section 115JB of the Tax Act. The excess of MAT tax over current tax is eligible to be carried forward and set-off in the future against the current tax liabilities over a period of 15 years.

The Company offsets tax assets and liabilities only if it has a legally enforceable right to set off current tax assets and current tax liabilities and the deferred tax assets and deferred tax liabilities relate to income taxes levied by the same tax authority.

Significant management judgement is required in determining provision for income-tax, deferred tax assets and liabilities and recoverability of deferred tax assets. The recoverability of deferred tax assets is based on estimates of taxable income by each jurisdiction in which the relevant entity operates and the period over which deferred tax assets will be recovered.

(D) Movement in deferred tax assets and liabilities

The details of movement in deferred tax assets and liabilities for the year ended 31 March 2020:

	As at 1 April 2019	Recognised in profit and loss	Recognised in OCI	As at 31 March 2020
Deferred tax assets/(liabilities):				
Minimum Alternate Tax	-	40	-	40
Trade receivables	-	61	-	61
Property , plant and equipment	(403)	(308)	-	(711)
Provision for employee benefits	279	45	27	351
Investments	11	(15)	7	3
Net deferred tax assets/(liabilities)	(113)	(177)	34	(256)

The details of movement in deferred tax assets and liabilities for the year ended 31 March 2019:

	As at 1 April 2018	Recognised in profit and loss	Recognised in OCI	As at 31 March 2019
Deferred tax assets/(liabilities):				
Property , plant and equipment	(308)	(95)	-	(403)
Provision for employee benefits	161	95	23	279
Investments	10	-	1	11
Net deferred tax assets/(liabilities)	(137)	-	24	(113)

(All amounts in ₹ millions, except share data and where otherwise stated)

(E) Unrecognised deferred tax assets

	As at 31 March 2020	As at 31 March 2019
Unrecognised MAT credit entitlement	1,237	1,619
	1,237	**1,619**

The Company did not recognise deferred tax assets of ₹ 1,237 million on MAT credit entitlement, as the Company is unable to estimate the availability of taxable profits with reasonable certainty after taking into consideration the tax holiday units/ benefits available including financial projections and availability of sufficient taxable income in foreseeable future. The above MAT credit expires at various dates ranging from 2029 through 2032.

30. Earnings per share (EPS)

	For the year ended 31 March 2020	For the year ended 31 March 2019
Earnings:		
Profit for the year	4,745	6,671
Shares:		
Number of equity shares at the beginning of the year	182,746,479	184,493,400
Effect of equity shares issued on exercise of stock options	95,712	123,292
Effect of equity shares bought back during the year	(907,668)	(411,270)
Weighted average number of equity shares – Basic	**181,934,523**	**184,205,422**
Dilutive effect of stock options outstanding	521,079	571,121
Weighted average number of equity shares – Diluted	**182,455,602**	**184,776,543**
Earnings per equity share (face value of ₹ 2/- each):		
Basic (in ₹)	26.08	36.22
Diluted (in ₹)	26.01	36.10

31. Financial instruments - fair values

Accounting classification and fair values

The following table shows the carrying amounts and fair values of the financial assets and financial liabilities including their levels in the fair value hierarchy.

As at 31 March 2020:

Particulars	Note	Carrying amount	Fair value		
			Level 1	Level 2	Level 3
A. Financials assets					
Financial assets measured at FVOCI					
Non-current investments	8	335	-	-	335
Current investments	8	50	50	-	-
Financial assets measured at amortised cost					
Non-current investments	8	501	-	-	-
Loans	9	765	-	-	-
Trade receivables	13	5,367	-	-	-
Cash and cash equivalents	14	79	-	-	-
Bank balances other than cash and cash equivalents	14	462	-	-	-
Other financial assets	10	8,653	-	-	-
		16,212	**50**	**-**	**335**

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	Note	Carrying amount	Fair value		
			Level 1	Level 2	Level 3
B. Financials liabilities					
Financial liabilities measured at amortised cost					
Borrowings (including lease liability)	17	3,140	-	-	17
Trade payables	21	2,342	-	-	-
Other financial liabilities	18	820	-	-	-
		6,302	-	-	17

As at 31 March 2019:

Particulars	Note	Carrying amount	Fair value		
			Level 1	Level 2	Level 3
A. Financials assets					
Financial assets measured at FVOCI					
Non-current investments	8	196	-	-	196
Current investments	8	68	68	-	-
Financial assets measured at amortised cost					
Non-current investments	8	3			
Current investments	8	1,200	-	-	-
Loans	9	665	-	-	-
Trade receivables	13	4,916	-	-	-
Cash and cash equivalents	14	115	-	-	-
Bank balances other than cash and cash equivalents	14	2,512	-	-	-
Other financial assets	10	7,024	-	-	-
		16,699	68	-	196
B. Financials liabilities					
Financial liabilities measured at amortised cost					
Borrowings	17	3,845	-	-	-
Trade payables	21	2,018	-	-	-
Other financial liabilities	18	779	-	-	-
		6,642	-	-	-

The Company's financial liabilities comprise of borrowings from banks, lease liability, trade payables and other financial liabilities. The main purpose of these financial liabilities is to finance the Company's operations. The Company's principal financial assets include loans, trade receivables, other financial assets, cash and cash equivalents and other bank balances that derive directly from its operations. The Company also holds certain strategic investments in entities other subsidiaries.

The fair value of cash and cash equivalents, bank balances, trade receivables, loans, unquoted debentures and bonds, borrowings, trade payables and other financial assets and liabilities approximate their carrying amount largely due to the nature of these instruments. The Company's loans have been contracted at market rates of interest. Accordingly, the carrying value of such loans approximate fair value.

The following methods and assumptions were used to estimate the fair values:

Level 1: The fair value of the quoted equity investments are based on market price at the reporting date.

Level 3: The Investments measured at fair value and falling under fair value hierarchy Level 3 are valued on the basis of valuation reports provided by external valuers with the exception of certain investments, where the impact of fair valuation of investment is considered as insignificant and hence carrying value and fair value is considered as same.

(All amounts in ₹ millions, except share data and where otherwise stated)

32. Financial risk management

The Company's financial risk management is an integral part of how to plan and execute its business strategies. The Company's activities expose it to a variety of financial risks: credit risk, liquidity risk and market risk. The Company's primary focus is to foresee the unpredictability of financial markets and seek to minimise potential adverse effects on its financial performance. A summary of the risks have been given below.

A. Market risk:

Market risk is the risk that the fair value of future cash flows of a financial instrument will fluctuate because of changes in market prices. Market risk comprises two types of risks: interest rate risk and currency risk. Financial instruments affected by market risk include borrowings, deposits, loans, trade receivables and trade payables.

i. Interest rate risk

Interest rate risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates. The Company's entire borrowings carried at amortised cost are variable rate instruments and are subject to fluctuation because of a change in market interest rates. The Company considers the impact of fair value interest rate risk on variable rate borrowings as not material.

The Company's variable rate borrowing is subject to interest rate risk. Below are the details of exposure to fixed rate and variable rate instruments:

Particulars	As at 31 March 2020	As at 31 March 2019
Fixed rate instruments		
Financial assets	9,119	10,562
Financial liabilities	17	-
Variable rate instruments		
Financial liabilities (other than lease liability)	3,123	3,845

ii. Foreign currency risk:

Foreign currency risk is the risk that the fair value or future cash flows of an exposure will fluctuate because of changes in foreign exchange rates. The Company is exposed to currency risk to the extent that there is mismatch between the currencies in which sales, purchase are denominated and the respective functional currencies of Company companies. The Company's exposure to the risk of changes in foreign exchange rates relates primarily to the Company's operating activities.

The Company's exposure to foreign currency financial assets and financial liabilities expressed in ₹ are as follows:

Financial assets

	31 March 2020			31 March 2019		
	Trade receivables*	Loans	Other financial assets	Trade receivables*	Loans	Other financial assets
- USD	3,449	413	19	2,739	368	11
- EUR	47	-	-	55	-	-
- CAD	123	-	-	147	-	-
- SGD	8	111	4	3	108	1

Financial liabilities

	31 March 2020		31 March 2019	
	Trade payables	Borrowings*	Trade payables	Borrowings*
- USD	214	1,655	158	701
- EUR	22	16	45	-
- GBP	0	-	1	-

'* Includes bills purchased and discounted which are forming part of trade receivables and current borrowings amounting to ₹ 1,671 (31 March 2019: ₹ 701). These are realised amounts and hence there is no further foreign currency risk is involved.

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

Foreign currency sensitivity

A reasonably possible strengthening (weakening) of the Indian Rupee against various foreign currencies at 31 March would have affected the measurement of financial instruments denominated in foreign currencies and affected equity and profit or loss by the amounts shown below. This analysis assumes that all other variables, in particular interest rates, remain constant and ignores any impact of forecast sales and purchases.

The following table demonstrates the sensitivity to a reasonably possible change in USD. The Company's exposure to foreign currency changes for all other currencies is not material.

Particulars	Impact on profit and loss after tax gain/(loss) for the year ended	
	31 March 2020	31 March 2019
USD sensitivity		
₹/USD - Appreciate by 10%	201	226
₹/USD - Depreciate by 10%	(201)	(226)

B. Credit risk

Credit risk is the risk of financial loss to the Company if a customer or counterparty to a financial instrument fails to meet its contractual obligations, and arises principally from the Company's receivables from customers and loans given. Credit risk arises from cash held with banks and financial institutions, as well as credit exposure to clients, including outstanding accounts receivables. The maximum exposure to credit risk is equal to the carrying value of the financial assets. The objective of managing counterparty credit risk is to prevent losses in financial assets. The Company assesses the credit quality of the counterparties, taking into account their financial position, past experience and other factors.

Trade and other receivables:

The Company's exposure to credit risk is influenced mainly by the individual characteristics of each customer. The demographics of the customer, including the default risk of the industry and country in which the customer operates, also has an influence on credit risk assessment. Credit risk is managed through credit approvals, establishing credit limits and continuously monitoring the creditworthiness of customers to which the Company grants credit terms in the normal course of business.

The maximum exposure to credit risk for trade receivables (Gross) by geographic region is as follows:

Particulars	As at 31 March 2020	As at 31 March 2019
India	1,914	2,846
USA	2,825	1,859
Rest of the world	803	211
	5,542	4,916

The ageing of trade receivables are as follows:

Particulars	As at 31 March 2020	As at 31 March 2019
Neither past due nor impaired	3,579	3,620
Past due not impaired:		
1-180 days	1,855	1,183
More than 180 days	108	113
Allowance for credit losses	(175)	-
	5,367	4,916

As per simplified approach the Company makes provision of expected credit losses on trade receivable using a provision matrix to mitigate the risk of default payment and make appropriate provision at each reporting date wherever required.

(All amounts in ₹ millions, except share data and where otherwise stated)

Other financial assets:
Other financial assets primarily consist cash and cash equivalents and deposits. Credit risk on cash and cash equivalents and deposits with banks and financial institutions are generally low as the said deposits have been made with the banks and financial institutions who have been assigned high credit rating by international and domestic credit rating agencies.

Investments in other than subsidiaries are strategic investments in the normal course of business of the Company. Loans to related parties are given for business purposes. The Company reassesses the recoverability of loans periodically. Interest recoveries from these loans are regular and there is no event of defaults.

C. Liquidity risk

Liquidity risk is the risk that the Company will encounter difficulty in meeting the obligations associated with its financial liabilities that are settled by delivering cash or another financial asset. The Company's approach to managing liquidity is to ensure, as far as possible, that it will have sufficient liquidity to meet its liabilities when they are due, under both normal and stressed conditions, without incurring unacceptable losses or risking damage to the Company's reputation.

Management monitors rolling forecasts of the Company's liquidity position and cash and cash equivalents on the basis of expected cash flows. The Company takes into account the liquidity of the market in which the entities operates. In addition, the Company's liquidity management policy involves projecting cash flows in major currencies and considering the level of liquid assets necessary to meet these, monitoring balance sheet liquidity ratios against internal and external regulatory requirements and maintaining debt financing plans.

Company's principal sources of liquidity are the cash flows generated from operations. The Company has no long-term borrowings and believes that the working capital is sufficient for its current requirements. Accordingly, no liquidity risk is perceived.

Maturities of financial liabilities
The tables below analyse the Company's financial liabilities into relevant maturity groupings based on their contractual maturities for all non-derivative financial liabilities. The amounts disclosed in the table are the contractual undiscounted cash flows. Balances due within 12 months equal their carrying balances as the impact of discounting is insignificant.

As at 31 March 2020	Carrying value	Up to 1 year	From 1 to 3 years	More than 3 years	Total
Financial liabilities					
Borrowings	3,123	3,123	-	-	3,123
Lease liabilities	17	8	7	393	408
Trade payables	2,342	2,342	-	-	2,342
Other financial liabilities	820	812	8	-	820
Total	**6,302**	**6,285**	**15**	**393**	**6,693**

As at 31 March 2019	Carrying value	Up to 1 year	From 1 to 3 years	More than 3 years	Total
Financial liabilities					
Borrowings	3,845	3,845	-	-	3,845
Trade payables	2,018	2,018	-	-	2,018
Other financial liabilities	779	771	8	-	779
Total	**6,642**	**6,634**	**8**	**-**	**6,642**

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

33. Capital management

The Company's objective when managing capital is to safeguard the Company's ability to continue as a going concern in order to provide returns for shareholders and benefits for stakeholders. The Company also proposes to maintain an optimal capital structure to reduce the cost of capital. Hence, the Company may adjust any dividend payments, return capital to shareholders or issue new shares. Total capital is the equity as shown in the Standalone Balance Sheet. Currently, the Company primarily monitors its capital structure on the basis of gearing ratio. Management is continuously evolving strategies to optimise the returns and reduce the risks. It includes plans to optimise the financial leverage of the Company.

The capital for the reporting year under audit is summarised as follows:

	As at 31 March 2020	As at 31 March 2019
Total borrowings	3,123	3,845
Less: Cash and cash equivalents	(79)	(115)
Net debt [A]	**3,044**	**3,730**
Total equity [B]	38,695	35,632
Total capital [C=A+B]	**41,739**	**39,362**
Gearing ratio (%) [A/C]	7%	9%

34. Corporate social responsibility (CSR) expenses

During the year, the amount required to be spent on corporate social responsibility activities amounted to ₹ 156 (31 March 2019: ₹ 116) in accordance with Section 135 of the Act, 2013. The following amounts were actually spent during the current and previous year:

Particulars	As at 31 March 2020	As at 31 March 2019
Amount spent in cash:		
(i) Amount spent for other than for construction/ acquisition of any asset	-	-
(ii) On purposes other than (i) above*	157	116
Amount yet to be paid in cash	-	-
Total	**157**	**116**

*The Company has contributed the amount of ₹ 157 (Previous year: ₹ 116) to NATCO Trust towards CSR activities (Refer note 35(a)).

35. Related party disclosures, as per Ind AS 24

(a) Names of the related parties and nature of relationship (to the extent transactions have taken place during the year)

Nature of relationship	Names of the related parties
1. Subsidiary companies	NATCO Pharma Inc., United States of America
	Time Cap Overseas Limited, Mauritius
	NATCO Pharma (Canada) Inc., Canada
	NATCO Pharma Asia Pte. Ltd., Singapore
	NATCO Pharma Australia PTY Ltd., Australia
	NATCO Lifesciences Philippines Inc., Philippines
2. Step-down subsidiary company	Natcofarma Do Brasil Ltda., Brazil
3. Entities in which Directors have control or have significant influence	Time Cap Pharma Labs Limited
	NATCO Trust
4. Key management personnel ("KMP")	
Chairman and Mangaing Director	Mr. V C Nannapaneni
Vice Chairman and Chief Executive Officer ("CEO")	Mr. Rajeev Nannapaneni
Wholetime Director	Mr. Potluri Prasad Sivaramakrishna
Wholetime Director	Mr. Lingarao Donthineni
Chief Financial Officer	Mr. S.V.V.N. Appa Rao
Company Secretary	Mr. Adinarayana M

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

5.	Non-Executive Directors and Independent Directors	
	Independent Director	Mr. Sreerama Murthy Gubbala
	Independent Director	Mr. Govinda Prasad Dasu
	Independent Director	Mr. Umamaheshwarrao Naidu Madireddi
	Independent Director	Mr. Venkateswara Rao Thallapaka
	Non-Executive Director	Mr. Sridhar Sankararaman
	Independent Director	Mrs. Leela Digumarti
6.	Relatives of KMP	Mrs. Durga Devi Nannapaneni
		Dr. N. Ramakrishna Rao
		Mrs. V S Swathi Kantamani

(b) Related party transactions during the year

Related party transactions during the year	For the year ended 31 March 2020	For the year ended 31 March 2019
Time Cap Overseas Limited, Mauritius		
Investment in equity shares	9	-
Share application money	-	2
Loan given	18	165
Interest income on loan	10	10
NATCO Pharma (Canada) Inc., Canada		
Sale of products	156	150
NATCO Pharma Asia Pte Ltd., Singapore		
Investment in equity shares	13	24
Loan given	-	108
Interest income on loan	6	1
Sale of products	14	7
Natcofarma Do Brasil Ltda., Brazil		
Sale of products	281	48
NATCO Pharma Australia Pty Ltd., Australia		
Investment in equity shares	4	7
NATCO Pharma Inc., United States of America		
Loan given	-	114
Interest income on loan	6	2
NATCO Lifesciences Philippines Inc., Philippines		
Investment in equity shares	24	12
Loan given	-	7
Interest income on loan	0	0
Time Cap Pharma Labs Limited		
Sales promotion expenses	-	6
Purchase of Land	-	49
Rental expense	5	5
NATCO Trust		
Donations	0	24
Contribution to corporate social responsibility activities	157	116
Mr. V C Nannapaneni		
Short-term employee benefits*	18	17
Leave encashment paid	1	1
Rental expense	2	2
Mr. Rajeev Nannapaneni		
Short-term employee benefits*	17	16
Leave encashment paid	1	1

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

Related party transactions during the year	For the year ended 31 March 2020	For the year ended 31 March 2019
Rental expense	3	1
Mr. Potluri Prasad Sivaramakrishna		
Short-term employee benefits*	18	14
Leave encashment paid	0	0
Mr. Lingarao Donthineni		
Short-term employee benefits*	18	14
Leave encashment paid	0	0
Mr. S.V.V.N. Appa Rao		
Short-term employee benefits*	9	6
Mr. Adinarayana M		
Short-term employee benefits*	5	4
Sitting fees:		
Mr. Govinda Prasad Dasu	0	0
Mrs. Leela Digumarti	0	0
Mr. Umamaheshwarrao Naidu Madireddi	0	0
Mr. Sreerama Murthy Gubbala	0	0
Mr. Venkateswara Rao Thallapaka	0	0

(c) Related party closing balances as on balance sheet date receivable/(payable):

	As at 31 March 2020	As at 31 March 2019
Loan receivable		
NATCO Pharma Inc., United States of America	124	114
Time cap Overseas Limited, Mauritius	289	247
NATCO Pharma Asia PTE Ltd., Singapore	111	108
NATCO Lifesciences Philippines Inc., Philippines	-	7
Interest receivable on loans		
NATCO Pharma Inc., United States of America	8	2
Time cap Overseas Limited, Mauritius	11	9
NATCO Pharma Asia PTE Ltd., Singapore	4	1
Trade receivables		
NATCO Pharma (Canada) Inc., Canada	120	132
Natcofarma Do Brasil Ltda., Brazil	266	47
NATCO Pharma Asia PTE Ltd., Singapore	8	7
Trade payable		
Time Cap Pharma Labs Limited	-	(0)
Remuneration payable		
Mr. V.C. Nannapaneni	-	(2)
Mr. Rajeev Nannapaneni	(1)	(1)
Mr. Lingarao Donthineni	(3)	(1)
Mr. Potluri Prasad Sivaramakrishna	(3)	(1)
Mr. S.V.N.N. Appa Rao	0	0
Mr. Adinarayana M	0	0

*This aforesaid amount does not include amounts in respect of gratuity and compensated absences as the same are determined on actuarial basis for the Company as a whole.

(All amounts in ₹ millions, except share data and where otherwise stated)

36. Segment reporting

The Company has presented segment information in the consolidated financial statements which are presented in the same Annual Report. Accordingly, in terms of paragraph 3 of Ind AS 108 'Operating Segments' no disclosures related to segment are presented in this standalone financial statements.

37. Contingent liabilities and commitments

(a) Commitments

	As at 31 March 2020	As at 31 March 2019
Estimated amount of contracts remaining to be executed on capital account and not provided for (net of advances)	834	753
Pending export obligation under EPCG Scheme	143	141

(b) Contingent liabilities

(i) Matters under appeals with tax authorities:

	As at 31 March 2020	As at 31 March 2019
Disputed sales tax liabilities	9	9
Disputed service tax liabilities	-	17
Disputed customs liability	2	2

(ii) The Company is contesting certain patent infringement cases filed against it by the innovators in the ordinary course of business. A few of these cases pertain to products already launched by the Company in the market. These cases are pending before different authorities / courts and most of the claims involve complex issues. The outcome from these claims are uncertain due to a number of factors involved in legal trial such as stage of the proceedings and the overall length and extent of pre-trial discovery; the entitlement of the parties to an action to appeal a decision; clarity as to theories of liability; damages and governing law; uncertainties in timing of litigation; and the possible need for further legal proceedings to establish the appropriate amount of damages, if any. Often, these issues are subject to uncertainties and therefore the probability of a loss, if any, being sustained and an estimate of the amount of any loss is difficult to ascertain. Consequently, for a majority of these claims, it is not possible to make a reasonable estimate of the expected financial effect, if any, that will result from ultimate resolution of the proceedings. Further, at present, the management does not expect such liabilities to be significant.

(iii) The Hon'ble Supreme Court (SC) has clarified in the case of Vivekananda Vidyamandir and Others Vs. The Regional Provident Fund Commissioner (II) West Bengal that various allowances like conveyance allowance, special allowance, education allowance, medical allowance etc., paid uniformly and universally by an employer to its employees shall form part of basic wages for computation of the provident fund contribution. However, considering that there are numerous interpretative issues relating to this judgement, on the basis of internal evaluation, supported by a legal opinion from an independent legal expert, management of the Company has determined that the aforesaid ruling is applicable prospectively.

38. Amounts incurred on research and development expenses

	For the year ended 31 March 2020	For the year ended 31 March 2019
Salaries and wages	527	501
Consumption of materials and spares	210	314
Power and fuel	33	29
Other research and development expenses	644	844
Capital equipment	242	288
	1,656	1,976

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

The aforementioned expenditure, other than capital equipment, are included under the respective heads of the Statement of Profit and Loss.

39. Capital work-in-progress

	As at 31 March 2020	As at 31 March 2019
Opening balance	6,375	4,800
Costs incurred toward construction activity	2,652	4,206
Expenses capitalised:		
Cost of materials consumed, net of trial run inventory recognised	10	1
Employee benefits expense	41	54
Power and fuel	38	39
Factory maintenance	73	88
Rates and taxes	22	3
Legal and professional charges	45	1
Others	18	23
Less:		
Capitalised during the year	(4,096)	(2,840)
	5,178	6,375

40. Leases

Transition to Ind AS 116

Ministry of Corporate Affairs ("MCA") through Companies (Indian Accounting Standards) Amendment Rules, 2019 and Companies (Indian Accounting Standards) Second Amendment Rules, has notified Ind AS 116 Leases which replaces the existing lease standard, Ind AS 17 leases and other interpretations. Ind AS 116 sets out the principles for the recognition, measurement, presentation and disclosure of leases for both lessees and lessors. It introduces a single, on-balance sheet lease accounting model for lessees.

Effective 01 April 2019, the Company adopted Ind AS 116 "Leases" and applied the standard to all lease contracts existing on 01 April 2019 using the modified retrospective method. Right-of-use of assets at 01 April 2019 for leases previously classified as operating leases were recognised and measured at an amount equal to lease liability (adjusted for related prepayments/ accruals). The Company recorded the lease liability at the present value of all future lease payments discounted at the incremental borrowing rate. Comparatives as at and for the year ended 31 March 2019 have not been retrospectively adjusted and therefore will continue to be reported under the accounting policies included as part of our Annual Report for year the ended 31 March 2019.

On 01 April 2019, the Company recognised lease liability of ₹ 20 (presented as a part of borrowings net of prepaid lease rent of ₹ 18) and right-of-use assets of ₹ 38 as at 01 April 2019 (presented as part of property, plant and equipment). The Company has reclassified the leasehold land of ₹ 251 to right-of-use asset as at 01 April 2019. The adoption of the standard did not have any material impact on the financial statements for the current period.

Following are the changes in the lease liability for the year ended 31 March 2020:

Particulars	Amount
Lease commitments as at 1 April 2019	20
Additions during the year	2
Finance cost accrued	3
Payment of lease liabilities	(8)
Lease liabilities as at 31 March 2020	17
Current lease liability	8
Non-current lease liabilities	9

(All amounts in ₹ millions, except share data and where otherwise stated)

The impact on account on adoption of Ind AS 116 is as follows :

Particulars	Amount
Increase in lease liability as at 31 March 2020 by	17
Increase in Right-of use as at 31 March 2020 by	284
Increase in finance cost by	3
Increase in depreciation by	2

Maturity analysis of lease liabilities as at 31 March 2020:

Maturity analysis – contractual undiscounted cash flows	Amount
Less than one year	8
One to three years	7
More then three years	393
Total undiscounted lease liabilities as at 31 March 2020	408

The Company does not face a significant liquidity risk with regard to its lease liabilities as the current assets are sufficient to meet the obligations related to lease liabilities as and when they fall due.

The following is the rental expense recorded for short-term leases for the year ended 31 March 2020:

Particulars	Amount
Variable lease expenses (other than short term)	-
Short-term lease expense	7
Low value lease expense	-

Amounts recognised in the statement of cash flows for the year ended 31 March 2020:

Particulars	Amount
Payment of lease liabilities	(8)
Short-term lease expense	(7)

41. During the year ended 31 March 2020, pursuant to the Upside Sharing Agreement dated 16 May 2019 entered with CX Securities Limited ("the Investor"), the Company has received a voluntary amount of USD 6.83 million (₹ 474 million) from the equity participant. In accordance with the Applicable Accounting Framework, the aforementioned gain, received from the equity participant, is recognised as an increase in equity, net of tax.

42. In March 2020, the World Health Organisation declared COVID-19 to be a pandemic. The Company has adopted measures to curb the spread of infection in order to protect the health of its employees and ensure business continuity with minimal disruption. The Company has considered internal and external information while finalizing various estimates and recoverability of assets in relation to its financial statement captions up to the date of approval of the financial statements by the Board of Directors. Considering the Company is in the business of manufacturing and supplying of pharmaceutical products which is categorised under essential goods, there has been a minimal disruption with respect to operations including production and distribution activities. The actual impact of the global health pandemic may be different from that which has been estimated, as the COVID-19 situation evolves in India and globally. The Company will continue to closely monitor any material changes to the future economic conditions.

Notes to standalone financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

43. The disclosures regarding details of specified bank notes held and transacted during 8 November 2016 to 30 December 2016 has not been made in these standalone financial statements since the requirement does not pertain to financial year ended 31 March 2020.

44. Events after reporting period

The Board of Directors at their meeting held on 17 June 2020 have recommended an interim dividend of ₹ 1 per equity share of ₹ 2 each for the year ended 31 March 2020.

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No. 116231W/ W-100024

Vikash Somani
Partner
Membership Number: 061272

Place: Hyderabad
Date: 17 June 2020

for and on behalf of the Board of Directors
NATCO Pharma Limited
CIN: L24230TG1981PLC003201

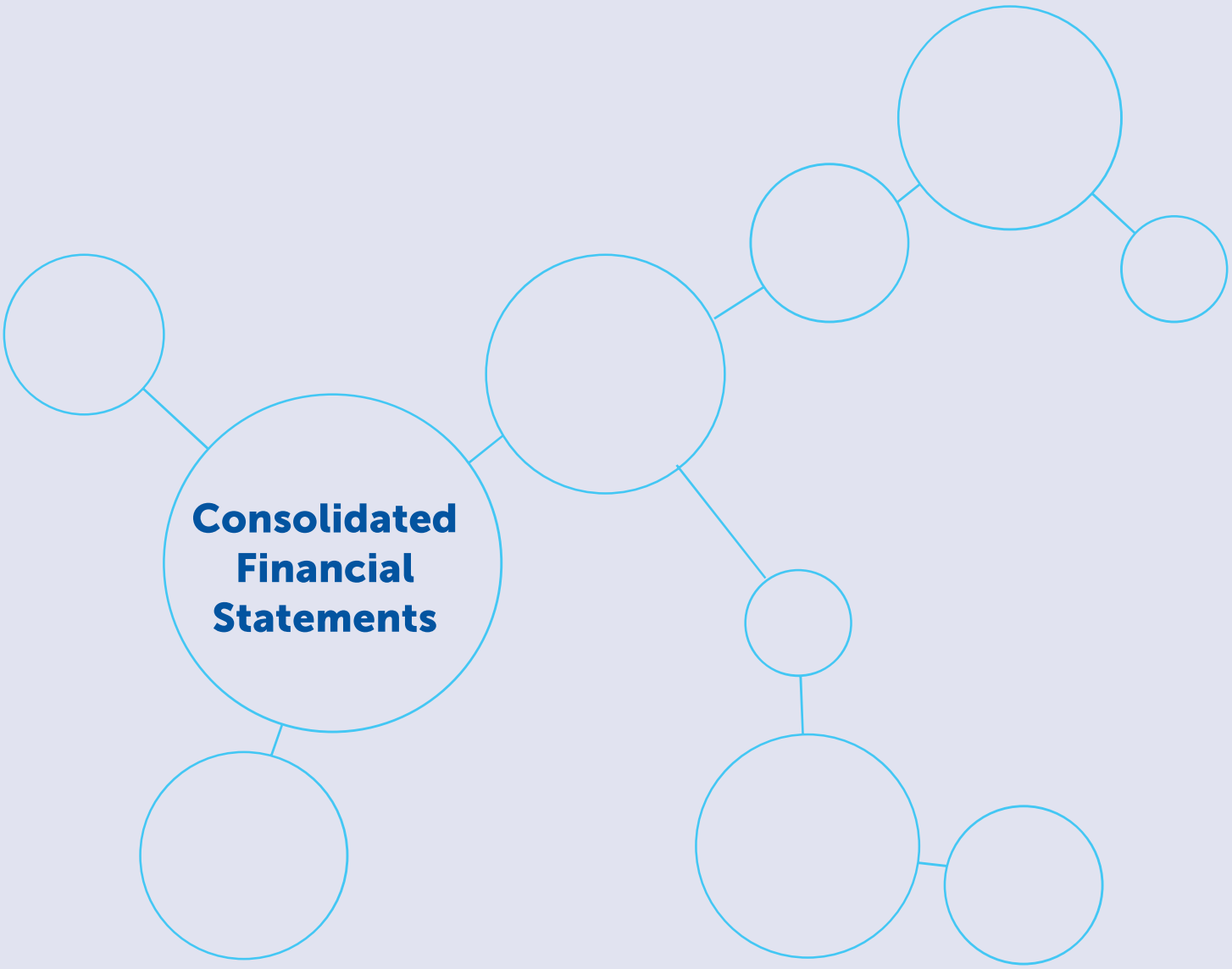
V C Nannapaneni
Chairman and Managing Director
DIN: 00183315

Rajeev Nannapaneni
Vice Chairman and CEO
DIN: 00183872

M. Adinarayana
Company Secretary

S V V N Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 17 June 2020


Consolidated
Financial
Statements

Independent Auditors' Report

To the Members of
NATCO Pharma Limited

Report on the Audit of Consolidated Financial Statements

Opinion

We have audited the consolidated financial statements of NATCO Pharma Limited (hereinafter referred to as the 'Holding Company") and its subsidiaries (Holding Company and its subsidiaries together referred to as "the Group"), which comprise the consolidated balance sheet as at 31 March 2020, and the consolidated statement of profit and loss (including other comprehensive income), consolidated statement of changes in equity and consolidated statement of cash flows for the year then ended, and notes to the consolidated financial statements, including a summary of significant accounting policies and other explanatory information (hereinafter referred to as "the consolidated financial statements").

In our opinion and to the best of our information and according to the explanations given to us, and based on the consideration of reports of other auditors on separate financial statements of such subsidiaries as were audited by the other auditors, the aforesaid consolidated financial statements give the information required by the Companies Act, 2013 ("Act") in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India, of the consolidated state of affairs of the Group, as at 31 March 2020, of its consolidated profit and other comprehensive income, consolidated changes in equity and consolidated cash flows for the year then ended.

Basis for Opinion

We conducted our audit in accordance with the Standards on Auditing (SAs) specified under Section 143(10) of the Act. Our responsibilities under those SAs are further described in the Auditor's Responsibilities for the Audit of the Consolidated Financial Statements section of our report. We are independent of the Group, in accordance with the ethical requirements that are relevant to our audit of the consolidated financial statements in terms of the Code of Ethics issued by the Institute of Chartered Accountants of India and the relevant provisions of the Act, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence obtained by us along with the consideration of audit reports of the other auditors referred to in sub paragraph (a) of the "Other Matters" paragraph below, is sufficient and appropriate to provide a basis for our opinion on the consolidated financial statements.

Key Audit Matters

Key audit matters are those matters that, in our professional judgment, were of most significance in our audit of the consolidated financial statements of the current period. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters.

The key audit matter	How the matter was addressed in our audit
Revenue recognition: Refer to Note 3(e) of the summary of significant accounting policies to the consolidated financial statements. Revenue is recognised when the control of the products being sold has transferred to the customer. The Group has a large number of customers operating in various geographies and sale contracts with customers have a variety of different terms relating to the recognition of revenue. Control is usually transferred upon shipment/ delivery to/ upon receipt of goods by the customer, in accordance with the delivery and acceptance terms agreed with the customers. We identified the recognition of revenue from sale of products as a key audit matter because the Group and its external stakeholders focus on revenue as a key performance indicator. There could be a risk that revenue is recognised in the incorrect period or before the control has been transferred to the customer.	In view of the significance of the matter we applied the following audit procedures in this area, among others to obtain sufficient and appropriate audit evidence: 1) Evaluated the appropriateness of the revenue recognition accounting policies by comparing with applicable accounting standards. 2) Tested design, implementation and operating effectiveness of the Group's controls over measurement and recognition of revenue in accordance with customer contracts which includes control over transaction pricing, including discounts and correct timing of revenue recognition. 3) Performed substantive testing (including year-end cut-off testing) by selecting samples of revenue transactions recorded during the year (and before and after the financial year end), including one off sales to customers, by verifying the underlying documents, which included sales invoices/ contracts and shipping documents. 4) Performed testing by selecting samples relating to revenue transactions, recorded during the year with relevant underlying documents and we read, analysed and identified the distinct performance obligations in these contracts. 5) We scrutinised manual journals posted to revenue to identify unusual items.

The key audit matter	How the matter was addressed in our audit
Deferred tax asset: The Holding Company operates in a complex tax jurisdiction in India with various tax exemptions available. The Holding Company has paid minimum alternate tax (MAT) under Section 115JB of the Income-tax Act, 1961. The MAT paid would be available as offset over a period of 15 years. The MAT credit is recognised as a deferred tax asset that will be available for offset when the Holding Company pays regular taxes under the provisions of Income-tax Act, 1961. Refer note 28(E) to the consolidated financial statements for unrecognised deferred tax asset amounting to ₹ 1,237 million as at 31 March 2020. In assessing whether the deferred tax assets will be realised, Holding Company considers whether some portion or all of the deferred tax assets will not be realised. The ultimate realisation of the deferred tax assets is dependent upon the generation of future taxable income during the periods in which the temporary differences become deductible. The extent of recognition of deferred tax asset on account of MAT credit requires significant judgment regarding the Holding Company's future taxable income which will result in utilisation of the MAT credit within the time limits available under the applicable Income tax laws.	In view of the significance of the matter, we applied the following audit procedures in this area, among others to obtain sufficient appropriate audit evidence: 1) Tested the operating effectiveness of controls over Holding Company's review of deferred tax asset recognition. 2) We analysed origination of MAT credit entitlement and reviewed Holding Company's assessment and conclusion in relation to its utilisation within the period allowed for carry forward and set off against foreseeable forecast taxable income streams. 3) We evaluated appropriateness of taxation disclosures in note 28 to the consolidated financial statements, including the enhanced disclosures made in respect of the utilisation period of deferred tax assets in relation to MAT credit entitlement.

Other Information

The Holding Company's management and the Board of Directors are responsible for the other information. The other information comprises the information included in the Holding Company's annual report, but does not include the consolidated financial statements and our auditors' report thereon. The Annual report is expected to be made available to us after the date of this auditor's report.

Our opinion on the consolidated financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

In connection with our audit of the consolidated financial statements, our responsibility is to read the other information identified above when it becomes available and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated.

When we read the Annual report, if we conclude that there is a material misstatement therein, we are required to communicate the matter to those charged with governance and take actions as per applicable laws and regulations.

Management's and Board of Directors' Responsibilities for the Consolidated Financial Statements

The Holding Company's Management and Board of Directors are responsible for the preparation and presentation of these consolidated financial statements in term of the requirements of the Act that give a true and fair view of the consolidated state of affairs, consolidated profit/ loss and other comprehensive income, consolidated statement of changes in equity and consolidated cash flows of the Group in accordance with the accounting principles generally accepted in India, including the Indian Accounting Standards (Ind AS) specified under Section 133 of the Act. The respective Management and Board of Directors of the companies included in the Group are responsible for maintenance of adequate accounting records in accordance with the provisions of the Act for safeguarding the assets of each company and for preventing and detecting frauds and other irregularities; the selection and application of appropriate accounting policies; making judgments and estimates that are reasonable and prudent; and the design, implementation and maintenance of adequate internal financial controls, that were operating effectively for ensuring accuracy and completeness of the accounting records, relevant to the preparation and presentation of the consolidated financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error, which have been used for the purpose of preparation of the consolidated financial statements by the Management and Directors of the Holding Company, as aforesaid.

In preparing the consolidated financial statements, the respective Management and Board of Directors of the companies included in the Group are responsible for assessing the ability of each company to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the respective Board of Directors either

intends to liquidate the Company or to cease operations, or has no realistic alternative but to do so.

The respective Board of Directors of the companies included in the Group is responsible for overseeing the financial reporting process of each company.

Auditor's Responsibilities for the Audit of the Consolidated Financial Statements

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

As part of an audit in accordance with SAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances. Under Section 143(3)(i) of the Act, we are also responsible for expressing our opinion on the internal financial controls with reference to the consolidated financial statements and the operating effectiveness of such controls based on our audit.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Management and Board of Directors.
- Conclude on the appropriateness of Management and Board of Directors use of the going concern basis of accounting in preparation of consolidated financial statements and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the appropriateness of this assumption. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the consolidated financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- Obtain sufficient appropriate audit evidence regarding the financial information of such entities or business activities within the Group to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the audit of financial information of such entities included in the consolidated financial statements of which we are the independent auditors. For the other entities included in the consolidated financial statements, which have been audited by other auditors, such other auditors remain responsible for the direction, supervision and performance of the audits carried out by them. We remain solely responsible for our audit opinion. Our responsibilities in this regard are further described in para (a) of the section titled 'Other Matters' in this audit report.

We believe that the audit evidence obtained by us along with the consideration of audit reports of the other auditors referred to in sub-paragraph (a) of the Other Matters paragraph below, is sufficient and appropriate to provide a basis for our audit opinion on the consolidated financial statements.

We communicate with those charged with governance of the Holding Company and such other entities included in the consolidated financial statements of which we are the independent auditors regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

From the matters communicated with those charged with governance, we determine those matters that were of

most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditors' report unless law or regulation precludes public disclosure about the matter or when, in extremely rare circumstances, we determine that a matter should not be communicated in our report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.

Other Matters

(a) We did not audit the financial statements of seven subsidiaries, whose financial statements reflect total assets of ₹ 1,839 million as at 31 March 2020, total revenues of ₹ 1,699 million and net cash outflows amounting to ₹ 49 million for the year ended on that date, as considered in the consolidated financial statements. These financial statements have been audited by other auditors whose reports have been furnished to us by the Management and our opinion on the consolidated financial statements, in so far as it relates to the amounts and disclosures included in respect of these subsidiaries and our report in terms of sub-section (3) of Section 143 of the Act, in so far as it relates to the aforesaid subsidiaries is based solely on the audit reports of the other auditors.

All the seven subsidiaries are located outside India whose financial statements and other financial information have been prepared in accordance with accounting principles generally accepted in their respective countries and which have been audited by other auditors under generally accepted auditing standards applicable in their respective countries. The Holding Company's management has converted the financial statements of such subsidiaries located outside India from accounting principles generally accepted in their respective countries to accounting principles generally accepted in India. We have audited these conversion adjustments made by the Holding Company's management. Our opinion in so far as it relates to the balances and affairs of such subsidiaries located outside India is based on the report of other auditors and the conversion adjustments prepared by the management of the Holding Company and audited by us.

Our opinion on the consolidated financial statements, and our report on Other Legal and Regulatory Requirements below, is not modified in respect of the above matters with respect to our reliance on the work done and the reports of the other auditors.

(b) The financial information for the corresponding year ended 31 March 2019 included in these consolidated financial statements, are based on the previously issued statutory financial statements audited by the predecessor auditor whose report for the year ended 31 March 2019 dated 27 May 2019 expressed an unmodified opinion on those financial statements. Our opinion is not modified in respect of this matter.

Report on Other Legal and Regulatory Requirements

A. As required by Section 143(3) of the Act, based on our audit and on the consideration of reports of the other auditors on separate financial statements of such subsidiaries as were audited by other auditors, as noted in the 'Other Matters' paragraph, we report, to the extent applicable, that:

a) We have sought and obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit of the aforesaid consolidated financial statements.

b) In our opinion, proper books of account as required by law relating to preparation of the aforesaid consolidated financial statements have been kept so far as it appears from our examination of those books and the reports of the other auditors.

c) The consolidated balance sheet, the consolidated statement of profit and loss (including other comprehensive income), the consolidated statement of changes in equity and the consolidated statement of cash flows dealt with by this Report are in agreement with the relevant books of account maintained for the purpose of preparation of the consolidated financial statements.

d) In our opinion, the aforesaid consolidated financial statements comply with the Ind AS specified under Section 133 of the Act.

e) On the basis of the written representations received from the directors of the Holding Company as on 31 March 2020 taken on record by the Board of Directors of the Holding Company none of the directors of the Holding Company, is disqualified as on 31 March 2020 from being appointed as a director in terms of Section 164(2) of the Act.

f) With respect to the adequacy of the internal financial controls with reference to financial statements of the Holding Company and the operating effectiveness of such controls, refer to our separate Report in "Annexure A".

B. With respect to the other matters to be included in the Auditor's Report in accordance with Rule 11 of the Companies (Audit and Auditor's) Rules, 2014, in our opinion and to the best of our information and according to the explanations given to us and based on the consideration of the reports of the other auditors on separate financial statements of the subsidiaries as noted in the 'Other Matters' paragraph:

i. The consolidated financial statements disclose the impact of pending litigations as at 31 March 2020 on the consolidated financial position of the Group. Refer Note 36(b) to the consolidated financial statements.

ii. The Group did not have any material foreseeable losses on long-term contracts including derivative contracts during the year ended 31 March 2020.

iii. There has been no delay in transferring amounts to the Investor Education and Protection Fund by the Holding Company during the year ended 31 March 2020.

iv. The disclosures in the consolidated financial statements regarding holdings as well as dealings in specified bank notes during the period from 8 November 2016 to 30 December 2016 have not been made in the financial statements since they do not pertain to the financial year ended 31 March 2020.

C. With respect to the matter to be included in the Auditor's report under Section 197(16):

In our opinion and according to the information and explanations given to us, the remuneration paid during the current year by the Holding Company to its directors is in accordance with the provisions of Section 197 of the Act. The remuneration paid to any director by the Holding Company is not in excess of the limit laid down under Section 197 of the Act. The Ministry of Corporate Affairs has not prescribed other details under Section 197(16) which are required to be commented upon by us.

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No.: 116231W/ W-100024

Vikash Somani
Partner
Membership No.: 061272
UDIN: 20061272AAAABD9793

Place: Hyderabad
Date: 17 June 2020

Annexure A to the Independent Auditors' report on the consolidated financial statements of NATCO Pharma Limited for the year ended 31 March 2020

Report on the internal financial controls with reference to the aforesaid consolidated financial statements under Clause (i) of Sub-section 3 of Section 143 of the Companies Act, 2013

(Referred to in paragraph A(f) under 'Report on Other Legal and Regulatory Requirements' section of our report of even date)

Opinion

In conjunction with our audit of the consolidated financial statements of the Company as of and for the year ended 31 March 2020, we have audited the internal financial controls with reference to consolidated financial statements of NATCO Pharma Limited (hereinafter referred to as "the Holding Company"), as of that date.

In our opinion, the Holding Company, have, in all material respects, adequate internal financial controls with reference to consolidated financial statements and such internal financial controls were operating effectively as at 31 March 2020, based on the internal financial controls with reference to consolidated financial statements criteria established by such companies considering the essential components of such internal controls stated in the Guidance Note on Audit of Internal Financial Controls Over Financial Reporting issued by the Institute of Chartered Accountants of India (the "Guidance Note").

Management's Responsibility for Internal Financial Controls

The Holding Company's management and the Board of Directors are responsible for establishing and maintaining internal financial controls with reference to consolidated financial statements based on the criteria established by the Holding Company considering the essential components of internal control stated in the Guidance Note. These responsibilities include the design, implementation and maintenance of adequate internal financial controls that were operating effectively for ensuring the orderly and efficient conduct of its business, including adherence to the respective company's policies, the safeguarding of its assets, the prevention and detection of frauds and errors, the accuracy and completeness of the accounting records, and the timely preparation of reliable financial information, as required under the Companies Act, 2013 (hereinafter referred to as "the Act").

Auditors' Responsibility

Our responsibility is to express an opinion on the internal financial controls with reference to consolidated financial statements based on our audit. We conducted our audit in accordance with the Guidance Note and the Standards on Auditing, prescribed under Section 143(10) of the Act, to the extent applicable to an audit of internal financial controls with reference to consolidated financial statements. Those Standards and the Guidance Note require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether adequate internal financial controls with reference to consolidated financial statements were established and maintained and if such controls operated effectively in all material respects.

Our audit involves performing procedures to obtain audit evidence about the adequacy of the internal financial controls with reference to consolidated financial statements and their operating effectiveness. Our audit of internal financial controls with reference to consolidated financial statements included obtaining an understanding of internal financial controls with reference to consolidated financial statements, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of the internal controls based on the assessed risk. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error.

We believe that the audit evidence we have obtained, is sufficient and appropriate to provide a basis for our audit opinion on the internal financial controls with reference to consolidated financial statements.

Meaning of Internal Financial controls with Reference to Consolidated Financial Statements

A company's internal financial controls with reference to consolidated financial statements is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal financial controls with reference to consolidated financial statements includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorisations of management and directors of the

company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorised acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Inherent Limitations of Internal Financial controls with Reference to consolidated Financial Statements

Because of the inherent limitations of internal financial controls with reference to consolidated financial statements, including the possibility of collusion or improper management override of controls, material misstatements due to error or fraud may occur and not be detected. Also, projections of any evaluation of the internal financial controls with reference to consolidated financial statements to future periods are subject to the risk that the internal financial controls with reference to consolidated financial statements may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No.: 116231W/ W-100024

Vikash Somani
Partner
Membership No.: 061272
UDIN: 20061272AAAABD9793

Place: Hyderabad
Date: 17 June 2020

Consolidated Balance Sheet

as at 31 March 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	Notes	As at 31 March 2020	As at 31 March 2019
I. ASSETS			
(1) Non-current assets			
(a) Property, plant and equipment	5	15,756	12,185
(b) Capital work-in-progress	38	5,180	6,376
(c) Intangible assets	6	88	87
(d) Financial assets			
(i) Investments	7	836	199
(ii) Loans	8	161	119
(iii) Other financial assets	9	42	66
(e) Other non-current assets	10	559	527
Total non-current assets		**22,622**	**19,559**
(2) Current assets			
(a) Inventories	11	5,580	5,290
(b) Financial assets			
(i) Investments	7	287	1,487
(ii) Trade receivables	12	5,513	5,062
(iii) Cash and cash equivalents	13	198	283
(iv) Bank balances other than (iii) above	13	462	2,512
(v) Loans	8	84	71
(vi) Other financial assets	9	8,588	6,947
(c) Other current assets	10	2,544	1,820
Total current assets		**23,256**	**23,472**
Total assets		**45,878**	**43,031**
II. EQUITY AND LIABILITIES			
(1) Equity			
(a) Equity share capital	14	364	365
(b) Other equity	15	37,371	34,525
Equity attributable to owners of the Company		**37,735**	**34,890**
(c) Non-controlling interest		112	20
Total equity		**37,847**	**34,910**
(2) Liabilities			
(A) Non-current liabilities			
(a) Financial liabilities			
(i) Borrowings	16	9	-
(ii) Other financial liabilities	17	8	8
(b) Provisions	18	902	710
(c) Deferred tax liabilities, net	28	259	116
Total non-current liabilities		**1,178**	**834**
(B) Current liabilities			
(a) Financial liabilities			
(i) Borrowings	16	3,150	3,863
(ii) Trade payables	20		
- Dues of micro and small enterprises		21	79
- Dues of creditors other than micro and small enterprises		2,533	2,091
(iii) Other financial liabilities	17	825	782
(b) Other current liabilities	19	134	316
(c) Provisions	18	105	90
(d) Current tax liabilities, net		85	66
Total current liabilities		**6,853**	**7,287**
Total liabilities		**8,031**	**8,121**
Total equity and liabilities		**45,878**	**43,031**
Significant accounting policies	3 and 4		

The accompanying notes form an integral part of the consolidated financial statements.
As per our report of even date attached

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No. 116231W/ W-100024

Vikash Somani
Partner
Membership Number: 061272

Place: Hyderabad
Date: 17 June 2020

for and on behalf of the Board of Directors
NATCO Pharma Limited
CIN: L24230TG1981PLC003201

V C Nannapaneni
Chairman and Managing Director
DIN: 00183315

M. Adinarayana
Company Secretary

Rajeev Nannapaneni
Vice Chairman and CEO
DIN: 00183872

S V V N Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 17 June 2020

Consolidated Statement of Profit and Loss

for the year ended 31 March 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	Notes	For the year ended 31 March 2020	For the year ended 31 March 2019
1. Income			
(a) Revenue from operations	21	19,150	20,945
(b) Other income	22	1,074	1,302
Total income		**20,224**	**22,247**
2. Expenses			
(a) Cost of materials consumed	23	3,290	3,331
(b) Purchases of stock-in-trade		1,278	550
(c) Changes in inventories of finished goods, work-in-progress and stock-in-trade	24	(752)	(339)
(d) Employee benefits expense	25	3,750	3,559
(e) Finance costs	26	215	193
(f) Depreciation and amortisation expense	5 and 6	998	810
(g) Other expenses	27	5,758	5,896
Total expenses		**14,537**	**14,000**
3. Profit before tax (1-2)		5,687	8,247
4. Tax expense:	28		
(a) Current tax		1,271	1,883
(b) Income-tax for earlier years		40	-
(c) Deferred tax		(205)	(60)
Total tax expenses		**1,106**	**1,823**
5. Profit for the year (3-4)		4,581	6,424
6. Other comprehensive income			
(a) Items that will not be reclassified subsequently to profit and loss			
(i) Remeasurement of defined benefit plans		(79)	(108)
Tax on remeasurement of defined benefit plans		27	23
(ii) Net gains / (losses) from investments in equity instruments designated at FVTOCI		(20)	(1)
Tax impact benefit / (expense) on equity instruments designated at FVTOCI		7	1
(b) Items that will be reclassified subsequently to profit and loss			
(i) Exchange differences on translation of foreign operations		(80)	9
Other comprehensive income, net of tax		(145)	(76)
7. Total comprehensive income for the year (5+6)		4,436	6,348
8. Profit for the year attributable to:			
Owners of the company		4,608	6,444
Non-controlling interests		(27)	(20)
Profit for the year		**4,581**	**6,424**
9. Other comprehensive income attributable to:			
Owners of the company		(145)	(76)
Non-controlling interests		-	-
Other comprehensive income for the year		**(145)**	**(76)**
10. Total comprehensive income attributable to:			
Owners of the company		4,463	6,368
Non-controlling interests		(27)	(20)
Total comprehensive income for the year		**4,436**	**6,348**
11. Earnings per equity share (Face value of ₹ 2 each)	29		
Basic (in ₹)		25.33	34.98
Diluted (in ₹)		25.26	34.87
Significant accounting policies	3 and 4		

The accompanying notes form an integral part of the consolidated financial statements.
As per our report of even date attached

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No. 116231W/ W-100024

Vikash Somani
Partner
Membership Number: 061272

Place: Hyderabad
Date: 17 June 2020

for and on behalf of the Board of Directors
NATCO Pharma Limited
CIN: L24230TG1981PLC003201

V C Nannapaneni
Chairman and Managing Director
DIN: 00183315

Rajeev Nannapaneni
Vice Chairman and CEO
DIN: 00183872

M. Adinarayana
Company Secretary

S V V N Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 17 June 2020

Consolidated Statement of Cash Flow

for the year ended 31 March 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	For the year ended 31 March 2020	For the year ended 31 March 2019
Cash flows from operating activities:		
Profit before tax	5,687	8,247
Adjustments :		
Depreciation and amortisation expense	998	810
Finance costs	215	193
Share based payment expense	144	255
Interest income	(791)	(898)
Allowance for credit losses	175	-
Bad debts written off	55	20
Liabilities written back	(29)	-
Profit on sale of property, plant and equipment, net	(163)	(135)
Unrealised foreign exchange loss, net	(64)	(102)
Operating profit before working capital changes	**6,227**	**8,390**
Working capital adjustments:		
Inventories	(289)	(906)
Trade receivables	(538)	1,388
Loans	(55)	(25)
Other financial assets	71	(71)
Other assets	(701)	20
Trade payables	417	(512)
Provisions	128	252
Other financial liabilities	173	(67)
Other liabilities	(182)	7
Cash generated from operating activities	**5,251**	**8,476**
Income taxes paid, net of refund	(1,078)	(1,788)
Net cash generated from operating activities (A)	**4,173**	**6,688**
Cash flows from investing activities:		
Acquisition of property, plant and equipment (Refer note b below)	(3,557)	(4,566)
Proceeds from sale of property, plant and equipment	221	178
Acquisition of intangible assets	(29)	(51)
Purchase of investments	(673)	(1,121)
Proceeds from sale of investments	1,203	200
Movement in other bank balances, net	2,087	(892)
Loans given to others	-	(20)
Interest received	874	524
Deposits made with financial institutions	(1,796)	(374)
Net cash used in investing activities (B)	**(1,670)**	**(6,122)**
Cash flows from financing activities		
Proceeds from issue of shares	1	0
Payment on buy-back of shares, including transaction costs	(536)	(1,347)
Contribution from shareholders of the Company	474	-
Contribution from non-controlling interest	119	2
Net proceeds from short-term borrowings (refer note c below)	(801)	2,131
Payment of lease liability including interest (refer note c below)	(8)	-
Dividends paid (including corporate dividend tax)	(1,536)	(1,108)
Interest paid	(221)	(187)
Net cash used in financing activities (C)	**(2,508)**	**(509)**
Net increase/(decrease) in cash and cash equivalents (A+B+C)	(5)	57
Effect of currency translation adjustment	(80)	9
Cash and cash equivalents as at the beginning of the year	283	217
Cash and cash equivalents as at the end of the year	**198**	**283**

Consolidated Statement of Cash Flow

for the year ended 31 March 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Components of cash and cash equivalents

Particulars	As at 31 March 2020	As at 31 March 2019
Cash and cash equivalents:		
Cash on hand	11	18
Balance with Banks:		
- Current accounts	187	134
- Deposit with original maturity within three months	-	131
	198	283

Notes:

a) The above Cash Flow Statement has been prepared under the "Indirect Method" as set out in the Indian Accounting Standard (Ind AS-7) - "Statement of Cash Flows".

b) Acquisition of Property, Plant and Equipment includes movements of capital work-in-progress, capital advances and capital creditors.

c) Debt reconciliation in accordance with Ind AS 7:

Particulars		For the year ended 31 March 2020	For the year ended 31 March 2019
Borrowings from banks:			
Opening balance		3,863	1,732
(Repayment) of / proceeds from borrowings, net		(801)	2,131
Non-cash items (Foreign exchange changes)		80	-
Closing balance		3,142	3,863
Lease liability:			
Opening balance		20	-
Recognised as at 1 April 2019		2	-
Additions and interest accrued during the year		3	-
Payment of lease liability		(8)	-
Closing balance		17	-
Significant accounting policies	3 and 4		

The accompanying notes form an integral part of the consolidated financial statements.
As per our report of even date attached

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No. 116231W/ W-100024

Vikash Somani
Partner
Membership Number: 061272

Place: Hyderabad
Date: 17 June 2020

for and on behalf of the Board of Directors
NATCO Pharma Limited
CIN: L24230TG1981PLC003201

V C Nannapaneni
Chairman and Managing Director
DIN: 00183315

Rajeev Nannapaneni
Vice Chairman and CEO
DIN: 00183872

M. Adinarayana
Company Secretary

S V V N Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 17 June 2020

Consolidated Statement of Changes in Equity

for the year ended 31 March 2020

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars	Equity share capital	Other equity								Total other equity attributable to owners of the Company	Non-controlling interest	Total equity
		Reserves and Surplus						Other comprehensive income				
		Securities premium	Capital reserve	Capital redemption reserve	General reserve	Share options outstanding account	Retained earnings	Net gains / (losses) from investments in equity instruments designated at FVTOCI	Foreign currency translation reserve			
As at 1 April 2018	369	15,209	207	5	595	239	14,120	40	(62)	30,353	38	30,760
Profit for the year		-	-	-	-	-	6,444	-	-	6,444	(20)	6,424
Other comprehensive income (net of taxes)	-	-	-	-	-	-	(85)	-	9	(76)	-	(76)
Buyback of shares	(4)	(1,325)	-	-	-	-	-	-	-	(1,325)	-	(1,329)
Share buyback expenses	-	(18)								(18)		(18)
Employee stock option expense	-		-	-	-	255	-	-	-	255	-	255
Dividend paid	-	-	-	-	-	-	(919)	-	-	(919)	-	(919)
Tax on distributed profits	-	-	-	-	-	-	(189)	-		(189)		(189)
Share options exercised	0	186	-	-	-	(186)	-	-	-	-	-	0
Changes in non-controlling interest	-	-	-	-	-	-	-	-	-	-	2	2
Transfer from securities premium on account of buyback of equity shares	-	(4)	-	4	-	-	-	-	-	-	-	-
As at 31 March 2019	**365**	**14,048**	**207**	**9**	**595**	**308**	**19,371**	**40**	**(53)**	**34,525**	**20**	**34,910**
Profit for the year	-	-	-	-	-	-	4,608	-	-	4,608	(27)	4,581
Other comprehensive income (net of taxes)	-	-	-	-	-	-	(52)	(13)	(80)	(145)	-	(145)
Transaction with shareholders (net of taxes) (Refer note 41)	-	-	309	-	-	-	-	-	-	309	-	309
Buyback of shares	(2)	(534)	-	-	-	-	-	-	-	(534)	-	(536)
Employee stock option expense	-	-	-	-	-	144	-	-	-	144	-	144
Dividend paid	-	-	-	-	-	-	(1,274)	-	-	(1,274)	-	(1,274)
Tax on distributed profits	-	-	-	-	-	-	(262)	-	-	(262)	-	(262)
Share options exercised	1	217	-	-	-	(217)	-	-	-	-	-	1
Changes in non-controlling interest	-	-	-	-	-	-	-	-	-	-	119	119
Transfer from securities premium on account of buyback of equity shares	-	(2)	-	2	-	-	-	-	-	-	-	-
As at 31 March 2020	**364**	**13,729**	**516**	**11**	**595**	**235**	**22,391**	**27**	**(133)**	**37,371**	**112**	**37,847**

The accompanying notes form an integral part of the consolidated financial statements.
As per our report of even date attached

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No. 116231W/ W-100024

Vikash Somani
Partner
Membership Number: 061272

Place: Hyderabad
Date: 17 June 2020

for and on behalf of the Board of Directors
NATCO Pharma Limited
CIN: L24230TG1981PLC003201

V C Nannapaneni
Chairman and Managing Director
DIN: 00183315

Rajeev Nannapaneni
Vice Chairman and CEO
DIN: 00183872

M. Adinarayana
Company Secretary

S V V N Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 17 June 2020

Notes to consolidated financial statements

1. Reporting entity information

NATCO Pharma Limited ("the Company" or "the Parent") is a public limited company domiciled and incorporated in with its registered office situated at NATCO House, Road No. 2, Banjara Hills, Hyderabad – 500034. The equity shares of the Company are listed on the National Stock Exchange (NSE) and Bombay Stock Exchange in India (BSE).

The Company along with its subsidiaries ("the Group") is engaged in the business of pharmaceuticals which comprises research and development, manufacturing and selling of bulk drugs and finished dosage formulations. The Group has manufacturing facilities in India which caters to both domestic and international markets including regulated markets like United States of America and Europe.

2. Basis of preparation

A. Statement of Compliance

These consolidated financial statements of the Group have been prepared in accordance with Indian Accounting Standards (Ind AS) as per the Companies (Indian Accounting Standards) Rules 2015, as amended, notified under Section 133 of Companies Act, 2013, (the 'Act') and other relevant provisions of the Act.

The consolidated financial statements for the year ended 31 March 2020 were authorized and approved for issue by the Company's Board of Directors on 17 June 2020.

New and amended standards adopted by the Group

Effective 1 April 2019, the Group has applied Ind AS 116 Leases. On transition to Ind AS 116, Right-of-use of assets at 1 April 2019 for leases previously classified as operating leases were recognised and measured at an amount equal to lease liability (adjusted for related prepayments/ accruals). As a result, the comparative information has not been restated and there is no impact on retained earnings as at 1 April 2019. Overall, the application of this standard did not have any material impact on the financial statements. Refer note 39 for further details.

Details of the Group's accounting policies are included in Note 3.

B. Functional and presentation currency

The consolidated financial statements are presented in Indian Rupee ('INR' or '₹') which is also the Company's functional currency. All amounts have been rounded-off to the nearest million, unless otherwise indicated.

Transactions and balances with values below the rounding off norm adapted by the Group have been reflected as '0' in relevant notes in the consolidated financial statements.

C. Operating cycle

The Group has ascertained its operating cycle as 12 months that is the time between the acquisition of assets for processing and their realisation in cash or cash equivalents.

D. Basis of Measurement

These consolidated financial statements have been prepared on the historical cost basis except for the following items:

Items	Measurement basis
Certain financial assets and liabilities	Fair value
Net defined benefit asset/ (liability)	Fair value of plan assets less present value of defined benefit obligations

E. Use of estimates and judgements

The preparation of the financial statements in conformity with Ind AS requires management to make estimates, judgements and assumptions. These estimates, judgements and assumptions affect the application of accounting policies and the reported amounts of assets and liabilities, the disclosures of contingent assets and liabilities at the date of the financial statements and reported amounts of revenues and expenses during the period. Accounting estimates could change from period to period. Actual results could differ from those estimates. Appropriate changes in estimates are made as and when management becomes aware of changes in circumstances surrounding the estimates. Changes in estimates are reflected in the financial statements in the period in which changes are made and, if material, such effects are disclosed in the notes to the financial statements.

F. Measurement of fair values

Certain accounting policies and disclosures of the Group require the measurement of fair values, for both financial and non-financial assets and liabilities.

The Group has an established control framework with respect to the measurement of fair values.

The finance team regularly reviews significant unobservable inputs and valuation adjustments.

Fair values are categorised into different levels in a fair value hierarchy based on the inputs used in the valuation techniques as follows:

- Level 1: quoted prices (unadjusted) in active markets for identical assets or liabilities.

- Level 2: inputs other than quoted prices included in Level 1 that are observable for the asset or liability, either directly (i.e. as prices) or indirectly (i.e. derived from prices).

- Level 3: inputs for the asset or liability that are not based on observable market data (unobservable inputs).

When measuring the fair value of an asset or a liability, the Group uses observable market data as far as possible. If the inputs used to measure the fair value of an asset or a liability fall into different levels of the fair value hierarchy, then the fair value measurement is categorised in its entirety in the same level of the fair value hierarchy as the lowest level input that is significant to the entire measurement.

The Group recognises transfers between levels of the fair value hierarchy at the end of reporting period during which the change has occurred.

3. Significant accounting policies

a. Basis of consolidation

i. Subsidiaries

Subsidiaries are all entities over which the Group has control. The Group controls an entity when the Group is exposed to, or has rights to, variable returns from its involvement with the entity and has the ability to affect those returns through its power to direct the relevant activities of the entity. Subsidiaries are fully consolidated from the date on which control is transferred to the Group. The financial statements of subsidiaries are included in the consolidated financial statement from the date on which control commences until the date on which control ceases.

ii. Non-controlling interests (NCI)

NCI are measured at their proportionate share of the acquiree's net identifiable asset at the date of acquisition. Changes in the Group's equity interest in a subsidiary that do not result in a loss of control are accounted for as equity transactions.

Non-controlling interest is presented separately from the liabilities or assets and the equity of the shareholders in the consolidated Balance Sheet. Non-controlling interest in the profit or loss of the Group is separately presented.

iii. Subsidiaries considered in the consolidated financial statements:

The following subsidiaries have been considered for the purpose of preparation of the consolidated financial statements:

Name of the subsidiaries	Country of Incorporation	Percentage holding/interest (%) As at 31 March	
		2020	2019
NATCO Pharma, Inc.,	United States of America	100.00	100.00
Time Cap Overseas Limited	Mauritius	90.44	90.36
NATCO Farma Do Brazil	Brazil	90.89	90.90
NATCO Pharma (Canada), Inc.	Canada	99.04	99.04
Natco Pharma Asia Pte. Ltd.	Singapore	99.76	99.73
NATCO Pharma Australia PTY Ltd.	Australia	100.00	100.00
NATCO Lifesciences Philippines Inc.	Philippines	100.00	100.00

Note 1: NATCO Farma Do Brazil is the Subsidiary of Time Cap Overseas Limited and interest in NATCO Pharma interest in NATCO Farma Do Brazil represents effective holding of the Group.

Note 2: Principal activity of all subsidiaries except Time Cap Overseas Limited is marketing of pharmaceutical products. Time Cap Overseas Limited is an intermediate investment holding company.

iv. Change in ownership interests

The Group treats transactions with non-controlling interests that do not result in a loss of control as transactions with equity owners of the Group. A change in ownership interest results in an adjustment between the carrying amounts of the controlling and non-controlling interests to reflect their relative interests in the subsidiary. Any difference between the amount of the adjustment to non-controlling interests and any consideration paid or received is recognised within equity.

v. Principles of consolidation

The Group combines the separate financial statements of the parent and its subsidiaries line by line adding together like items of assets, liabilities, contingent liabilities, equity, income and expenses. Intercompany transactions, balances and unrealised gains on transactions between group companies are eliminated. Unrealised losses are also eliminated unless the transaction provides evidence of an impairment of the transferred asset.

The consolidated financial statements have been prepared using uniform accounting policies for like transactions and other events in similar circumstances. The accounting policies adopted in the preparation of consolidated financial statements are consistent with those of previous year. The financial statements of each of the subsidiaries and associates used for the purpose of consolidation are drawn up to same reporting date as that of the Company, i.e., year ended on 31 March.

b. Property, plant and equipment (PPE)

Recognition and initial measurement

Items of property, plant and equipment, are measured at cost (which includes capitalised borrowing costs, if any) less accumulated depreciation and accumulated impairment losses, if any. Cost of an item of property, plant and equipment includes its purchase price, duties, taxes, after deducting trade discounts and rebates, any directly attributable cost of bringing the item to its working condition for its intended use and estimated costs of dismantling and removing the item and restoring the site on which it is located.

The cost of a self-constructed item of property, plant and equipment comprises the cost of materials, direct labour and any other costs directly attributable to bringing the item to its intended working condition and estimated costs of dismantling, removing and restoring the site on which it is located, wherever applicable.

If significant parts of an item of property, plant and equipment have different useful lives, then they are accounted for as separate items (major components) of property, plant and equipment. Any gain or loss on disposal of an item of property, plant and equipment is recognised in profit or loss.

Subsequent expenditure

Subsequent expenditure is capitalised only if it is probable that the future economic benefits associated with the expenditure will flow to the Group.

Depreciation

Depreciation is calculated on cost of items of property, plant and equipment less their estimated residual value using straight line method over the useful lives of assets estimated by the Group. Depreciation rates followed by the Group coincides with rates prescribed in Schedule II to the Companies Act, 2013. Depreciation amount is recognised in the Statement of Profit and Loss. Depreciation for assets purchased / sold during the period is proportionately charged.

The estimated useful lives of items of property, plant and equipment are as follows:

Tangible assets	Estimated useful life (in years)	Companies Act life (in years)
Buildings	5 to 60	5 to 60
Plant and machinery	5 to 20	5 to 20
Computers	3 to 6	3 to 6
Vehicles	8 to 10	8 to 10
Office equipment	5	5
Furniture and fixtures	10	10

Freehold land is not depreciated.

The residual values, useful lives and methods of depreciation of property, plant and equipment are reviewed at each financial year-end and adjusted prospectively, if appropriate.

De-recognition

An item of property, plant and equipment and any significant part initially recognised is derecognised upon disposal or when no future economic benefits are expected from its use or disposal. Any gain or loss arising on de-recognition of the asset (calculated as the difference between the net disposal proceeds and the carrying amount of the asset) is included in the Statement of profit and loss, when the asset is derecognised.

Capital work-in-progress

Capital work-in-progress includes cost of property, plant and equipment under installation / under development as at the balance sheet date.

c. Intangible assets

Recognition and initial measurement

Intangible assets (software) are stated at their cost of acquisition. The cost comprises purchase price, borrowing cost if capitalization criteria are met and directly attributable cost of bringing the asset to its working condition for the intended use. Any trade discount and rebates are deducted in arriving at the purchase price.

Subsequent measurement (amortisation)
The cost of capitalised software is amortised over a period of 6 years, on a straight-line basis. Amortisation on the addition/disposals is charged on pro-rata basis from/until the date of such addition/disposal.

d. Foreign currencies
Transactions in foreign currencies are initially recorded by the Group at its functional currency spot rates at the date of the transaction. Monetary assets and liabilities denominated in foreign currency are translated at the functional currency spot rates of exchange at the reporting date. Exchange differences that arise on settlement of monetary items or on reporting at each balance sheet date are recognised as income or expenses in the period in which they arise. Non-monetary items which are carried at historical cost denominated in a foreign currency are reported using the exchange rates at the date of transaction. Non-monetary items measured at fair value in a foreign currency are translated using the exchange rates at the date when the fair value is determined.

Group companies
The results and financial position of foreign operations (none of which has the currency of a hyperinflationary economy) that have a functional currency different from the presentation currency are translated into the presentation currency as follows:

1. assets and liabilities are translated at the closing rate at the date of the balance sheet,

2. income, expenses and cash flow items are translated at average exchange rates for the respective periods; and

3. All resulting exchange differences are recognised in OCI.

When a foreign operation is disposed of in its entirety or partially such that control is lost, the cumulative amount of exchange differences related to that foreign operation recognised in OCI is reclassified to profit or loss as part of the gain or loss on disposal. If the Group disposes off part of its interest in a subsidiary but retains control, then the relevant proportion of the cumulative amount is re-allocated to NCI. When the Group disposes off only a part of its interest in an associate while retaining significant influence, the relevant proportion of the cumulative amount is reclassified to Statement of Profit or Loss.

e. Revenue recognition
The Group derives revenues primarily from sale of finished dosage formulations, active pharmaceutical ingredients (APIs), including niche and technically complex molecules.

The specific recognition criteria described below must also be met before revenue is recognised:

Sale of goods:
Revenue from sale of goods is recognised when a promise in a customer contract (performance obligation) has been satisfied by transferring control over the promised goods to the customer. Control is usually transferred upon shipment/ delivery to/ upon receipt of goods by the customer, in accordance with the delivery and acceptance terms agreed with the customers. The amount of revenue to be recognised is based on the consideration expected to be received in exchange for goods, excluding trade discounts, volume discounts, sales returns, chargeback, medicaid payments, rebates, shelf stock adjustments, where applicable and any taxes or duties collected on behalf of the government which are levied on sales such as goods and services tax, etc., where applicable. Revenue is only recognised to the extent that it is highly probable a significant reversal will not occur.

The Group from time to time enters into marketing arrangements with certain business partners for the sale of its products in certain markets. Under such arrangements, the Group sells its products to the business partners at a non-refundable base purchase price agreed upon in the arrangement and is also entitled to a profit share which is over and above the base purchase price. The profit share is typically dependent on the business partner's ultimate net sale proceeds or net profits, subject to any reductions or adjustments that are required by the terms of the arrangement. Such arrangements typically require the business partner to provide confirmation of units sold and net sales or net profit computations for the products covered under the arrangement.

Revenue in an amount equal to the base purchase price is recognised in these transactions upon delivery of products to the business partners. An additional amount representing the profit share component is recognised as revenue only to the extent that it is highly probable that a significant reversal will not occur.

At the end of each reporting period, the Company updates the estimated transaction price (including updating its assessment of whether an estimate of variable consideration is constrained) to represent faithfully the circumstances present at the end of the reporting period and the changes in circumstances during the reporting period.

Sale of services:
Revenue from sale of dossiers/ licenses/services, includes in certain instances, certain performance obligations and based on evaluation of whether or not these obligations are in consequential or perfunctory, revenue is recognised in accordance with the terms of the contracts with the customers when the related performance obligation is completed at point in time or spread over a period of time, as applicable.

The Group does not expect to have any contracts where the period between the transfer of the promised goods or services to the customer and payment by the customer exceeds one year. As a consequence, it does not require to adjust any of the transaction prices for the time value of money.

f. Borrowing costs
Borrowing costs directly attributable to the acquisition or construction of those property, plant and equipment which necessarily takes a substantial period of time to get ready for their intended use are capitalised. All other borrowing costs are expensed in the period in which they are incurred in the Statement of Profit and Loss.

g. Government grants
Government grants are recognised where there is reasonable assurance that the grant will be received and all attached conditions will be complied with. When the grant relates to revenue, it is recognised in the Statement of Profit and Loss on a systematic basis over the periods to which they relate. When the grant relates to an asset, it is presented as a reduction to the carrying value of the related asset.

Export benefits available under prevalent schemes are accrued in the year in which the goods are exported and no significant uncertainty exist regarding its ultimate collection.

h. Impairment of non-financial assets (Intangible assets and property, plant and equipment)
At each reporting date, the Group reviews the carrying amounts of its non-financial assets (other than inventories and deferred tax assets) to determine whether there is any indication of impairment. If any such indication exists, then the asset's recoverable amount is estimated. Intangible assets with indefinite useful life are tested annually for impairment. For the purpose of impairment testing, the recoverable amount (i.e. the higher of the fair value less cost to sell and the value-in-use) is determined on an individual asset basis unless the asset does not generate cash flows that are largely independent of those from other assets. In such cases, the recoverable amount is determined for the cash generating unit to which the asset belongs. If such assets are considered to be impaired, the impairment to be recognised in the Statement of Profit and Loss is measured by the amount by which the carrying value of the assets exceeds the estimated recoverable amount of the asset. Value in use is based on the estimated future cash flows, discounted to their present value using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset or cash generating unit. An impairment loss is reversed in the Statement of Profit and Loss if there has been a change in the estimates used to determine the recoverable amount. The carrying amount of the asset is increased to its revised recoverable amount, provided that this amount does not exceed the carrying amount that would have been determined (net of any accumulated amortization or depreciation) had no impairment loss been recognised for the asset in prior years.

i. Financial instruments

i. Initial recognition and measurement
Trade receivables and debt securities issued are initially recognised when they are originated. All other assets and financial liabilities are initially recognised when the Group becomes a party to the contractual provisions of the instrument. Transaction costs that are directly attributable to the acquisition or issue of financial assets and financial liabilities, that are not at fair value through profit or loss, are added to the fair value on initial recognition.

ii. Classification and subsequent measurement
Financial assets
The Group classifies financial assets as subsequently measured at amortised cost, fair value through other comprehensive income ("FVOCI") or fair value through profit or loss ("FVTPL") on the basis of following:

- the entity's business model for managing the financial assets and
- the contractual cash flow characteristics of the financial asset.

Amortised Cost:
A financial asset shall be classified and measured at amortised cost if both of the following conditions are met:

- the financial asset is held within a business model whose objective is to hold financial assets in order to collect contractual cash flows; and

- the contractual terms of the financial asset give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding.

Fair Value through OCI:
A financial asset shall be classified and measured at fair value through OCI if both of the following conditions are met:

- the financial asset is held within a business model whose objective is achieved by both collecting contractual cash flows and selling financial assets; and
- the contractual terms of the financial asset give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding.

Fair Value through Profit or Loss:
A financial asset shall be classified and measured at fair value through profit or loss unless it is measured at amortised cost or at fair value through OCI.

All recognised financial assets are subsequently measured in their entirety at either amortised cost or fair value, depending on the classification of the financial assets.

Classification of investments:

a. **Debt instruments at amortised cost –** A 'debt instrument' is measured at the amortised cost if both the following conditions are met:

   - The asset is held within a business model whose objective is to hold assets for collecting contractual cash flows, and
   - Contractual terms of the asset give rise on specified dates to cash flows that are solely payments of principal and interest (SPPI) on the principal amount outstanding.

   After initial measurement, such financial assets are subsequently measured at amortised cost using the effective interest rate (EIR) method.

b. **Equity investments –** All equity investments in scope of Ind-AS 109 are measured at fair value. Equity instruments which are held for trading are classified at fair value through profit and loss (FVTPL). For all other equity instruments, the Group decides to classify the same either as at fair value through other comprehensive income (FVOCI) or fair value through profit and loss (FVTPL). The Group makes such election on an instrument by instrument basis. The classification is made on initial recognition and is irrevocable.

c. **Mutual funds –** All mutual funds in scope of Ind-AS 109 are measured at fair value through profit and loss (FVTPL).

Interest income and dividend income:
For all financial instruments measured at amortised cost, interest income is recorded using the effective interest rate (EIR), which is the rate that exactly discounts the estimated future cash payments or receipts over the expected life of the financial instrument or a shorter period, where appropriate, to the net carrying amount of the financial asset. Interest income is included in other income in the Statement of Profit and Loss.

Dividend income is recognised when the Company's right to receive the payment is established, which is generally when shareholders approve the dividend.

Financial liabilities
Financial liabilities are subsequently carried at amortised cost using the effective interest method. For trade and other payables maturing within one year from the balance sheet date, the carrying amounts approximate fair value due to the short maturity of these instruments.

iii. De-recognition

Financial assets

The Group derecognises a financial asset when the contractual rights to the cash flows from the financial asset expire, or it transfers the right to receive the contractual cash flows in a transaction in which substantially all of the risks and rewards of ownership of the financial assets are transferred or in which the Group neither transfers nor retains substantially all of the risks and rewards of ownership and does not retain control of the financial asset.

If the Group enters into transactions whereby it transfers assets recognised on its balance sheet, but retains either all or substantially all of the risks and rewards of the transferred assets, the transferred assets are not derecognised.

Financial liabilities

The Group derecognises a financial liability when its contractual obligations are discharged or cancelled, or expire.

The Group also derecognises a financial liability when its terms are modified and the cash flows under the modified terms are substantially different. In this case, a new financial liability based on the modified terms is recognised at fair value. The difference between the carrying amount of the financial liability extinguished and a new financial liability with modified terms is recognised in the Statement of Profit and Loss.

iv. Offsetting

Financial assets and financial liabilities are offset and the net amount presented in the balance sheet when, and only when, the Group currently has a legally enforceable right to set off the amounts and it intends either to settle them on a net basis or realise the asset and settle the liabilities simultaneously.

v. Financial guarantee contracts

Financial guarantee contracts are those contracts that require a payment to be made to reimburse the holder for a loss it incurs because the specified party fails to make a payment when due in accordance with the terms of a debt instrument. Financial guarantee contracts are recognised initially as a liability at fair value, adjusted for transaction costs that are directly attributable to the issuance of the guarantee. Subsequently, the liability is measured at the higher of the amount of expected loss allowance determined as per impairment requirements of Ind-AS 109 and the amount recognised less cumulative amortisation.

j. Impairment of financial assets

The Group recognises loss allowances using the expected credit loss (ECL) model for the financial assets which are not fair valued through profit or loss. Loss allowance for trade receivables with no significant financing component is measured at an amount equal to lifetime ECL. For all other financial assets, expected credit losses are measured at an amount equal to the 12-month ECL, unless there has been a significant increase in credit risk from initial recognition in which case those are measured at lifetime ECL. The amount of expected credit losses (or reversal) that is required to adjust the loss allowance at the reporting date to the amount that is required to be recognised is recognised as an impairment gain or loss in statement of profit or loss.

k. Inventories

Inventories are valued at the lower of cost (including prime cost, non-refundable taxes and duties and other costs incurred in bringing the inventories to their present location and condition) and estimated net realisable value, after providing for obsolescence, where appropriate. The comparison of cost and net realisable value is made on an item-by-item basis. The net realisable value of materials in process is determined with reference to the selling prices less estimated cost of completion or selling expenses of related finished goods. Cost of inventories is determined using the weighted average cost method. Raw materials, packing materials and other supplies held for use in production of inventories are not written down below cost except in cases where material prices have declined, and it is estimated that the cost of the finished products will exceed their net realisable value.

The provision for inventory obsolescence is assessed regularly based on estimated usage and shelf life of products.

Work-in-progress is valued at input material cost plus conversion cost as applicable.

Finished goods, work-in-progress and stock-in-trade are valued at the lower of net realisable value and cost (including prime cost, non-refundable taxes and duties and other costs incurred in bringing the inventories to their present location and condition), computed on a weighted average basis.

l. Income taxes

Income tax comprises current and deferred tax. It is recognised in profit or loss except to the extent that it relates to an item recognised directly in equity or in other comprehensive income.

i. Current tax

Current tax comprises the expected tax payable or receivable on the taxable income or loss for the year and any adjustment to the tax payable or receivable in respect of previous years. The amount of current tax reflects the best estimate of the tax amount expected to be paid or received after considering the uncertainty, if any related to income taxes. It is measured using tax rates (and tax laws) enacted or substantively enacted by the reporting date.

ii. Deferred tax

Deferred tax is recognised in respect of temporary differences between the carrying amounts of assets and liabilities for financial reporting

purposes and the corresponding amounts used for taxation purposes.

Deferred tax is not recognised for:

- temporary differences arising on the initial recognition of assets or liabilities in a transaction that is not a business combination and that affects neither accounting nor taxable profit or loss at the time of transaction.

- temporary differences related to investments in subsidiaries when the timing of the reversal of the temporary differences can be controlled and it is probable that the temporary differences will not reverse in the foreseeable future.

Deferred tax assets are recognised to the extent that it is probable that future taxable profits will be available against which they can be used. This is assessed based on the Group's forecast of future operating results, adjusted for significant non-taxable income and expenses and specific limits on the use of any unused tax loss or credit.

Deferred tax assets recognised or unrecognised are reviewed at each reporting date and are recognised / reduced to the extent that it is probable / no longer probable respectively that the related tax benefit will be realised.

Deferred tax is measured at the tax rates that are expected to apply to the period when the asset is realised or the liability is settled, based on the laws that have been enacted or substantively enacted by the reporting date.

The measurement of deferred tax reflects the tax consequences that would follow from the manner in which the Group expects, at the reporting date, to recover or settle the carrying amount of its assets and liabilities.

The Group offsets, the current tax assets and liabilities (on a year on year basis) and deferred tax assets and liabilities, where it has a legally enforceable right and where it intends to settle such assets and liabilities on a net basis.

Deferred tax relating to items recognised outside profit or loss is recognised outside profit or loss (either in other comprehensive income or in equity).

m. **Cash and cash equivalents**

Cash and cash equivalents includes cash on hand, demand deposits with banks, other short-term highly liquid investments with original maturities of three months or less that are readily convertible into known amounts of cash and which are subject to an insignificant risk of changes in value.

n. **Post-employment, long-term and short-term employee benefits**

Defined contribution plan

A defined contribution plan is a post-employment benefit under which an entity pays a specific contribution to a separate entity and has no obligation to pay any further amounts. The Group's contribution to provident fund and employee state insurance schemes is charged to the Statement of profit and loss during the period in which the employee renders the related service. The Group's contributions towards Provident Fund are deposited with the Regional Provident Fund Commissioner under a defined contribution plan. The Group has no obligation, other than the contribution payable to these funds.

Defined benefit plan

The Group has gratuity as defined benefit plan where the amount that an employee will receive on retirement is defined by reference to the employee's length of service and final salary. The liability recognised in the balance sheet for defined benefit plans is the present value of the defined benefit obligation (DBO) at the reporting date net of fair value of plan assets. Management estimates the DBO annually with the assistance of independent actuaries, by adopting the projected unit credit method. Actuarial gains and losses resulting from re-measurements of the liability are included in other comprehensive income.

The Group has subscribed to a group gratuity scheme of Life Insurance Corporation of India (LIC). Under the said policy, the eligible employees are entitled for gratuity upon their resignation, retirement or in the event of death in lumpsum after deduction of necessary taxes upto a maximum limit of ₹ 2 million. Liabilities in respect of the Gratuity Plan are determined by an actuarial valuation, based upon which the Group makes contributions to the Gratuity Fund.

Other long-term employee benefits

The Group also provides benefit of compensated absences to its employees which are in the nature of long-term benefit plan. Liability in respect of compensated absences becoming due and expected

to be availed more than one year after the balance sheet date is estimated on the basis of an actuarial valuation performed by an independent actuary using the projected unit credit method as on the reporting date. Actuarial gains and losses arising from experience adjustments and changes in actuarial assumptions are recorded in the Statement of profit or loss in the year in which such gains or losses arise.

Short-term employee benefits

Short-term employee benefits comprise of employee costs such as salaries, bonus etc. is recognized on the basis of the amount paid or payable for the period during which services are rendered by the employee.

o. Share-based payments

Certain employees of the Group are entitled to remuneration in the form of equity settled instruments, for rendering services over a defined vesting period. Equity instruments granted are measured by reference to the fair value of the instrument at the date of grant. The fair value determined at the grant date is expensed over the vesting period of the respective tranches of such grants. The stock compensation expense is determined based on the Group's estimate of equity instruments that will eventually vest using fair value in accordance with Ind AS 102, Share based payment.

The employee benefits expense is measured using the fair value of the employee stock options and is recognised over vesting period with a corresponding increase in equity. The vesting period is the period over which all the specified vesting conditions are to be satisfied.

p. Provisions, contingent liabilities and contingent assets

General

Provisions are recognised when the Group has a present obligation (legal or constructive) as a result of a past event, it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation and a reliable estimate can be made of the amount of the obligation. When the Group expects some or all of a provision to be reimbursed, the expense relating to a provision is presented in the Statement of Profit and Loss, net of any reimbursement.

If the effect of the time value of money is material, provisions are discounted using a current pre-tax rate that reflects, when appropriate, the risks specific to the liability. When discounting is used, the increase in the provision due to the passage of time is recognised as a finance cost.

Contingent liabilities and Contingent assets

A disclosure for contingent liabilities is made where there is a possible obligation or a present obligation that may probably not require an outflow of resources. When there is a possible or a present obligation where the likelihood of outflow of resources is remote, no provision or disclosure is made.

Contingent assets are neither recognised nor disclosed. However, when realisation of income is virtually certain, related asset is recognised.

Onerous contracts

Provision for onerous contracts. i.e. contracts where the expected unavoidable cost of meeting the obligations under the contract exceed the economic benefits expected to be received under it, are recognised when it is probable that an outflow of resources embodying economic benefits will be required to settle a present obligation as a result of an obligating event based on a reliable estimate of such obligation.

q. Earnings per share

Basic Earnings Per Share ('EPS') is computed by dividing the net profit attributable to the equity shareholders by the weighted average number of equity shares outstanding during the year. Diluted earnings per share is computed by dividing the net profit by the weighted average number of equity shares considered for deriving basic earnings per share and also the weighted average number of equity shares that could have been issued upon conversion of all dilutive potential equity shares. Dilutive potential equity shares are deemed converted as of the beginning of the year, unless issued at a later date. In computing diluted earnings per share, only potential equity shares that are dilutive and that either reduces earnings per share or increases loss per share are included. The number of shares and potentially dilutive equity shares are adjusted retrospectively for all periods presented in case of share splits.

r. Cash flow statement

Cash flows are reported using indirect method, whereby net profits before tax is adjusted for the effects of transactions of a non-cash nature and any deferrals or accruals of past or future cash receipts or payments and items of income or expenses associated with investing or financing cash flows. The cash flows from regular revenue generating (operating activities), investing and financing activities of the Group are segregated.

s. Research and development
Expenditure on research activities are expensed as and when incurred. Development expenses which meet defined criteria for capitalisation are capitalised if its ability to generate future economic benefits is reasonably certain. All other development costs are expensed as and when incurred. Capital expenditure incurred on research and development is capitalised as property, plant and equipment and depreciated in accordance with the depreciation policy of the Group.

t. Ind AS 116, Leases:
Accounting as lessee
A contract is, or contains, a lease if the contract conveys the right to control the use of an identified asset for a period of time in exchange for consideration.

The Group recognises right-of-use asset representing its right to use the underlying asset for the lease term at the lease commencement date. The cost of the right-of-use asset measured at inception shall comprise of the amount of the initial measurement of the lease liability adjusted for any lease payments made at or before the commencement date less any lease incentives received, plus any initial direct costs incurred and an estimate of costs to be incurred by the lessee in dismantling and removing the underlying asset or restoring the underlying asset or site on which it is located. The right-of-use assets is subsequently measured at cost less any accumulated depreciation, accumulated impairment losses, if any and adjusted for any remeasurement of the lease liability. The right-of-use assets is depreciated using the straight-line method from the commencement date over the shorter of lease term or useful life of right-of-use asset. The estimated useful lives of right-of use assets are determined on the same basis as those of property, plant and equipment. Right-of-use assets are tested for impairment whenever there is any indication that their carrying amounts may not be recoverable. Impairment loss, if any, is recognised in the Statement of profit and loss.

The Group measures the lease liability at the present value of the lease payments that are not paid at the commencement date of the lease. The lease payments are discounted using the interest rate implicit in the lease, if that rate can be readily determined. If that rate cannot be readily determined, the Group uses incremental borrowing rate. For leases with reasonably similar characteristics, the Group, on a lease by lease basis, may adopt either the incremental borrowing rate specific to the lease or the incremental borrowing rate for the portfolio as a whole. The lease payments shall include fixed payments, variable lease payments, residual value guarantees, exercise price of a purchase option where the Group is reasonably certain to exercise that option and payments of penalties for terminating the lease, if the lease term reflects the lessee exercising an option to terminate the lease. The lease liability is subsequently remeasured by increasing the carrying amount to reflect interest on the lease liability, reducing the carrying amount to reflect the lease payments made and remeasuring the carrying amount to reflect any reassessment or lease modifications or to reflect revised in-substance fixed lease payments. The Group recognises the amount of the re-measurement of lease liability due to modification as an adjustment to the right-of use asset and Statement of profit and loss depending upon the nature of modification. Where the carrying amount of the right-of-use asset is reduced to zero and there is a further reduction in the measurement of the lease liability, the Group recognises any remaining amount of the re-measurement in Statement of profit and loss.

The Group has elected not to apply the requirements of Ind AS 116 Leases to short-term leases of all assets that have a lease term of 12 months or less and leases for which the underlying asset is of low value. The lease payments associated with these leases are recognized as an expense on a straight-line basis over the lease term.

Refer note 39 "Leases" of the financial statements for transition related disclosures.

4. Key accounting estimates and judgements

The preparation of financial statements in conformity with the Ind AS requires judgements, estimates and assumptions to be made that affect the reported amounts of assets and liabilities on the date of the financial statements, the reported amounts of revenues and expenses during the reporting period and the disclosures relating to contingent liabilities as of the date of the financial statements. Although these estimates are based on the management's best knowledge of current events and actions, uncertainty about these assumptions and estimates could result in outcomes different from the estimates. Difference between actual results and estimates are recognised in the period in which the results are known or materialise. Estimates and underlying assumptions are reviewed on an ongoing basis. Any revision to accounting estimates is recognised prospectively in the current and future periods.

Management considers the accounting estimates and assumptions discussed below to be its critical accounting estimates and, accordingly, provide an explanation of each below. The discussion below

should also be read in conjunction with the Group's disclosure of significant accounting policies which are provided in Note 3 to the consolidated financial statements, 'Significant accounting policies'.

Critical judgments:
Taxes on income:
Significant judgments are involved in determining the provision for income taxes, including possibility of utilisation of Minimum Alternate Tax (MAT) credit in future.

Impairment of investments:
Significant judgment is involved in determining the estimated future cash flows from the investments to determine their value in use to assess whether there is any impairment in their carrying amounts as reflected in the consolidated financial statements.

Critical estimates:
Recognition of deferred tax assets – The extent to which deferred tax assets can be recognised is based on an assessment of the probability of the Group's future taxable income against which the deferred tax assets can be utilised. In addition, significant judgement is required in assessing the impact of any legal or economic limits.

Evaluation of indicators for impairment of assets: The evaluation of applicability of indicators of impairment of assets requires assessment of several external and internal factors which could result in deterioration of recoverable amount of the assets.

Useful lives of depreciable/amortisable assets: Management reviews its estimate of the useful lives of depreciable/amortisable assets at each reporting date, based on the expected utility of the assets. Uncertainties in these estimates relate to technical and economic obsolescence that may change the utility of certain software, IT equipment and other plant and equipment.

Defined benefit obligation (DBO): Management's estimate of the DBO is based on a number of critical underlying assumptions such as standard rates of inflation, mortality, discount rate and anticipation of future salary increases. Variation in these assumptions may significantly impact the DBO amount and the annual defined benefit expenses.

Fair value measurements: Management applies valuation techniques to determine the fair value of financial instruments (where active market quotes are not available) and non-financial assets. This involves developing estimates and assumptions consistent with how market participants would price the instrument. Management uses the best information available. Estimated fair values may vary from the actual prices that would be achieved in an arm's length transaction at the reporting date.

Provisions: The Group exercises judgement in measuring and recognising provisions and the exposures to contingent liabilities related to pending litigation or other outstanding claims subject to negotiated settlement, mediation, arbitration or government regulation, as well as other contingent liabilities. Judgement is necessary in assessing the likelihood that a pending claim will succeed, or a liability will arise, and to quantify the possible range of the financial settlement. Because of the inherent uncertainty in this evaluation process, actual losses may be different from the originally estimated provision.

5. Property, plant and equipment

	Freehold land	Leasehold land	Buildings	Plant and equipment	Office equipment	Furniture	Vehicles	Computers	Right-of use (Leasehold lands)	Total
Gross carrying amount										
As at 1 April 2018	1,769	262	3,575	7,701	63	177	200	164	-	13,911
Additions	363	-	864	1,565	2	43	35	21	-	2,893
Disposals	(41)	-	(1)	(3)	-	-	(10)	-	-	(55)
Exchange difference	-	-	(3)	(1)	-	-	-	-	-	(4)
Balance as at 31 March 2019	**2,091**	**262**	**4,435**	**9,262**	**65**	**220**	**225**	**185**	**-**	**16,745**
Recognised on adoption of Ind AS 116 (Refer Note 39)	-	-	-	-	-	-	-	-	38	38
Reclassified on adoption of Ind AS 116 (Refer Note 39)	-	(262)	-	-	-		-	-	262	-
Additions	429	-	1,805	2,111	2	152	22	63	2	4,586
Disposals	(33)	-	-	(40)	(0)	(0)	(8)	-	-	(81)
Exchange difference	-	-	(15)	(11)	(0)	(1)	(0)	0	-	(27)
Balance as at 31 March 2020	**2,487**	**-**	**6,225**	**11,322**	**67**	**371**	**239**	**248**	**302**	**21,261**
Accumulated depreciation										
As at 1 April 2018	-	8	720	2,719	37	69	102	129	-	3,784
Charge for the year	-	3	127	593	2	17	25	20	-	787
Disposals	-	-	-	(2)	-	-	(9)	-	-	(11)
Exchange difference	-	-	0	0	0	0	0	0	-	0
Balance as at 31 March 2019	-	11	847	3,310	39	86	118	149	-	4,560
Reclassified on adoption of Ind AS 116 (Refer Note 39)	-	(11)	-	-	-	-	-	-	11	-
Charge for the year	-	-	178	719	2	26	18	22	8	973
Disposals	-	-	-	(21)	(0)	(0)	(2)	-	-	(23)
Exchange difference	-	-	(2)	(3)	(0)	(0)	0	0	-	(5)
Balance as at 31 March 2020	**-**	**-**	**1,023**	**4,005**	**41**	**112**	**133**	**171**	**19**	**5,504**
Net book value as at 31 March 2019	**2,091**	**251**	**3,588**	**5,952**	**26**	**134**	**107**	**36**	**-**	**12,185**
Net book value as at 31 March 2020	**2,487**	**-**	**5,202**	**7,317**	**26**	**259**	**105**	**77**	**283**	**15,756**

(i) Contractual obligations

Refer to note 36(a) for disclosure of contractual commitments for the acquisition of property, plant and equipment.

(ii) Right-of-use assets consists of leasehold land from the State Industrial Development Corporation of Uttarakhand Limited for a period of 90 years, Uttar Pradesh State Industrial Development Corporation Limited for a period of 87 years and Ramky Pharma City (India) Limited for a period of 33 years which is renewable for a further period of 2 terms of 33 years each at the option of the Company.

(iii) Land parcels with an aggregate carrying amount of ₹4 (31 March 2019: ₹ 4) are under dispute pending in a court as to the ownership of the property. The management, based on available information and advice of legal counsel, is confident of favourable outcome in this case and hence, no adjustments are made in these financial statements.

(iv) The following lands have come into the books of the Company pursuant to the merger of Natco Organics Limited and Karanth Pharma Chemical Labs Private Limited (transferor companies) with the Company in the earlier years. Hence, the name of the transferor companies are appearing in the title deeds of these lands.

i) Freehold land at Sanathnagar Industrial estate, Hyderabad.

ii) Freehold land at No. 74/7B, Vaikkadu TPP Salai, Manali, Chennai.

(v) During the previous year, the Company was provisionally allotted a parcel of land from Andhra Pradesh Industrial Infrastructure Corporation Limited ('APIIC') in Attivaram, Nellore District, Andhra Pradesh for a consideration of ₹ 66 which shall be registered in the name of the Company based on fulfilment of certain conditions laid down by APIIC.

(vi) Refer to note 39 for disclosure of leases under Ind AS 116.

(vii) Refer to note 16 for disclosure of security against borrowings.

(All amounts in ₹ millions, except share data and where otherwise stated)

6. Intangible assets

	Computer Software	Total
Gross carrying amount		
As at 1 April 2018	149	149
Additions	51	51
As at 31 March 2019	**200**	**200**
Additions	29	29
Deletions	(3)	(3)
As at 31 March 2020	**226**	**226**
Accumulated amortisation		
As at 1 April 2018	90	90
Charge for the year	23	23
As at 31 March 2019	**113**	**113**
Charge for the year	25	25
Deletions	0	-
As at 31 March 2020	**138**	**138**
Net carrying amount		
As at 31 March 2019	87	87
As at 31 March 2020	**88**	**88**

7. Investments

	As at 31 March 2020	As at 31 March 2019
I. **Non-current**		
At fair value through other comprehensive income		
a. Investment in equity instruments (fully paid-up)		
Unquoted		
139,451 (31 March 2019: 139,451) equity shares of ₹10 each, in OMRV Hospitals Private Limited	105	105
21,769 (31 March 2019: 21,769) equity shares of ₹10 each, in Veda Seedsciences Private Limited	79	79
8000 (31 March 2019: Nil) equity shares of ₹ 10 each, in Cipher Oncology Private Limited	10	-
978 (31 March 2019: Nil) equity shares of ₹ 10 each, in Medplus Health Services Private Limited	75	-
34,400 (31 March 2019: 34,400) equity shares of ₹10 each, in Pattancheru Enviro-Tech Limited	0	0
27,000 (31 March 2019: 27,000) equity shares of ₹10 each, in Jayalakshi Spinning Mills Limited	0	0
4,054 (31 March 2019: 4,054) shares of 1USD NATIVITA Joint Limited Liability Company	0	0
30 (31 March 2019: 30) equity shares of Euro 0.5 per share of Pharnasanta B.V	0	0
750 (31 March 2019: 750) equity shares of ₹100 each, in Jeedimetla Effluent Treatment Limited	0	0
Less: Provision for impairment in value of investments	0	0
	269	185
b. Other investments		
Unquoted		
1,624 (31 March 2019: 1,060) units of ₹10,000 each, in Endiya Trust	16	11
500,000 (31 March 2019: Nil) 0.05% compulsorily convertible preference shares (CCPS) of ₹100 each, in OMRV Hospitals Private Limited	50	-
	66	11

(All amounts in ₹ millions, except share data and where otherwise stated)

	As at 31 March 2020	As at 31 March 2019
At amortised cost		
Unquoted		
National Saving Certificate	-	-
Application money for investment in Kotak Alternate Investment Plan	-	3
Quoted		
250,000 (31 March 2019: Nil) 9.25% non-convertible debentures (NCD) of ₹1,000 each, in Muthoot Finance limited	250	-
250 (31 March 2019: Nil) 8.39% Series III Perpetual Bonds of ₹ 1,000,000 each, issued by State Bank of India	251	-
	501	3
Total non-current investments	**836**	**199**
Aggregate book value of unquoted investments	335	199
Aggregate book value of quoted investments	501	-
Aggregate market value of quoted investments	512	-
Aggregate amount of impairment in the value of investments	0	0
II. Current		
Quoted		
Investments in equity instruments of others (fully paid-up)		
(At fair value through other comprehensive income)		
10,000 (31 March 2019: 10,000) equity shares of ₹10 each, in Neuland Laboratories Limited	3	7
5,500 (31 March 2019: 5,500) equity shares of ₹1 each, in Sun Pharmaceuticals Industries Limited	2	3
778 (31 March 2019: 778) equity shares of ₹2 each, in Alkem Laboratories Limited	2	1
15,000 (31 March 2019: 15,000) equity shares of ₹1 each, in Cadila Healthcare Limited	4	5
100,000 (31 March 2019: 100,000) equity shares of ₹10 each, in Laurus Labs Limited	32	40
150,000 (31 March 2019: 150,000) equity shares of ₹1 each, in Lanco Infratech Limited	0	0
22,700 (31 March 2019: 22,700) equity shares of ₹1 each, in GMR Infrastructure Limited	0	0
50,400 (31 March 2019: 50,400) equity shares of ₹1 each, in GVK Power & Infrastructure Limited	0	0
50,000 (31 March 2019: 50,000) equity shares of ₹1 each, in Panacea Biotec Limited	6	10
3,176 (31 March 2019: 3,176) equity shares of ₹10 each, in ICICI Prudential Life Insuarance Company Limited	1	1
Unquoted		
Investments in others (fully paid-up)		
(At amortised cost)		
Investment in Global Dynamic Opportunities Fund Limited	237	219
Nil (31 March 2019: 12,000) non-convertible debentures of ₹100,000 in Citicorp Finance India Limited	-	1,200
Total current investments	**287**	**1,487**
Aggregate book value of unquoted investments	237	1,419
Aggregate cost of quoted investments	60	60
Aggregate market value of quoted investments	50	68

8. Loans

	As at 31 March 2020	As at 31 March 2019
(Unsecured, considered good)		
Non-current		
Loans to others	20	20
Security deposits	141	99
Total non-current loans	**161**	**119**
Current		
Loans to employees	84	71
Total current loans	**84**	**71**

(All amounts in ₹ millions, except share data and where otherwise stated)

9. Other financial assets

	As at 31 March 2020	As at 31 March 2019
(Unsecured, considered good)		
Non-current		
Deposits classified at amortised cost:		
- Bank deposits with maturity beyond 12 months*	36	61
- Interest on deposits and investments, accrued but not due	6	5
	42	66
* Bank deposits are given as margin money against bank guarantees/performance guarantees issued by banks.		
Current		
Deposits classified at amortised cost:		
- Deposits with financial institutions	8,112	6,316
- Interest on deposits, accrued but not due	469	553
Other receivables	7	78
	8,588	6,947

10. Other assets

	As at 31 March 2020	As at 31 March 2019
(Unsecured, considered good)		
Non-current		
(i) Capital advances	547	492
(ii) Advances other than capital advances		
- Prepaid expenses (Refer note 39)	-	18
- Balance with statutory authorities	12	17
	559	527
Current		
Advances other than capital advances		
- Advance to material/service providers	1,407	618
- Prepaid expenses	180	139
- Export incentives receivable	260	304
- Balance with statutory authorities	696	750
- Other advances	1	9
	2,544	1,820

11. Inventories

	As at 31 March 2020	As at 31 March 2019
Raw materials [including goods-in-transit of ₹26 (31 March 2019: ₹4)]	1,627	2,111
Work-in-progress	1,566	1,406
Finished goods	1,140	735
Stock-in-trade	342	219
Stores and spares [including goods-in-transit of ₹5 (31 March 2019: ₹44)]	640	561
Packing materials [including goods-in-transit of ₹1 (31 March 2019: ₹Nil)]	265	258
	5,580	5,290

The write-down of inventories to net realisable value during the year amounted to ₹ 31 (31 March 2019: ₹ 2).

Notes to consolidated financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

12. Trade receivables

	As at 31 March 2020	As at 31 March 2019
(Unsecured)		
Trade receivables:		
- Considered good	5,688	5,062
- Credit impaired	-	-
	5,688	5,062
Less: Allowance for credit losses	175	-
	5,513	5,062

13. Cash and bank balances

	As at 31 March 2020	As at 31 March 2019
Cash and cash equivalents:		
Cash on hand	11	18
Balance with banks:		
- Current accounts	187	134
- Deposit with original maturity within three months	-	131
	198	283
Bank balances other than cash and cash equivalents:		
Bank deposits with maturity within 12 months	428	2,490
Unpaid dividend account	34	22
	462	2,512

14. Equity share capital

i. Authorised share capital

	As at 31 March 2020		As at 31 March 2019	
	Number	Amount	Number	Amount
Equity shares of ₹ 2 each	20,00,00,000	400	20,00,00,000	400

ii. Issued, subscribed and fully paid up

	As at 31 March 2020		As at 31 March 2019	
	Number	Amount	Number	Amount
Equity shares of ₹ 2 each	18,20,67,975	364	18,27,46,479	365
	18,20,67,975	364	18,27,46,479	365

iii. Reconciliation of number of equity shares outstanding at the beginning and at the end of the year

	As at 31 March 2020		As at 31 March 2019	
	Number	Amount	Number	Amount
Equity shares				
Balance at the beginning of the year	18,27,46,479	365	18,44,93,400	369
Add: Equity shares issued pursuant to employee stock option plan (Refer note 14(viii))	3,05,840	1	2,68,735	0
Less: Bought back during the year and extinguished before balance sheet date (Refer notes given below)	(9,84,344)	(2)	(18,77,640)	(4)
	18,20,67,975	364	18,28,84,495	365
Less: Bought back during the year and extinguished after the balance sheet date (Refer notes given below)	-	-	(1,38,016)	(0)
Balance at the end of the year	18,20,67,975	364	18,27,46,479	365

(All amounts in ₹ millions, except share data and where otherwise stated)

Notes:

(a) During the year ended 31 March 2020, the Company bought back and extinguished 984,344 equity shares of ₹ 2 each for an aggregate purchase value of ₹ 536 at an average price of ₹ 544 per share, excluding transaction costs under the buy-back of equity shares plan approved by the Board of directors on 05 November 2018.

(b) During the year ended 31 March 2019, the Company bought back 2,015,656 equity shares of ₹ 2 each for an aggregate purchase value of ₹ 1,329 at an average price of ₹ 659 per share, excluding transaction costs under the buy-back of equity shares plan approved by the Board of directors on 05 November 2018. Out of the total shares bought back, 1,877,640 equity shares of ₹ 2 each were extinguished before 31 March 2019 and the balance 138,016 equity shares were extinguished in two tranches on 5 April 2019 and 22 April 2019.

iv. Rights, preferences and restrictions attached to equity shares

The Company has only one class of equity shares having a par value of ₹ 2 per share. Each holder of equity shares is entitled to one vote per share. The dividend proposed by the Board of Directors is subject to the approval of the shareholders in the ensuing general meeting. In the event of liquidation of the Company, the holders of equity shares will be entitled to receive the remaining assets of the Company, after distribution of all preferential amounts in proportion of their shareholding.

v. Details of shareholder holding more than 5% share capital

Name of the equity shareholder	As at 31 March 2020		As at 31 March 2019	
	Number	% holding	Number	% holding
V C Nannapaneni *	2,80,27,975	15.39%	4,07,51,315	22.30%
Time Cap Pharma Labs Limited	1,71,57,220	9.42%	1,71,57,220	9.39%
Natsoft Information Systems Private Limited	1,57,67,500	8.66%	1,57,67,500	8.63%
V S Swathi Kantamani	1,59,83,340	8.78%	32,60,000	1.78%

*including shares held in the capacity of Karta of Hindu Undivided Family (HUF) aggregating 5,440,045 (31 March 2019: 5,440,045)

vi. Shares reserved for issuance under Stock Option Plans of the Company

	As at 31 March 2020		As at 31 March 2019	
	Number	Amount	Number	Amount
NATCO Employee Stock Option Plan:				
ESOP 2015	74,810	0.04%	2,15,800	0.12%
ESOP 2016	87,310	0.05%	1,47,280	0.08%
ESOP 2017	3,70,525	0.20%	4,85,235	0.27%
	5,32,645		8,48,315	

vii. Aggregate number of bonus shares issued, shares issued for consideration other than cash and shares bought back during the period of five years immediately preceding the reporting date:

	2019-20	2018-19	2017-18	2016-17	2015-16
Equity Shares issued under Stock Option Plans of the Company	3,05,840	2,68,735	1,85,600	1,33,555	-
Equity shares bought-back (Refer note 14(iii))	9,84,344	20,15,656	-	-	-

viii. Share based payments

(a) The Company has instituted the NATCO Employee Stock Option Plan 'ESOP-2015', NATCO Employee Stock Option Plan 'ESOP-2016' and NATCO Employee Stock Option Plan 'ESOP-2017' ("the ESOP Schemes"). The ESOP Schemes were formulated in accordance with the Securities Exchange Board of India (Share Based Employee Benefits) Regulations, 2014 issued by the Securities and Exchange Board of India ("SEBI"). Pursuant to the terms of the ESOP Schemes, the Board of Directors of the Company have granted 750,000 options (post split), 174,330 options and 600,000 options to eligible employees on 12 August 2015, 11 November 2016 and 2 November 2017, respectively. The terms of the ESOP Schemes provide that each option entitles the holder to one equity share of ₹ 2 each (post split) and that the options can be settled only by way of issue of equity shares. The options vest in a phased manner ranging from 1 to 5 years from the date of grant and the options are entirely time-based with no performance conditions.

(All amounts in ₹ millions, except share data and where otherwise stated)

(b) During the year ended 31 March 2020, the Company had accrued stock compensation cost of ₹ 144 (31 March 2019: ₹ 255) in respect of the ESOP Schemes.

(c) The details of options are as follows:

ESOP 2015, ESOP 2016 and ESOP 2017	As at 31 March 2020		As at 31 March 2019	
	Number of options	Weighted average exercise price	Number of options	Weighted average exercise price
Outstanding at the beginning of the year	8,48,315	2	11,44,380	2
Granted during the year	-	2	-	2
Forfeited during the year	-	2	-	2
Vested during the year	3,58,675	2	2,96,065	2
Exercised during the year	3,05,840	2	2,68,735	2
Expired during the year	15,775	2	27,330	2
Outstanding at the end of the year	5,26,700	2	8,48,315	2
Exercisable at the end of the year	43,005	2	-	-

The weighted average remaining contractual life of unvested options is 12.35 months (31 March 2019: 16.83 months).

The weighted average share price on the date of exercise of options during the years ended 31 March 2020 and 31 March 2019 was ₹ 567 and ₹ 732 per share, respectively.

There were no stock options granted by the Company for the years ended 31 March 2020 and 31 March 2019. The fair value of stock options granted in earlier years had been measured using the Black–Scholes option pricing model at the date of the grant. The Black-Scholes option pricing model includes assumptions regarding dividend yields, expected volatility, expected terms and risk free interest rates.

ix. Dividend paid and proposed

Dividends on equity shares were declared and paid by the Company during the year:

	As at 31 March 2020		As at 31 March 2019	
	Dividend per Equity share (₹)	Amount	Dividend per Equity share (₹)	Amount
First interim dividend	1.25	227	1.50	277
Second interim dividend	1.00	182	3.50	642
Third interim dividend	3.50	638		-
Dividend distribution tax on above		215		189
Total		1,262		1,108

After the reporting dates the following dividend was proposed by the directors subject to the approval at the annual general meeting; the dividends have not been recognised as liabilities. Payment of dividends would be subject to deduction of tax at source when declared or paid.

	Year ended 31 March 2020		Year ended 31 March 2019	
	Dividend per Equity share (₹)	Amount	Dividend per Equity share (₹)	Amount
Fourth interim dividend	1	182	-	-
Final dividend on equity shares		-	1.25	227
Dividend distribution tax on above		-		47
Total		182		274

(All amounts in ₹ millions, except share data and where otherwise stated)

15. Other equity

A Reserve and surplus

	As at 31 March 2020	As at 31 March 2019
Reserves and surplus		
Securities premium	13,729	14,048
Capital reserve	516	207
Capital redemption reserve	11	9
General reserve	595	595
Share options outstanding account	235	308
Retained earnings	22,391	19,371
Total reserves and surplus	37,477	34,538
Other comprehensive income		
Gain on FVTOCI equity securities	27	40
Foreign currency translation reserve	(133)	(53)
	(106)	(13)
	37,371	34,525

B Nature and purpose of other reserves

Securities premium

Securities premium is used to record the premium on issue of shares. The reserve is utilised in accordance with provisions of the Companies Act, 2013.

Capital reserve

Capital reserve was created on amalgamation of certain entities into the Company in the earlier years and the transactions with shareholders. The Group uses capital reserve for transactions in accordance with the provisions of the Companies Act, 2013.

Capital redemption reserve

The Company had purchased its own shares and as per the provision of the applicable laws, a sum equal to the nominal value of the shares so purchased is required to be transferred to the capital redemption reserve. The Group uses capital redemption reserve for transactions in accordance with the provisions of the Companies Act, 2013.

General reserve

The Group generally appropriates a portion of its earnings to the general reserve to be used for contingencies. These reserves are freely available for use by the Group.

Share options outstanding account

This reserve represents the excess of the fair value of the options on the grant date over the strike price which is accumulated by the Group in respect of all options that have been granted. The Group transfers the proportionate amounts, outstanding in this account, in relation to options exercised to securities premium on the date of exercise of such options.

Fair value through other comprehensive income (FVTOCI) equity securities

The Group has elected to recognise the change in fair value of certain equity instruments in other comprehensive income. These changes are accumulated within the FVTOCI equity instruments reserve within equity. The Group transfers amounts from this reserve to retained earnings when the relevant equity instruments are derecognised.

Retained earnings

Retained earnings mainly represent all current and prior year profits as disclosed in the statement of profit and loss and other comprehensive income pertaining to remeasurement gains/(losses) arising from the actuarial valuation of the defined benefit plan less dividend distribution.

Foreign currency translation reserve

Exchange differences arising on translation of the foreign operations are recognised in other comprehensive income as described in accounting policy and accumulated in a separate reserve within equity. The cumulative amount is reclassified to profit or loss when the net investment is disposed-off.

Notes to consolidated financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

16. Borrowings

	As at 31 March 2020	As at 31 March 2019
Non-current		
Lease liabilites (refer note 39)	9	-
	9	-
Current		
Lease liabilites (refer note 39)	8	-
Loan repayable on demand from banks:		
Working capital loans (secured)	1,340	1,038
Working capital loans (unsecured)	1,802	2,825
	3,150	3,863

Notes:

(i) Working capital loans (secured) represents cash credit, bills purchased and discounted with various banks. These working capital loans are secured by joint pari-passu first charge on all the current assets and property, plant and equipment of: i) Land admeasuring 17.19 acres comprised in survey no. 70 of village Nandikonda, Mandal Peddavoora, District Nalgonda in the State of Telangana together with all buildings and structures thereon and all plant and equipment attached to the earth. ii) House/premise bearing municipal no. 8-2-120/112/A/33 and 8-2-120/112/A/32 in plot no. 100 admeasuring 1166 sq. yards with all its building and fixed assets situated at Road No.2, Banjara Hills, Hyderabad - 500033.

(ii) Working capital loans (unsecured) represents overdraft, bills purchased and discounted with various banks.

(iii) The rate of interest applicable was in the range of 2.40% to 12%.

17. Other financial liabilities

	As at 31 March 2020	As at 31 March 2019
Non-current		
Deposits from customers	8	8
	8	8
Current		
Interest accrued but not due	-	6
Book overdraft	135	-
Capital creditors	403	482
Unpaid dividend *	34	22
Payroll related liabilities	247	265
Other payables	6	7
	825	782

* Investor Education and Protection Fund shall be credited when due.

18. Provisions

	As at 31 March 2020	As at 31 March 2019
Non-current		
Provision for employee benefits:		
Provision for gratuity (refer note (a))	564	439
Provision for compensated absences (refer note (b))	338	271
	902	710
Current		
Provision for employee benefits:		
Provision for gratuity (refer note (a))	52	47
Provision for compensated absences (refer note (b))	53	43
	105	90

(All amounts in ₹ millions, except share data and where otherwise stated)

(a) Gratuity

The Group has subscribed to a group gratuity scheme of Life Insurance Corporation of India (LIC). Under the said policy, the eligible employees are entitled for gratuity upon their resignation, retirement or in the event of death in lumpsum after deduction of necessary taxes upto a maximum limit of ₹ 2. Liabilities in respect of the Gratuity Plan are determined by an actuarial valuation, based upon which the Group makes contributions to the Gratuity Fund.

The following tables sets out the status of the gratuity plan and the reconciliation of opening and closing balances of the present value and defined benefit obligation.

(i) Reconciliation of the present value of defined benefit obligation

	As at 31 March 2020	As at 31 March 2019
Opening balance	554	370
Current service cost	65	69
Interest cost	43	29
Benefits paid	(14)	(21)
Actuarial loss recognised in the other comprehensive income:		
Experience adjustment	30	196
Change in demographic assumptions	-	(15)
Change in financial assumptions	48	(74)
Closing balance	**726**	**554**

(ii) Reconciliations of present value of plan asset

	As at 31 March 2020	As at 31 March 2019
Opening balance	68	83
Interest income	5	7
Employer contribution	52	-
Benefits paid	(14)	(21)
Actuarial losses recognised in the other comprehensive income:		
Return on plan assets, excluding interest income	(1)	(1)
Closing balance	**110**	**68**

(iii) Reconciliation of net defined benefit obligation

	As at 31 March 2020	As at 31 March 2019
Present value of funded obligation	726	554
Fair value of plan assets	(110)	(68)
Amount recognised in the balance sheet	**616**	**486**

(iv) Expense recognised in the statemet of profit and loss under employee benefit expense:

	Year ended 31 March 2020	Year ended 31 March 2019
Current service cost	65	69
Interest cost	43	29
Interest income	(5)	(7)
Net cost	**103**	**91**

(All amounts in ₹ millions, except share data and where otherwise stated)

(v) Remeasurments recognised in the statement of other comprehensive income

	Year ended 31 March 2020	Year ended 31 March 2019
Experience adjustment on funded obligation	78	107
Return on plan assets, excluding interest income	1	1
Net gratuity costs in other comprehensive income	**79**	**108**

(vi) Plan assets comprises of the following:

	As at 31 March 2020	As at 31 March 2019
Group gratuity fund with LIC	110	68

(vii) Summary of actuarial assumptions:

	As at 31 March 2020	As at 31 March 2019
Discount rate	6.85%	7.70%
Estimates rate of return on plan assets	6.85%	7.70%
Salary escalation rate	7.00%	1 - 2 year 10.00% thereafter 7%
Mortality rate	Indian Assured Lives Mortality(2012-14)	Indian Assured Lives Mortality(2006-08)

The estimates of future salary increase considered in actuarial valuation takes account of inflation,seniority, promotion and other relevant factors such as supply and demand in the employment market.

(viii) Sensitivity analysis:

The significant actuarial assumptions for the determination of the defined benefit obligation are the discount rate and the salary growth rate. The calculation of the net defined benefit liability is sensitive to these assumptions. However, the impact of these changes is not ascertained to be material by the management.

The sensitivity analysis of significant actuarial assumptios as at the end of the period is shown below.

		As at 31 March 2020	As at 31 March 2019
A.	Defined benefit obligation without effect of projected salary growth	726	554
B.	Salary escalation rate		
	Salary rate +100 basis points	78	58
	Salary rate -100 basis points	(68)	(50)
C.	Discount rate		
	Discount rate +100 basis points	(73)	(55)
	Discount rate -100 basis points	88	64

(ix) Expected contribution

The expected contributions for defined benefit plan for the next financial year will be in line with the contribution for the period and is expected by the Management to be ₹ 60 (31 March 2019: ₹ 47).

(x) Maturity profile of defined benefit obligation (valued on undiscounted basis):

	As at 31 March 2020	As at 31 March 2019
Within 1 year	66	47
2 to 5 years	162	142
6 to 10 years	300	274
More than 10 years	1,333	1,188

(All amounts in ₹ millions, except share data and where otherwise stated)

(xi) The weighted average duration of the defined benefit plan obligation at the end of the reporting period is 11 years (Previous year: 11 years).

(b) Compensated absences:
The accrual for unutilised leave is determined for the entire available leave balance standing to the credit of the employees at the year-end. The value of such leave balances that are eligible for carry forward, is determined by an actuarial valuation as at the end of the year and is charged to the statement of profit and loss. The actual liability towards leave obligations as at 31 March 2020 is ₹ 391 (31 March 2019: ₹ 314). Expense recognised in the statement of profit and loss under employee benefit expense is ₹ 99 (31 March 2019: ₹ 143).

19. Other liabilities

	As at 31 March 2020	As at 31 March 2019
Current		
Statutory liabilities	94	94
Advance from customers	4	189
Others	36	33
	134	316

20. Trade payables

	As at 31 March 2020	As at 31 March 2019
Current		
Total outstanding dues of micro enterprisees and small enterprises [Refer note below]	21	79
Total outstanding dues of creditors other than micro enterprises and small enterprises	2,533	2,091
	2,554	2,170

Note:
Under the Micro, Small and Medium Enterprises Development Act, 2006, (MSMED) which came into force from 2 October 2006, certain disclosures are required to be made relating to Micro and Small enterprises. On the basis of the information and records available with the Management, the outstanding dues to the Micro and Small enterprises as defined in the MSMED as set out in following disclosure.

Particulars		As at 31 March 2020	As at 31 March 2019
(i)	the principal amount and the interest due thereon remaining unpaid to any supplier as at the end of each accounting year;	21	79
(ii)	the amount of interest paid by the buyer in terms of Section 16 of MSMED Act, 2006 along with the amounts of the payment made to the supplier beyond the appointed day during each accounting year;	-	-
(iii)	the amount of interest due and payable for the period of delay in making payment (which have been paid but beyond the appointed day during the year) but without adding the interest specified under MEMED Act, 2006;	-	-
(iv)	the amount of interest accrued and remaining unpaid at the end of each accounting year; and	-	1
(v)	the amount of further interest remaining due and payable even in the succeeding years, until such date when the interest dues as above are actually paid to the small enterprise, for the purpose of disallowance as a deductible expenditure under the MSMED Act, 2006.	-	-

The above information regarding Micro, Small and Medium Enterprises has been determined to the extent such parties have been identified on the basis of information available with the Group. This has been relied upon by the auditors.

Notes to consolidated financial statements

(All amounts in ₹ millions, except share data and where otherwise stated)

21. Revenue from operations

	For the year ended 31 March 2020	For the year ended 31 March 2019
Revenue from contracts with customers:		
Sale of goods	17,125	20,400
Sale of services	1,451	68
Job work income	302	150
Total (a)	**18,878**	**20,618**
Other operating revenues:		
Export incentives	224	235
Budgetary Support	31	62
Scrap sales	17	30
Total (b)	**272**	**327**
Total revenue from operation (a+b)	**19,150**	**20,945**
Disaggregation of revenue		
Revenue based on Geography (product destination):		
India	7,218	7,929
USA	8,230	8,741
Rest of the world	3,430	3,948
	18,878	**20,618**
Timing of revenue recognition:		
Goods transferred at a point in time	17,125	20,400
Services transferred over time	1,753	218
	18,878	**20,618**
Reconciliation of revenue from operations with contract price:		
Revenue as per contracted price	20,310	22,519
Adjusted for:		
Sales returns	(399)	(257)
Trade discounts and rebates	(1,033)	(1,644)
Total revenue from operations	**18,878**	**20,618**

Contract liabilities resulting from advance payments by customers for delivery of goods are predominantly recognised as sales within one year. The aggregate amount of the transaction price allocated to the performance obligations that are unsatisfied as on 31 March 2020 is ₹ 4(31 March 2019: ₹ 189) resulting from advance payments and shown under other current liabilities.

22. Other income

	For the year ended 31 March 2020	For the year ended 31 March 2019
Provisions no longer required written back	29	-
Interest income from financial assets carried at amortised cost	791	898
Profit on sale of property, plant and equipment, net	163	135
Foreign exchange gain, net	51	249
Other receipts	40	20
	1,074	**1,302**

23. Cost of materials consumed

	For the year ended 31 March 2020	For the year ended 31 March 2019
Raw material consumed	3,018	3,116
Packing material consumed	272	215
	3,290	**3,331**

(All amounts in ₹ millions, except share data and where otherwise stated)

24. Changes in inventories of finished goods, work-in-progress and stock-in-trade:

	For the year ended 31 March 2020	For the year ended 31 March 2019
Opening stock:		
- Finished goods	735	621
- Work-in-progress	1,406	1,239
- Stock-in-trade	219	164
	2,360	2,024
Closing stock:		
- Finished goods	1,140	735
- Work-in-progress	1,566	1,406
- Stock-in-trade	342	219
	3,048	2,360
Currency translation adjustment	64	3
	(752)	(339)

25. Employee benefits expense

	For the year ended 31 March 2020	For the year ended 31 March 2019
Salaries, wages and bonus	3,129	2,872
Contribution to provident fund and other funds	223	199
Gratuity expense (Refer note 18)	103	91
Share based payment expense (Refer note 14(viii))	144	255
Staff welfare expenses	151	142
	3,750	3,559

Defined contribution plan:
The Group makes contributions, determined as a specified percentage of employee salaries, in respect of qualifying employees towards provident fund and employee state insurance schemes which are defined contribution plans. The Group has no obligations other than to make the specified contributions. The contribution to provident fund and employyes state insurance charged to the statement of profit and loss is ₹ 223 (31 March 2019: ₹ 199).

26. Finance costs

	For the year ended 31 March 2020	For the year ended 31 March 2019
Interest expense on liabilities at amortised cost:		
- Bank overdraft and others	177	162
Other borrowing cost	38	31
	215	193

27. Other expenses

	For the year ended 31 March 2020	For the year ended 31 March 2019
Consumption of stores and spares	290	372
Power and fuel	624	596
Rental charges (Refer note 39)	33	37
Repairs and maintenance:		
- Buildings	55	50
- Plant and equipment	163	192
- Others	26	34
Insurance	147	103
Rates and taxes	366	380
Factory maintenance expenses	266	196
Clinical and analytical charges	469	283

(All amounts in ₹ millions, except share data and where otherwise stated)

	For the year ended 31 March 2020	For the year ended 31 March 2019
Carriage and freight outward	45	53
Donations*	42	287
Corporate social responsibility (CSR) expenses (Refer note 33)	157	116
Corporate environment responsibility (CER) expenses	2	-
Communication expenses	76	68
Office maintenance	83	75
Travelling and conveyance	256	257
Legal and professional fees	356	335
Payment to auditors**		
- Audit fees	8	8
- Expenses reimbursed	0	0
Directors sitting fee	1	1
Allowance for doubtful receivables	175	-
Bad debts (net of related liabilities) written off	55	20
Foreign exchange loss, net	-	22
Royalty expense	259	698
Sales promotion	936	847
Research and development expenses (refer note 37)	633	724
Miscellaneous expenses	235	142
	5,758	5,896

* Includes political contributions of ₹ 23 (31st March 2019: ₹ 233) made in accordance with Section 182 of the Companies Act, 2013.

** Including audit fee of subsidiary companies.

28. Income-tax

(A) Components of Income-tax expenses

		For the year ended 31 March 2020	For the year ended 31 March 2019
(i)	Tax expense recognised in profit and loss		
	Current tax:		
	Current year tax	1,271	1,883
	Income-tax for earlier years	40	-
		1,311	1,883
	Deferred tax charge/(credit) (net):		
	Minimum Alternate Tax (MAT) credit utilisation (Refer note 28(E))	(382)	(60)
	Origination and reversal of temporary differences	177	-
		(205)	(60)
	Tax expense for the year	1,106	1,823
(ii)	Tax recognised in other comprehensive income		
	Items that will not be reclassified to profit and loss		
	- Remeasurement of defined benefit plans	27	23
	- Net gains / (losses) from investments in equity instruments designated at FVTOCI	7	1
		34	24

(All amounts in ₹ millions, except share data and where otherwise stated)

(B) Reconciliation of effective tax rate

The major components of income tax expense and the reconciliation of expected tax expense based on the domestic effective tax rate of the Company at 34.944% (31 March 2019: 34.944%) and the reported tax expense in the statement profit and loss are as follows:

	For the year ended 31 March 2020	For the year ended 31 March 2019
Profit before tax	5,687	8,247
Enacted tax rate applicable to the Company in India*	34.944%	34.944%
Tax using the Company's domestic tax rate	1,987	2,882
Tax effect of:		
Expense not deductible for tax purposes	74	50
Additional deduction allowed under Income-tax Act	(431)	(446)
Unrecognised deferred tax asset in subsidiaries	19	28
Additional allowances under Income-tax Act	(378)	(685)
Effect of change in tax laws and rate in jurisdictions outside India	60	71
Utilisation of previously unutilised MAT credit**	(382)	(60)
Capital gain tax	(25)	(17)
Other timing differences	142	-
Tax pertaining to earlier years	40	-
Income tax expense	1,106	1,823

*The Taxation Laws (Amendment) Ordinance, 2019 ('Ordinance') was promulgated by the President of India on 20 September 2019. The Ordinance has amended the Income-tax Act, 1961 and Finance Act, 2019 to inter-alia provide an option to a domestic company in India to pay income tax at reduced rate of 22% plus applicable surcharge and cess subject to certain conditions. The Company has made an assessment of the impact of the Ordinance and decided to continue with the existing tax structure until utilisation of accumulated minimum alternative tax (MAT) credit.

** Also refer note 41

(C) Deferred tax assets and liabilities

The tax effects of significant temporary differences that resulted in deferred tax assets and liabilities and a description of the items that created these differences is given below:

	As at 31 March 2020	As at 31 March 2019
Deferred tax assets/(liabilities):		
Minimum Alternate Tax*	40	-
Trade receivables	61	-
Property , plant and equipment	(711)	(403)
Provision for employee benefits	350	278
Investments	1	9
	(259)	(116)

* As per Indian tax laws, companies are liable for a Minimum Alternate Tax ("MAT" tax) when current tax, as computed under the provisions of the Income-tax Act, 1961 ("Tax Act"), is determined to be below the MAT tax computed under section 115JB of the Tax Act. The excess of MAT tax over current tax is eligible to be carried forward and set-off in the future against the current tax liabilities over a period of 15 years.

The Group offsets tax assets and liabilities year on year basis only if it has a legally enforceable right to set off current tax assets and current tax liabilities and the deferred tax assets and deferred tax liabilities relate to income taxes levied by the same tax authority.

Significant management judgement is required in determining provision for income-tax, deferred tax assets and liabilities and recoverability of deferred tax assets. The recoverability of deferred tax assets is based on estimates of taxable income by each jurisdiction in which the relevant entity operates and the period over which deferred tax assets will be recovered.

(All amounts in ₹ millions, except share data and where otherwise stated)

(D) Movement in deferred tax assets and liabilities

The details of movement in deferred tax assets and liabilities for the year ended 31 March 2020:

	As at 1 April 2019	Recognised in profit and loss	Recognised in OCI	As at 31 March 2020
Deferred tax assets/(liabilities):				
Minimum Alternate Tax	-	40	-	40
Trade receivables	-	61	-	61
Property, plant and equipment	(403)	(308)	-	(711)
Provision for employee benefits	278	45	27	350
Investments	9	(15)	7	1
Net deferred tax assets/(liabilities)	**(116)**	**(177)**	**34**	**(259)**

The details of movement in deferred tax assets and liabilities for the year ended 31 March 2019:

	As at 1 April 2018	Recognised in profit and loss	Recognised in OCI	As at 31 March 2019
Deferred tax assets/(liabilities):				
Property, plant and equipment	(307)	(95)	-	(403)
Provision for employee benefits	160	95	23	278
Investments	8	-	1	9
Net deferred tax assets/(liabilities)	**(139)**	**-**	**24**	**(116)**

(E) Unrecognised deferred tax assets

	As at 31 March 2020	As at 31 March 2019
Unrecognised MAT credit entitlement	1,237	1,619
Carry forward losses of subsidiaries	153	171
	1,390	**1,790**

The Group did not recognise deferred tax assets of ₹ 1,237 million on MAT credit entitlement, as the Group is unable to estimate the availability of taxable profits with reasonable certainty after taking into consideration the tax holiday units/ benefits available including financial projections and availability of sufficient taxable income in foreseeable future. The above MAT credit expires at various dates ranging from 2029 through 2032.

29. Earnings per share (EPS)

	For the year ended 31 March 2020	For the year ended 31 March 2019
Earnings:		
Profit attributable to equity share holders of the Company	4,608	6,444
Shares:		
Number of equity shares at the beginning of the year	18,27,46,479	18,44,93,400
Effect of equity shares issued on exercise of stock options	95,712	1,23,292
Effect of equity shares bought back during the year	(9,07,668)	(4,11,270)
Weighted average number of equity shares – Basic	**18,19,34,523**	**18,42,05,422**
Dilutive effect of stock options outstanding	5,21,079	5,71,121
Weighted average number of equity shares – Diluted	**18,24,55,602**	**18,47,76,543**
Earnings per equity share (face value of ₹ 2/- each):		
Basic (in ₹)	25.33	34.98
Diluted (in ₹)	25.26	34.87

(All amounts in ₹ millions, except share data and where otherwise stated)

30. Financial instruments - fair values

Accounting classification and fair values

The following table shows the carrying amounts and fair values of the financial assets and financial liabilities including their levels in the fair value hierarchy.

As at 31 March 2020:

Particulars	Note	Carrying amount	Fair value		
			Level 1	Level 2	Level 3
A. Financials assets					
Financial assets measured at FVTOCI					
Non-current investments	7	335	-	-	335
Current investments	7	50	50	-	-
Financial assets measured at amortised cost					
Non-current investments	7	501	-	-	-
Current investments	7	237	-	-	-
Loans	8	245	-	-	-
Trade receivables	12	5,513	-	-	-
Cash and cash equivalents	13	198	-	-	-
Bank balances other than cash and cash equivalents	13	462	-	-	-
Other financial assets	9	8,630	-	-	-
		16,171	**50**	**-**	**335**
B. Financials liabilities					
Financial liabilities measured at amortised cost					
Borrowings (including lease liability)	16	3,159	-	-	17
Trade payables	20	2,554	-	-	-
Other financial liabilities	17	833	-	-	-
		6,546	**-**	**-**	**17**

As at 31 March 2019:

Particulars	Note	Carrying amount	Fair value		
			Level 1	Level 2	Level 3
A. Financials assets					
Financial assets measured at FVOCI					
Non-current investments	7	196	-	-	196
Current investments	7	68	68	-	-
Financial assets measured at amortised cost					
Non-current investments	7	3			
Current investments	7	1,419	-	-	-
Loans	8	190	-	-	-
Trade receivables	12	5,062	-	-	-
Cash and cash equivalents	13	283	-	-	-
Bank balances other than cash and cash equivalents	13	2,512	-	-	-
Other financial assets	9	7,013	-	-	-
		16,746	**68**	**-**	**196**
B. Financials liabilities					
Financial liabilities measured at amortised cost					
Borrowings	16	3,863	-	-	-
Trade payables	20	2,170	-	-	-
Other financial liabilities	17	790	-	-	-
		6,823	**-**	**-**	**-**

(All amounts in ₹ millions, except share data and where otherwise stated)

The Group's financial liabilities comprise of borrowings from banks, lease liabilities, trade payables and other financial liabilities. The main purpose of these financial liabilities is to finance the Group's operations. The Group's principal financial assets include loans, trade receivables, other financial assets, cash and cash equivalents and other bank balances that derive directly from its operations. The Group also holds certain strategic investments in entities other subsidiaries.

The fair value of cash and cash equivalents, bank balances, trade receivables, loans, unquoted debentures and bonds, borrowings, trade payables and other financial assets and liabilities approximate their carrying amount largely due to the nature of these instruments. The Group's loans have been contracted at market rates of interest. Accordingly, the carrying value of such loans approximate fair value.

The following methods and assumptions were used to estimate the fair value :

Level 1: The fair value of the quoted investments are based on market price at the reporting date.

Level 3: The Investments measured at fair value and falling under fair value hierarchy Level 3 are valued on the basis of valuation reports provided by external valuers with the exception of certain investments, where the impact of fair valuation of investment is considered as insignificant and hence carrying value and fair value is considered as same.

31. Financial risk management

The Group's financial risk management is an integral part of how to plan and execute its business strategies. The Group's activities expose it to a variety of financial risks: credit risk, liquidity risk and market risk. The Group's primary focus is to foresee the unpredictability of financial markets and seek to minimise potential adverse effects on its financial performance. A summary of the risks have been given below.

A. **Market risk**:

Market risk is the risk that the fair value of future cash flows of a financial instrument will fluctuate because of changes in market prices. Market risk comprises two types of risks: interest rate risk and currency risk. Financial instruments affected by market risk include borrowings, deposits, trade receivables and other financial instruments.

i. Interest rate risk

Interest rate risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates. The Group's entire borrowings carried at amortised cost are variable rate instruments and are subject to fluctuation because of a change in market interest rates. The Group considers the impact of fair value interest rate risk on variable rate borrowings as not material.

The Group's variable rate borrowings are subject to interest rate risk. Below are the details of exposure to fixed rate and variable rate instruments:

Particulars	As at 31 March 2020	As at 31 March 2019
Fixed rate instruments		
Financial assets	9,334	10,440
Financial liabilities	17	-
Variable rate instruments		
Financial liabilities (other than lease liability)	3,142	3,863

ii. Foreign currency risk:

Foreign currency risk is the risk that the fair value or future cash flows of an exposure will fluctuate because of changes in foreign exchange rates. The Group is exposed to currency risk to the extent that there is mismatch between the currencies in which sales, purchase are denominated and the respective functional currencies of Group companies. The Group's exposure to the risk of changes in foreign exchange rates relates primarily to the Group's operating activities.

The Group's exposure to foreign currency financial assets and financial liabilities expressed in ₹ are as follows:

(All amounts in ₹ millions, except share data and where otherwise stated)

Financial assets and financial liabilities:

	31 March 2020			31 March 2019		
	Trade receivables*	Borrowings*	Trade payables	Trade receivables*	Borrowings*	Trade payables
- USD	3,449	1,655	214	2,739	701	158
- EUR	47	16	22	55	-	45
- CAD	123	-	-	147	-	-
- GBP	-	-	0	-	-	1
- SGD	8	-	-	3	-	-

* Includes bills purchased and discounted which are forming part of trade receivables and current borrowings amounting to ₹ 1,671 (31 March 2019: ₹ 701). These are realised amounts and hence there is no further foreign currency risk is involved.

Foreign currency sensitivity

A reasonably possible strengthening (weakening) of the Indian Rupee against various foreign currencies at 31 March would have affected the measurement of financial instruments denominated in foreign currencies and affected equity and profit or loss by the amounts shown below. This analysis assumes that all other variables, in particular interest rates, remain constant and ignores any impact of forecast sales and purchases.

The following table demonstrates the sensitivity to a reasonably possible change in USD. The Group's exposure to foreign currency changes for all other currencies is not material.

Particulars	Impact on profit and loss after tax gain/(loss) for the year ended	
	31 March 2020	31 March 2019
USD sensitivity		
₹/USD - Appreciate by 10%	158	188
₹/USD - Depreciate by 10%	(158)	(188)

B. Credit risk

Credit risk is the risk of financial loss to the Group if a customer or counterparty to a financial instrument fails to meet its contractual obligations, and arises principally from the Group's receivables from customers and loans given. Credit risk arises from cash held with banks and financial institutions, as well as credit exposure to clients, including outstanding accounts receivables. The maximum exposure to credit risk is equal to the carrying value of the financial assets. The objective of managing counterparty credit risk is to prevent losses in financial assets. The Group assesses the credit quality of the counterparties, taking into account their financial position, past experience and other factors.

Trade and other receivables:

The Group's exposure to credit risk is influenced mainly by the individual characteristics of each customer. The demographics of the customer, including the default risk of the industry and country in which the customer operates, also has an influence on credit risk assessment. Credit risk is managed through credit approvals, establishing credit limits and continuously monitoring the creditworthiness of customers to which the Group grants credit terms in the normal course of business.

The maximum exposure to credit risk for trade receivables by geographic region was as follows:

Particulars	As at 31 March 2020	As at 31 March 2019
India	1,913	2,846
USA	2,713	1,859
Rest of the world	1,062	357
	5,688	5,062

(All amounts in ₹ millions, except share data and where otherwise stated)

The ageing of trade receivables are as follows:

Particulars	As at 31 March 2020	As at 31 March 2019
Neither past due nor impaired	3,745	3,886
Past due not impaired:		
1-180 days	1,830	1,060
More than 180 days	113	116
Allowance for credit losses	(175)	-
	5,513	5,062

As per simplified approach the Group makes provision of expected credit losses on trade receivable using a provision matrix to mitigate the risk of default payment and make appropriate provision at each reporting date wherever required.

Other financial assets:
Other financial assets primarily consist cash and cash equivalents and deposits. Credit risk on cash and cash equivalents and deposits with banks and financial institutions are generally low as the said deposits have been made with the banks and financial institutions who have been assigned high credit rating by international and domestic credit rating agencies. Investments in other than subsidiaries are strategic investments in the normal course of business of the Gompany.

C. Liquidity risk

Liquidity risk is the risk that the Group will encounter difficulty in meeting the obligations associated with its financial liabilities that are settled by delivering cash or another financial asset. The Group's approach to managing liquidity is to ensure, as far as possible, that it will have sufficient liquidity to meet its liabilities when they are due, under both normal and stressed conditions, without incurring unacceptable losses or risking damage to the Group's reputation.

Management monitors rolling forecasts of the Group's liquidity position and cash and cash equivalents on the basis of expected cash flows. The Group takes into account the liquidity of the market in which the entities operates. In addition, the Group's liquidity management policy involves projecting cash flows in major currencies and considering the level of liquid assets necessary to meet these, monitoring balance sheet liquidity ratios against internal and external regulatory requirements and maintaining debt financing plans.

The Group's principal sources of liquidity are the cash flows generated from operations. The Group has no long-term borrowings and believes that the working capital is sufficient for its current requirements. Accordingly, no liquidity risk is perceived.

Maturities of financial liabilities
The tables below analyse the Group's financial liabilities into relevant maturity groupings based on their contractual maturities for all financial liabilities. The amounts disclosed in the table are the contractual undiscounted cash flows. Balances due within 12 months equal their carrying balances as the impact of discounting is insignificant.

As at 31 March 2020	Carrying value	Up to 1 year	From 1 to 3 years	More than 3 years	Total
Financial liabilities					
Borrowings	3,142	3,142	-	-	3,142
Lease liabilities	17	8	7	393	408
Trade payables	2,554	2,554	-	-	2,554
Other financial liabilities	833	825	8	-	833
Total	6,546	6,529	15	393	6,937

As at 31 March 2019	Carrying value	Up to 1 year	From 1 to 3 years	More than 3 years	Total
Financial liabilities					
Borrowings	3,863	3,863	-	-	3,863
Trade payables	2,170	2,170	-	-	2,170
Other financial liabilities	790	782	8	-	790
Total	6,823	6,815	8	-	6,823

(All amounts in ₹ millions, except share data and where otherwise stated)

32. Capital management

The Group's objective when managing capital is to safeguard the Group's ability to continue as a going concern in order to provide returns for shareholders and benefits for stakeholders. The Group also proposes to maintain an optimal capital structure to reduce the cost of capital. Hence, the Group may adjust any dividend payments, return capital to shareholders or issue new shares. Total capital is the equity as shown in the Consolidated Balance Sheet. Currently, the Group primarily monitors its capital structure on the basis of gearing ratio. Management is continuously evolving strategies to optimise the returns and reduce the risks. It includes plans to optimise the financial leverage of the Group.

The capital for the reporting year under review is summarised as follows:

Particulars	As at 31 March 2020	As at 31 March 2019
Total borrowings	3,159	3,863
Less: Cash and cash equivalents	(198)	(283)
Net debt [A]	**2,961**	**3,580**
Total equity [B]	37,847	34,910
Total capital [C=A+B]	**40,808**	**38,490**
Gearing ratio (%) [A/C]	7%	9%

33. Corporate social responsibility (CSR) expenses

During the year, the amount required to be spent on corporate social responsibility activities amounted to ₹ 156 (31 March 2019: ₹ 116) in accordance with Section 135 of the Act, 2013. The following amounts were actually spent during the current and previous year:

Particulars	For the year ended 31 March 2020	For the year ended 31 March 2019
Amount spent in cash:		
(i) Amount spent for other than for construction/ acquisition of any asset	-	-
(ii) On purposes other than (i) above*	157	116
Amount yet to be paid in cash	-	-
Total	**157**	**116**

The Group has contributed the amount of ₹ 157 (Previous year: ₹ 116) to NATCO Trust towards CSR activites (Refer note 34(a)).

34. Related party disclosures, as per Ind AS 24

(a) Names of the related parties and nature of relationship (to the extent transactions have taken place during the year)

Nature of relationship	Names of the related parties
1. Entities in which Directors have control or have significant influence	Time Cap Pharma Labs Limited
	NATCO Trust
2. Key management personnel ("KMP")	
Chairman and Mangaing Director	Mr. V C Nannapaneni
Vice Chairman and Chief Executive Officer ("CEO")	Mr. Rajeev Nannapaneni
Wholetime Director	Mr. Potluri Prasad Sivaramakrishna
Wholetime Director	Mr. Lingarao Donthineni
Chief Financial Officer	Mr. S.V.V.N. Appa Rao
Company Secretary	Mr. Adinarayana M
3. Non-Executive Directors and Independent Directors	
Independent Director	Mr. Sreerama Murthy Gubbala
Independent Director	Mr. Govinda Prasad Dasu
Independent Director	Mr. Umamaheshwarrao Naidu Madireddi
Independent Director	Mr. Venkateswara Rao Thallapaka
Non-Executive Director	Mr. Sridhar Sankararaman
Independent Director	Mrs. Leela Digumarti
4. Relatives of KMP	Mrs. Durga Devi Nannapaneni
	Dr. N. Ramakrishna Rao
	Mrs. V S Swathi Kantamani

(All amounts in ₹ millions, except share data and where otherwise stated)

(b) Related party transactions during the year

	For the year ended	
	31 March 2020	31 March 2019
Time Cap Pharma Labs Limited		
Sales promotion expenses	-	6
Purchase of Land	-	49
Rental expense	5	5
NATCO Trust		
Donations	-	24
Contribution to corporate social responsibility activities	157	116
Mr. V.C. Nannapaneni		
Short-term employee benefits*	18	17
Leave encashment paid	1	1
Rental expenses	2	2
Mr. Rajeev Nannapaneni		
Short-term employee benefits*	17	16
Leave encashment paid	1	1
Rental expenses	3	1
Mr. Potluri Prasad Sivaramakrishna		
Short-term employee benefits*	18	14
Leave encashment paid	0	0
Mr. Lingarao Donthineni		
Short-term employee benefits*	18	14
Leave encashment paid	-	0
Mr. S.V.V.N. Appa Rao		
Short-term employee benefits*	9	6
Mr. Adinarayana M		
Short-term employee benefits*	5	4
Sitting fees		
Mr. Govinda Prasad Dasu	0	0
Mrs. Leela Digumarti	0	0
Mr. Umamaheshwarrao Naidu Madireddi	0	0
Mr. Sreerama Murthy Gubbala	0	0
Mr. Venkateswara Rao Thallapaka	0	0

*This aforesaid amount does not include amounts in respect of gratuity and compensated absences as the same are determined on actuarial basis for the Group as a whole.

(c) Related party closing balances as on balance sheet date receivable/(payable):

	As at	
	31 March 2020	31 March 2019
Trade payable		
Time Cap Pharma Labs Limited	-	(0)
Managerial Remuneration		
Mr. V.C. Nannapaneni	-	(2)
Mr. Rajeev Nannapaneni	(1)	(1)
Mr. Lingarao Donthineni	(3)	(1)
Mr. Potluri Prasad Sivaramakrishna	(3)	(1)
Mr. S.V.N.N. Appa Rao	0	0
Mr. Adinarayana M	0	0

(All amounts in ₹ millions, except share data and where otherwise stated)

35. Segment reporting

The management has assessed the identification of reportable segments in accordance with the requirements of Ind AS 108 'Operating Segment' and believes that the Group has only one reportable segment namely "Pharmaceuticals". The products being sold under this segment are of similar nature and comprises of pharmaceutical products only.

The operating segments are reported in a manner consistent with the internal reporting provided to the Company's Chief Operating Decision Maker (CODM). The CODM has been identified as the Chief Executive Officer (CEO) of the Group who reviews the internal management reports prepared based on an aggregation of financial information for all entities in the Group on a periodic basis.

Geography-wise details of the Group's revenues from external customers and its non-current assets (other than financial instruments) and revenue from major customers are given below:

i. Revenue from Operations:

	Year ended 31 March 2020	Year ended 31 March 2019
India	7,490	8,256
USA	8,230	8,741
Rest of the world	3,430	3,948
	19,150	20,945

ii. Non-current assets*

	As at 31 March 2020	As at 31 March 2019
India	20,923	18,524
USA	-	-
Rest of the world	101	124
	21,024	18,648

* Non-current assets for this purpose consist of property, plant and equipments, Capital work-in-progress and intangibles.

iii. Major customers

The Group has two customer who contributed more than 10% of the Group's total revenue during the current year and previous year. The revenue from such major customer(s) during the year is ₹ 7,266 (31 March 2019: ₹ 5,245).

36. Contingent liabilities and commitments

		As at 31 March 2020	As at 31 March 2019
(a)	Commitments		
	Estimated amount of contracts remaining to be executed on capital account and not provided for (net of advances)	834	753
	Pending export obligation under EPCG Scheme	143	141
(b)	Contingent liabilities		
(i)	Matters under appeals with tax authorities:		
	Disputed sales tax liabilities	9	9
	Disputed service tax liabilities	-	17
	Disputed customs liability	2	2

(ii) The Group is contesting certain patent infringement cases filed against it by the innovators in the ordinary course of business. A few of these cases pertain to products already launched by the Group in the market. These cases are pending before different authorities / courts and most of the claims involve complex issues. The outcome from these claims are uncertain due to a number of factors involved in legal trial such as stage of the proceedings and the overall length and extent of pre-trial discovery; the entitlement of the parties to an action to appeal a decision; clarity as to theories of liability; damages and governing law; uncertainties in timing of litigation; and the possible need for further legal proceedings to establish the appropriate amount of damages, if any. Often, these issues are subject to uncertainties and therefore the probability of a loss, if

any, being sustained and an estimate of the amount of any loss is difficult to ascertain. Consequently, for a majority of these claims, it is not possible to make a reasonable estimate of the expected financial effect, if any, that will result from ultimate resolution of the proceedings. Further, at present, the management does not expect such liabilities to be significant.

(iii) The Hon'ble Supreme Court (SC) has clarified in the case of Vivekananda Vidyamandir and Others Vs. The Regional Provident Fund Commissioner (II) West Bengal that various allowances like conveyance allowance, special allowance, education allowance, medical allowance etc., paid uniformly and universally by an employer to its employees shall form part of basic wages for computation of the provident fund contribution. However, considering that there are numerous interpretative issues relating to this judgement, on the basis of internal evaluation, supported by a legal opinion from an independent legal expert, management of the Company has determined that the aforesaid ruling is applicable prospectively.

37. Amounts incurred on research and development expenses

	For the year ended	
	31 March 2020	31 March 2019
Salaries and wages	527	501
Consumption of materials, spares	210	314
Power and fuel	33	29
Other research and development expenses	773	1,032
Capital equipment	242	288
	1,785	2,164

The aforementioned expenditure, other than capital equipment, are included under the respective heads of the Statement of Profit and Loss.

38. Capital work-in-progress

	As at	
	31 March 2020	31 March 2019
Opening balance	6,376	4,800
Costs incurred toward construction activity	2,653	4,207
Expenses capitalised:		
Cost of materials consumed, net of trial run inventory recognised	10	1
Employee benefits expense	41	54
Power and fuel	38	39
Factory maintenance	73	88
Rates and taxes	22	3
Legal and professional charges	45	1
Others	18	23
Less:		
Capitalised during the year	(4,096)	(2,840)
	5,180	6,376

39. Leases

Transition to Ind AS 116

Ministry of Corporate Affairs ("MCA") through Companies (Indian Accounting Standards) Amendment Rules, 2019 and Companies (Indian Accounting Standards) Second Amendment Rules, has notified Ind AS 116 Leases which replaces the existing lease standard, Ind AS 17 leases and other interpretations. Ind AS 116 sets out the principles for the recognition, measurement, presentation and disclosure of leases for both lessees and lessors. It introduces a single, on-balance sheet lease accounting model for lessees.

Effective 01 April 2019, the Group adopted Ind AS 116 "Leases" and applied the standard to all lease contracts existing on 01 April 2019 using the modified retrospective method. Right-of-use of assets at 01 April 2019 for leases previously classified as operating leases were recognised and measured at an amount equal to lease liability (adjusted for related prepayments/ accruals). The Group recorded the lease liability at the present value of all future lease payments discounted at the incremental borrowing rate. Comparatives as at and for the year ended 31 March 2019 have not been retrospectively adjusted

(All amounts in ₹ millions, except share data and where otherwise stated)

and therefore will continue to be reported under the accounting policies included as part of our Annual Report for the year ended 31 March 2019.

On 01 April 2019, the Group recognised lease liability of ₹ 20 (presented as a part of borrowings net of prepaid lease rent of ₹ 18) and right-of-use assets of ₹ 38 as at 1 April 2019 (presented as part of property, plant and equipment). The Group has reclassified the leasehold land of ₹ 251 (net of accumulated depreciation) to right-of-use asset as at 01 April 2019. The adoption of the standard did not have any material impact on the financial statements for the current period.

Following are the changes in the lease liability for the year ended 31 March 2020:

Particulars	Amount
Lease commitments as at 1 April 2019	20
Additions during the year	2
Finance cost accrued	3
Payment of lease liabilities	(8)
Lease liabilities as at 31 March 2020	**17**
Current lease liability	8
Non-current lease liabilities	9

The impact on account on adoption of Ind AS 116 is as follows :

Particulars	Amount
Increase in lease liability as at 31 March 2020 by	17
Increase in Right-of use as at 31 March 2020 by	284
Increase in finance cost by	3
Increase in depreciation by	2

Maturity analysis of lease liabilities as at 31 March 2020:

Maturity analysis – contractual undiscounted cash flows	Amount
Less than one year	8
One to three years	7
More then three years	393
Total undiscounted lease liabilities as at 31 March 2020	**408**

The Group does not face a significant liquidity risk with regard to its lease liabilities as the current assets are sufficient to meet the obligations related to lease liabilities as and when they fall due.

The following is the rental expense recorded for short-term leases for the year ended 31 March 2020:

Particulars	Amount
Variable lease expenses (other than short term)	-
Short-term lease expense	33
Low value lease expense	-

Amounts recognised in the statement of cash flows for the year ended 31 March 2020:

Particulars	Amount
Payment of lease liabilities	(8)
Short-term lease expense	(33)

(All amounts in ₹ millions, except share data and where otherwise stated)

40. Additional information as required under para 2 of General Instruction for the preparation of Consolidated Financial Statements of Schedule III, Division III to the Companies Act, 2013.

For the year ended 31 March 2020

Name of the entity	Net assets		Share in profit or loss		Share in other comprehensive income (OCI)		Share in total comprehensive income (TCI)	
	As a % of consolidated net assets	Amount	As a % of consolidated profit or loss	Amount	As a % of consolidated OCI	Amount	As a % of consolidated TCI	Amount
Parent company								
NATCO Pharma Limited	102%	38,695	103%	4,745	44%	(64)	105%	4,681
Foreign subsidiaries								
NATCO Pharma Inc.	1%	305	0%	1	1%	(1)	0%	(0)
NATCO Lifesciences Philippines Inc.	0%	8	0%	(9)	0%	-	0%	(9)
Time Cap Overseas Limited	-1%	(291)	-6%	(286)	0%	-	-6%	(286)
NATCO Pharma (Canada), Inc.	1%	329	1%	56	0%	-	1%	56
NATCO Pharma Asia Pte. Ltd.	0%	11	0%	(13)	0%	-	0%	(13)
NATCO Pharma Australia PTY Ltd.	0%	1	0%	(2)	0%	-	0%	(2)
Non-controlling interests								
Time Cap Overseas Limited	0%	(109)	1%	28	0%	-	1%	28
NATCO Pharma (Canada) Inc.	0%	(3)	0%	(1)	0%	-	0%	(1)
Adjustment arising out of consolidation	-3%	(1,099)	2%	89	55%	(80)	0%	9
Total	100%	37,847	100%	4,608	100%	(145)	100%	4,463

For the year ended 31 March 2019

Name of the entity	Net assets		Share in profit or loss		Share in other comprehensive income (OCI)		Share in total comprehensive income (TCI)	
	As a % of consolidated net assets	Amount	As a % of consolidated profit or loss	Amount	As a % of consolidated OCI	Amount	As a % of consolidated TCI	Amount
Parent company								
NATCO Pharma Limited	102%	35,632	104%	6,671	120%	(91)	103%	6,580
Foreign subsidiaries								
NATCO Pharma Inc.	1%	283	0%	2	-8%	6	0%	8
NATCO Lifesciences Philippines Inc.	0%	9	0%	(5)	0%	-	0%	(5)
Time Cap Overseas Limited	0%	(99)	-4%	(230)	0%	-	-4%	(230)
NATCO Pharma (Canada), Inc.	1%	270	1%	51	0%	-	1%	51
NATCO Pharma Asia Pte. Ltd.	0%	10	0%	(17)	0%	-	0%	(17)
NATCO Pharma Australia PTY Ltd.	0%	0	0%	(7)	0%	-	0%	(7)
Non-controlling interests								
Time Cap Overseas Limited	0%	(20)	0%	21	0%	-	0%	21
NATCO Pharma (Canada) Inc.	0%	0	0%	(1)	0%	-	0%	(1)
Adjustment arising out of consolidation	-3%	(1,175)	-1%	(41)	-12%	9	-1%	(32)
Total	100%	34,910	100%	6,444	100%	(76)	100%	6,368

(All amounts in ₹ millions, except share data and where otherwise stated)

41. During the year ended 31 March 2020, pursuant to the Upside Sharing Agreement dated 16 May 2019 entered with CX Securities Limited ("the Investor"), the Group has received a voluntary amount of USD 6.83 million (₹ 474 million) from an equity participant. In accordance with the Applicable Accounting Framework, the aforementioned gain, received from the equity participant, is recognised as an increase in equity, net of tax.

42. In March 2020, the World Health Organisation declared COVID-19 to be a pandemic. The Group has adopted measures to curb the spread of infection in order to protect the health of its employees and ensure business continuity with minimal disruption. The Group has considered internal and external information while finalising various estimates and recoverability of assets in relation to its financial statement captions up to the date of approval of the financial statements by the Board of Directors. Considering the Group is in the business of manufacturing and supplying of pharmaceutical products which is categorised under essential goods, there has been a minimal disruption with respect to operations including production and distribution activities. The actual impact of the global health pandemic may be different from that which has been estimated, as the COVID-19 situation evolves in India and globally. The Group will continue to closely monitor any material changes to the future economic conditions.

43. The disclosures regarding details of specified bank notes held and transacted during 8 November 2016 to 30 December 2016 has not been made in these standalone financial statements since the requirement does not pertain to financial year ended 31 March 2020.

44. Events after reporting period

The Board of Directors, at the meeting held on 17 June 2020, had recommended an interim dividend of ₹ 1 per equity share of face value of ₹ 2/- each.

for B S R & Associates LLP
Chartered Accountants
ICAI Firm Registration No. 116231W/ W-100024

Vikash Somani
Partner
Membership Number: 061272

Place: Hyderabad
Date: 17 June 2020

for and on behalf of the Board of Directors
NATCO Pharma Limited
CIN: L24230TG1981PLC003201

V C Nannapaneni
Chairman and Managing Director
DIN: 00183315

Rajeev Nannapaneni
Vice Chairman and CEO
DIN: 00183872

M. Adinarayana
Company Secretary

S V V N Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 17 June 2020

Notice to Members

Notice is hereby given that the 37th Annual General Meeting of the members of the Company will be held on Thursday, the 15th day of October, 2020 at 11.00 a.m. IST through Video Conferencing ("VC") / Other Audio Visual Means ("OAVM") to transact the following business:

ORDINARY BUSINESS:

1. **Adoption of audited Annual Financial Statements for the Financial Year 2019-20**

   To receive, consider and adopt the Audited Financial Statements, both on Standalone and Consolidated basis of the Company for the Financial Year ended March 31, 2020, together with the reports of Board of Directors, and the Auditors and others thereon.

2. **To confirm the already paid four interim dividends on equity shares during the Financial Year 2019-20 as final dividend**

   To consider and, if thought fit, to pass the following Resolution as an Ordinary Resolution:

   "**RESOLVED THAT** the interim dividend of ₹ 1.25 (Rupees one and paisa twenty five only) per equity share of ₹ 2/- each declared in the Board Meeting held on August 9, 2019 amounting to ₹ 22,72,02,668.75 (Rupees Twenty two crores seventy two lakhs two thousand six hundred sixty eight and seventy five paisa only) on 18,17,62,135 equity shares of ₹ 2/- each, second interim dividend of ₹ 1 (Rupee One only) per equity share of ₹ 2/- each declared in the Board Meeting held on November 12, 2019 amounting to ₹ 18,18,87,350 (Rupees Eighteen crores eighteen lakhs eighty seven thousand three hundred and fifty only) on 18,18,87,350 equity shares of ₹ 2/- each, third interim dividend of ₹ 3.50 (Rupees Three and paisa fifty only) per equity share of ₹ 2/- each declared in the Board Meeting held on February 12, 2020 amounting to ₹ 63,72,37,912.50 (Rupees Sixty three crores seventy two lakhs thirty seven thousand nine hundred twelve and paisa fifty only) on 18,20,67,975 equity shares of ₹ 2/- each and fourth interim dividend of ₹ 1 (Rupee one only) per equity share of ₹ 2/- each declared in the Board Meeting held on June 17, 2020 amounting to ₹ 18,20,67,975 (Rupees Eighteen crores twenty lakhs sixty seven thousand nine hundred and seventy five only) on 18,20,67,975 equity shares of ₹ 2/- each thus total aggregating to ₹ 122,83,95,906.25/- (Rupees One hundred twenty two crores eighty three lakhs ninety five thousand nine hundred six and twenty five paisa only) be and is hereby approved as the final dividend for the Financial Year 2019-20."

3. **Reappointment of Sri Sridhar Sankararaman (DIN: 06794418) as a Director liable to retire by rotation**

   To consider and, if thought fit, to pass the following resolution as an Ordinary Resolution:

   "**RESOLVED THAT** Sri Sridhar Sankararaman (DIN: 06794418) who retires by rotation and being eligible offers himself for re-appointment, be and is hereby reappointed as a Director of the Company, who shall be liable for retirement by rotation."

SPECIAL BUSINESS:

4. **Reappointment of Sri V.C. Nannapaneni (DIN: 00183315) as Chairman and Managing Director**

   To consider and, if thought fit, to pass the following resolution as a Special Resolution:

   "**RESOLVED THAT** pursuant to the provisions of Sections 152, 196, 197, 198, and all other applicable provisions of the Companies Act, 2013 ("Act") read with the provisions of Schedule V thereto and the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014, (including any statutory modification(s) or re-enactment thereof, for the time being in force) and the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Sri V.C. Nannapaneni (DIN: 00183315), whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act proposing his candidature for the office of Director, be and is hereby reappointed as Chairman and Managing Director of the Company for a period of one (1) year from April 1, 2020 to March 31, 2021 with the remuneration as detailed below:

   a. Salary not exceeding ₹ 1,85,00,000 (Rupees one crore eighty five lakhs only) per annum including dearness allowance and all other allowances.

   b. Managerial commission not exceeding 0.5% of the net profits calculated as per Section 198 of the Act.

   c. Perquisites:

      i. Reimbursement of Medical Expenses for major ailments not exceeding 50% of the salary.

      ii. Contribution to Provident Fund, Superannuation Fund or Annuity Fund to the

extent either singly or put together are not taxable under Income Tax Act, 1961.

iii. Gratuity payable at a rate not exceeding half month's salary for each completed year of service.

iv. Encashment of leave as per rules of the Company.

v. Special incentive not exceeding 20% of salary per annum.

RESOLVED FURTHER THAT the Board of Directors of the Company be and is hereby authorized to vary, alter or modify the remuneration as may be agreed by the Board of Directors and Sri V.C. Nannapaneni.

RESOLVED FURTHER THAT notwithstanding as above in the financial year closing on March 31, 2021, if the Company has no profits or if its profits are inadequate, the Company shall pay to Sri V.C. Nannapaneni the remuneration by way of salary, allowances and perks not exceeding the limits specified under Schedule V of the Act or any statutory modification(s) or re-enactment thereof.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or Company Secretary or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

5. **Reappointment of Sri Rajeev Nannapaneni (DIN: 00183872) as Vice Chairman and Chief Executive officer**

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"RESOLVED THAT pursuant to the provisions of Sections 152, 196, 197, 198, and all other applicable provisions of the Companies Act, 2013 ("Act") read with the provisions of Schedule V thereto and the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014, (including any statutory modification(s) or re-enactment thereof for the time being in force) and the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Sri Rajeev Nannapaneni (DIN: 00183872), whose reappointment is recommended by the Nomination and Remuneration Committee of the Company be and is hereby reappointed as the Vice Chairman and Chief Executive Officer of the Company for a period of one (1) year from April 1, 2020 to March 31, 2021 with the remuneration as detailed below:

a) Salary not exceeding ₹ 1,70,00,000 (Rupees one crore seventy lakhs only) per annum including dearness allowance and all other allowances.

b) Managerial commission not exceeding 0.5% of the net profits calculated as per Section 198 of the Act.

c) Perquisites:

i. Reimbursement of Medical Expenses for major ailments not exceeding 50% of the salary.

ii. Contribution to Provident Fund, Superannuation Fund or Annuity Fund to the extent either singly or put together are not taxable under Income Tax Act, 1961.

iii. Gratuity payable at a rate not exceeding half month's salary for each completed year of service.

iv. Encashment of leave as per rules of the Company.

v. Special incentive not exceeding 20% of salary per annum.

RESOLVED FURTHER THAT the Board of Directors of the Company be and is hereby authorized to vary, alter or modify the remuneration as may be agreed by the Board of Directors and Sri Rajeev Nannapaneni.

RESOLVED FURTHER THAT notwithstanding as above in the financial year closing on March 31, 2021, if the Company has no profits or if its profits are inadequate, the Company shall pay to Sri Rajeev Nannapaneni the remuneration by way of salary, allowances and perks not exceeding the limits specified under Schedule V of the Act or any statutory modification(s) or re-enactment thereof.

RESOLVED FURTHER THAT the Board be and is hereby authorised to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or Company Secretary or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

6. Reappointment of Sri P.S.R.K Prasad (DIN: 07011140) as Director and Executive Vice President (Corporate Engineering Services)

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"**RESOLVED THAT** pursuant to the provisions of Sections 152, 196, 197, 198, and all other applicable provisions of the Companies Act, 2013 ("Act") read with provisions of Schedule V thereto and the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014, (including any statutory modification(s) or re-enactment thereof for the time being in force) and the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Sri P.S.R.K. Prasad, (DIN: 07011140), whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act, proposing his candidature for the office of Director, be and is hereby reappointed as Director and Executive Vice President (Corporate Engineering Services) of the Company for a period of one (1) year from April 1, 2020 to March 31, 2021 with the remuneration as detailed below:

a) Salary not exceeding ₹ 1,63,80,000/- (Rupees one crore sixty three lakhs and eighty thousand only) per annum including dearness allowance and all other allowances.

b) Perquisites:

i. Reimbursement of Medical Expenses for major ailments not exceeding 50% of the salary.

ii. Contribution to Provident Fund, Superannuation Fund or Annuity Fund to the extent either singly or put together are not taxable under Income Tax Act, 1961.

iii. Gratuity payable at a rate not exceeding half month's salary for each completed year of service.

iv. Encashment of leave as per rules of the Company.

v. Special incentive not exceeding 50% of salary per annum.

vi. Loan(s) as per the Scheme of the Loan approved by the members.

RESOLVED FURTHER THAT the Board of Directors of the Company be and is hereby authorised to vary, alter or modify the remuneration as may be agreed by the Board of Directors and Sri P.S.R.K. Prasad.

RESOLVED FURTHER THAT notwithstanding as above in the financial year closing on March 31, 2021, if the Company has no profits or if its profits are inadequate, the Company shall pay to Sri P.S.R.K. Prasad the remuneration by way of salary, allowances and perks not exceeding the limits specified under Schedule V of the Act or any statutory modification(s) or re-enactment thereof.

RESOLVED FURTHER THAT the Board be and is hereby authorised to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or Company Secretary or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

7. Reappointment of Dr. D. Linga Rao (DIN: 07088404) as Director and President (Tech. Affairs)

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"**RESOLVED THAT** pursuant to the provisions of Sections 152, 196, 197, 198, and all other applicable provisions of the Companies Act, 2013 ("Act") ") read with provisions of Schedule V thereto and the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014, (including any statutory modification(s) or re-enactment thereof for the time being in force) and SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Dr. D. Linga Rao (DIN: 07088404) whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act proposing his candidature for the office of Director, be and is hereby reappointed as Director and President (Tech. Affairs) of the Company for a period of one (1) year from April 1, 2020 to March 31, 2021 with such remuneration as detailed below:

a. Salary not exceeding ₹ 1,63,80,000/- (Rupees one crore sixty three lakhs and eighty thousand only) per annum including dearness allowance and all other allowances.

b. Perquisites:

i. Reimbursement of Medical Expenses for major ailments not exceeding 50% of the salary.

ii. Contribution to Provident Fund, Superannuation Fund or Annuity Fund to the extent either singly or put together are not taxable under Income Tax Act, 1961.

iii. Gratuity payable at a rate not exceeding half month's salary for each completed year of service.

iv. Encashment of leave as per rules of the Company.

v. Special incentive not exceeding 80% of salary per annum.

vi. Loan as per the policy of the Company.

RESOLVED FURTHER THAT the Board of Directors of the Company be and is hereby authorised to vary, alter or modify the remuneration as may be agreed by the Board of Directors and Dr. D. Linga Rao.

RESOLVED FURTHER THAT notwithstanding as above in the financial year closing on March 31, 2021, if the Company has no profits or if its profits are inadequate, the Company shall pay to Dr. D. Linga Rao the remuneration by way of salary, allowances and perks not exceeding the limits specified under Schedule V of the Act or any statutory modification(s) or re-enactment thereof.

RESOLVED FURTHER THAT the Board be and is hereby authorised to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or Company Secretary or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

8. **Reappointment of Dr. M.U.R. Naidu (DIN: 05111014) as an Independent Director**

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"**RESOLVED THAT** pursuant to the provisions of Sections 149, 152 and any other applicable provisions of the Companies Act, 2013 ("Act") read with the provisions of Schedule IV thereto and Companies (Appointment and Qualification of Directors) Rules, 2014, (including any statutory modification(s) or re-enactment thereof for the time being in force) and SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Dr. M.U.R. Naidu (DIN: 05111014) whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act proposing his candidature for the office of Director, be and is hereby reappointed as an Independent Director of the company, who is not liable to retire by rotation, to hold office for a further term of 5 (five) years i.e., up to the conclusion of 42nd Annual general Meeting to be held in the Calendar year 2025.

RESOLVED FURTHER THAT the Board be and is hereby authorised to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or Company Secretary or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

9. **Ratification of remuneration of Cost Auditors**

To consider and, if thought fit, with or without modifications, to pass the following resolution as an Ordinary Resolution:

"**RESOLVED THAT** pursuant to Section 148 of the Companies Act, 2013 ('Act') and Rule 6 of the Companies (Cost Records and Audit) Rules, 2014 and all other applicable provisions, if any, of the Act and the rules made thereunder, as amended from time to time, the members be and hereby ratify the remuneration of ₹ 1,75,000/- (Rupees one lakh seventy five thousand only) and taxes as applicable plus out of pocket expenses payable to M/s. S.S. Zanwar & Associates (Firm Registration No.100283) Cost Auditors appointed by the Board of Directors of the Company to conduct the Cost Audit for the financial year ending March 31, 2021.

RESOLVED FURTHER THAT the Board be and is hereby authorised to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or Company Secretary or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

10. **To approve the Scheme for giving of Loan(s) to Non-Promoter Working Director(s)**

To consider and, if thought fit, with or without modifications, to pass the following resolution as a Special Resolution:

"**RESOLVED THAT** pursuant to provision of Section 185, 186 and all other applicable provisions of the Companies Act, 2013 and Rules made thereunder,

SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 and all other applicable provisions, if any, as amended from time to time, the Scheme for giving loan (s) to Non-Promoter Working Director (s) (Loan Scheme) which is circulated to the members along with this notice as per the terms and conditions contained there in which envisages providing loans to Non-Promoter Working Director(s) be and is hereby approved.

RESOLVED FURTHER THAT the Loan to be sanctioned to Non-Promoter Working Director(s) shall not exceed 36 month's of his salary.

RESOLVED FURTHER THAT the tenure of repayment of loan to be granted to the Non-Promoter Working Director(s) shall not be more than three years and interest to be charged as decided by the Nomination and Remuneration Committee/ Board of Directors as per Marginal cost of funds based Lending Rate (MCLR) of State Bank of India prevailing on the date of sanction of loan..

RESOLVED FURTHER THAT that the Nomination and Remuneration Committee/ Board of Directors be and are hereby authorised to implement the Loan Scheme at its discretion and do all such things that it may think fit and proper, including directions for settling any questions or difficulties that may arise and to do all such acts, deeds, matters and things of whatsoever nature as may be deemed expedient for implementing and giving effect to the above Loan Scheme."

By Order of the Board
For NATCO Pharma Limited

M. Adinarayana
Company Secretary and
Vice President (Legal & Corp. Affairs) (FCS:3808)

Date: June 17, 2020
Place: Hyderabad

NOTES

1. In view of the continuing Covid-19 pandemic, the Ministry of Corporate Affairs ("MCA") has vide its Circular dated May 5, 2020 read with circulars dated April 8, 2020 and April 13, 2020 (collectively referred to as "MCA Circulars") permitted the holding of the Annual General Meeting ("AGM") through VC / OAVM, without the physical presence of the Members at a common venue. In compliance with the provisions of the Companies Act, 2013 ("Act"), SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 ("SEBI Listing Regulations") and MCA Circulars, the AGM of the Company is being held through VC / OAVM. The detailed procedure for participation in the meeting through VC/OAVM is as per Note no. 15 & 19 and available at the Company's website www.natcopharma.co.in

   The Members can join the AGM in the VC/OAVM mode 15 minutes before and after the scheduled time of the commencement of the Meeting by following the procedure mentioned in the Notice. The facility of participation at the AGM through VC/OAVM will be made available for 1000 members on first come first served basis. This will not include large Shareholders (Shareholders holding 2% or more shareholding), Promoters, Institutional Investors, Directors, Key Managerial Personnel, the Chairpersons of the Audit Committee, Nomination and Remuneration Committee and Stakeholders Relationship Committee, Auditors etc. who are allowed to attend the AGM without restriction on account of first come first served basis.

2. An explanatory statement pursuant to Section 102(1) of the Companies Act, 2013 in respect of special businesses is annexed hereto.

3. Pursuant to the provisions of the Act, a Member entitled to attend and vote at the AGM is entitled to appoint a proxy to attend and vote on his/her behalf and the proxy need not be a Member of the Company. Since this AGM is being held pursuant to the MCA Circulars through VC / OAVM, physical attendance of Members has been dispensed with. Accordingly, the facility for appointment of proxies by the Members will not be available for the AGM and hence the Proxy Form and Attendance Slip are not annexed to this Notice.

4. Corporate/Institutional Members are encouraged to attend and vote in the AGM held through VC or OAVM. Hence Corporate/Institutional Members authorising their representative to attend and vote at the AGM through VC / OAVM on its behalf are requested to send a duly certified copy of the Board resolution/power of attorney to the company or upload the same on VC or OAVM portal/ e-voting portal.

5. Members holding shares in physical form are requested to notify any change in their address or bank mandates immediately to the Registrars and Share Transfer Agents **M/s. Venture Capital and Corporate Investments Pvt. Ltd., 12-10-167, Bharat Nagar, Hyderabad - 500 018, Telangana, India** and members holding shares in electronic form are requested to notify any change in mailing address or bank mandates to their respective Depository Participants with whom they are maintaining their demat accounts.

6. In compliance with the aforesaid MCA Circulars and SEBI Circular dated May 12, 2020, Notice of the

37th AGM along with the Annual Report for the FY 2019-20 is being sent only through electronic mode to those Members whose email addresses are registered with the Company/ Depositories. Members may note that the 37th AGM Notice and Annual Report for the FY 2019-20 will also be available on the Company's website i.e., www.natcopharma.co.in, websites of the Stock Exchanges i.e., BSE Limited and National Stock Exchange of India Limited at www.bseindia.com and www.nseindia.com respectively and on the website of NSDL https:/www.evoting.nsdl.com

7. Members attending the AGM through VC / OAVM will be counted for the purpose of reckoning the quorum under Section 103 of the Act. AGM has been convened through VC/OAVM in compliance with applicable provisions of the Companies Act, 2013 read with MCA Circular No. 14/2020 dated April 08, 2020 and MCA Circular No. 17/2020 dated April 13, 2020 and MCA Circular No. 20/2020 dated May 05, 2020.

8. Members holding shares in electronic form may note that the Bank particulars registered against their respective depository accounts will be used by the Company for payment of dividend, if any. The Company or its Registrars and share Transfer Agents cannot act on any request received directly from the members holding shares in electronic form for any changes of bank particulars or bank mandates. Such changes are to be advised only to the Depository Participants.

9. Pursuant to Finance Act, 2020, dividend income will be taxable in the hands of shareholders w.e.f. April 1, 2020 and the Company is required to deduct tax at source from dividend paid to shareholders at the prescribed rates. For the prescribed rates for various categories, the shareholders are requested to refer to the Finance Act, 2020 and amendments thereof. The shareholders are requested to update their PAN with the Company/ depositories (in case of shares held in demat mode).

   A Resident individual shareholder with PAN and who is not liable to pay income tax can submit a yearly declaration in Form No. 15G/15H, to avail the benefit of non-deduction of tax at source by email to info@vccipl.com. Shareholders are requested to note that in case their PAN is not registered, the tax will be deducted at a higher rate of 20%.

   Non-resident shareholders can avail beneficial rates under tax treaty between India and their country of residence, subject to providing necessary documents i.e., No Permanent Establishment and Beneficial Ownership Declaration, Tax Residency Certificate, Form 10F, any other document which may be required to avail the tax treaty benefits by sending an email to info@vccipl.com.

10. Relevant documents referred to in Notice are open for inspection by the members at the Registered Office of the Company on all working days, during business hours up to the date of the meeting.

11. Members who have not registered their e-mail addresses so far are requested to register their email addresses for receiving all communications including Annual Report, Notices, Circulars, etc., from the Company in electronic mode.

12. In case of Joint Holders attending the meeting, only such Joint Holder who is first in the order of names will be entitled to vote.

13. The Register of Members and Share Transfer Books will remain closed for 3 (Three) days i.e. from Tuesday, October 13, 2020 to Thursday, October 15, 2020 (both days inclusive).

14. Members who wish to claim Dividends, which remain unclaimed within a period of seven (7) years are requested to either correspond with the Legal & Secretarial Department at the Company's Registered Office or the Company's Registrars and Share Transfer Agents (i.e., M/s. Venture Capital and Corporate Investments Private Limited). Members are requested to note that dividends not en-cashed or claimed within seven (7) years and 30 days from the date of declaration of the Dividend, will be transferred to the Investor Education and Protection Fund (IEPF) of Government of India as per Section 124(5) of the Companies Act, 2013. In view of this, members are advised to send the un-encashed dividend warrants to the Company or to our Registrars for issue of new warrants/demand drafts. The Unpaid Dividend, Shares transferred to IEPF Authority are updated in our website http://www.natcopharma.co.in/

15. Instructions for e-voting and joining the AGM are as follows:

A. Voting through electronic means

   i) In compliance with the provisions of Section 108 of the Act, read with Rule 20 of the Companies (Management and Administration) Rules, 2014, as amended from time to time and Regulation 44 of the SEBI Listing Regulations, the Members are provided with the facility to cast their vote electronically, through the e-voting services provided by NSDL, on all the resolutions set forth

in this Notice. The instructions for e-voting are given herein below.

ii) The remote e-voting period commences on Monday, October 12, 2020 (9:00 a.m. IST) and ends on Wednesday, October 14, 2020 (5:00 p.m. IST). During this period, Members holding shares either in physical form or in dematerialised form, as on Thursday, October 8, 2020 i.e. cut-off date, may cast their vote electronically. The e-voting module shall be disabled by NSDL for voting thereafter. Those Members, who will be present in the AGM through VC / OAVM facility and have not cast their vote on the Resolutions through remote e-voting and are otherwise not barred from doing so, shall be eligible to vote through e-voting system during the AGM.

iii) The Members who have cast their vote by remote e-voting prior to the AGM may also attend/ participate in the AGM through VC / OAVM but shall not be entitled to cast their vote again.

iv) The voting rights of Members shall be in proportion to their shares in the paid-up equity share capital of the Company as on the cut-off date.

v) Any person, who acquires shares of the Company and becomes a Member of the Company after sending of the Notice and holding shares as of the cut-off date, may obtain the login ID and password by sending a request at evoting@nsdl.co.in. However, if he/she is already registered with NSDL for remote e-voting then he/she can use his/her existing User ID and password for casting the vote.

vi) The details of the process and manner for remote e-voting are explained herein below:

Step 1: Log-in to NSDL e-voting system at https://www.evoting.nsdl.com/

Step 2: Cast your vote electronically on NSDL e-voting system.

Details on Step 1 are mentioned below:

How to Log-in to NSDL e-voting website?

1. Visit the e-voting website of NSDL. Open web browser by typing the following URL: https://www.evoting. nsdl.com/ either on a personal computer or on a mobile.

2. Once the home page of e-voting system is launched, click on the icon "Login" which is available under "Shareholders" section.

3. A new screen will open. You will have to enter your User ID, your Password and a Verification Code as shown on the screen. Alternatively, if you are registered for NSDL eservices i.e. IDEAS, you can log-in at https://eservices.nsdl.com/ with your existing IDEAS login. Once you log-in to NSDL eservices after using your log-in credentials, click on e-voting and you can proceed to Step 2 i.e., cast your vote electronically.

4. Your User ID details are given below:

Manner of holding shares i.e. Demat (NSDL or CDSL) or Physical	Your User ID is:
Your User ID is:	8 Character DP ID followed by 8 Digit Client ID For example, if your DP ID is IN300*** and Client ID is 12****** then your user ID is IN300***12******
For Members who hold shares in Demat account with CDSL.	16 Digit Beneficiary ID For example, if your Beneficiary ID is 12********** then your user ID is 12**********
For Members holding shares in Physical Form.	EVEN Number followed by Folio Number registered with the company For example, if EVEN is 123456 and folio number is 001*** then user ID is 123456001***

5. Your password details are given below:

a) If you are already registered for e-voting, then you can use your existing password to login and cast your vote.

b) If you are using NSDL e-voting system for the first time, you will need to retrieve the 'initial password' which was communicated to you by NSDL. Once you retrieve your 'initial password', you need to enter the 'initial password' and the system will force you to change your password.

c) How to retrieve your 'initial password'?

i) If your email ID is registered in your demat account or with the Company, your 'initial password' is communicated to you on your email ID. Trace the email sent to you

from NSDL in your mailbox from evoting@nsdl.com. Open the email and open the attachment i.e., a .pdf file. Open the .pdf file. The password to open the .pdf file is your 8 digit client ID for NSDL account, last 8 digits of client ID for CDSL account or folio number for shares held in physical form. The .pdf file contains your 'User ID' and your 'initial password'.

ii) In case you have not registered your email address with the Company/ Depository, please follow instructions mentioned below in this notice.

6. If you are unable to retrieve or have not received the 'initial password' or have forgotten your password:

   a) Click on "Forgot User Details/Password?" (If you are holding shares in your demat account with NSDL or CDSL) option available on www.evoting.nsdl.com.

   b) "Physical User Reset Password?" (If you are holding shares in physical mode) option available on www.evoting.nsdl.com.

   c) If you are still unable to get the password by aforesaid two options, you can send a request at evoting@nsdl.co.in mentioning your demat account number/folio number, your PAN, your name and your registered address.

   d) Members can also use the one-time password (OTP) based login for casting the votes on the e-Voting system of NSDL.

7. After entering your password, click on Agree to "Terms and Conditions" by selecting on the check box.

8. Now, you will have to click on "Login" button.

9. After you click on the "Login" button, Home page of e-voting will open.

Details on Step 2 are mentioned below:

How to cast your vote electronically on NSDL e-voting system?

1. After successful login at Step 1, you will be able to see the Home page of e-voting. Click on e-voting. Then, click on Active Voting Cycles.

2. After click on Active Voting Cycles, you will be able to see all the companies "EVEN" in which you are holding shares and whose voting cycle is in active status.

3. Select "EVEN" of the Company, which is 114587.

4. Now you are ready for e-voting as the Voting page opens.

5. Cast your vote by selecting appropriate options i.e., assent or dissent, verify/modify the number of shares for which you wish to cast your vote and click on "Submit" and also "Confirm" when prompted.

6. Upon confirmation, the message "Vote cast successfully" will be displayed.

7. You can also take the printout of the votes cast by you by clicking on the print option on the confirmation page.

8. Once you confirm your vote on the resolution, you will not be allowed to modify your vote.

B. Process for those shareholders whose email ids are not registered with the depositories for procuring user id and password and registration of e mail ids for e-voting for the resolutions set out in this notice:

1. In case shares are held in physical mode please provide Folio No., Name of shareholder, scanned copy of the share certificate (front and back), PAN (self attested scanned copy of PAN card), AADHAR (self attested scanned copy of Aadhar Card) by email to investors@natcopharma.co.in

2. In case shares are held in demat mode, please provide DPID-CLID (16 digit DPID + CLID or 16 digit beneficiary ID), Name, client master or copy of Consolidated Account statement, PAN (self attested scanned copy of PAN card), AADHAR (self attested scanned copy of Aadhar Card) to investors@natcopharma.co.in

3. Alternatively member may send an e-mail request to evoting@nsdl.co.in for obtaining User ID and Password by proving the details mentioned in Point (1) or (2) as the case may be.

The instructions for members for e-voting on the day of the AGM are as under:

1. The procedure for e-Voting on the day of the AGM is same as the instructions mentioned above for remote e-voting.

Notice to Members

2. Only those Members/ shareholders, who will be present in the AGM through VC/OAVM facility and have not casted their vote on the Resolutions through remote e-Voting and are otherwise not barred from doing so, shall be eligible to vote through e-Voting system in the AGM.

3. Members who have voted through Remote e-Voting will be eligible to attend the AGM. However, they will not be eligible to vote at the AGM.

4. The details of the person who may be contacted for any grievances connected with the facility for e-Voting on the day of the AGM shall be the same person mentioned for Remote e-voting.

Instructions for members for attending the AGM through VC/OAVM are as under:

1. Member will be provided with a facility to attend the AGM through VC/OAVM through the NSDL e-Voting system. Members may access the same at https://www.evoting.nsdl.com under shareholders/members login by using the remote e-voting credentials. The link for VC/OAVM will be available in shareholder/ members login where the EVEN of Company will be displayed. Please note that the members who do not have the User ID and Password for e-Voting or have forgotten the User ID and Password may retrieve the same by following the remote e-Voting instructions mentioned in the notice to avoid last minute rush. Further members can also use the OTP based login for logging into the e-Voting system of NSDL.

2. Members are encouraged to join the Meeting through Laptops for better experience.

3. Further Members will be required to allow Camera and use Internet with a good speed to avoid any disturbance during the meeting.

4. Please note that Participants Connecting from Mobile Devices or Tablets or through Laptop connecting via Mobile Hotspot may experience Audio/Video loss due to Fluctuation in their respective network. It is therefore recommended to use Stable Wi-Fi or LAN Connection to mitigate any kind of aforesaid glitches.

5. Shareholders who would like to express their views/ask questions during the meeting may register themselves as a speaker may send their request mentioning their name, demat account number/folio number, email id, mobile number at investors@natcopharma.co.in on or before October 10, 2020 (5:00 P.M.) IST.

6. Shareholders who would like to express their views/ have questions may send their questions in advance mentioning their name demat account number/ folio number, email id, mobile number at investors@natcopharma.co.in. The same will be replied by the Company suitably.

7. Those shareholders who have registered themselves as a speaker will only be allowed to express their views/ ask questions during the meeting. The Company reserves the right to restrict the number of speakers depending on the availability of time for the AGM.

General Guidelines for shareholders

i) Institutional / Corporate shareholders (i.e. other than individuals, HUF, NRI, etc.) are required to send a scanned copy (PDF/JPG Format) of the relevant Board Resolution/ Authority letter etc., with attested specimen signature of the duly authorised signatory(ies) who are authorised to vote, to the Scrutinizer by email to dvrao@dvraoassociates.com with a copy marked to evoting@nsdl.co.in

ii) It is strongly recommended not to share your password with any other person and take utmost care to keep your password confidential. Login to the e-voting website will be disabled upon five unsuccessful attempts to key in the correct password. In such an event, you will need to go through the "Forgot User Details/Password?" or "Physical User Reset Password?" option available on https://www.evoting.nsdl.com to reset the password.

iii) In case of any queries relating to e-voting you may refer to the FAQs for Shareholders and e-voting user manual for Shareholders available at the download section of https://www.evoting.nsdl.com or call on toll free no.: 1800-222-990 or send a request at evoting@nsdl.co.in.

16. The Company has appointed Sri CS Vasudeva Rao Devaki, Practicing Company Secretary (C.P. No. 12123) as Scrutinizer to scrutinize the voting process in a fair and transparent manner.

a) The scrutinizer shall immediately after the conclusion of voting at the AGM, first unblock the votes cast at the meeting thereafter unblock the votes cast through e-voting in the presence of at least two (2) witnesses not in the employment of the Company and make a Scrutinizer's Report of

the votes cast in favour or against, if any, forthwith to the Chairman of the Company as per the norms.

b) The Results shall be declared immediately after the receipt of Scrutinizer's Report. The Results declared along with the Scrutinizer's Report shall be available for inspection and also placed on the website of the Company and the results shall simultaneously be communicated to the Stock Exchanges where the shares of the Company are listed.

17. The Securities and Exchange Board of India (SEBI) has mandated the submission of Permanent Account Number (PAN) by every participant in securities market. Members holding shares in Physical form can submit their PAN details to the Company / Share Transfer Agents.

18. Since the AGM will be held through VC / OAVM, the Route Map is not annexed in this Notice.

19. Process for registration of email id for obtaining Annual Report and user id/password for e-voting and updation of bank account mandate for receipt of dividend:

Physical Holding	Send a request to the Registrar and Transfer Agents of the Company, at info@vccilindia.com providing Folio No., Name of shareholder, scanned copy of the share certificate (front and back), PAN (self attested scanned copy of PAN card), AADHAR (self attested scanned copy of Aadhar Card) for registering email address. Following additional details need to be provided in case of updating Bank Account Details: a) Name and Branch of the Bank in which you wish to receive the dividend, b) the Bank Account type, c) Bank Account Number allotted by their banks after implementation of Core Banking Solutions d) 9 digit MICR Code Number, and e) 11 digit IFSC Code f) a scanned copy of the cancelled cheque bearing the name of the first shareholder
Demat Holding	Please contact your Depository Participant (DP) and register your email address and bank account details in your demat account, as per the process advised by your DP.

Notice to Members

20. (a) Brief profile of Executive Directors who are seeking reappointment at the AGM

Name of the Director	Sri V.C. Nannapaneni	Sri Rajeev Nannapaneni	Sri P.S.R.K Prasad	Dr. D. Linga Rao
Category	Chairman & Managing Director	Vice Chairman & Chief Executive Officer	Director & Executive Vice President (Corporate Engineering Services)	Director & President (Tech. Affairs)
DIN	00183315	00183872	07011140	07088404
Birth date and Age	November 30, 1945, 74 years	June 22, 1977, 42 years	January 15, 1958, 62 years	October 29, 1952, 67 years
Qualifications	MS (Pharmacy) & MS(Pharmaceutical Administration)	BA (Quantitative Economics) & B.A. (History)	B.E. Mechanical Engineering	M.Sc., Ph.D. in Chemistry (JNTU)
Past experience	Worked with a) Lit Drug Company, New Jersey, USA, b) Vitarine Fine Pharmaceuticals, New York, c) Time Cap Labs Inc., USA	Worked in a) Merill Lynch, USA b) Natco Systems LLC, USA	Worked with a) Ahmedabad Textiles Industries Research Association b) Mehta Inorganic & Marine Chemical Industries c) Coromandel Fertilizers Limited d) Shah Ceramics Limited e) Stiles India Limited f) Saudi Ceramic Co., Riyadh	Worked with a) Indian Drugs and Pharmaceuticals Limited, b) Novochem Laboratories Private Limited.
Date of appointment as Directors	September 19,1981	November 30, 2005	November 12, 2014	February 11, 2015
Nature of Appointment	Reappointment	Reappointment	Reappointment	Reappointment
Tenure of Appointment	April 1, 2020 to March 31, 2021	April 1, 2020 to March 31, 2021	April 1, 2020 to March 31, 2021	April 1, 2020 to March 31, 2021
Percentage of shares held	12.41%	0.62%	0.0267%	0.031%
No. of board meetings attended out of 4 (Four) meetings held.	4 (Four)	4 (Four)	3 (Three)	3 (Three)
Relationship with other directors or KMP of the company	Father of Sri Rajeev Nannapaneni	Son of Sri V.C. Nannapaneni	None	None
Directorship in other companies	1. Natco Aqua Limited 2. NDL Infratech Private Limited 3. Natco Power Private Limited	1. Natco Aqua Limited 2. NATSOFT Information Systems Private Limited	None	None

(b) Brief profile of Independent/Non-Executive Directors seeking reappointment:

Name of the Director	Dr. M.U.R. Naidu	Sri Sridhar Sankararaman
Category	Independent Director	Non-Independent and Non-Executive Director
DIN	05111014	06794418
Birth date and Age	October 16, 1949 and 70 years	January 4, 1981 and 39 years
Qualifications	Doctor of Medicine, FCCP, FIPS	Chartered Accountant, MBA (ISB) & M.Com
Past experience	a) Demonstrator, Government Medical College, Jabalpur b) Lecturer in Pharmacology, Govt. Medical College, Bhopal c) Senior Research Executive, IDPL Research Centre, Hyderabad d) Assistant Professor Clinical Pharmacology, Clinical Pharmacology and Therapeutics, The Nizam's Institute of Medical Sciences, Hyderabad e) Associate Professor and Head, Clinical Pharmacology Clinical Pharmacology and Therapeutics, The Nizam's Institute of Medical Sciences, Hyderabad f) Additional Professor and Head Clinical Pharmacology, Clinical Pharmacology and Therapeutics, The Nizam's Institute of Medical Sciences, Hyderabad g) Professor and Head, Clinical Pharmacology & Therapeutics, Clinical Pharmacology and Therapeutics, The Nizam's Institute of Medical Sciences, Hyderabad h) Dean, faculty of Medicine, The Nizam's Institute of Medical Sciences, Hyderabad. i) Professor Clinical Pharmacology and Therapeutic (Contract), The Nizam's Institute of Medical Sciences, Hyderabad	15 years of experience which includes 11 years in Private Equity in following organisations: a) Arthur Andersen LLP (UK) b) Sun Capital (UK) c) Multiples Alternate Asset Management Pvt Ltd (India)
Date of appointment as Directors	February 11, 2015	May 23, 2018
Nature of Appointment	Re- appointment as an Independent Director who is not liable to retire by rotation.	Director liable to retire by rotation and eligible for reappointment.
Tenure of Appointment	5 years term up to 42nd Annual General Meeting to be held in the Calendar year 2025	NA
Percentage of shares held	0.008%	Nil
No. of board meetings attended out of 4 (Four) meetings held.	3 (Three)	4 (Four)
Relationship with other directors or KMP of the company	None	None
Directorship in other companies	None	None

Explanatory statement

(Pursuant to Section 102(1) of the Companies Act, 2013)

ITEM NO. 4

Reappointment of Sri V.C. Nannapaneni (DIN: 00183315) as Chairman and Managing Director

Sri V.C. Nannapaneni (DIN: 00183315) is associated with the Company as founder/promoter/mentor since 1981 the year of incorporation of your Company has rich and varied experience in the Industry and driving the Company towards higher growth in terms of revenues as well as profitability. He is highly qualified.

Sri V.C. Nannapaneni attained the age of 74 years (DOB: November 30, 1945) as on November 30, 2019. Services of Sri V.C. Nannapaneni are very much essential for the Company's future prospects and further growth of the Company. It would be in the interest of the Company to have his vast experience and professional services as Chairman and Managing Director to your Company. The Board believes that the Company will benefit from his professional expertise and rich varied experience.

As recommended by the Nomination and Remuneration Committee, the Board of Directors at their meeting

held on June 17, 2020 after receiving the consent from Sri V.C. Nannapaneni, approved the reappointment of Sri V.C. Nannapaneni as Chairman & Managing Director of the Company for a period of one (1) year from April 1, 2020 to March 31, 2021 with such remuneration as specified in the resolution subject to the consent of members which is just and reasonable.

For additional information relating to Sri V.C. Nannapaneni we request to refer to the section on "Brief Profile of the Directors seeking reappointment at the Annual General Meeting" in Note No. 20 (a).

Except Sri V.C. Nannapaneni & Sri Rajeev Nannapaneni, no other Director or Key Managerial Personnel or their relatives is/are concerned or interested in the said item of business.

The Board accordingly recommends the Special Resolution as set out in Item No.4 of the notice for approval of the members.

ITEM NO. 5

Reappointment of Sri Rajeev Nannapaneni (DIN: 00183872) as Vice Chairman and Chief Executive Officer

Sri Rajeev Nannapaneni, Vice Chairman and Chief Executive Officer is associated with the Company for the past 20 years and he is looking after all the functional operations of the Company including but not limited to Production, Financial, Legal & Secretarial, New Drug Launches, Domestic and International Marketing, Exports, Imports, etc.

Based on the recommendation of the Nomination and Remuneration Committee, the Board of Directors at their meeting held on June 17, 2020, after receiving consent to act as a Vice Chairman and Chief Executive Officer, approved the reappointment of Sri Rajeev Nannapaneni (DIN: 00183872) as Vice Chairman and Chief Executive Officer of the Company for a period of one (1) year with effect from April 1, 2020 to March 31, 2021 with such remuneration as specified in the resolution subject to the consent of members which is just and reasonable to Sri Rajeev Nannapaneni.

For additional information relating to Sri Rajeev Nannapaneni we request to refer to the section on "Brief Profile of the Directors seeking Reappointment at the Annual General Meeting" in note No. 20 (a).

Except Sri V.C. Nannapaneni & Sri Rajeev Nannapaneni, no other Director or Key Managerial Personnel or their relative is/are concerned or interested in the said item of business.

The Board accordingly recommends the Special Resolution as set out in Item No. 5 of the Notice for approval of the members.

ITEM NO. 6

Reappointment of Sri P.S.R.K. Prasad (DIN: 07011140) as a Director and Executive Vice President (Corporate Engineering Services)

Sri P.S.R.K. Prasad has over 31 years of experience in various sectors such as textile, chemicals and pharmaceuticals and working with our Company for the past 25 years. He has got vast and good knowledge in procuring right equipment(s) and machinery for production processes and to provide all utility services and to utilise the resources like manpower, material in an optimum way and to ensure safety of life and property.

In view of the highly competitive employee market, inflationary trends and taking into consideration industry standards and other relevant factors and as recommended by the Nomination and Remuneration Committee, the Board of Directors at their meeting held on June 17, 2020 approved the reappointment of Sri P.S.R.K. Prasad (DIN: 07011140) for a period of one (1) year on the Board of the Company with effect from April 1, 2020 to March 31, 2021 with such remuneration as specified in the resolution subject to the consent of members which is just and reasonable to Sri P.S.R.K. Prasad.

For additional information relating to Sri P.S.R.K. Prasad members are requested to refer to the section on "Brief Profile of the Directors seeking Reappointment at the Annual General Meeting" in note No.20 (a)

Except Sri P.S.R.K. Prasad, no Director or Key Managerial Personnel or their relatives is/are concerned or interested in the said item of business.

The Board accordingly recommends the Special Resolution as set out in Item No. 6 of the Notice for approval of the members.

ITEM NO. 7

Reappointment of Dr. D. Linga Rao (DIN: 07088404) as a Director & President (Tech. Affairs)

Dr. D. Linga Rao is working as Director and President (Technical Affairs) of the Company. He has over 41 years of experience in the pharmaceutical industry and has been working with our Company for over 26 years. He has vast experience in various departments like R&D, Quality Control, Quality Assurance and Regulatory affairs.

In view of the job responsibilities, taking into consideration the industry standards and other relevant factors and as recommended by the Nomination and Remuneration Committee, the Board of Directors at their meeting held on June 17, 2020 approved the reappointment of Dr. D. Linga Rao (DIN: 07088404) for a period of one (1) year on the Board of the Company with effect from April 1, 2020 to

March 31, 2021 with such remuneration as specified in the resolution subject to the consent of members which is just and reasonable to Dr. D. Linga Rao.

For additional information relating to Dr. D. Linga Rao we request to refer to the section on "Brief Profile of the Directors seeking Re-appointment at the Annual General Meeting" in note No. 20 (a).

Except Dr. D. Linga Rao, no Director or Key Managerial Personnel or their relatives is/are concerned or interested in the said item of business.

The Board accordingly recommends the Special Resolution as set out in Item No. 7 of the Notice for approval of the members.

ITEM NO. 8

Reappointment of Dr. M.U.R. Naidu (DIN: 05111014) as an Independent Director

At the Annual General Meeting held on September 26, 2015, Dr. M.U.R. Naidu (DIN: 05111014) was appointed as an Independent Director for a term of five (5) years i.e., up to the 37th Annual General Meeting of the Company to be held in the calendar year 2020. He attained the age of 70 years (October 16, 1949) as on June 17, 2020. His vast professional experiences in the past are very essential for the Company. It would be in the interest of the Company to have his professional experience to act as an Independent Director of the Company for a further term of five (5) years.

Based upon the recommendation of Nomination and Remuneration Committee and pursuant to Sections 149, 152, read with Schedule IV of the Companies Act, 2013 (the Act) and other applicable provisions, if any and the Companies (Appointment and Qualification of Directors) Rules, 2014, and SEBI (Listing Obligation and Disclosure Requirements) Regulations, 2015 as amended from time to time, Board recommends to the members for their approval to reappoint Dr. M.U.R. Naidu as an Independent Director for a further term of 5 (five) years i.e., up to 42nd Annual General Meeting of the Company to be held in the Calendar year 2025.

In the opinion of the Board, Dr. M.U.R. Naidu, fulfil the conditions specified in the Act and rules framed there under for reappointment as an Independent Director. Dr. M.U.R. Naidu meets the criteria of Independence as prescribed in the Act and under SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015.

For additional information relating to Dr. M.U.R. Naidu request to refer to the Section on "Brief Profile of the Directors seeking Re-Appointment at the Annual General Meeting" in note No. 20 (b).

Except Dr. M.U.R. Naidu, no Director or Key Managerial Personnel or their relatives is/are concerned or interested in the said item of the business.

The Board accordingly recommends the Special Resolution as set out in Item No. 8 of the Notice for approval of the members.

ITEM NO. 9

Ratification of remuneration of Cost Auditors

The Board, on the recommendation of the Audit Committee, had approved the appointment and remuneration of M/s. S.S. Zanwar & Associates, (Firm Registration No. 100283) Cost Auditors to conduct the audit of the cost records of the Company for the financial year ending March 31, 2021.

In accordance with the provisions of Section 148 of the Companies Act, 2013 read with Rules made thereunder, the remuneration payable to the Cost Auditors has to be ratified by the shareholders of the Company.

Accordingly, consent of the members is sought for passing an Ordinary Resolution for ratification of the remuneration payable to Cost Auditors to conduct Cost Audit for the financial year ending March 31, 2021.

None of the Directors and Key Managerial Personnel of the Company or their respective relatives is concerned or interested in the said item of business.

The Board accordingly recommends the resolution as set out in Item No. 9 of the notice for approval of the members.

ITEM NO. 10

To approve the Scheme of Loan(s) to Non-Promoter Working Directors

The Board, on the recommendation of the Nomination and Remuneration Committee and Audit Committee, had approved the Scheme of Loan(s) to Non-Promoter Working Director(s) of the Company which aims to attract, motivate, improve productivity and retain manpower, by creating a congenial work environment, encouraging initiatives, personal growth and team work, and inculcating a sense of

belonging and involvement, besides offering appropriate remuneration packages and superannuation benefits.

Given below is the Scheme for giving Loan(s) to Non-Promoter Working Director(s):

SCHEME FOR GIVING OF LOAN(S) TO NON-PROMOTER WORKING DIRECTOR(S) (LOAN SCHEME)

PREAMBLE OF THE LOAN SCHEME

This Loan Scheme is made pursuant to the provisions of Section 185 of the Companies Act, 2013 and other applicable provisions of the Companies Act, 2013.

The Loan Scheme of the Company is designed to attract, motivate, improve productivity and retain manpower, by creating a congenial work environment, encouraging initiatives, personal growth and team work, and inculcating a sense of belonging and involvement, besides offering appropriate remuneration packages and superannuation benefits.

This Loan Scheme applies to Non-Promoter Working Director(s) of the Company.

OBJECTIVE OF THE SCHEME

The Loan Scheme outlined below aims at providing financial support by the Company to Non-Promoter Working Director(s) of the Company for purchase of home, vehicle, medical and other personal needs of the Non-Promoter Working Director(s).

QUANTUM OF LOAN

Under this scheme Non-Promoter Working Director is eligible to get a loan amount not exceeding 36 month's of his/her salary.

RATE OF INTEREST

Subject to Section 186 and other applicable provisions of the Companies Act, 2013, the interest will be charged as per Marginal Cost of funds based Lending Rate of State Bank of India or as decided by the Nomination and Remuneration Committee/Board of Directors.

REPAYMENT OF LOAN

The tenure of repayment of loan sanctioned under this Scheme shall not be more than three years from the date of disbursement of loan. The loan along with interest shall be repaid by Non-Promoter Working Director(s) from the salary, incentive etc., payable to them.

In the event of Non Promoter Working Director ceases the employment of the Company, the loan amount outstanding at the relevant time will be adjusted against the terminal benefits payable to him.

REVIEW OF THIS SCHEME

The Nomination and Remuneration Committee will review this Loan Scheme from time to time, as appropriate, and shall recommend to the Board.

Except Sri P.S.R.K. Prasad, Director and Executive Vice President (Corporate Engineering Services) and Dr. D. Linga Rao as a Director & President (Tech. Affairs), no Director or Key Managerial Personnel or their relatives is/are concerned or interested in the said item of the business.

The Board accordingly recommends the Special Resolution as set out in Item No. 10 of the Notice for approval of the members.

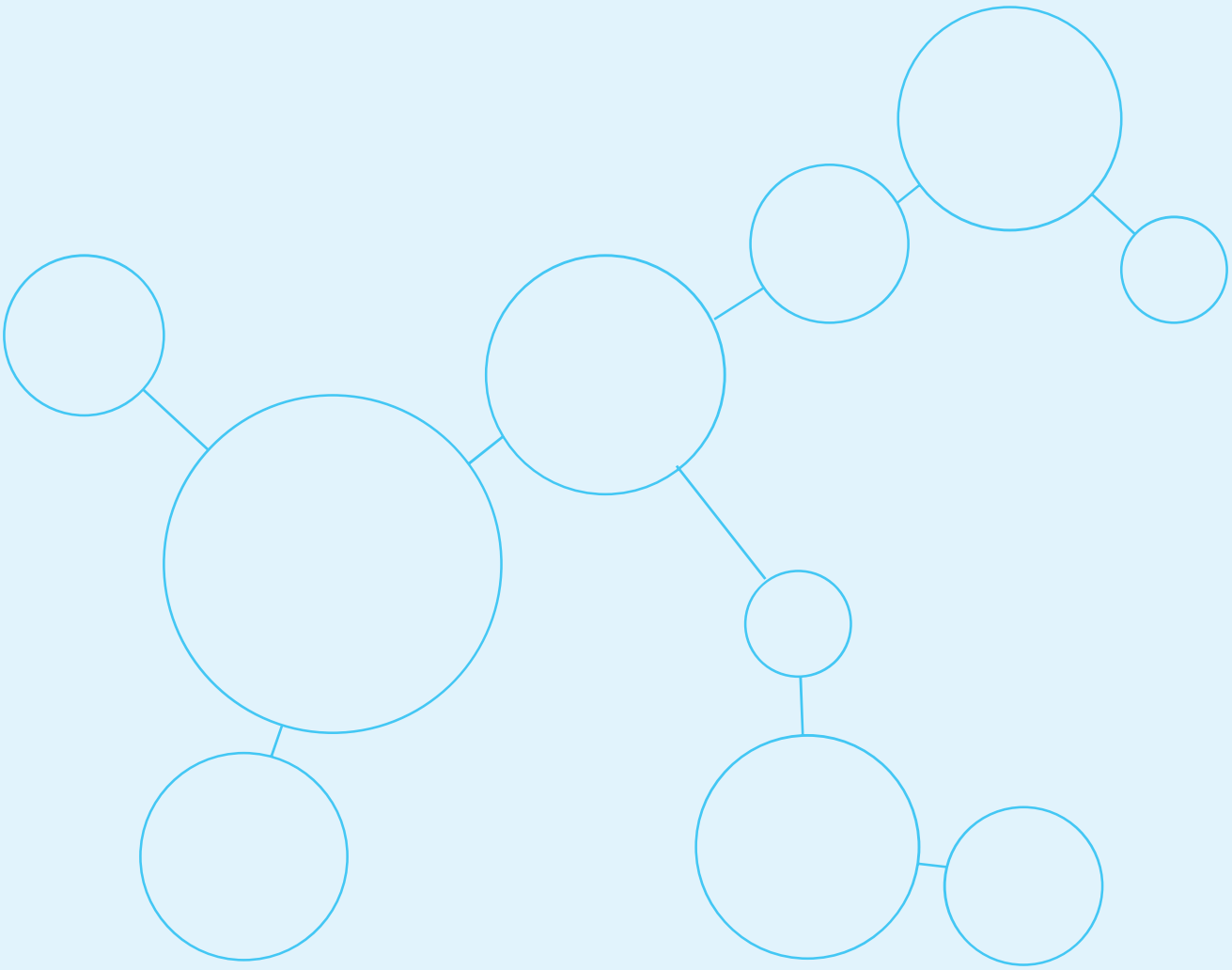
By Order of the Board
For NATCO Pharma Limited

M. Adinarayana
Company Secretary and
Vice President (Legal & Corp. Affairs) (FCS:3808)

Date: June 17, 2020
Place: Hyderabad

Notes

Notes



NATCO PHARMA LIMITED
Natco House, Road No. 2, Banjara Hills,
Hyderabad – 500 034.
www.natcopharma.co.in
CIN: L24230TG1981PLC003201

/Concept, content and design at AICL (hello@aicl.in)

NATCO



Building on Synergies.

Driving Diversification.

2018-19

36th Annual Report

NATCO PHARMA LIMITED

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Key numbers of FY 2018-19 on consolidated basis

Total Revenue
₹ **22,247** million

PAT
₹ **6,444** million

EBITDA
₹ **9,250** million

Basic EPS
₹ **34.98**

Disclaimer

In this Annual Report, we have disclosed forward-looking information to enable investors to comprehend our prospects and take investment decisions. This report and other statements - written and oral - that we periodically make contain forward-looking statements that set out anticipated results based on the management's plans and assumptions. We have tried, wherever possible, to identify such statements by using words such as 'anticipate', 'estimate', 'expects', 'projects', 'intends', 'plans', 'believes', and words of similar substance in connection with any discussion of future performance. We cannot guarantee that these forward-looking statements will be realised, although we believe we have been prudent in our assumptions. The achievements of results are subject to risks, uncertainties and even inaccurate assumptions. Should known or unknown risks or uncertainties materialise, or should underlying assumptions prove inaccurate, actual results could vary materially from those anticipated, estimated or projected. Readers should keep this in mind. We undertake no obligation to publicly update any forward-looking statement, whether as a result of new information, future events or otherwise. Revenue splits for different geographies used in the Corporate Overview and Management Discussion & Analysis sections are based on management assessments.



The global pharmaceutical and lifesciences sector is ever evolving, thereby creating the demand for unexplored synergies, innovation and diversification. Ever since we began our journey, we have consistently reinvented ourselves and course-corrected our strategies to remain resilient and create value for our stakeholders.

In all these years, we have meticulously built businesses across different molecules, multiple therapy segments and global markets, through strategic alliances and manufacturing capabilities. The intersecting synergies between all these activities act as a force multiplier for us to grow and diversify our business.

We have steadily increased our presence from an oncology-focused product portfolio to multiple therapy segments. Similarly, we have widened our footprint from India and the US, to many other markets globally. This has been possible only due to our deep focus and niche approach.

We have strengthened our business through a carefully selected portfolio of products and markets which has contributed to our sustainable growth. Despite economic volatility and sector-specific headwinds, we have successfully demonstrated our ability to adapt ourselves to the changing business climate by streamlining our resources and focusing on growth areas.

After our initial high-impact foray into oncology in 2003, through Imatinib, we have made our mark in the gastro hepatology segment through the launch of Hep C; Further, we capitalised through well-recognised product launches of Glatiramer Acetate, Liposomal Doxorubicin and Oseltamivir in the US.

A few years ago, we made a conscious decision to diversify our exposure into other non-US markets to minimise the impact from economic and geographic risks. This was possible by leveraging our research and manufacturing skills as well as reinforcing our regulatory efforts across regions.

We have also taken a unique global portfolio approach towards our products by filing for approvals across different markets. The result is that today, we have a much stronger presence in Canada, promising opportunities in Brazil and incremental growth coming in from India and the rest of the world.

During the year, we continued to file carefully chosen high-potential products. The result of one such filing is Ibrutinib tablets, which we believe is a first-to-file. We continue to build niche products for the US, which we hope will lead to blockbuster returns in future.

With sustainability deeply embedded in our business model, we have made selective investments in crop health sciences, by building on our existing resources and skill sets in both chemistry and manufacturing. We have also fostered value-accretive alliances with partners at all levels to ensure the continuity of our business growth.

About NATCO Pharma

Growing with quality and consistency

We are in the business of pharmaceuticals with research, manufacturing and marketing of Finished Dosage Formulations (FDF) and Active Pharmaceutical Ingredients (API). Creativity runs deep in our DNA; and with emphasis on quality, we have stringently run our research programmes to develop unique products that help us stay ahead of the curve. NATCO has invested in developing well-built systems in its manufacturing facilities to ensure consistent delivery of products.

Our capability is to manufacture niche pharma products in line with market requirements and patient needs. We have a strong presence in India and the US, with growing market potential in Canada, Brazil and rest of the World (ROW).

We bring dedicated focus on a limited set of molecules and we bring those out into the market at affordable prices for people in need.

We have come a long way from where we started. The seeds of today's NATCO were sown over 15 years ago with our foray into India's oncology segment. We have consistently delivered products since then, which have kept us ahead of the competition.

Our success in the oncology segment enabled us to expand into the US market; and we followed the same approach of filing for select high-value molecules across markets. Our growth in India and the US enabled us to establish our footprint with our subsidiaries in Canada, Brazil and other regions. Today, we reach out to 40+ countries either directly or through our alliance partners.

We have adopted a differentiated approach unlike many of our peers with focus on limited competition products that help maximise our earnings. Within the FDF business, our strengths emanate from our success in oncology, which remains a flagbearer with a continued strong pipeline of molecules.

We have strong focus on the strategically important active ingredient manufacturing business, a significant proportion of which is captively consumed in the manufacturing of the finished dosage formulation.

Our capability to develop multi-step cytotoxic high-potency APIs is also well demonstrated.

We have shown an inherent ability to take calculated bets, leverage on their success and diversify into new geographies and businesses. We have done so, through growth in India and then expansion in the US, and most recently in Brazil and Canada. Our recent diversification into the business of crop health sciences is an example of our ability to leverage our strengths across sectors.

The foundation of NATCO's business is built on experienced management with strong R&D focus and deft decision-making, which equips us to monetise on emerging opportunities.

Our mission

Making specialty medicines accessible to all

Experience

35+

Years of rich experience in the ever-evolving pharmaceutical industry

Assets

6 FDF

2 API

Manufacturing facilities

2

Well-established research centres

Filings

51

Cumulative ANDAs filed till date

45

Cumulative USDMFs filed till date

5

ANDAs filed in FY 2018-19

3

USDMF's filed in FY 2018-19

Patents

218

International patents filed

152

International patents granted

213

India patents filed

87

India patents granted

Abbreviated New Drug Application (ANDA)
Drug Master File (DMF)





About NATCO Pharma

Business segments at a glance*#

Domestic FDF

₹ 7,347 million
Revenue in FY 2018-19

33%
Revenue contribution in FY 2018-19

- Strong brand position in the domestic oncology and Hepatitis-C segments
- Has ten brands in excess of ₹ 100 million revenue in the domestic oncology and pharma specialty segment
- Launched six products during the year; target to launch 6-8 products a year
- 350+ specialist sales force
- 400+ distributors

API (domestic and exports)

₹ 2,719 million
Revenue in FY 2018-19

12%
Revenue contribution in FY 2018-19

- Our APIs are used for both - captive consumption and third party customers
- Portfolio of 45 USDMFs with niche products under development
- Exports made predominantly to Europe and South America

International FDF

₹ 8,791 million
Revenue in FY 2018-19

40%
Revenue contribution in FY 2018-19

- Portfolio of niche and complex products for the US market
- Front-end partnerships with leading global generic pharma companies
- Niche Para-IV and Para-III filings

Subsidiaries

₹ 1,083 million
Revenue in FY 2018-19

5%
Revenue contribution in FY 2018-19

- Operations in Brazil, Canada, Singapore, Philippines and Australia
- Demonstrated growth in Canada
- Positioned well for monetisation in Brazil for FY 2019-20 and beyond

* Figures regrouped wherever necessary
\# The revenues excludes certain operating and non-operating incomes not related to major segments

Our manufacturing facilities

In India, we have two API manufacturing facilities and six FDF production facilities. We manufacture a wide range of dosage forms-including tablets, capsules and injectables.

At NATCO, we have demonstrated our ability to handle different manufacturing processes, such as lyophilisation and complete isolation technology to manufacture cytotoxic products. Our experience and insight also enable us to handle products that require a specialised environment.

FDF

Locations	Capability	Key product categories	Major approvals
Kothur, Telangana	Oral solid dosages including Cytotoxic Orals, Cytotoxic Injectables and Pre Filled Syringes	Oncology, Gastroenterology, Central Nervous System, Antiviral and Cardiology	USFDA, GMP (DCA), German Health Authority, Australia TGA, ANVISA (Brazil)
Nagarjunasagar, Telangana	Lyophilised Injectables, Liquid Injectables, Dry Powder Injectables and Large Volume Parenterals	Oncology, Antibiotics and Antiviral	WHO GMP and Kenya MOH
Pharma City, Dehradun, Uttarakhand	Oral solid dosages including Cytotoxic Orals Cytotoxic Injectables	Oncology and Antiviral	WHO GMP
UPSIDC Industrial Area, Dehradun, Uttarakhand	Oncology Oral Solid Dosages	Oncology	WHO GMP and EU GMP
Guwahati, Assam	Oral Solid Dosages	Gastroenterology	GMP
Vishakapatnam, Andhra Pradesh	Oral Solid Dosages	Oncology	In Process

United States Food and Drug Administration (USFDA), Good manufacturing practice (GMP), Agência Nacional de Vigilância Sanitária (ANVISA), Ministry of Health (MOH), Therapeutic Goods Administration (TGA)

APIs

Locations	Capability	Key product categories	Major approvals
Mekaguda, Telangana	Active Pharmaceutical Ingredients (APIs) & API Intermediates	Antineoplastic, Hepatitis C, Anti emetic, Antidepressant, Antimigraine, Antiulcerative, Immunomodulator, Multiple sclerosis, Hyperphosphatemia	USFDA, PMDA (Japan), COFEPRIS (Mexico), EDQM (Europe), Korean FDA, WHO, EU GMP (Germany)
Manali, Chennai, Tamil Nadu	Active Pharmaceutical Ingredients (APIs) & API Intermediates	Antineoplastic	WHO GMP (CDSCO), USFDA

Pharmaceuticals and Medical Devices Agency (PMDA), Comisión Federal para la Protección contra Riesgos Sanitarios (COFEPRIS), Central Drugs Standard Control Organisation (CDSCO)

Research and development centres

Locations	Team size	Capability
Hyderabad, Telangana	**Over 250**	**API**
Kothur, Telangana	**Over 150**	**FDF**



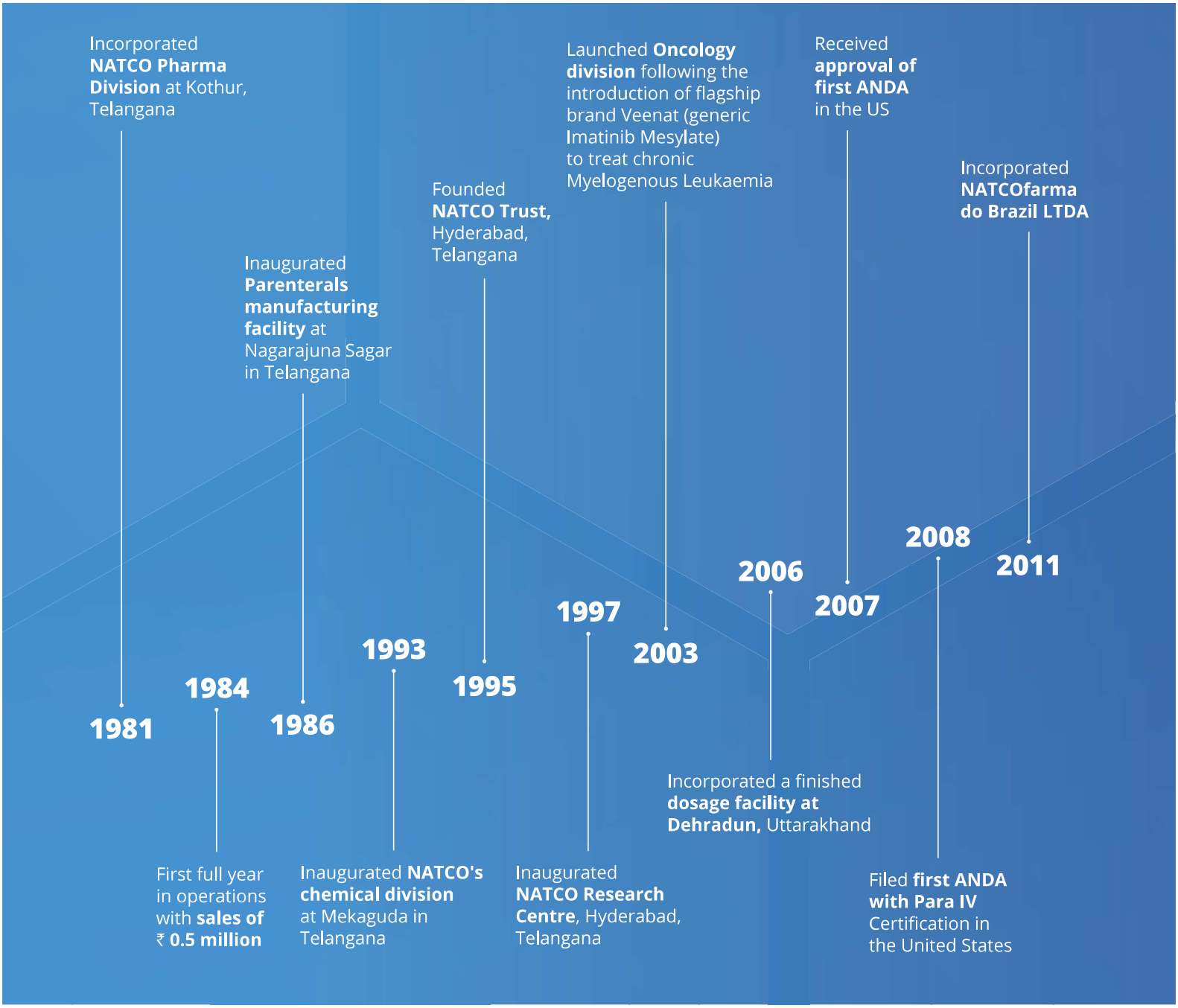
New plant at Vishakhapatnam, Andhra Pradesh

Our FDF facility in Vishakhapatnam is a part of Special Economic Zone (SEZ) and is intended to cater primarily to the export market. We have completed the manufacturing set-up and readiness, and the facility is expected to commence commercial operations during FY 2019-20. It will focus mostly on oral solid dosages (tablets and capsules). It also has a cytotoxic block for products in the oncology space.

Two units are under construction for Crop Health Sciences: Chemical and Formulations.

Key milestones

Building on a firm foundation



2012

Compulsory License was granted by **Government of India for patent protected anti-cancer drug Nexavar of Bayer**

2013

Established **NATCO Pharma Canada Inc.** for sales and distribution in Canada

2014

Set up **NATCO Pharma Australia Pty Ltd.** for sales and distribution in Australia

2015

Launched **generic Sofosbuvir in India and Nepal** for Hepatitis C

2016

Launched **generic version of Oseltamivir Phosphate capsules** in the US

2017

Started **Cardiology and Diabetology divisions** for domestic market with launches like Dabigatran

Launched **Glatiramer Acetate injection** (20 & 40 mg/ml) in the US

Launched **complex drug delivery product, liposomal doxorubicin** in the US

2018

USFDA completed inspection of **NATCO's Mekaguda API facility with zero observations**

NATCO launched its **first generic version of oral tablets** Teriflunomide for Multiple Sclerosis in India

NATCO introduced **generic Posaconazole injection**, available for the first time in India

Business highlights FY 2018-19

Every quarter takes us farther

Q1

(April – June)

- Launched Tetrabenazine tablets in the US market
- First company to launch a generic version of Teriflunomide in India
- First company to launch Posaconazole injection in India

Q2

(July-September)

- Received tentative approval for Cabazitaxel vials ANDA
- Received tentative approval for Teriflunomide tablets ANDA
- Launched Everolimus tablets and Letrozole tablets in Brazil
- Launched NAT-Tenofovir tablets 300 mg in Canada (Entry into HIV/Hepatitis space)
- Launched Imatinib tablets in Malaysia through our marketing partner

Q4

(January-March)

- Received final approval for Imatinib tablets ANDA
- Received final approval for Abiraterone tablets ANDA
- Filed ANDA for Bosentan tablets for oral suspension, possibly sole first-to-file

Q3

(October-December)

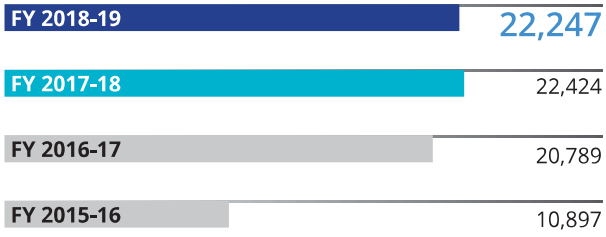
- Received tentative approval for Erlotinib Tablets ANDA
- Filed ANDA for Ibrutinib tablets, possibly sole first-to-file
- Filed ANDA for Carfilzomib 10mg vials, possibly sole first-to-file
- Launched Herduo, first Indian brand of Lapatinib tablets

Key performance indicators

Performance highlights

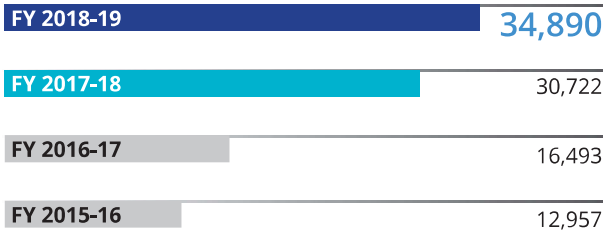
Revenue (₹ in million)

26.9% 3-year CAGR



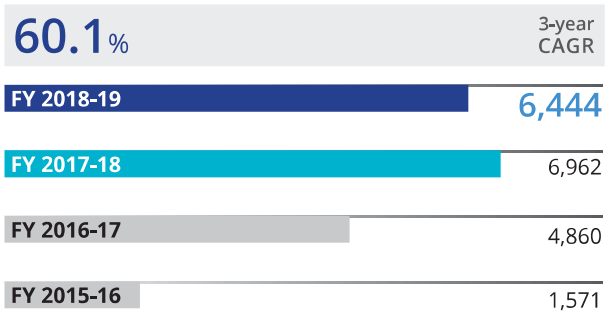
Net worth (₹ in million)

39.1% 3-year CAGR



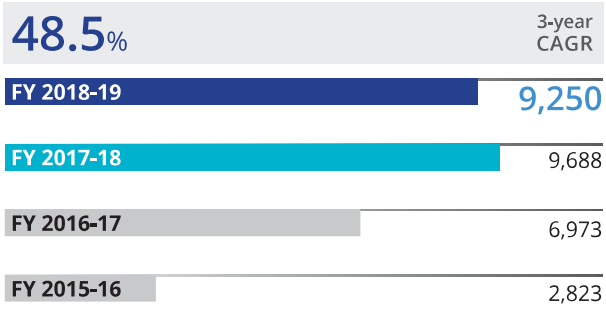
PAT (₹ in million)

60.1% 3-year CAGR



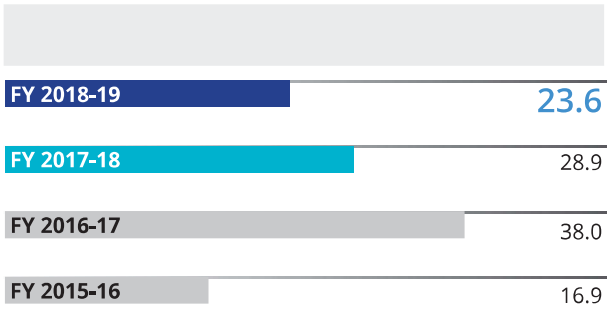
EBITDA (₹ in million)

48.5% 3-year CAGR

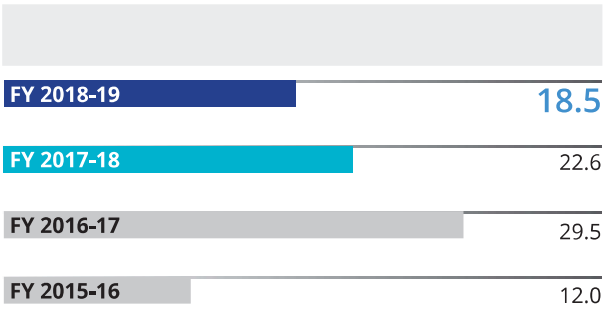


All figures and percentages are on a consolidated basis

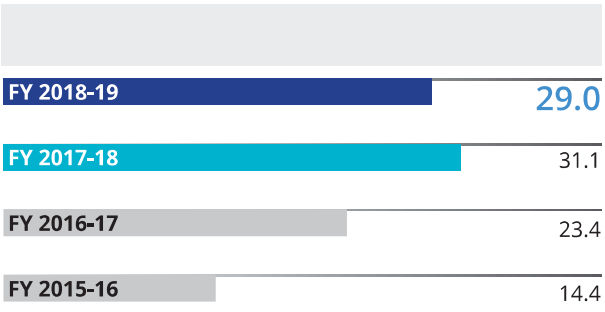
ROCE (%)



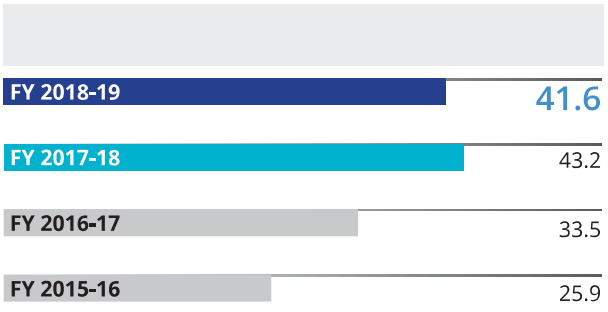
ROE (%)



PAT Margin (%)



EBITDA Margin (%)



All figures and percentages are on a consolidated basis

Megatrends

Macrotrends influencing overarching strategies

The global pharma landscape is seeing strategic shifts that are likely to have long-term consequences for the industry. Here are a few key trends that we closely observe to constantly course-correct our actionable insights to take advantage of opportunities and minimise business risks.





1. US

Generics face pricing pressures, specialty drugs command higher value

There have been significant pricing pressures across the globe for pharmaceutical products. Market consolidations have further intensified the price pressures.

The number of generic players have also significantly increased which will also add to the tough pricing environment. However, list prices of recently launched drugs, especially in the specialty, orphan and oncology areas are often at higher prices.

We believe the interesting opportunities in the US market will be restricted to niche products and complex generics. Given that it is our area of focus, With niche products like Liposomal Doxorubicin, Glatiramer Acetate and others in the pipeline we hope to continue on the path of sustainable growth in the US.



2. Brazil

Moving towards generics

With an estimated spending of $31.8 billon, the Brazilian healthcare market is the world's seventh largest. The Brazilian government's largest spending is on healthcare and 80% of the pharmaceutical market is being driven by federal and local tenders. To contain its healthcare costs, the Brazilian government is moving towards generics.

The Brazilian Health Surveillance Agency—Agência Nacional de Vigilância Sanitária—(ANVISA) has announced that it is working on clearing the backlog of new and generic drug approvals, leading to multiple opportunities for players who have filed for such approvals.

We are present in Brazil through our subsidiary 'NATCO farma do Brazil'. With our strong pipeline of oncology products we hope to leverage on the prevailing opportunities. During the year we launched Everolimus tablets and Letrozole tablets, which will help us to grow in the market.



3. India

Increasing healthcare needs

In the last two decades, India has witnessed an alarming rise in the incidence of heart disease, diabetes and cancers. Incrementally rising pace of public awareness, with wider access to information, is driving demand for higher provision of services and quality of care.

Notably, the Government's Ayushman Bharat-Pradhan Mantri Jan Aarogya Yojana (AB-PMJAY), which targets over 50 crore beneficiaries is seen as the 'world's largest healthcare programme'.

NATCO is focused on launching several oncology, cardiology and diabetology products. We believe that delivering niche products at affordable pricing will position us to reach a wider population. It will also help us to participate in inclusive government schemes.



4. China

An exciting opportunity

Pharmaceutical spending in China reached $137 billion in 2018, making it the world's second largest pharma market. Over the last year or so, there has been a shift in China's drug approval policy. In the forthcoming, years China could be a significant opportunity for Indian players.

We are closely observing the developments in China and working on filing of oncology products that are in line with our larger business objectives.

Management message

Strengthening synergies, accelerating execution



Dear Shareholders,

I am glad to report that despite a challenging operating environment, we put up a resilient performance during the year. Encouragingly, we are setting up a sound platform for sustainable growth by building on our synergies and diversifying strategically.



> A few years ago, we perceived risks surrounding our business, especially the onset of strong headwinds in the US market and had taken firm steps to increase our pace of development in the emerging markets, especially India, Brazil and Canada.

Our investments in emerging markets are bearing fruit and we are growing our footprints in Canada, Brazil and South East Asia. NATCO has seen strong growth in the oncology segment in India and through our high barrier-to-entry products, Liposomal Doxorubicin and Glatiramer Acetate in the US.

FY 2018-19 was a testing time for the pharmaceutical sector as a whole. The market dynamics in the US and India were largely unfavourable, and there were several macro pressures on the business. Some of our key products in the US have seen strong competitive pressures while in India, we have seen market size reduction in the Hepatitis C portfolio.

Despite pressures on the pharmaceutical sector and changing market scenario in the US, NATCO had a rather steady year. We are aware that our affordable, life-saving products have a market across the world and are formulating new strategies to take our products to all relevant markets.

Performing stably with diversity focus

A few years ago, we perceived risks surrounding our business, especially the onset of strong headwinds in the US market and had taken firm steps to increase our pace of development in the emerging markets, especially India, Brazil and Canada.

Currently, we are reaping the fruits of NATCO's foresight, and all the above-mentioned markets gave us considerable reasons to cheer during the year. Our consolidated revenue in the non-US markets stood at ₹ 11,727 million for FY 2018-19.

Our domestic FDF business contributed to about 33% of our revenues for FY 2018-19. During the year, we expanded our oncology portfolio through the launch of two new products. Similarly, we extended our portfolio of products in other non-oncology segments in India through four diverse launches.

Our subsidiaries in Canada and Brazil showed promising progress. Our Canadian subsidiary continued its path of profitability and generated revenues of ₹ 960 million in FY 2018-19 vis-à-vis revenues of ₹ 737 million in the previous year. Our Canadian subsidiary has 20+ filings in total as of FY 2018-19. With our robust portfolio in oncology filings, we see a significant good growth potential in the coming years.

99

Deriving growth through synergistic efforts was the focus. We laid the foundation towards holistic growth by expanding existing products into new geographies through global portfolio strategy.

In the Brazilian market, we were successful through approvals of two oncology products - Everolimus tablets and Letrozole tablets. Everolimus tablets was the first generic to be launched in Brazil and we hope to build a firm market position this year. We continue to upgrade our laboratories, facilities and expand with more key team members.

In the US, as we operate in the complex moleculesspace where the competitive intensity is low; our existing products continued to gain market share.

During the year, we filed for five ANDAs in the US, of which we believe three are potential first-to-file products. We strengthened our pipeline through the filing of Ibrutinib tablets which we believe to be a large potential opportunity for the company.

We remain focused on developing and filing more ANDAs in the US in the area of niche, differentiated products, which we believe will provide more rewarding opportunities. As we continually balance our portfolio of products and growth in the US, we expect majority of revenue to be coming from non-US markets.

NATCO is focusing on filing of oncology products for markets in China and has begun exploratory work for expansion into Africa. We believe that this will help us diversify further into new geographies for growth.

Enhancing capacities

Our endeavour to create complex and niche products for various markets and therapeutic areas is only possible with the untiring efforts of scientists and technicians in our R&D team. We have a dedicated R&D team of 400+ personnel. For the year, our R&D spend stood at ₹ 1,976 million or 9% of our revenue. In keeping with our objective to diversify into emerging markets and new therapeutic areas, we have earmarked a larger share of our R&D spend towards developing products for these new initiatives.

We have worked on increasing our capacities across various units and have spent ₹ 4,413 million on it. Our new plant at Visakhapatnam is operationally ready and will commence operations in FY 2019-20.

Further, we have added new capacities, predominantly at our Kothur and Mekaguda facilities.

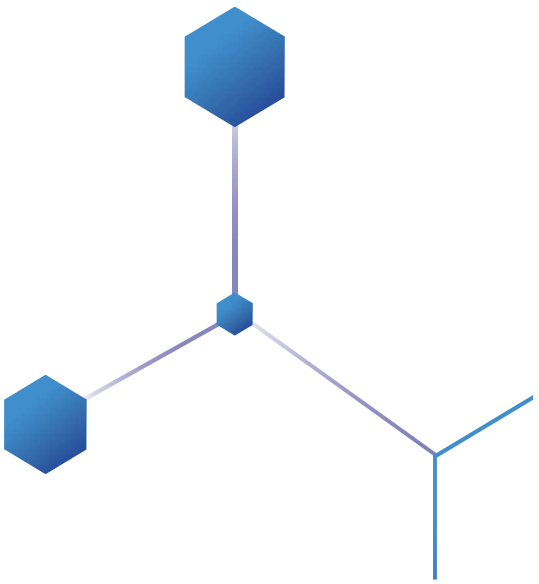
Building on synergies

During the year, NATCO has carefully assessed opportunities to diversify its business using existing skills and capabilities. Deriving growth through synergistic efforts was the focus. We laid the foundation towards holistic growth by expanding existing products into new geographies through global portfolio strategy. This strategy of filing a single product in multiple regions will help in building multiple revenue sources, and thereby increase the return on investment.

As we had seen the imminent headwinds in the pharma sector and the US market, we began diversifying our resources towards building businesses in new markets and those investments are now reaping rewards. We see our near-term growth driven by the markets of India, Brazil and Canada and believe these markets will increasingly contribute to a larger percentage of our topline over the next few years.

We are currently investing to further establish our presence in Australia, Singapore, China and South East Asian countries and are confident that our businesses in these markets will propel growth in the future.

A key decision taken during the year was to leverage our skills in organic chemistry and foray into the crop health sciences space. We believe there are opportunities in the current agrichemicals market that we could leverage to address unmet needs in Integrated Pest Management (IPM). We are investing



in greenfield plants at Nellore in Andhra Pradesh to manufacture the technical (active ingredient) and formulated crop protection changes.

Focusing on sustainable priorities

NATCO has always focused on being a sustainable business. Responsible operations, people and products have been the key pillars, based on which we deliver in a financially, socially and environmentally responsible manner.

Currently, ~24% of our energy requirements are met by making use of renewable sources like wind and solar energy. Using systemic approaches for continual improvements over the years, our onus on safety and environmental systems, stand us in good stead to ensure an empowering work culture.

NATCO practices energy conservation efforts with a variety of initiatives from rainwater harvesting, waste treatment to domestic organic waste conversion. We have embarked on the journey of NATCO's very first formal sustainability report as well.

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> A key decision taken during the year was to leverage our skills in organic chemistry and foray into the crop health sciences space.

Giving back to shareholders

In FY 2018-19, the pharma sector witnessed pressures from domestic and international markets, leading to a correction in the market value of companies.

During the year, we announced a buyback and purchased about 30 lakh shares worth ₹ 1.86 billion. The buyback reflects our faith in NATCO's long-term prospects, and a move to improve the return on equity for shareholders.

During the year we have given three interim dividends amounting to Rs 1382 million including dividend distribution tax of Rs 236 million and it results in a pay-out of 20.72% of standalone profit after tax of the company for FY 2018-19.

Evolving a holistic growth approach

At NATCO, we believe that sustainable growth and progress is not just about revenues and profits but also includes adding value to communities we work with and people at large. Through our CSR initiatives we work towards making a positive contribution to the lives of the under-privileged sections of society. We aim to enrich the lives of people and communities through our work in the fields of education, healthcare, nutrition, potable water, improving sanitation and developing community infrastructure.

Our Environment, Health and Safety (EHS) philosophy is to conduct our business in a manner whereby we have minimal impact on the planet; we continue to take multiple initiatives to reduce our carbon emissions across functions.

Summing up

The Company is thankful for the efforts put together by teams who work across various countries, plants and departments making critical medicines accessible to all and creating meaningful impact in the lives of millions of stakeholders.

V. C. Nannapaneni,
Chairman and Managing Director

Rajeev Nannapaneni,
Vice Chairman and CEO





Building businesses in diverse markets

From India to the world, this has been our journey over the decades. Starting from India, we carefully crafted our foray into the US, and several other regions globally. Our products are now sold in over 40 nations, catering to the unmet needs of millions of patients.

We had built our foundation in India by expanding into a portfolio of oncology products. To ensure the best return on invested capital, we made a strong entry into US with limited competition molecules as well as through select products from our oncology portfolio. Leveraging on this strategy and with incremental resources we have seen continual growth from Brazil, Canada and several South East Asian countries.

Our growth markets

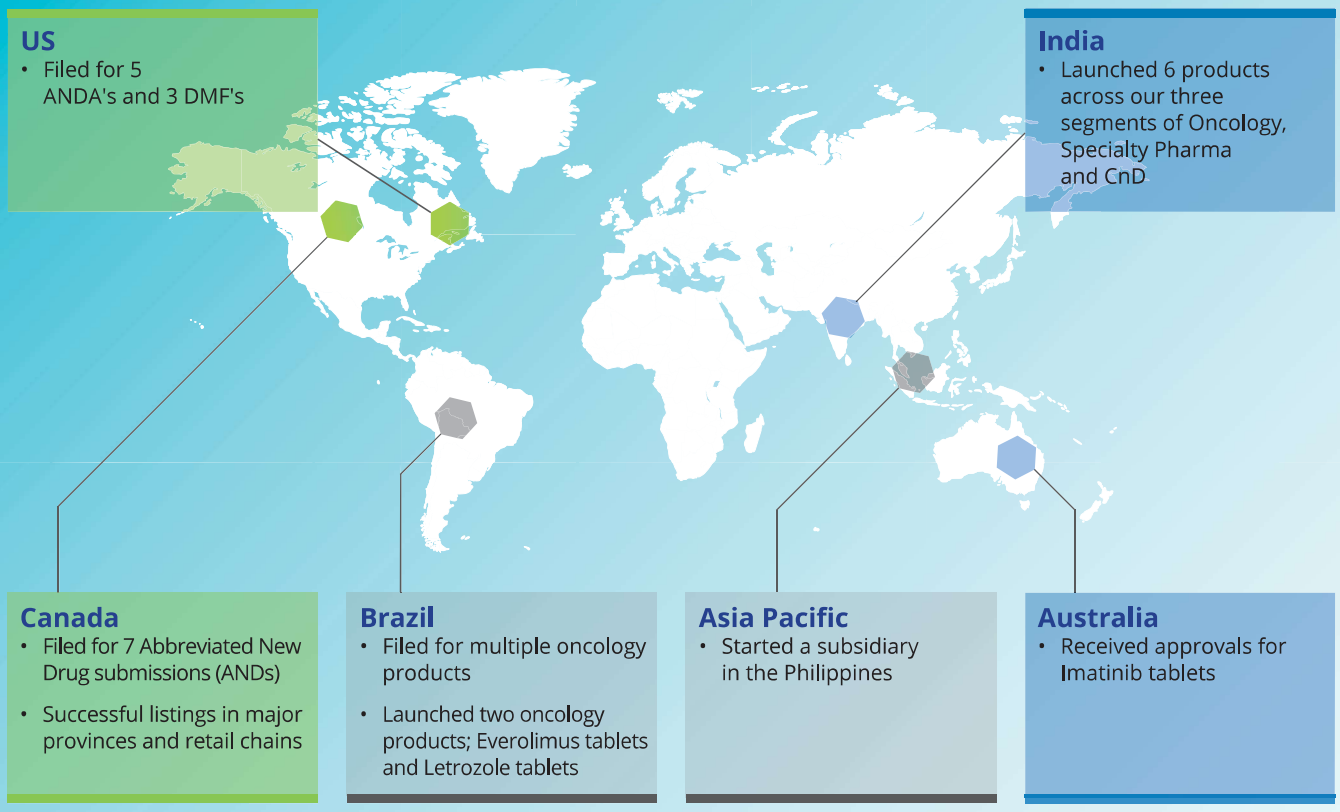
Our domestic business in India continues to be one of the foundational pillars, despite pressure in the Hep C portfolio. We were able to launch first-in-India products like Teriflunomide and Posaconazole. We believe that we are the largest oncology firm supplying medicines in India with a clear lead over our peers.

This underlines the fact that we have committed resources to bring oncology medicines in India. Our strong pipeline of products are expected to grow in the gastro-hepatology and cardiology and diabetology (CnD) segments in the near future.

In the Canadian market, we continued to strengthen our foothold through aggressive entries into new provinces. During the reporting year, we had seven filings at Health Canada taking our cumulative total to over 20 filings.

Our Brazilian entity made good traction during the year with approvals on two oncology products – Everolimus tablets and Letrozole tablets.

We believe that this is the beginning of our growth story in the region. We have done high-potential filings, including products in the oncology segment.



The above data pertains to FY 2018-19

Consolidating our US business

In the US market, we grew our market share in both complex molecules of generic Glatiramer Acetate and Liposomal Doxorubin. We truly believe these two products to be high barrier to enter with potential recurring earnings in the near term.

We have benefited significantly from the sale of Oseltamivir during the past two years with an expected decline in revenue in the coming years due to increased competition and price erosion.

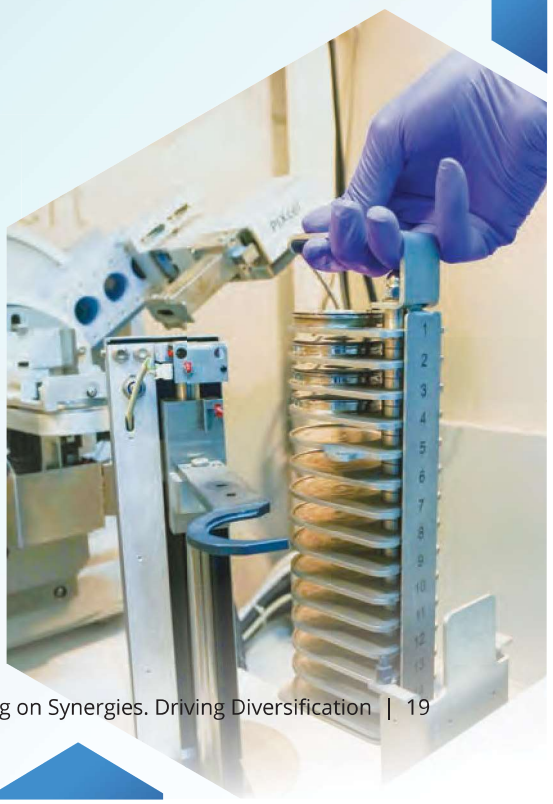
Forging diverse partnerships

As we move into multiple markets, with geography specific niche products, it is important for us to strengthen partnerships that complement our capabilities.

Towards this aim, we are teaming up with partners who follow industry leading practices. This will help us in bringing unique products to the market in shorter time frames. In 2019, we have formed a fully owned subsidiary in the Philippines, NATCO Lifesciences Philippines Inc.

The subsidiary will focus on oncology products and we are expecting a couple of key launches in the next few years. Leveraging on our presence in the region, we hope it will be a key growth lever in the region in the coming years.

In the domestic market, we are actively using third-party manufacturers when appropriate, to support and ensure sustainable supply of active ingredients. While for emerging and regulated markets we are forging new alliances for front-end marketing.



Leveraging synergies through diversity

At NATCO, our success is the outcome of our ability to deep-dive into the fundamentals of chemistry, to identify more efficient ways to manufacture and deliver products with speed and precision. We have identified a unique set of products for India and the US, and devised a strategy to expand them to several other geographies.



Evolving a new approach to regulatory filings

Over the past year, we have made a conscious effort to adopt a global portfolio strategy for product development and filing in several regulatory markets across. Under this strategy, we incorporate elements in design process and quality systems that enable us to file and launch products across several geographies.

While there are incremental costs incurred in filing for the product in multiple regions, it results in increased returns on investment. Historically, we have focused on specific pipeline for India and for the US. With a global portfolio approach this has expanded into several regions, such as Brazil, Canada and South East Asian countries.

Success of the global portfolio strategy

NATCO has followed the strategy of using its niche oncology portfolio to further its presence across different geographies. One such product which follows the strategy mentioned is Everolimus.

With a global developmental approach in mind, we have filed for the drug in the US and targeted other regions with a potential demand.

As such, we have launched the product in Brazil.

Liposomal Doxorubicin is another example of this strategy wherein we have filed for marketing authorisation in several countries across the world including countries within the EU.

The flu medicine Oseltamivir, too, was initially launched in India and then in 2016, in the US and Canada as the first generic version of capsules. We are targeting to launch the product in other markets.



Diversifying into products with more entry barriers

It was important for us to continually migrate towards higher entry barrier products to ensure a sustainable business. The result is that we are developing products with new synthetic routes, alternate manufacturing techniques, improved and efficient production systems.

We believe that identifying and developing products with diverse barriers is the new way to be ahead of the competitive curve. This approach helps ensure that our competitive advantage is not eroded by marketing uncertainties or evolving business climates.

Everolimus tablet is another example, which has multiple layers of difficulty in its development and manufacturing. And, the company was able to successfully launch the product.



Our approach towards diverse products

During the past several years the Company has carefully chosen to enhance certain capabilities into new manufacturing techniques such as spray drying and hotmelt extrusion technologies to enable novel solid dispersion methodologies.

We are also leveraging our success in liposomal formulations and peptide chemistry to diversify into other product opportunities.

Everolimus tablet is another example, which has multiple layers of difficulty in its development and manufacturing. And, the company was able to successfully launch the product.

Advancing R&D diversification

Our research and development team continues to propel NATCO's overall business outcomes. The team is instrumental in creating high-quality complex products that have helped us attain positive outcomes across markets.

Our 400+ R&D team work on a range of activities, including developing new products, improving existing products, drug delivery systems and expanding product applications.

The diversification that we see today is driven by ideas generated by senior management and executed effectively by our research team in creating multiple products, combination products and innovative dosages.

Diversifying research for new markets

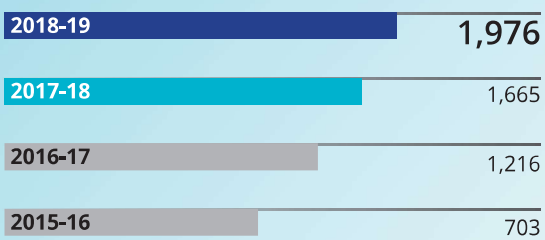
Over the last three years, our R&D investment expanded by 41.13% CAGR with total spend being ₹ 1,976 million or 9% of our revenues for the year FY 2018-19. The Company has continued to advance its technology platforms of peptide chemistry and liposomes, with an intent to diversify its product portfolio. With a specific focus on diversifying its technological capabilities, the company has also added novel solid dispersion technologies.

We believe that with this and other technical expertise it would enable the company to target newer difficult molecules.



R&D Expense (%)

41.13% 3-year CAGR



Mixing it up with diverse dosage combinations

Fixed-dose combination (FDC)
A combination drug is an FDC that includes two or more active pharmaceutical ingredients (APIs) combined in a single dosage form. While these are more complex to manufacture, they ensure increased compliance by patients and result in lower side effects.

During the year, we launched an FDC of Sofosbuvir-Daclatasvir tablets to treat Hepatitis C under the brand name Hepcinat Plus and an oral fixed-dose combination of Sofosbuvir and Velapatasvir under our brand Velpanat.

The Company is also working on other dosage forms to cater for the unmet needs of patients.

Leveraging crop health sciences

We are using our expertise in organic chemistry to leverage our skillsets and expand into the agrichemical space. After carefully assessing the market potential and understanding our own strengths, we are targeting a unique set of molecules for the Indian market, which have a potential to expand to other regions.

NATCO has also entered strategic alliances with partners who will help us in making inroads into the segment. We have already initiated activities related to the construction of facilities in Nellore area, Andhra Pradesh for both active ingredient and crop protection products.

Our agrichemical venture complements our differentiated R&D approach and will be a key growth lever in the coming years.

We are using our expertise in organic chemistry to leverage our skillsets and expand into the agrichemical space.



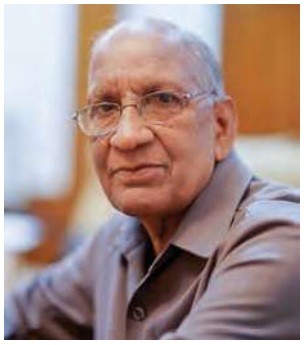




Board of Directors



V.C. Nannapaneni
Chairman &
Managing Director



G.S. Murthy
Independent Director



T.V. Rao
Independent Director



Rajeev Nannapaneni
Vice Chairman & CEO



D.G. Prasad
Independent Director



Dr. Leela Digumarti
Independent Director



P.S.R.K. Prasad
Director and Executive
Vice President Corp
Engineering Services



Dr. M.U.R. Naidu
Independent Director



Dr. Linga Rao Donthineni
Director and President -
Technical Affairs



Sridhar Sankararaman
Non-Executive and
Non-Independent Director

Key management team

V.C. Nannapaneni
Chairman & Managing Director

Rajeev Nannapaneni
Vice Chairman & CEO

P.S.R.K. Prasad
Director and Executive Vice President Corp Engineering Services

Dr. Linga Rao Donthineni
Director and President - Technical Affairs

M. Adinarayana
Company Secretary & Vice President - Legal & Corporate Affairs

Appa Rao S.V.V.N.
Chief Financial Officer

Dr. Apte S. S.
Vice President - R&D, NDDS

Dr. Durga Prasad K.
Vice President - R&D, Chemical Synthesis

Dr. Gopalakrishnan Vaidyanathan
Vice President - Analytical R&D

Lakshminarayana A.
Vice President - HR & OD

Dr. Pavan Bhat
Executive Vice President - Technical Operations

Dr. Pulla Reddy M.
Executive Vice President - R&D

Rajesh Chebiyam
Vice President - Acquisitions, Institutional Investor Management and Corporate Communications

Dr. Ramesh Dandala
Executive Vice President – Technology Transfer, Intellectual Property Rights and Regulatory Affairs (API)

Dr. Rami Reddy B.
Director - FDF

Dr. Satyanarayana K.
Vice President - R&D

Dr. Shankar Reddy B.
Vice President - R&D, Chemical Synthesis

Srivatsava K.
Vice President - Marketing & Sales, Domestic

Subba Rao Mente
Vice President - Global Generics

Sunil Kotaru
Vice President - Supply Chain Management

Suresh Prabhakar Kamath
Vice President - Operations (Visakhapatnam Unit)

Venkat Rao Tummala
Vice President – Manufacturing, Chemical Division

Srinivas Ch.
Vice President - Demand and Supply Planning

Risk framework and mitigation strategy

Pre-emptive measures for a resilient business

Risks			
 **Regulatory risk**	 **Business portfolio risk**	 **Currency volatility risk**	 **Geographic risk**
Nature of risks			
An unfavourable facility inspection from USFDA or other major regulatory body can lead to a significant delay of product exports.	NATCO is exposed to the risk of revenue generation from limited therapeutic segments. This could have an impact on the financial viability of the Company.	Fluctuations in foreign currency could result in variations in margins for the Company.	Being excessively dependent on the domestic and US market could affect sustainability in the long run.
Controls and actions			
The Company has rigorous training programmes for all employees in the manufacturing facilities and detailed internal processes and quality monitoring systems to ensure full compliance.	The company is currently diversified into multiple therapeutic segments in India such as oncology, hepatology, cardiology and diabetology. NATCO has been aggressively been launching products across these segments. In the US and many other markets, the company has chosen molecules independent of therapy segment.	The Company is naturally hedged with imports. With the expected depreciation in the rupee, the Company stands to gain on exports.	Today the company has notable revenues from India, US and Canada with escalating monetisation from Brazil and South East Asian regions. Given the company's strategy, going forward we expect even lesser dependency on any one specific geography.

	Human Capital risk	Health, Safety and Environment	Price control risk	Patent risk
	Our success depends on our ability to retain and attract key qualified personnel, and if we are not able to retain them or recruit additional qualified personnel, we may be unable to successfully develop our business.	Being in the business of healthcare, it is imperative for the Company to ensure 'no risk' in regards to health and safety of its stakeholder fraternity. Non-compliance with domestic and international regulations may lead to business disruptions.	Increased adoption of tender systems and other forms of price controls in the market could reduce revenue/profit realisation for our products.	The Company's inability to defend patent challenges could prevent the Company from selling products or may result in financial liabilities.
	The Company has a policy of providing excellent working environment for employees across all sections for a better work-life balance. The compensation paid by the Company is comparable with industries of its class and size. The Company has formulated an ESOP scheme to award and retain talent.	The Company endeavours to achieve zero incidents and maintains full compliance with the laws and regulations it is governed with. All its manufacturing facilities and R&D centres are compliant with regulatory laws, and are periodically audited.	The Company usually sets its prices at competitive rates. Any impact of price control would be felt to a similar extent by its competitors, thereby making it indifferent to the situation.	The Company enters strategic partnerships for product launches with major distributors and renowned pharma companies, wherein the downside risks (legal costs) are shared. For domestic markets, certain products entail risks but the Company carefully asses the risks before any launch.

Corporate social responsibility (CSR)

Strengthening our community connect

At NATCO, we are firm believers in participatory growth and in sharing the fruits of our labour with the communities we work with. We believed that there were significant sections of society that were left untouched by development. To bridge this gap, the NATCO Trust was established in 1995.

The core areas of NATCO Trust



Education

NATCO Trust is committed to create an enabling environment for children through education initiatives, with emphasis on quality as well as on providing appropriate infrastructure, skilled teachers, innovative teaching methodology and curriculum.

Our work in the area of education includes supporting NATCO nurtured institutions as well as addressing the need gaps of government schools and anganwadis. During the year, we had the privilege of adding value to the lives of over 14,000 students through our initiatives in education.



NATCO High School: NATCO High School was established in the Rangapur village of Kothur mandal (Rangareddy district) of Telangana in the year 1995. The journey started with over 70 students and 10 staff members while today it has over 1400 students.

At NATCO High school we introduced the XSEED methodology of teaching for pre-primary to primary students and the Butterfly methodology for students in the 6th to 10th class. The study of field-based agriculture was added to the curriculum. Infrastructure at the school was upgraded as we added a multi-purpose auditorium, sports facilities and agriculture lab to the campus.



The NATCO School Of Learning: NATCO School of Learning (CBSE Syllabus) was established at Gollamudipadu village, Ponnur Mandal of Guntur District, Andhra Pradesh in 2011, with an objective of providing good education to the local communities.

The school located in a serene environment of 9 acres of land with state of art facilities, trained teachers, XSEED – idiscovery methodology of teaching, well equipped computer lab, library, science laboratory, art and craft, gardening, landscaping and sports facility. It follows the CBSE Syllabus and the students excelled academically in the 10th standard examination, with around 90% of them passing with distinction.



NATCO Government High School: NATCO Trust entered a public private partnership (MoU) with the district administration of Hyderabad to partner in the construction of additional classrooms for a Government High School located in a highly concentrated urban slum, of Borabanda near Jubilee Hills, Hyderabad, Telangana.

NATCO Government High School currently has over 2000 children, and has both Primary and High Schools in the same compound and teaches through both Telugu and English medium.

It is the only Government high school for entire Borabanda slum (more than 3 lakhs population) and NATCO has aided in the construction of basic facilities like 30 classrooms; a science lab and a library; separate sanitation facilities for female, male students and teaching staff and a public addressing system.

NATCO TRUST – SCORECARD FY 2018-19

Education	Nutrition	Livelihoods	Sports
Touched over 14,000 children	Over 500 mothers and children benefited	Over 200 youth and farmers benefited	Promotion of community sports in over 40 schools

Health	Potable water	Sanitation and Plantation	Creation of community infrastructure
Community outreach over 48,000 patients with 5000 patients reached daily through hospital services	Over 30,000 people benefited in over 40 villages	Over 40 schools and 30 *Anganwadis* in targeted areas	Additional classrooms, speciality wards community halls, sanitation facilities and other such infrastructure units

Health



20,000

People benefited through our satellite healthcare unit at Mekaguda village

We have set up various healthcare facilities across therapeutic areas. A number of such facilities have had a far-reaching impact on the community.

NATCO Digital Primary Health Centre: This is a standalone satellite healthcare unit at Rangareddy district in Telangana that addresses all basic outpatient healthcare facilities and caters to neighbourhood villages. It served over 20,000 people from 74 surrounding villages in FY 2018-19.



L. V. Prasad - NATCO Eye Center: This is a modern, fully equipped facility in the Kothur mandal, Rangareddy district located in 2.2 acres of land. It is now fully operational and caters to over 60 patients a day and conducts over five surgeries every day.

Comprehensive Cancer Care Unit, Guntur: NATCO Trust is constructing a cancer center at Guntur General Hospital (GGH), Andhra Pradesh (AP) for which the government has allotted land to the extent of 4,000.sq yards within the premises of GGH. This will be the first medical linear accelerator (LINAC) facility among Government hospitals in AP. Spread over 77,000 sqft, it is expected to commence operations in the FY 2019-20 and would serve the needs of patients from several districts in the state.



Mobile Clinics: NATCO Trust's comprehensive mobile health care units were started with the objective of reaching out to the rural population. They travel the length and breadth of 32 villages at Kothur and Nagarjunasagar locations in Telangana reaching over 36000 patients in the FY 2018-19. The clinics are equipped with a qualified doctor, nurse and a pharmacist and provide both consultation and medicines, free of cost.

Nutritional centres and kitchen gardens



33

Nutritional centres in 23 villages

The Nutritional Centres provide support in the form of a supplementary food on a daily basis to pregnant women and lactating mothers and their children from underprivileged families. We support 33 nutritional centres in 23 villages

To increase awareness about nutritious food and promote self-sufficiency, training is provided on cultivating nutritional backyard kitchen gardens. We distributed different varieties of vegetable seeds and saplings to promote Non-Pesticide Management (NPM) and organic backyard kitchen gardens

Potable water plants



2,200

Children benefited through centralised potable water distribution

To prevent water-borne diseases and to provide potable water to the community we established potable water plants for the communities in over 40 villages

Provided centralised potable water distribution to 17 *anganwadis*, 13 government primary and high schools. This benefited over 2,200 children in five gram panchayats at Nandigama and Kothur mandal of Ranga Reddy district of Telangana state

Livelihoods



₹6,00,000

Earned by women trained at the centre

We have set up skill development centres that help individuals improve their farming and non-farming skills, thereby increasing their ability to earn income

Organising basic tailoring, IT, beautician and pre-primary teacher training certificate courses (PPTTC) for women. About 80 women trained at the centre earned an income of over ₹ 6,00,000 for two months by stitching school uniforms Taught natural farming and non-pesticide management to over 50 farmers who are applying these practices in 78 acres of land

Supported over 65 farmers to promote organic cultivation with buy-back facility and cultivation extended to ~70 acres of land

Environment, health & safety (EHS)

Delivering on our sustainability commitments

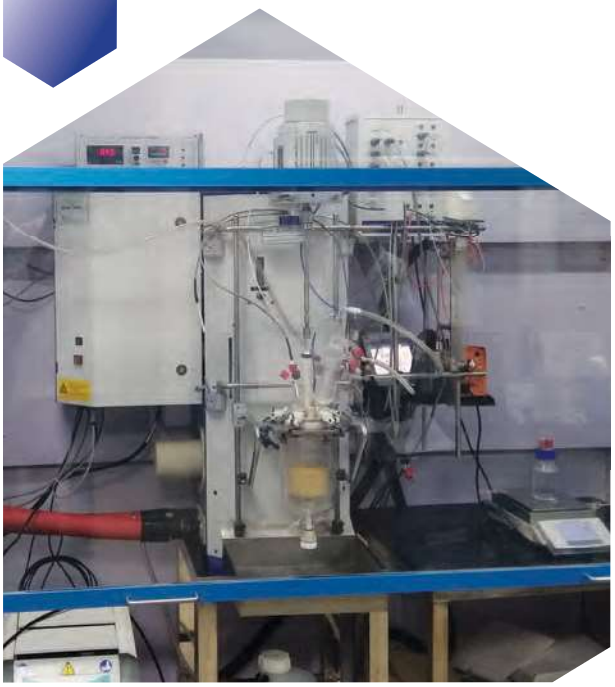
Safety by design

NATCO provides utmost importance to safety and practices the 'Safety By Design' concept for its drug moleculeS. This concept is followed at every stage including conception, development and commercial manufacture.

For the purpose, we have established a state-of-the-art Process Safety Engineering Lab at NATCO Research Centre, Hyderabad with an investment of ₹ 50 million.

So far, the laboratory has executed over dozens of projects and delivered their Process Safety Engineering reports.





The lab classifies the hazards in the process with respect to chemicals, process equipment and environment. It then provides proper mitigation solutions by modifying the process, making required changes in the manufacturing facility and coordinating with concerned departments and stakeholders.

Energy efficiency

During the year, we continued to enhance our dependence on renewable energy through the following processes:



- Increased our onsite solar power generation plant to 3 MW at Mekaguda unit from 1MW earlier
- Began the installation of an onsite rooftop solar power plant at Kothur unit
- Initiated the use of solar energy for boiler feed water pre-heating by using a parabolic Solar Dish concentrator at the Sagar unit
- Installed windmill at Ananthapur, Andhra Pradesh and started generating power; during FY 2018-19 ~1.16 million KWH of power was supplied to the grid. The power generated from the wind mill is expected to cater to the needs of our facilities in Vishakapatnam and Nellore
- In our Chennai facility over 90% of the power requirement is met through renewable sources

The Eco Park

Two years ago, an idea was conceived to convert a construction waste material yard at the Mekaguda site into a park. The objective of the Eco Park was to use the waste materials present and convert it into a sustainable space, which can be used by everyone.

The former construction waste material yard has now been transformed into a park where birds come calling, greenery is in abundance and where nature reigns supreme. The unique feature of the Eco Park is that it's sustainable at its very core – for example, waste concrete posts and using leftover stones from other construction sites have been used as benches.

Spread over an acre, the garden, also has a small hut, steeped in old world charm – with a bullock cart, old village furniture and some outdoor seating, which further accentuates the beauty of the park.

The plan is to use the garden for monthly review meetings and special occasions. The sylvan surroundings and chirping birds would be a refreshing addition to the formal proceedings.



Management Discussion and Analysis

Economic review

Global economy

Global economic growth slowed in 2018 to 3.6% from 3.8% in 2017 (Source: International Monetary Fund's World Economic Outlook). A slowdown in the Eurozone, trade tensions in China and macro-economic stress in developing economies such as Argentina and Turkey led to this slowdown. Escalating trade tensions between the US and China coupled with uncertainty on Brexit added to the volatility in financial markets and delayed investment decisions, putting further brakes on economic activity.

Eurozone's economic growth dipped to 1.8% in 2018 from 2.4% in 2017 due to weak export performance and low domestic demand. China's growth rate also fell to 6.6% from 6.9% in 2017 as tight monetary policy reduced demand in the domestic market. The US economy, however managed to buck the trend and register a 2.9% growth in 2018. Good employment rates, favourable business conditions and marginal inflation helped the world's largest economy grow at its strongest pace in nearly a decade.



Global growth pattern

(%)

	2018	2019 (P)	2020 (P)
World output	3.6	3.3	3.6
USA	2.9	2.3	1.9
Euro Area (Germany, France, Italy, Spain)	1.8	1.3	1.5
Japan	0.8	1.0	0.5
Canada	1.8	1.5	1.9
UK	1.4	1.2	1.4
Other advanced economies[1]	2.9	2.6	2.2
Emerging market and developing economies	4.8	4.5	4.4
China	6.6	6.3	6.1
Brazil	1.1	2.1	2.5

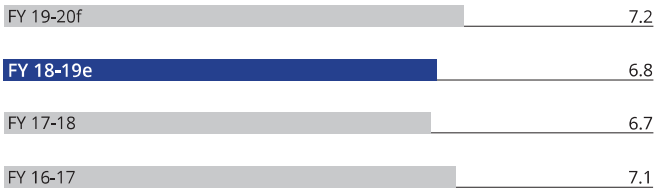
[1]Excludes Canada, Japan, the UK, the US and the Euro area countries | P: Projections

IMF expects global economic growth to slow down further to 3.3% in 2019. To address such tepid growth forecasts, central banks of most major economies migrated to a more accommodative policy and the US Federal Reserve has also indicated that it will not hike rates this year. IMF expects growth to pick up in the second half before stabilising at 3.6% in 2020.

Indian economy

In FY 2018-19, the Indian economy recorded a growth of 6.8%, making it one of the fastest growing large economies of the world. This growth was driven by strong capital formation, rising exports and an increase in private consumption. During the year, India's ranking in the World Bank's Ease of Doing Business index improved for second year in a row, moving up 23 places to reach 77th position. This was the outcome of government's focus on structural reforms and improving infrastructure. An upswing in consumption and investment, lower oil prices and a favourable monetary policy are the factors that are likely to help India's economic growth bounce back to 7.2% in 2019-20.

India's GDP growth (%)



Source: CSO, RBI e = estimate; f = forecast

India's growth over the next few years is likely to be driven by a number of factors including:

Stable government

Given the continuation of a strong and stable government at the centre, the work done in the areas of structural reforms will continue uninterrupted. It will also ensure a steady and sustained policy framework. This stable environment is a key positive for economic growth.

Foreign Direct Investment (FDI)

India has been ranked 11th in the Global FDI Confidence Index 2018, making it the second highest ranked emerging market for FDI. India's FDI equity inflows reached US $33.49 billion during FY 2018-19 while the cumulative FDI equity inflows to the country from April 2000 to December 2018 reached US $409.15 billion. FDI is important as the country needs significant investments to upgrade its infrastructure and propel growth.

Encouragement to manufacturing

The 'Make in India' programme launched by the government aims to encourage manufacturing in the country which will lead to large-scale job creation and foster economic growth. The unique initiative aims to utilise the existing Indian talent base, creating additional employment opportunities and empowering secondary and tertiary sector Moreover, it represents a complete change of the Government's mindset - a shift from issuing authority to business partner.

Consumption-driven economy

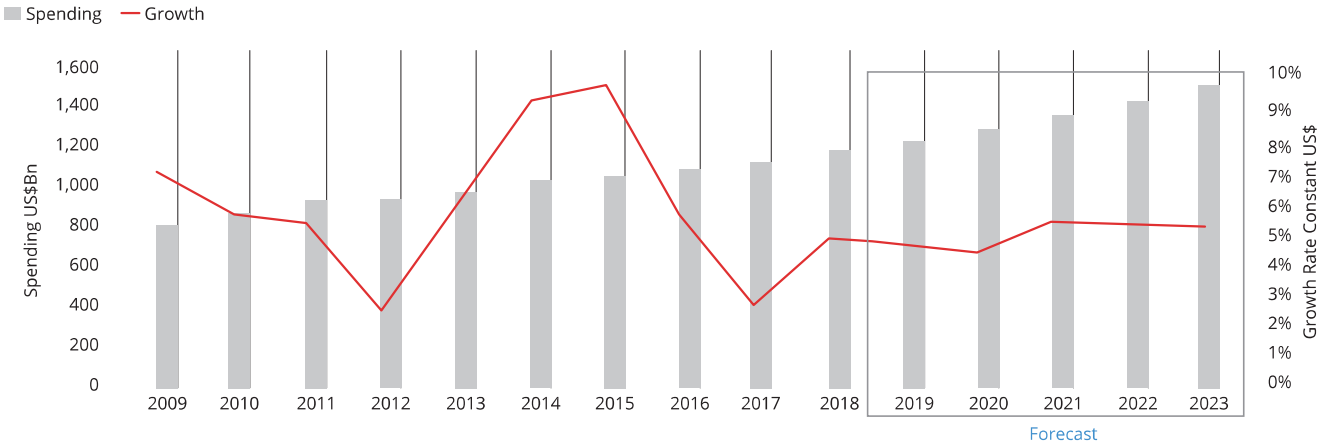
The fact that almost 60% of India's economy is fuelled by domestic consumption makes it resilient to the fluctuations in the global economy. Given the accommodative monetary policy and government initiatives such as deductions given in direct tax, people will be left with more money in their hands; this is likely to boost the consumption and investment cycle.



Global pharmaceutical market review

The global spending on medicines reached $1.2 trillion in 2018 and is expected to exceed $1.5 trillion by 2023; growing at a compounded annual growth rate (CAGR) of 3–6% over the next five years (Source: IQVIA: The Global Use of Medicine in 2019 and Outlook to 2023). The growth curve will be driven by factors such as aging populations, longer life expectancy rates, improved purchasing power and prevalence of chronic diseases.

Exhibit 1: Global medicine spending and growth 2009-2023



Source: IQVIA Market Prognosis, Sep 2018; IQVIA Institute, Dec 2018

Exhibit 2: Global medicine spending and growth in selected region, 2018-2023



UNITED STATES
2018: $485Bn + 5.2%
2014-18: 7.2% 5-year CAGR
2019: $507Bn + 4.6%
2023: $625Bn-665Bn
+4-7% 5-year CAGR

TOP 5 EUROPE
2018: $178Bn + 3.9%
2014-18: 4.7% 5-year CAGR
2019: $182Bn + 2.8%
2023: $195Bn-225Bn +
1-4% 5-year CAGR

PHARMERGING
2018: $286Bn + 6.9%
2014-18: 9.3% 5-year CAGR
2019: $293Bn + 7%
2023: $355Bn-385Bn
+5-8% 5-year CAGR

WORLDWIDE
2018: $1,205Bn + 4.8%
2014-18: 6.3% 5-year CAGR
2019: $1,245Bn + 4.5%
2023: $1,505Bn-1,535Bn +
3-6% 5-year CAGR

JAPAN
2018: $86Bn + 1.8%
2014-18: 1.0% 5-year CAGR
2019: $89Bn + 0.9%
2023: $89Bn-93Bn
(-) 3-0% 5-year CAGR

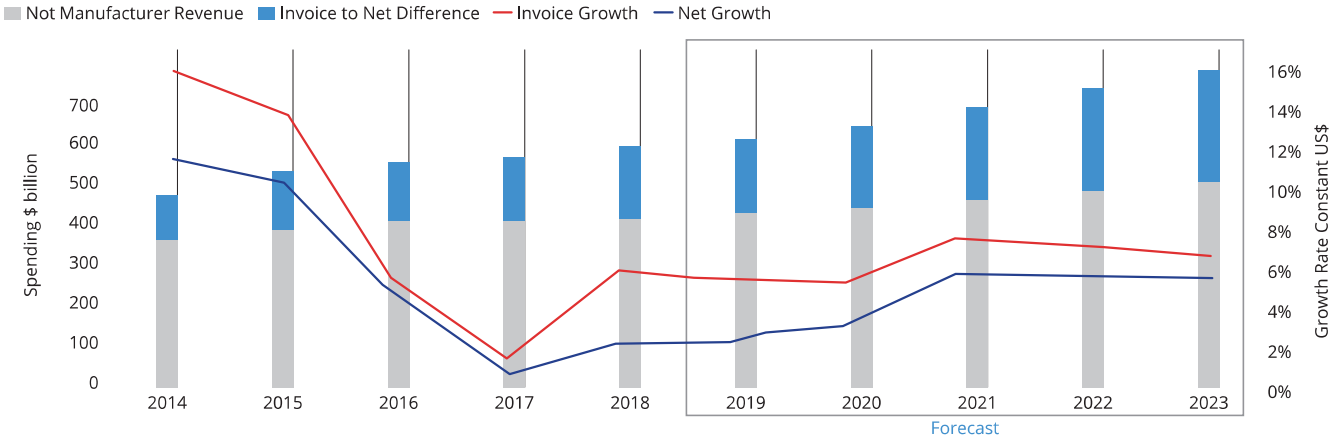
Source: IQVIA Market Prognosis, Sep 2018; IQVIA Institute, Dec 2018
Notes: Market sizes shown in US$ with actual and forecasting exchange rates; growth shown in constant dollars at Q2 2018 exchange rates; Japan growth decline on constant dollar basis is due to exchange rate dynamics

US

The US pharma spending registered $484.9 billion in 2018 on the back of new product updates and brand pricing. Most drug makers limited their annual price hike to 6% for branded products due to criticism of price hikes by manufacturers on established products.

While there was a move to cap prices of established drugs, the list prices of recently launched specialty, orphan and oncology drugs were still high. The median annual cost for new medicines in these segments rose significantly with oncology and orphan drugs likely to have median prices well above $100,000 per year by 2023.

Exhibit 5: U.S.invoice spending on medicines and net manufacturer revenue and growth ($ billion)



(Source: IQVIA Market Prognosis, September 2018; IQVIA Institute, December 2018)

Outlook

The US pharma market is seen growing at a CAGR 4-7% to US $625-655 billion in 2023, which is lower compared to the 7.2% CAGR in 2014-18.

While overall invoice spending growth is expected to increase to 6% in 2023, from 1.2% in 2017, net manufacturer revenue growth is likely to be 1–2% lower than invoice growth. Off-invoice discounts, rebates, statutory payments are expected to keep net revenue growth below inflation levels for the next five years.

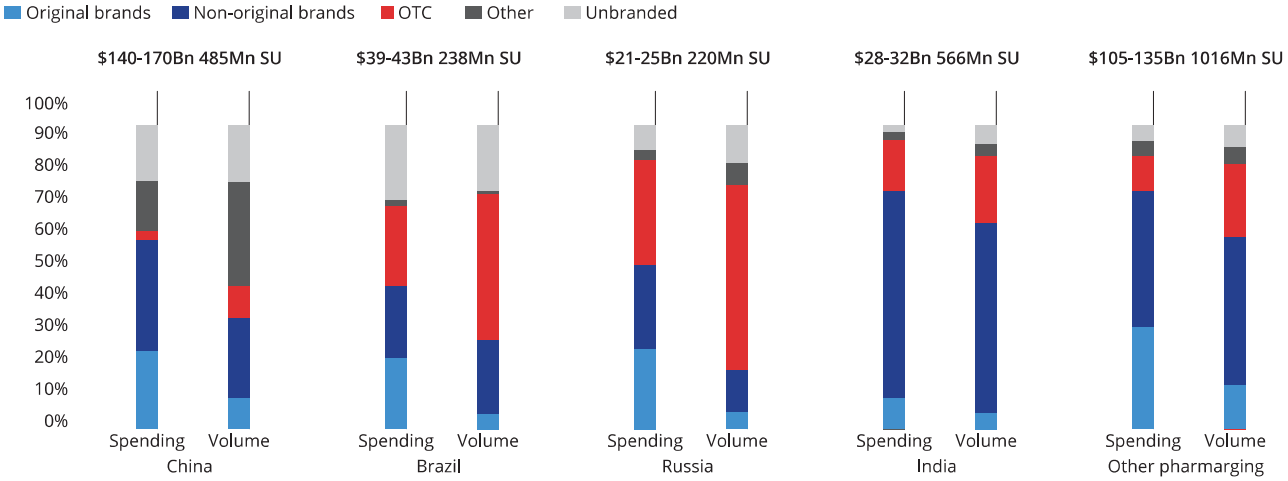
Pharmerging markets

Pharmerging markets are emerging markets in the pharma space; characterised by less than $30,000 GDP/per capita and greater than $1 billion absolute prescription medicines market growth potential between 2014 and 2019.

Spending on medication in pharmerging markets recorded a robust 9.3% CAGR in 2014-18 to register $285.9 billion. Factors such as governments' efforts to make healthcare products accessible to multiple geographies and consumers' ability to afford better healthcare products on the back of higher disposable income bolstered overall spending.



Exhibit 31: Pharmerging medicine spending by volume and type, 2023



Source: IQVIA Market Prognosis, Sep 2018; IQVIA Institute, Dec 2018

Outlook

Pharmerging markets are expected to grow at CAGR 5–8% over the next five years. This dip from 9.3% in the past five years is ascribed to the absence of growth driving factors encountered in the last five years.

Within the pharmerging markets, China, Brazil and India have the greatest medicine spending. China is the second largest pharmaceutical market globally with total spending of $137 billion in 2018. Government reforms to improve insurance access and recent upgrades in the hospital and primary care infrastructure boosted spend. China's pharma market is likely to grow at 3-6% and register $140-170 billion by 2023 vis-à-vis Brazil which is likely to grow at 5-8% to $30-43 billion.

Pharmaceutical spending growth for pharmerging markets by region (US$ billion)

Region/Country	2018	2014-2018 CAGR	2023	2019-2023 CAGR
China	132.3	7.6	140-170	3-6
Tier II markets	67.7	10.7	91-95	7-10
Brazil	31.8	10.8	39-43	5-8
India	20.4	11.2	28-32	8-11
Russia	15.5	9.9	21-25	7-10
Tier III markets	85.9	11.3	105-135	7-10
Pharmerging markets	**285.9**	**9.3**	**355-385**	**5-8**

(Source: IQVIA Market Prognosis, September 2018; IQVIA Institute, December 2018)

India

Pharma spending in India stood at $20.4 billion for 2018 and is expected to grow at a CAGR 8-11% in the next five years to touch $28-32 billion, making India one of the top 10 pharma markets by 2020. The rise in the number of middle-class households, improved medical infrastructure and increased penetration of health insurance will enhance growth. Domestic Active Pharmaceutical Ingredient (API), consumption is expected to reach US $18.8 billion by FY 2021-22.[1]

India's research and development competency and efficient production facilities helped it secure a leading rank among global producers of cost-effective generic medicines and vaccines. India supplied 20% of the total global pharma demand by volume. In FY 2017-18, India exported pharma products worth $17.27 billion and by 2020, the industry estimates the exports to grow by 30% to reach $20 billion.

1RNCOS, BMI, Datamonitor, KemwellBiopharma, Chemical Pharmaceutical Generic Association, ICRA Report estimates, pharmanewsprwire.com, DGCI&S

The Government of India has taken several initiatives to promote healthcare in the country. Targeting more than 500 million beneficiaries, Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana (PMJAY) is the largest government-funded healthcare programme in the world. Additional benefits such as rural healthcare programmes and extension of comprehensive primary healthcare are expected to augment growth for pharmaceutical sector.

Business overview

NATCO Pharma Ltd. (NATCO) is a vertically integrated pharma company, which manufactures Finished Dosage Formulations (FDF), Active Pharmaceutical Ingredients (API) and Intermediates. NATCO markets its products in India, the US and the rest of the world (ROW) markets. With its niche focus and nimble strategy, NATCO has created a stronghold in oncology and gastro hepatology segments in India.

During recent years, NATCO has launched complex molecules like Glatiramer Acetate Injections (both 20 mg and 40 mg), and Liposomal Doxorubin in US, which are contributing to stable business. During the reporting period the company filed for five ANDA's and three DMF's in unique segments in line with its objective of niche molecule filings in US. The Company is well positioned for growth in emerging markets like Canada and Brazil with launches and approvals in both markets

In India, NATCO has built a strong presence in the oncology and gastro-hepatology segment and is building up its products in the Cardiology and Diabetology (CnD) segment.

The Company has fortified its position further in domestic business through six new product launches, including two in oncology and four, collectively in pharma specialty and CnD.

NATCO's FDF facility in Vishakhapatnam is a part of Special Economic Zone (SEZ) and is intended to cater predominantly to the export market. The Company has completed the manufacturing set-up, and the facility is expected to commence commercial operations during the FY 2019-20.

In the long term, the Company sees its growth driven by multiple markets, products and businesses. NATCO expects good prospects in Canada, Brazil and India, apart from establishing a presence in Singapore and other regions of South East Asia.

Over the past couple of years, the company has made a conscious decision to select products, which could have a potential market in the US, India and other emerging ROW countries by following the global portfolio strategy. This strategy of selecting multiple markets for a single product increases the possibility of better return on investment.

On the emerging markets front, the Company has strengthened its position in Brazil and Canada with good approvals and launches and is positive about its prospects in the region.

The Company is also leveraging its core competency in organic chemistry to foray into the Crop Health Sciences space.

Business segments

NATCO's business can be broadly classified into two categories: FDF and API. Its formulations business caters to the domestic and international markets. In the domestic formulations market, the Company operates in the divisions of oncology, pharma specialties and CnD.

The Company's international formulations business caters to the US and ROW markets predominantly in Brazil and Canada and is currently increasing its footprints in South East Asia. The API manufactured has both captive consumption and is sold to customers.

Domestic formulations

In the domestic market, NATCO Pharma is one of the largest players in the oncology segment and a key player in the pharma specialty space.

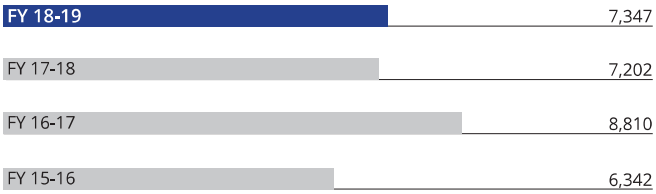
During the year FY 2018-19, the domestic business grew with strong support from the oncology segment. The Company believes that it will maintain a strong growth in the domestic segment through both, its existing products and new launches. NATCO plans to launch 6-8 products across all three domestic formulation business divisions in the coming year.

NATCO regularly hosts Continuous Medical Education (CME) programmes for the doctor community, keep them abreast of the latest developments. The Company's endeavour is to bring affordable products in the market.

NATCO is well placed to meet the rigorous regulatory requirements due to the company's strong culture of manufacturing high-quality medicines with strict process controls. This, we believe will help us continue on the path of sustainable growth.

Domestic FDF sales

Revenue (₹ in million)



3-year CAGR

5.03%

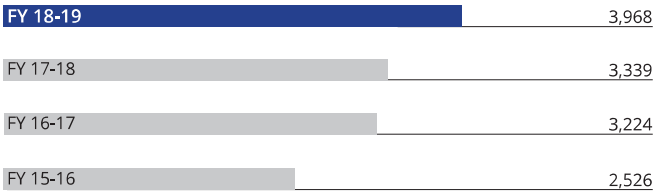
Oncology

With a portfolio of 29 products, the Company is amongst the largest players in the Indian oncology market. It has six brands- Veenat, Lenalid, Erlonat, Geftinat, Sorafenat and Bortenat- which have recorded sales of over ₹ 100 million in FY 2018-19. During the year, the Company launched Lepatinib and Certinib, contributing to the overall growth in the segment. NATCO has a dedicated sales force of representatives and strategically located network of distributors who are driving the business ahead.

The revenue of the oncology segment has grown from ₹ 3,339 million to ₹ 3,968 million reflecting a growth of 18.84%. This was in spite of competitive pressures and pricing controls during the year.

Oncology revenues

Revenue (₹ in million)



3-year CAGR

16.25%

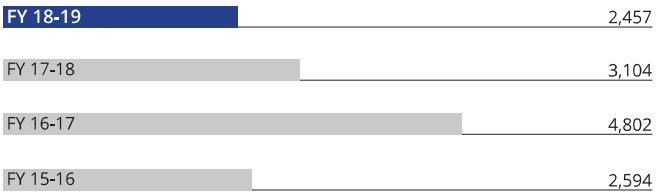
Pharma specialties

NATCO's specialties division caters predominantly to the gastroenterology segment, in addition orthopaedics and critical care. The Company continues to be a market leader in the Hep C segment of drugs, despite the overall decline in the size of the market. While our revenues have fallen from ₹ 3,104 million to ₹ 2,457, we hope to regain the market due to our robust portfolio.

In orthopaedics, the Company currently markets two brands while it has four niche brands in the critical care segment. The Company has strong pipeline of products to be launched under this division in the coming years.

Pharma speciality excluding third party

Revenue (₹ in million)



3-year CAGR

-1.74%

Cardiology and Diabetology

Since the start of the Cardiology and Diabetology (CnD) division by NATCO, there have been unique first-to-launch products such as Argatroban and Dabigatran injections to treat patients with thrombosis syndrome.

The Company has several other unique molecules in the pipeline some of which have been attempted for launch during the year. Although the net revenue generated by the segment has been less than ₹ 10 crore in the financial year, NATCO confident that the Company will carve out a niche area for itself in this segment. For FY 2019-20, the Company has multiple new product launches planned in the CnD segment.

International formulations

The Company exports its FDF products from India to several international geographies either through its local partners or directly through its subsidiaries such as in Canada and Brazil.

During the year the Company has increased revenue streams from regions beyond the US.

During the year, the total international exports were ₹ 8,791 million. Additionally, the contribution from its subsidiaries stood at ₹ 1,083 million.

Total Revenues

₹ 8,791 million

International formulation sales: Geography-wise (₹ in million)

Year	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19
Export sales to the US, including profit share	1,125.6	7,696.8	9,542.0	8,246.0
Export sales to RoW (all non-US)	1,168.2	673.2	816.0	545.0
Sales from subsidiaries (net)	1,194.4	630.0	937.0	1,083.0

US

During the financial year, NATCO has seen an increase in market share in both Liposomal Doxorubicin and Glatiramer Acetate, which are well-positioned for increased earnings while we expect Oseltamivir to face competition and decline in revenues.

During the year, the Company's niche focus strategy in the US was further attested with the filing of another high value product - Ibrutinb tablets. We believe this is a potential first-to-file (FTF) blockbuster molecule. The Company's strategy is to continuously identify such molecules for its future growth.

In FY 2018-19, the Company filed five ANDAs in the US, which includes three potential first-to-file opportunities. As of 31 March, 2019, the Company has 36 approved ANDAs and 20 Para IVs yet to be launched. The key products are:

Key Para-IV products in the pipeline		
Key Brand	Molecule	Therapeutic segment /Primary indication
Nexavar	Sorafenib	Cancer/Kidney and Liver
Tykerb	Lapatinib Ditosylate	Cancer/Breast
Revlimid	Lenalidomide	Cancer/Multiple Myeloma
Afinitor	Everolimus (higher strength)	Cancer/Breast
Zytiga	Abiraterone	Cancer/Prostate
Aubagio	Teriflunomide	CNS/Multiple Sclerosis
Tarceva	Erlotinib	Cancer/NSCLC and Pancreatic
Kyprolis	Carfilzomib	Cancer/Multiple Myeloma
Pomalyst	Pomalidomide	Cancer/Multiple Myeloma
Sovaldi	Sofosbuvir	Anti-Viral / Hep C
Imbruvica	Ibrutinib	Cancer/Leukemia

ROW markets

Canada

The Canadian market is serviced through NATCO's subsidiary, NATCO Pharma Canada Inc. The Company's key product Oseltamivir (all strengths) continues to be in a strong market position even in the third year since its launch. During the year, NATCO Canada also entered the HIV/Hepatitis space with the launch of Tenofovir Disoproxil Fumarate. With these initiatives, the Canadian operations recorded revenues of ₹ 960 million, representing a healthy growth of 24.3% over revenues of ₹ 737 million in FY 2017-18.

In FY 2018-19, the Canadian subsidiary filed seven generic submissions to Health Canada and received approval for three products. As of 31 March, 2019, NATCO Canada obtained a total of 16 approvals with the total number of filings over 20.

Brazil

It was a landmark year for our subsidiary, NATCO farma do Brazil as it has received approvals for its Everolimus tablet as the first generic in Brazil and Letrozole tablets as the third-generic player. The launch of Everolimus through hospital tenders helped establish its footprints in the country.

The Brazilian market is tender-driven, with government and regional tenders accounting for about 80% of medicine sales in the country. Directionally, the Brazilian market is moving towards generics.

Given the growth prospects that Brazilian markets offers, the subsidiary is investing in upgrading its infrastructure and participating in more government tenders. During the year, NATCO has received two significant approvals and is expecting approvals of two significant products which will drive near-term growth. As on 31 March, 2019, we have eight filings in Brazil.

Other ROW markets

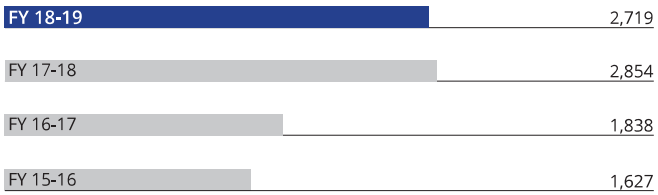
The Company is taking its range of existing products to markets where it sees a significant potential for them. Currently, NATCO commenced marketing of its products in Singapore and has received approval for several products. In Singapore, considering the smaller size of the market, it remains optimistic of growth given the diverse portfolio of products being filed.

The Company is also in the process of taking its products to a host of emerging markets such as Taiwan, Indonesia, the Philippines, Commonwealth of Independent States (CIS) Countries and Africa.

API
The API business is strategically important since it develops APIs for the captive consumption of many of NATCO's critical FDF products in addition to supplying to direct customers. The vertically integrated API facility is one of the core strengths of the Company as it helps in sustaining the business in times of margin pressures or disruption in raw material supply. This division also sells API for its regulatory customers.

Gross API revenues

Revenue (₹ in million)



3-year CAGR

18.67%

In FY 2018-19, revenues from the API division stood at ₹ 2,719 million. As of 31 March, 2019, NATCO has a total of 45 active DMFs with the USFDA for products in therapeutic areas such as oncology, central nervous system, anti-asthmatic, anti-depressant and gastrointestinal disorders.

Financial overview
In FY 2018-19, NATCO's revenue from operations on a consolidated basis amounted to ₹ 22,247 million, recording a 26.9% CAGR over the last 3 years. Profit after tax stood at ₹ 6,444 million, representing a CAGR of 60.1% over the last 3 years.

The EBITDA for the year was ₹ 9,250 million, representing an EBITDA margin of 41.6%.

The market capitalisation of the Company as on 31 March 2019, ₹ 97.21 billion.

The Company declared three interim dividends for the FY 2018-19 and the dividend pay-out for the 1st and 2nd interim dividend amounted to ₹ 919 million while the dividend distribution tax amounted to ₹ 189 million. A third interim dividend payout in 2019 was given out which will amount to ₹ 227 million with a dividend distribution tax amounting to ₹ 47 million. Collectively, all the three dividends stand to 17.18% of standalone profit (excluding divided distribution tax) .

Threats, risks and concerns
Adverse assessment of a manufacturing facility by any key regulatory body has the potential to significantly change the business prospects of any pharmaceutical company.

Environment, Health and Safety
NATCO constantly strives to provide its employees with a safe and healthy work environment and has taken multiple initiatives to reduce its impact on the environment.

To improve occupational health and safety, the Company motivates its employees to achieve 'Goal Zero' where the aim is to have zero incidents, zero harm to people and zero damage to the environment. In order to achieve this goal, the Company has scheduled training programmes to increase awareness on environment, health and safety for employees across all units.

Reducing carbon footprint is another key priority for NATCO. Towards this aim, during FY 2018-19 the Company undertook multiple clean energy initiatives such as upgrading the solar power plant at Mekaguda to 3 MW from 1 MW and commissioned a windmill at Anantapur that will supply power to the Vishakhapatnam unit.



Board's Report

Dear Members,

The Board is pleased to present the Thirty-Sixth Annual Report on the business and operations of the Company together with the Audited Financial Statements for the year ended 31st March, 2019.

Company Overview

Your company is a vertically integrated pharmaceutical company having presence in multiple speciality therapeutic segments. Over the years, the Company has developed an innate ability to deliver moleculeS, which are complex and hard to manufacture. The Company has constantly innovated and manufactured speciality medicines and niche pharmaceutical products. The Company has its corporate headquarters at Hyderabad.

Financial Results

A summary of the Company's financial results for the Financial Year 2018-19 is as under:

(₹ in million)

	Standalone		Consolidated	
	Year ended 31st March, 2019	Year ended 31st March, 2018	Year ended 31st March, 2019	Year ended 31st March, 2018
Net Revenue /Income	21,161	21,479	22,247	22,424
Gross profit before interest and depreciation	9,463	9,678	9,250	9,688
Finance Cost	188	147	193	154
Profit before depreciation and amortisation - (Cash Profit)	9,275	9,531	9,057	9,534
Depreciation and Amortisation	801	655	810	662
PBT before exceptional items	8,474	8,876	8,247	8,872
Exceptional items	-	-	-	-
Profit before Tax (PBT)	8,474	8,876	8,247	8,872
Provision for Tax –Current	1,863	2,173	1,883	2,199
Provision for Tax –Deferred	(60)	(279)	(60)	(279)
Profit after Tax	6,671	6,982	6,424	6,952
Other comprehensive income (OCI)	(91)	(47)	(76)	(52)
Total Comprehensive income for the period	6,580	6,935	6,348	6,900

Dividend

The Company declared three interim dividends for the FY 2018-2019, the details of which are as follows:

S. No.	Date of Board Meeting	Date of payment	Interim Dividend Declared per equity share of face value ₹ 2/- each in ₹
1.	8th August, 2018	20th August, 2018	1.50
2.	12th February, 2019	21th February, 2019	3.50
3.	27th May, 2019	On or before 14th June, 2019	1.25
	Total		**6.25**

The dividend pay-out for the 1st and 2nd Interim dividend amounted to ₹ 919 million and dividend distribution tax amounted to ₹ 189 million. Thus the 1st and 2nd Interim dividend resulted in total pay-out of 16.61% of the standalone profit after tax of the Company for the year under review.

The two Interim Dividends have been paid to all eligible shareholders and the third interim dividend is declared on 27th May, 2019 which is due for payment on or before 14th June, 2019. The pay-out proposed for 3rd interim dividend amounts to ₹ 227 million and dividend distribution tax of ₹ 47 million. The aggregate of three interim dividends amounts to ₹ 1382 million including dividend distribution tax of ₹ 236 million and it results in a pay-out of 20.72% of Standalone Profit after tax of the company for F.Y. 2018-19.

Accordingly your Directors recommend that the above three interim dividends be treated as the final dividend of the Company for the Financial Year 2018-19. The Dividend Distribution Policy of the company is annexed to this report as "**Annexure VIII**" and is also available on the Company's website www.natcopharma.co.in.

Transfer to Reserves

The Board has decided to retain the entire amount of profits in the profit and loss account for the year under review.

Share Capital

During the year under review, 2,68,735 equity shares were issued and allotted under Employee Stock Option Schemes (ESOP- NATSOP 2015, NATSOP 2016 & NATSOP 2017) and a total of 20,15,656 shares were bought back by the Company through open market route under the SEBI (Buy-back of Securities) Regulations, 2018, out of which 18,77,640 shares were extinguished before 31st March, 2019. Accordingly, the issued and subscribed share capital of the company as on 31st March, 2019 stood at ₹ 365 million divided into 18,27,46,479 equity shares of ₹ 2/- each as against ₹ 369 million divided into 18,44,93,400 equity shares of ₹ 2/- each as on 31st March, 2018.

Buyback

During the year under review, the company announced buyback of shares commencing from 19th November 2018 for a sum of ₹ 250 crores through open market for a price not exceeding ₹ 1000 per share. During the year ended 31st March 2019, the Company bought back 20,15,656 equity shares of ₹ 2 each for an aggregate purchase value of ₹ 1,329 million, excluding transaction costs. Out of the total shares bought back, 18,77,640 equity shares of ₹ 2 each were extinguished before 31st March, 2019 and the balance 1,38,016 equity shares were extinguished in two tranches on 5th April, 2019 and 22nd April, 2019.

Deposits

During FY 2018-19, the Company did not accept any fixed deposit within the meaning of Sections 73 and 74 of the Companies Act, 2013 read together with the Companies (Acceptance of Deposits) Rules, 2014 and therefore no amount of principal or interest was outstanding, as on the date of balance sheet.

Change in the nature of Business, if any

During the year, the company has taken approval from shareholders to venture into agro chemical business.

Subsidiaries

The Consolidated Financial Statements of the Company are prepared in accordance with relevant Indian Accounting Standards (Ind AS) issued by the Institute of Chartered Accountants of India and forms an integral part of this Report.

During the period under review NATCO Life sciences Philippines Inc. was added as a subsidiary of the company

Pursuant to Section 129 (3) of the Companies Act, 2013 read with Rule 5 of the Companies (Accounts) Rules 2014, a statement containing the salient features of the financial statements of our Subsidiaries is given in Form AOC-1, which is attached as "**Annexure I**" to the Board's Report.

Particulars of Loans, Guarantees and Investments

The Company provides investments, loans and guarantees to its subsidiaries for its business purpose. Details of investments, loans, and guarantees covered under Section 186 of the Companies Act, 2013, form part of the notes to the financial statements provided in this annual report.

Corporate Governance and additional Share holders Information

Pursuant to the SEBI (Listing Obligation and Disclosure Requirements) Regulations, 2015 ("Listing Regulations"), a detailed report on the corporate governance systems and practices of the Company is given under Corporate Governance Report which is part of this Annual Report. Similarly, other detailed information for shareholders is provided in the chapter Additional Shareholders' Information.

A certificate from CS P Renuka, Company Secretary in Practice (C.P.No. 3460) on the compliance with the conditions of corporate governance is part of the Corporate Governance Report. A certificate from her that none of the Directors on the Board of the company are disqualified from being appointed or continuing as a Directors of company by the Ministry of Corporate Affairs or any statutory authority is attached to this Annual Report.

Management Discussion and Analysis

A detailed report on the Management Discussion and Analysis is provided as a separate chapter in the annual report.

Board of Directors

In accordance with the provisions of the Companies Act, 2013, Mr Rajeev Nannapaneni (DIN: 00183872) is liable to retire by rotation and being eligible offers himself for reappointment at the ensuing Annual General Meeting of the Company.

Board in its meeting held on 23rd May, 2018 appointed Mr. Sridhar Sankararaman (DIN: 06794418) as an additional director and his appointment as a Non-Executive and

Non-Independent Director of the Company who is liable to retire by rotation was approved by the shareholders in their meeting held on 15th September, 2018. Mr. Vivek Chhachhi (DIN: 00496620) resigned as a Non-executive and Non-independent director w.e.f from 23rd May, 2018 due to his professional obligations and other pre-occupations.

Board Evaluation

As per provisions of the Companies Act, 2013 and the Listing Regulations as amended from time to time, an evaluation of the performance of the Board was undertaken. The contribution and impact of individual Directors were reviewed through a peer evaluation on parameters such as level of engagement and participation in board/committee meetings, flow of information, independence of judgment, conflicts resolution, managing relationships within the Board and their contribution in enhancing the Board's overall effectiveness. The feedback obtained from the interventions was discussed in detail and, where required, independent and collective action points for improvement put in place.

Appointment of Directors and Remuneration Policy

The assessment and appointment of members to the Board is based on a combination of criterion that includes ethics, personal and professional stature, domain expertise, gender diversity and specific qualification required for the position. The independent Board member is also assessed on the basis of independence criteria defined in Section 149(6) of the Companies Act, 2013 and Regulation 16(1)(b) of the Listing Regulations

In accordance with Section 178(3) of the Companies Act, 2013, and on recommendations of Nomination and Remuneration Committee, the Board adopted a remuneration policy for Directors, Key Management Personnel (KMPs) and Senior Management which is available on the website of the Company www.natcopharma.co.in.

Upon recommendation of the Nomination and Remuneration Committee, the Board of Directors at their meeting held on 27th May, 2019 approved the re-appointment of the following Independent Directors for a further term of five (5) years i.e up to 41st Annual general Meeting to be held in the Calendar year 2024 in terms of the provisions of the Companies Act, 2013, subject to the consent of the Members of the Company at their ensuing Annual General Meeting:

1. Mr. G.S. Murthy (DIN: 00122454)
2. Mr. D.G. Prasad (DIN: 00160408)
3. Mr. T.V. Rao (DIN: 05273533)
4. Dr. Mrs. Leela Digumarti (DIN: 06980440)

Declaration by Independent Directors

All Independent Directors of the Company have submitted requisite declarations confirming that they continue to meet the criteria of independence as prescribed under section 149(6) of the Companies Act, 2013 and Regulation 16(1) (b) of the SEBI Listing Regulations. The Independent Directors have also confirmed that they have complied with the Company's Code of Conduct.

Number of Meetings of the Board and its Committees and other Committees

The Board currently has eight (8) committees, namely, Audit Committee, Stakeholders Relationship Committee, Nomination and Remuneration Committee, Compensation Committee, Allotment Committee, Corporate Social Responsibility Committee, Risk Management Committee and Buy back Committee.

Other Committees

Other Committees includes Share Transfer Committee, Internal Complaints Committee and Land Committee.

A detailed update on the Board, its composition, detailed charter including terms of reference of various Board Committees, number of Board and Committee meetings held during FY 2018-19 and attendance of the Directors is provided in the Corporate Governance Report, which forms part of the Annual report.

All the recommendations made by the Committees of Board including the Audit Committee were accepted by the Board. During the year the Board constituted Buyback Committee comprising of the Chairman and Managing Director, Vice Chairman and Chief Executive Officer, Company Secretary and the Chief Financial Officer for the purpose of Buyback.

Business Risk Management

The Company has a risk management mechanism in place to manage uncertainties through identification, analysis, assessment, implementing and monitoring to reduce the impact of risks to the business which is discussed in detail in the Management Discussion and Analysis section.

Material changes and commitments affecting financial position between end of financial year and date of report

No material changes and commitments have occurred after the close of the financial year till the date of this report which may affect the financial position of the Company.

Business Responsibility Report

As mandated by the Securities and Exchange Board of India (SEBI), the Business Responsibility Report (BRR) forms part of this Annual Report. The BRR contains a detailed report on business responsibilities vis-à-vis the nine principles of

the National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Business framed by the Ministry of Corporate Affairs.

Internal Financial Controls

The Company has in place adequate Internal Financial Controls commensurate with the business operations of the Company which are operating effectively. Your Company has adopted policies and procedures for ensuring the orderly and efficient conduct of its business, including adherence to the Company's policies, the safeguarding of its assets, prevention and detection of frauds and errors, accuracy and completeness of the accounting records, and timely preparation of reliable financial disclosure.

Reporting of Frauds

There was no instance of fraud during the year under review, which required the Statutory Auditors to report to the Audit Committee and/or Board under section 143(12) of the Companies Act, 2013 and Rules framed thereunder.

Insurance

The Company's plant, property, equipment and stocks are adequately insured against all major risks. The Company also has appropriate liability insurance covers particularly for product liability and clinical trials. The Company has also taken Directors' and Officers' Liability Policy to provide coverage against the liabilities arising on them.

Directors Responsibility Statement

Pursuant to Section 134(3)(c) of the Companies Act, 2013 in relation to financial statements of the company for the year ended 31st March 2019, the board of directors state that:-

a) The applicable accounting standards have been followed in preparation of the financial statements and there are no material departures from the said standards.

b) Reasonable and prudent accounting policies have been used in preparation of the financial statements and that they have been consistently applied and that reasonable and prudent judgements and estimates have been made in respect of items not concluded by the year end, so as to give a true and fair view of the state of affairs of the company as at 31st March, 2019 and of the profit for the year ended on that date.

c) Proper and sufficient care has been taken for the maintenance of adequate accounting records in accordance with the provisions of the Companies Act, 2013 for safeguarding the assets of the company and for preventing and detecting fraud and other irregularities.

d) The financial statements have been prepared on a going concern basis.

e) Proper internal financial controls were in place and were adequate and operating effectively and

f) Proper systems were devised to ensure compliance with the provisions of all applicable laws and that such systems were adequate and operating effectively.

Related Party Transactions

In accordance with Section 134(3)(h) of the Companies Act, 2013 and Rule 8(2) of the Companies (Accounts) Rules, 2014, the particulars of contract(s) or arrangement(s) entered into by the Company with related parties referred to in Section 188(1) in Form AOC-2 is attached as "**Annexure II**" to this Board's Report.

The details of related party disclosures form part of the notes to the financial statements provided in this Annual Report.

Vigil Mechanism/Whistle Blower Policy

The Company believes in upholding professional integrity and ethical behaviour in the conduct of its business. To uphold and promote these standards, the Company has a Vigil Mechanism / Whistle Blower Policy which serves as a mechanism for its Directors and employees to report genuine concerns about unethical behavior, actual or suspected fraud or violation of the Code of Conduct without fear of reprisal. The policy also provides employee(s) access to the Chairperson of the Audit Committee under certain circumstances. The details of the procedures are also available on the website of the Company www.natcopharma.co.in.

A brief note on the Whistle Blower Policy is also provided in the Report on Corporate Governance, which forms part of this Annual Report.

Internal Complaints Committee

The Company has Internal Complaints Committees in place in all the units in line with the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013. A brief note on the same is provided in the Report on Corporate Governance, which forms part of this Annual Report.

Auditors

Statutory Auditors

The members of the Company at their Annual General Meeting held on 27th September, 2014 appointed M/s Walker Chandiok & Co. LLP (Firm Registration No. 001076N/N500013) as the statutory auditors of the Company to act as such from the conclusion of the Annual

General Meeting (AGM) held for the financial year 2013-14 till the conclusion of the AGM to be held for the Financial Year 2018-19.

Pursuant to Section 139 of the Companies Act, 2013 and the rules made thereunder, it is mandatory for the Company to rotate the current statutory auditors on completion of a maximum term of ten (10) years permitted thereunder. Accordingly, based on the recommendation of the Audit Committee of the Company, the Board of Directors of the Company have appointed M/s. B S R & Associates LLP (ICAI FRN: 116231W/W-100024) as the Statutory Auditors of the Company to hold office for a period of five (5) years i.e. from the conclusion of the ensuing Annual General Meeting till the conclusion of the 41st Annual General Meeting of the Company to be held for the financial year 2023-2024 in the place of retiring auditors i.e. M/s.Walker Chandiok & Co. LLP (Firm Registration No.001076N/N500013), subject to the consent of the members of the company at the ensuing Annual General Meeting.

Secretarial Auditor

Pursuant to Section 204 of the Companies Act, 2013 read with Rule 9 of the Companies (Appointment & Remuneration of Managerial Personnel) Rules, 2014, CS Balachandra Sunku with Certificate of Practice (CP) No. 12745, a practicing Company Secretary conducted the secretarial audit of the Company for FY 2018-19. The Secretarial Audit Report in form No. MR-3 is attached as "**Annexure III**" to this Board's Report.

Upon recommendation of the Audit Committee, the Board has appointed CS B. Kiran Kumar (CP No. 15876), M/s BK Associates, a practicing Company Secretary as secretarial auditor of the Company for the FY 2019-2020.

Cost Auditors

Pursuant to Section 148 of the Companies Act, 2013 read with the Companies (Audit and Auditors) Rules, 2014 and the Companies (Cost Records and Audit) Amendment Rules, 2014, the Company maintains the cost audit records in respect of its pharmaceutical business. The Board has, on the recommendation of the Audit Committee, appointed M/s. S.S. Zanwar & Associates (Firm Registration No.:100283) as cost auditors of the Company for FY 2018-19. The provisions also require that the remuneration of the cost auditors be ratified by the shareholders and accordingly the same is put forward to the shareholders for their ratification in the ensuing AGM. The cost audit report for the FY 2018-19 will be filed with the Central Government within the stipulated timeline and the relevant cost audit reports for FY 2017-18 were filed within the due date to the Central Government.

Significant and Material Orders Passed by the Courts/Regulators

During FY 2018-19, there were no significant and/or material orders, passed by any Court or Regulator or Tribunal, which may impact the going concern status or the Company's operations in future.

Corporate Social Responsibility Initiatives

The Board formulated a Corporate Social Responsibility (CSR) Policy which is in full force and operation and is subject to monitoring by the CSR Committee of Directors from time to time.

The details about the CSR initiatives taken during the FY 2018-19 are discussed in a separate head which forms a part of this Annual Report.

The Annual Report on CSR activities of the Company is attached as "**Annexure IV**" to this Board's Report

Transfer of unpaid and unclaimed dividend amounts and shares to Investor Education and Protection Fund

Pursuant to the provisions of Section 124(5) & (6) of the Companies Act, 2013, the dividends which remained unclaimed for a continuous period of seven years and the shares pertaining to the shareholders who have not claimed dividend for a continuous period of seven years were transferred to the Investor Education and Protection Fund (IEPF) established by the Central Government. The details of which are disclosed in the Corporate Governance Report.

Employees Stock Option Scheme

Details pertaining to the Employee Stock Option Schemes are disclosed in the Corporate Governance Report which forms a part of this Annual Report.

Credit Rating

ICRA Limited has reaffirmed their rating "AA" (which means high degree of safety regarding timely servicing of financial obligations and has very low credit risk) for various banking facilities enabling your company to avail facilities from banks at attractive interest rates indicating a very strong degree of safety for timely payment of financial obligations such as payment of interest and repayment of principal, if any.

Particulars of Employees

The information as required under Section 197 of the Act read with Rule 5(1) of the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014 are given in Annexure V which forms part of this report.

The information required under Rule 5(2) and (3) of the Companies (Appointment and Remuneration of Managerial

Personnel) Rules, 2014, is provided in an Annexure forming part of this Report. In terms of the second proviso to Section 136 of the Act, the Report and Accounts are being sent to the Members excluding the aforesaid Annexure. The said annexure is open for inspection at the Registered Office of the Company and any member interested in obtaining the same may write to the Company Secretary at the Registered Office of the Company.

Conservation of Energy, Research and Development, Technology Absorption, Foreign Exchange Earnings and Outgo

The details of Energy Conservation, Research and Development, Technology Absorption and Foreign Exchange Earnings and Outgo as required under section 134(3) (m) of the Companies Act, 2013, read with Rule 8(3) of the Companies (Accounts) Rules, 2014 is annexed to this report as "**Annexure VI**".

Extract of Annual Return

As required under Sections 92(3) and 134(3)(a) of the Companies Act, 2013 read with Rule 12 of Companies (Management and Administration) Rules, 2014, the extract of Annual Return in Form MGT-9 forms part of this report as "**Annexure VII**".

Compliance with Secretarial Standards

The Company has complied with Secretarial Standards issued by the Institute of Company Secretaries of India.

Acknowledgements

The Board wish to place on record their appreciation to shareholders, government authorities, banks, business partners, medical practitioners and other stakeholders for the assistance, co-operation and encouragement extended to the Company. The Board also commend the continuing commitment and dedication of the employees at all levels, which has been critical for the Company's success. The Board look forward to their continued unstinted support in future also.

For and on behalf of the Board of Directors

V.C. Nannapaneni
Chairman and Managing Director
(DIN:00183315)

Place: Hyderabad
Date: 27th May, 2019

Annexure-I to the Board's Report

FORM NO. AOC-1

(Pursuant to first proviso to sub-section (3) of Section 129 read with Rule 5 of Companies (Accounts Rules, 2014)

Statement containing salient features of the financial statement of subsidiaries:

(₹ in Millions)*

	NATCO Pharma INC	NATCO Canada Inc	Time cap Overseas Ltd	NATCO Do Brasil Ltda	NATCO Pharma Asia PTE Ltd	NATCO Pharma Australia Pty Ltd	NATCO Life sciences Philippines Inc
Share Capital	41.85	146.55	819.38	710.52	88.95	48.97	13.66
Reserves & Surplus	233.12	123.23	(41.61)	(629.93)	(78.68)	(48.78)	(4.49)
Total Assets	402.93	520.62	1034.97	494.79	123.04	0.86	17.35
Total Liabilities	127.96	250.84	257.20	414.20	112.77	0.68	8.17
Investments	-	-	918.40	-	-	-	-
Turnover	-	959.80	-	314.89	12.55	-	0.79
Profit before taxation	3.34	69.38	(3.81)	(266.15)	(16.55)	(7.11)	(6.44)
Provision for taxation	1.07	18.42	-	39.91	-	-	1.93
Profit after taxation	2.27	50.96	(3.81)	(226.24)	(16.55)	(7.11)	(4.51)
Proposed Dividend							
Report Currency	USD	CAD	USD	BRL	SGD	AUD	PESO
Closing exchange rate	69.32	51.91	69.32	17.66	51.13	49.20	1.31
Average exchange rate	69.76	53.15	69.76	18.48	51.34	50.84	1.32
% of Shareholding	100%	99.04%	90.36%	90.90%	99.73%	100%	100%**

* all amounts are in rupees millions except closing and average exchange rates

** Includes the shares held by the nominee shareholders of the subsidiaries on behalf of the Company.

For and on behalf of the Board of Directors

V.C. Nannapaneni
Chairman and Managing Director
(DIN:00183315)

Place: Hyderabad
Date: 27th May, 2019

Annexure-II to the Board's Report

Form No. AOC – 2

(Pursuant to Clause (h) of Sub-Section (3) of section 134 of the Act and Rule 8(2) of the companies (Accounts) Rules, 2014)

Disclosure of particular of contracts/arrangements entered into by the Company with related parties referred to in sub-section (1) of Section 188 of the Companies Act, 2013 including certain arm's length transactions under third proviso thereto.

1. There are no contracts/arrangements/transactions entered into by the Company with related parties referred to in sub-section (1) of Section 188 of the Companies Act, 2013 which are not at arm's length basis.

2. The following are the contracts/arrangements/transactions entered into by the Company with related parties referred to in sub-section (1) of Section 188 of the Companies Act, 2013 which are at arm's length basis.

Sl. No.	Name(s) of the related party and nature of relationship	Nature of Contract / arrangements / transaction	Duration of the contracts / arrangements/ transactions	Salient terms of the contracts or arrangements or transactions including the value, if any in ₹ million	Date(s) of approval by the Board if any:	Amount paid as advances, if any in ₹
1.	Mr. V.C. Nannapaneni, Chairman & Managing Director	Renewal of Lease Agreement	2 years	To locate western India Marketing Office and accommodation to Senior Executives visiting Mumbai Rent payable ₹ 2.1 million p.a.	6th February, 2018	Nil
2.	Mr. Rajeev Nannapaneni, Vice Chairman & CEO	Renewal of Lease Agreement	2 years	To locate Chennai Marketing Office and Guest House – Rent payable ₹ 1.2 million p.a.	6th February, 2018	Nil
3.	Mr. Rajeev Nannapaneni, Vice Chairman & CEO	Renewal of Lease Agreement	2 years	To locate Chemical Division, Chennai city office Rent payable -₹ 0.12 million p.a.	6th February, 2018	Nil
4.	M/s. Time Cap Pharma Labs Ltd Shareholding of Mr. V. C. Nannapaneni	Renewal of Lease Agreement	2 years	To locate Delhi office and Guest house Rent payable-₹ 2.1 million p.a.	6th February, 2018	Nil
5.	M/s. Time Cap Pharma Labs Ltd Shareholding of Mr. V. C. Nannapaneni	Renewal of Lease Agreement	2 years	To locate godown at Kothur, Rangareddy Dist. Rent payable - ₹ 1.2 million p.a.	23rd May, 2018	Nil
6.	M/s. Time Cap Pharma Labs Ltd Shareholding Of Mr. V. C. Nannapaneni	Renewal of Lease Agreement	2 years	To locate Company's Solar Panel Production at Kothur, Rangareddy Dist. Rent payable - ₹ 1.2 million p.a.	23rd May, 2018	Nil

Sl. No.	Name(s) of the related party and nature of relationship	Nature of Contract / arrangements / transaction	Duration of the contracts / arrangements/ transactions	Salient terms of the contracts or arrangements or transactions including the value, if any in ₹ million	Date(s) of approval by the Board if any:	Amount paid as advances, if any in ₹
7.	M/s. Time Cap Pharma Labs Ltd. Shareholding of Mr. V.C. Nannapaneni	Lease agreement	2 year	To locate Time Cap Pharma Labs Ltd C & F office at Sanathnagar Rent received ₹ 0.18 million*	23rd May, 2018	Nil
8.	M/s. Time Cap Pharma Labs Ltd. Shareholding of Mr. V.C. Nannapaneni	Sale of raw-materials	1 year	Sale of raw materials to Time Cap Pharma Labs Ltd. ₹ 0.07 million	6th February, 2018	Nil
9.	Natco Pharma (Canada) Inc. Subsidiary	Sales	1 year	To sell finished goods to Natco Pharma (Canada) Inc. ₹ 150 million	6th February, 2018	Nil
10.	Natco Pharma Asia Pte. Ltd. Subsidiary	Sales	1 year	To sell finished goods to Natco Pharma Asia Pte Ltd. ₹ 7 million	6th February, 2018	Nil
11.	NatcoFarma Do Brasil Step-down Subsidiary	Sales	1 year	To sell finished goods to Natco Pharma Do Brasil Ltda ₹ 48 million	6th February, 2018	Nil
12.	Time Cap Pharma Labs Ltd. Shareholding of Mr.V.C. Nannapaneni	Purchase of land	One time	Purchase of 23,232 sq. yards industrial land from M/s. Time Cap Pharma Limited for ₹ 49 million including registration charges	23rd May,2018	Nil
13.	Time Cap Pharma Labs Ltd. Shareholding of Mr. V.C. Nannapaneni	Commission and expenses reimbursement	1 year	To pay commission and reimburse expenses related to C&F services provided by M/s. Time Cap Pharma Limited ₹ 6 million*	6th February, 2018	Nil

Note: *Company terminated w.e.f. January, 2019, the Clearing & Forwarding Agreement with Time Cap Pharma Labs Limited and accordingly the transactions pertaining to payment of commission and reimbursement of expenses to Time Cap Pharma Labs Limited and payment of rent by Time Cap Pharma Labs Limited for its C&F warehouse located in the Company's premises, reported earlier, were not entered into by the Company.

All the above transactions were entered by the Company with Related Parties in the ordinary course of business at prevailing market rates.

For and on behalf of the Board of Directors

V.C. Nannapaneni
Chairman and Managing Director
(DIN:00183315)

Place: Hyderabad
Date: 27th May, 2019

Annexure-III to the Board's Report

Form MR-3

SECRETARIAL AUDIT REPORT

(For the financial year ended 31st March, 2019)
[Pursuant to Section 204(1) of the Companies Act, 2013 and Rule No. 9 of the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014 read with Regulation 24A of SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015]

To
The Members
NATCO Pharma Limited
NATCO House, Road No.2
Banjara hills, Hyderabad.
Telangana – 500034.

I have conducted the secretarial audit of the compliance of applicable statutory provisions and the adherence to good corporate practices by **NATCO Pharma Limited** (hereinafter called the Company). Secretarial Audit was conducted in a manner that provided me a reasonable basis for evaluating the corporate conducts/statutory compliances and expressing my opinion thereon.

Based on my verification of the Company's books, papers, minute books, forms and returns filed and other records maintained by the Company and also the information provided by the Company, its officers, agents and authorized representatives during the conduct of secretarial audit, I hereby report that in my opinion, the Company has, during the audit period covering the financial year ended on 31st March, 2019 complied with the statutory provisions listed hereunder and also that the Company has proper Board-processes and compliance-mechanism in place to the extent, in the manner and subject to the reporting made hereinafter:

I have examined the books, papers, minute books, forms and returns filed and other records maintained by the Company for the financial year ended on 31st March, 2019 according to the provisions of:

(i) The Companies Act, 2013 (the Act) and the rules made thereunder;

(ii) The Securities Contracts (Regulation) Act, 1956 ('SCRA') and the rules made thereunder;

(iii) The Depositories Act, 1996 and the Regulations and Bye-laws framed thereunder;

(iv) Foreign Exchange Management Act, 1999 and the rules and regulations made thereunder to the extent of Foreign Direct Investment, Overseas Direct Investment and External Commercial Borrowings;

(v). The following Regulations and Guidelines prescribed under the Securities and Exchange Board of India Act, 1992 ('SEBI Act') to the extent applicable to the Company:-

(a) The Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 2011 and amendments thereto;

(b) The Securities and Exchange Board of India (Prohibition of Insider Trading) Regulations, 2015;

(c) The Securities and Exchange Board of India (Share Based Employee Benefits) Regulations, 2014;

(d) The Securities and Exchange Board of India (Registrars to an Issue and Share Transfer Agents) Regulations, 1993 regarding the Companies Act and dealing with client, and amendments thereto;

(e) The SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015;

(f) The Securities and Exchange Board of India (Issue of Capital and Disclosure Requirements) Regulations, 2018 and amendments thereto; and

(g) The SEBI (Buy-back of securities) Regulations, 2018

(h) The SEBI (Issue and Listing of Debt Securities) Regulations, 2008

(i) The SEBI (Issue and Listing of Non-Convertible Redeemable Preference Shares) Regulations, 2013.

(j) The SEBI (Delisting of Equity Shares) Regulations, 2009

And the circulars/guidelines issued thereunder;

(vi). Other laws applicable specifically to the Company namely:

(a) The Drugs and Cosmetics Act, 1940 and The Drugs and Cosmetics Rules, 1945.

(b) The Narcotic Drugs and Psychotropic Substances (Amendment) Act, 2014 and the Narcotic Drugs and Psychotropic Substances Rules, 1985.

(c) The Drugs (Prices Control) Order, 2013 made under Essential Commodities Act, 1955.

(d) Drugs and Magic Remedies (Objectionable Advertisement) Act, 1954 and the rules made thereunder;

(e) The Air (Prevention and Control of Pollution) Act, 1981

(f) The Water (Prevention and Control of Pollution) Act, 1974

(g) The Environment Protection Act, 1986.

(h) The Harzardous and other wastes (Management, Handling and Transboundary Movement) Rules, 2016 and amendments thereof.

(vii). Labour Laws applicable to the Company:

(a) The Factories Act, 1948

(b) The Payment of Wages Act, 1936

(c) The Payment of Gratuity Act, 1972

(d) The Payment of Bonus Act, 1965 and amendments thereto;

(e) Employees Provident Fund and Miscellaneous Provisions Act, 1952

(f) Employees State Insurance Act, 1948 and Employees State Insurance (General) Regulations, 1950.

(g) The Employees Exchanges (Compulsory notification of vacancies) Act, 1959 and Rules, 1960

(h) The Contract Labour (Regularisation and Abolition) Act, 1970

(i) The Maternity Benefits Act, 1961 and amendments thereto;

(j) AP Shops and Establishment Act, 1988.

(viii) The other General Laws applicable to the Company.

(a) The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 to be read with The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Rules, 2013

I have also examined compliance with the applicable clauses of the following:

(i) Secretarial Standards issued by the Institute of Company Secretaries of India.

(ii) The Listing Agreements entered into by the Company with the BSE Limited and National Stock Exchange of India Limited, including the compliances as specified under the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015.

I report that, during the year under review, the Company has complied with the provisions of the Acts, Rules, Regulations, Guidelines and Standards etc., mentioned above.

I further report that, there were no events/actions in pursuance of:

a) The Securities and Exchange Board of India (Delisting of Equity Shares) Regulations, 2009;

b) The SEBI (Issue and Listing of Debt Securities) Regulations, 2008

c) The SEBI (Issue and Listing of Non-Convertible Redeemable Preference Shares) Regulations, 2013.

I hereby report that:

(a) The Company has, in my opinion, complied with the provisions of the Companies Act, 2013 and the Rules made under the Act as notified by Ministry of Corporate Affairs and the Memorandum and Articles of Association of the Company in all respects.

(b) The Company has complied with the provisions of the Securities Contracts (Regulation) Act, 1956 and the Rules made under that Act, with regard to maintenance of minimum public shareholding.

(c) The Company has complied with the provisions of the Depositories Act, 1996 and the Byelaws framed thereunder by the Depositories with regard to dematerialisation / rematerialisation of securities and reconciliation of records of dematerialised securities with all securities issued by the Company.

(d) The Company has complied with the provisions of the FEMA, 1999 and the Rules and Regulations made under that Act, to the extent it is applicable.

(e) The Company has complied with the requirements under the Equity Listing Agreements entered into with BSE Limited, NSE Limited and regulations of The SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 to the extent applicable.

(f) The Company has complied with the provisions of the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 and the Rules and Regulations made under the Act, to the extent it is applicable.

I further report that:

(a) The Company has complied with the provisions of the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 2011 including the provisions with regard to disclosures and maintenance of records required under the said Regulations;

(b) The Company has complied with the provisions of the Securities and Exchange Board of India (Prohibition of Insider Trading) Regulations, 2015 including the provisions with regard to disclosures and maintenance of records required under the said Regulations;

(c) The Company has complied with the provisions of the Securities and Exchange Board of India (Share Based Employee Benefits) Regulations, 2014 including the provisions with regard to disclosures and maintenance of records required under the said Regulations;

I further report that:

(a) The Board of Directors of the Company is duly constituted with proper balance of Executive Directors, Non-Executive Directors, Independent Directors and Independent Woman Director. The changes in the composition of the Board of Directors that took place during the period under review were carried out in compliance with the provisions of the Act.

(b) Adequate notice is given to all the directors about schedule of the Board Meetings, Agenda and detailed notes on agenda were sent at least seven days in advance, and a system exists for seeking and obtaining further information and clarifications on the agenda items before the meeting and for meaningful participation at the meeting.

(c) Decisions at the Board Meetings, as represented by the management, were duly approved and no dissenting views have been observed so as to record.

(d) The Company has obtained all necessary approvals under the various provisions of the Act;

(e) There was no prosecution initiated and no fines or penalties imposed during the year under review under the Act, SEBI Act, SCRA, Depositories Act, Listing Agreement and Rules, Regulations and Guidelines framed under these Acts against / on the Company, its Directors and Officers.

(f) The Directors have complied with the disclosure requirements in respect of their eligibility of appointment, their being independent and compliance with the Code of Business Conduct & Ethics for Directors and Management Personnel;

With reference to the compliance of Industry Specific Acts of the Company, I relied upon Management Representation letter issued by the Compliance Officer of the Company. My report of compliance would be limited to their reporting and subject to the observations and comments made by them in their report, if any.

With reference to the compliance of the Labor and Financial Laws, I relied upon Management Representation Letter issued by the Compliance Officer, Chief Financial Officer of the Company and also report of Statutory Auditors. My report of compliance would be limited to their reporting and subject to the observations and comments made by them in their report, if any.

Based on the information received and records maintained, there are adequate systems and processes in the Company commensurate with the size and operations of the Company to monitor and ensure compliance with applicable laws, rules, regulations and guidelines. I further report that during the audit period:

i) The Board of Directors at its meeting held on 08th August, 2018 recommended to alter the existing objects clause of the Memorandum of Association of the Company to enable it to manufacture all kinds of chemicals, including industrial chemicals, laboratory chemicals, photographic chemicals, fine chemicals, biological chemicals, agrichemicals and specialty chemicals and same was approved by the Shareholders at the 35th Annual General Meeting of the Company held on 15th of September, 2018.

ii) The Compensation Committee of the Company its meeting held on 27th September, 2018 pursuant to NATCO Employees Stock Option Scheme 2015 (NATSOP 2015) approved the allotment of third tranche of the options entitling 1,40,965 equity shares of ₹ 2/- (Rupees Two Only) to eligible employees, which was earlier approved by the Shareholders at their Extra Ordinary General Meeting held on 27th June, 2015.

iii) The Board of Directors at its meeting held on 05th November, 2018 pursuant to NATCO Employees Stock Option Scheme 2016 (NATSOP 2016) approved the allotment of second tranche of the options entitling 17,500 equity shares of ₹ 2/- (Rupees Two Only) to eligible employees, which was earlier approved by the Shareholders at the 33rd Annual General Meeting held on 30th September 2016.

iv) The Board of Directors at its meeting held on 05th November, 2018 pursuant to NATCO Employees Stock Option Scheme 2017 (NATSOP 2017) approved the allotment of first tranche of the options entitling 1,10,270 Equity Shares of ₹ 2/- (Rupees Two Only) to eligible employees, which was earlier approved by the Shareholders at the 34th Annual General Meeting held on 28th September 2017.

v) The Board of Directors at its meeting held on 05th November, 2018 approved the Buy-back by the company of fully paid-up equity shares of face value of ₹ 2 (Rupees Two Only) each of the Company from all the shareholders of the company (except promoters, promoter group and persons in control of the Company) at a price not exceeding ₹ 1,000/- (Rupees One Thousand Only) per Equity Share ("Maximum buyback Price") excluding any other expenses ("Transaction Costs"), further Board approved buyback of a minimum of ₹ 1,250 Million (Rupees One Thousand Two Hundred and Fifty Millions only) being 50% of Maximum buyback size, and the buyback not to exceed 10% of the aggregate of the total paid-up equity capital and free reserves of the Company for which approval of Shareholders is not required as per the Provisions of the Companies Act, 2013.

And there were no specific events /actions in pursuance of the above referred laws, rules, regulations, guidelines, etc., having a major bearing on the Company's affairs.

CS Balachandra Sunku
M. No. F5496
CP. No. 12745

Place: Hyderabad
Date: 27th May, 2019

Note: This report is to be read with my letter of even date which is annexed herewith and which forms an integral part of this report.

Annexure to Form MR-3

(For the financial year ended 31st March 2019)

To
The Members
NATCO Pharma Limited

Our report of even date is to be read along with this letter.

1. Maintenance of Secretarial records is the responsibility of the management of the Company. Our responsibility is to express an opinion on these secretarial records based on our audit.
2. We have followed the audit practices and process as were appropriate to obtain reasonable assurance about the correctness of the contents of the Secretarial records. The verification was done on test basis to ensure that correct facts are reflected in Secretarial records. We believe that the process and practices, we followed provide a reasonable basis for our opinion.
3. We have not verified the correctness and appropriateness of financial records and Books of Accounts of the Company.
4. Wherever required, we have obtained the Management Representation Letter about the Compliance of laws, rules and regulations and happening of events etc.
5. The Compliance of the provisions of Corporate and other applicable laws, rules, regulations, standards is the responsibility of management. Our examination was limited to the verification of procedure on test basis.
6. The Secretarial Audit report is neither an assurance as to the future viability of the Company nor of the efficacy or effectiveness with which the management has conducted the affairs of the Company.

CS Balachandra Sunku
M. No. F5496
CP. No. 12745

Place: Hyderabad
Date: 27th May, 2019

Annexure-IV to the Board's Report

ANNUAL REPORT ON CORPORATE SOCIAL RESPONSIBILITY (CSR) ACTIVITIES FOR THE FINANCIAL YEAR ENDED MARCH 31, 2019

1. A brief outline of the Company's CSR policy, including overview of Projects or Programs proposed to be undertaken and a reference to the web-link to the CSR policy and projects or programs:

   Your company as a responsible corporate entity framed CSR policy as stipulated by the Companies Act, 2013 to undertake all or any of the objectives contained in Schedule VII of the Companies Act, 2013. Your company intends to actively contribute to the social and economic development of the communities in which it operate by participating actively in building a better, sustainable way of life for the weaker sections of society. The CSR Policy may be accessed on the Company's website at the link: www.natcopharma.co.in.

2. The Composition of CSR Committee:
   The CSR Committee comprises of the Directors namely Shri G.S.Murthy (Chairman), Shri V.C.Nannapaneni and Shri Rajeev Nannapaneni

3. Average net profits of the Company for last three financial years: ₹ 5776.33 million.

4. Prescribed CSR Expenditure (two per cent of the amount as in item 3 above): ₹ 115.53 million.

5. Details of CSR spent during the financial year:

a) Total amount spent for the financial year 2018-19: ₹ 116.00 million

b) Amount unspent, if any: Nil.

c) Manner, in which the amount spent during the financial year is detailed below:

(₹ in Millions)

	CSR Project / Activity	Sector	Location of the project /Programme	Amount spent on the projects / programs	Amount spent direct / implementing agency
A.	**Expenditure on Projects / Programs**				
1	NATCO Trust Managed School:				
	a. NATCO High School	Education	Rangapur Village, Kothur Mandal, Ranga Reddy District, Telangana	17.00	NATCO Trust
	b. NATCO School of Learning	Education	Gollamudipadu Village, Ponnuru Mandal, Guntur District, A.P.	11.35	NATCO Trust
2	Sports for Development Project	Education	Kothur Mandal, Ranga Reddy District, Telangana	0.35	NATCO Trust
3	Infrastructure and manpower support to anganwadi centres	Early childhood Education	Kothur and Nandigam Mandals in Ranga Reddy District , Telangana	11.73	NATCO Trust
4	After school Tuition Centres	Education	Pedavoora Mandal, Nalgonda District, Govt Primary School, Borabanda, Hyderabad, Kothur and Nandigam Mandals of Telangana. Ponnuru Mandal, Guntur district, Andhra Pradesh	1.94	NATCO Trust

(₹ in Millions)

	CSR Project / Activity	Sector	Location of the project /Programme	Amount spent on the projects / programs	Amount spent direct / implementing agency
5	Infrastructure support to Government schools	Education	Chiluvuru and Tadikonda villages in Guntur District, A.P.	17.82	NATCO Trust
6	Infrastructure support to Government primary and high schools	Education	Kothur and Nanhigam Mandals in Rangareddy District, Telangana	5.49	NATCO Trust
7	NATCO Mobile Health Clinics	Health	Ranga Reddy and Nalgonda District, Telangana	4.81	NATCO Trust
8	Community health camps	Health	Ranga Reddy District in Telangana and Prakasam District in A.P.	2.50	NATCO Trust
9	Nutrition Centre	Health	Ranga Reddy and Nalgonda District, Telangana	1.85	NATCO Trust
10	Patient Counselling	Health	Hyderabad & Rangareddy , Hyderabad District, Telangana	2.25	NATCO Trust
11	Construction cancer block at Govt General Hospital	Health	Guntur District, A.P.	22.17	NATCO Trust
12	Operation theatre and modular machine support to Guntur General Hospital	Health	Guntur District, A.P.	6.48	NATCO Trust
13	Refurbishment to Government Maternity hospital	Health	Hyderabad District , Telangana	1.59	NATCO Trust
14	Digital PHC	Health	Mekaguda, Ranga Reddy District	3.86	NATCO Trust
15	NATCO Career Counselling and Guidance Centre	Livelihood	Ranga Reddy,Nalgonda District, Telangana,Guntur District,A.P.	1.28	NATCO Trust
	Total (A)			**112.47**	
B.	**Administrative expenses**				
1	Implementing expenses	Education		2.05	NATCO Trust
2	Implementing expenses	Health		1.12	NATCO Trust
3	Implementing expenses	Livelihood		0.36	NATCO Trust
	Total (B)			**3.53**	
	Total (A+B)			**116.00**	

6. In case the company has failed to spend the two per cent of the average net profit of the last three financial years or any part thereof, the company shall provide the reasons for not spending the amount in its Board report:

   Not Applicable.

7. A responsibility statement of the CSR Committee that the implementation and monitoring of CSR Policy, is in compliance with CSR objectives and Policy of the company:

"The directors report that your company has complied with its CSR Policy along with the provisions of the Companies Act, 2013 and rules made there under and the implementation and monitoring of CSR Policy is in compliance with the CSR objectives and Policy of the Company".

For and on behalf of the Board of Directors

V.C. Nannapaneni
Chairman and Managing Director
(DIN:00183315)

Place: Hyderabad
Date: 27th May, 2019

Annexure-V to the Board's Report

Information required under Section 197 (12) of the Companies Act, 2013 read with Rule 5 (1) of the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014)

(i) The ratio of the remuneration of each director to the median remuneration of the employees of the Company, the percentage increase in remuneration of each director, CEO, CFO and CS, for FY 2018-19 and comparison of the remuneration of each Key Managerial Personnel (KMP) against the performance of the Company:

Name	Designation	Ratio of Remuneration of each Director/KMP to the median remuneration of employees	% increase in remuneration during FY2019
Mr. V. C. Nannapaneni	Chairman and Managing Director	52	0
Mr. Rajeev Nannapaneni	Vice Chairman and CEO	47	0
Mr. P.S.R.K Prasad	Whole Time Director	41	7
Dr. D Linga Rao	Whole Time Director	41	7
Mr. M. Adinarayana	Company Secretary	12	11
Mr. S.V.V.N Apparao	Chief Financial Officer	16	10

Mr. T.V. Rao, Mr. G.S. Murthy, Mr. D.G. Prasad, Dr. Leela Digumarthi and Dr. M.U.R. Naidu, Independent Directors were paid only sitting fees for attending the Board / Committee Meetings.

(ii) The median remuneration of employees increased by 14.07% in FY 2018-19.

(iii) The number of permanent employees on the rolls of Company as on 31st March 2019 is 4957.

(iv) The average increase in remuneration paid to employees is 15.67 % for FY 2018-19 compared to 2017-18. Compared to FY 2017-18, the standalone revenue in FY 2018-19 fell by 1.50% and profit before tax fell by 4.52 %

(v) It is hereby affirmed that the remuneration paid during FY 2018-19 is as per the remuneration policy of the company

Annexure-VI to the Board's Report

Conservation of Energy, Research and Development, Technology Absorption, Foreign Exchange Earnings and Outgo

Conservation of Energy, Technology Absorption

A) Conservation of Energy –

a) During the year, the Company has implemented energy conservation projects across its various business units. A few of the key initiatives include:

1. Installation of Energy efficient equipment & optimization of processes consuming energy: Major projects in this category:

   a) Installed new high efficiency Utility equipment during the last fiscal and achieved significant saving of INR 1 million in various utility areas.

   b) Conversion of CFL based lighting to LED lighting has been taken up during FY 2018-19 and completed the replacement at continuous use area.

2. Identifying cheaper power sources both in-house and external and Utilizing the alternate sources of energy:

   a) Installed 1.15 Mw Solar plant at Chemical Division, Mekaguda, which lead to savings of approximately INR 0.3 million for part of the year since installation.
   Expected saving per annum is approximately INR 10 million.

   b) Installed 2.1 MW wind mill at Anantapur, for captive power use for Vizag plant. Expected saving for FY 2019-20 is INR 20 million.

3. Steps in progress for increasing the utilization of alternate renewable sources of energy:

   a) Feasibility studies for Wind Power Generation for captive power utilization at Chemical Division, Mekaguda has been completed and as per data evaluated by consultant there is low potential for commercial installation of wind mill in this area.

(B) Technology Absorption

Efforts made towards technology absorption: As part of the technology absorption, the Company engages in in-house development of bulk drugs & formulations, conducts pilot studies for potential scale-up so as to improve efficiency both in terms of time and productivity of products is positive and can be installed at Chemical plant Mekaguda.

Disclosure of particulars with respect to conservation of energy.

A: Power and Fuel Consumption	For the year ended 31.03.2019	For the year ended 31.03.2018
1. Electricity		
a) Purchased Units	67600362	61998529
Total amount (₹ million)	401.12	361.89
Rate / Unit (₹)	5.93	5.84
b) Own Generation:		
i) Through Diesel		
Generator Units	1637558	1463650
Units / ltr. Of Diesel Oil	3.51	3.52
Cost / Unit (₹)	20.28	17.77
ii) Through Windmill		
Generator Units	4050102	3605733
Total Cost Per Year (₹ million)	7.03	7.04
Cost / per Unit (₹)	1.74	1.95
iii) Through Solar		
Generator Units	4940174	1559907
Total Cost Per Year (₹ million)	7.42	7.62
Cost / per Unit (₹)	1.50	4.88
2. Coal D/C grade		
Quantity (Tonnes)	5368	5511
Total amount (₹ million)	42.02	49.46
Average rate per tonne (₹)	7828	8975
3. Furnace Oil		
Quantity (Ltr)	2275037	726798
Total amount (₹ million)	94.15	20.35
Average rate per Ltr (₹)	41.38	27.99

(B) Expenditure on R&D

Amount (₹ in Million)

		For the year ended 31.03.2019	For the year ended 31.03.2018
a)	R&D Expenditure	1976	1665
b)	Total R&D Expenditure as percentage of Net Revenue from Operations (Including capital expenditure)	9.34%	7.75%

(C) Foreign Exchange Earnings and Outgo

The Company earned foreign exchange amounting to ₹ 11536 million and used foreign exchange amounting to ₹ 2939 million during the year ended 31st March, 2019

For and on behalf of the Board of Directors

V.C. Nannapaneni
Chairman and Managing Director
(DIN:00183315)

Place: Hyderabad
Date: 27th May, 2019

Annexure VII to the Board's Report

Form No.MGT-9
Extract of Annual Return

as on Financial year ended on 31.03.2019
[Pursuant to Section 92(3) of the Companies Act, 2013 and rule 12(1) of the Company (Management & Administration) Rules, 2014]

I. Registration and other details

CIN	L24230TG1981PLC003201
Registration Date	19th September, 1981
Name of the Company	NATCO Pharma Limited
Category / Sub-category of the Company	Company Limited by Shares / Public Company
Address of the Registered Office & Contact details	NATCO House, Road # 2, Banjara Hills Hyderabad 500 034, Telangana, India Tel: 040-23547532
Whether Listed Company	Yes
Name, Address & Contact details of the Registrars and Share Transfer Agents	Venture Capital and Corporate Investments Pvt Ltd 12-10-167 Bharat Nagar Hyderabad 500016 Tel Nos.040-23818475/23818476/23868023 Fax No.040-23868024 Email: info@vccilindia.com

II. Principal Business Activities of the Company

All the business activities contributing 10% or more of the total turnover of the company shall be stated:-

Sl. No	Name and Description of main products/services	NIC Code of the product/ services	% to total turnover of the Company
1.	Pharmaceuticals	21005	100%

III. Particulars of Holding, Subsidiary and Associate Companies

Sl. No	Name and Address of the Company	CIN/GLN	Holding/ Subsidiary/ Associate	% of shares held	Applicable section
1	NATCO Pharma Inc., Address : C/o SaveMart, 241W, Roseville Road, Suite:6, Lancaster, PA 17601	SRV 060928109-4232479	Subsidiary	100	2(87)
2	Time Cap Overseas Limited Address: C/o IQ EQ Fund Services (Mauritius) Ltd, 33 Edith Cavell Street, Port Louis 11324 Mauritius.	098889-C2/GBL	Subsidiary	90.36	2(87)
3	NATCO Pharma (Canada) Inc Address: PLAZA 1, SUITE # 200, 2000 ARGENTIA RD, MISSISSAUGA, ON.L5N 1P7.	834474-4	Subsidiary	99.04	2(87)
4	NATCO Pharma Asia Pte.Ltd Address: 62, UBI Road 1, #03-21, Oxley Bizhub 2, Singapore 408734	201230076Z	Subsidiary	99.73	2(87)
5	NATCO Pharma Australia Pty Ltd Address: Level 1, 313 Burwood Road,Hawthron, VIC,Australia 3122	601 572 301	Subsidiary	100	2(87)
6	NATCO farma Do Brasil Ltda Address: Av. Nossa Senhora dos Navegantes Nº 955 Edif. Global Tower sala 1702,	08.157.293/0001-27 MATRIZ	Step down Subsidiary	90.90	2(87)
7	NATCO Lifesciences Philippines Inc Address: Unit-1-B Ground Floor, Manor Building 2629 Taft Avenue Brgy, 719 Zone 78 Malate Manila, Philippines	CS201803730	Subsidiary	100*	2(87)

*includes the shares held by nominee shareholders of the subsidiaries on behalf of the Company.

IV. SHAREHOLDING PATTERN

i. Category-wise Shareholding

Category of shareholder	No. of Shares held at the beginning of he Financial year				No. of Shares held at the end of the Financial year				% of Change during the year
	Demat	Physical	Total	% of total Shares	Demat	Physical	Total	% of total Shares	
A. Promoters									
(1) Indian									
a) Individual / HUF	4,90,93,560	0	4,90,93,560	26.61	4,89,25,885	0	4,89,25,885	26.75	0.14
b) Central Govt.	0	0	0	0	0	0	0	0	0
c) State Govt.(s)	0	0	0	0	0	0	0	0	0
d) Bodies Corporate	3,30,34,470	0	3,30,34,470	17.9095	3,30,34,470	0	3,30,34,470	18.06	0.16
e) Banks / FI	0	0	0	0					0
f) Trust	46,82,750	0	46,82,750	2.54	46,82,750	0	46,82,750	2.56	0.02
Sub-Total (A)(1):	**8,68,10,7800**	**0**	**8,68,10,780**	**47.05**	**8,66,43,105**		**8,66,43,105**	**47.37**	**0.32**
(2) Foreign									
a) NRIs – Individuals	24,38,540	0	24,38,540	1.32	24,38,540	0	24,38,540	1.33	0.01
b) Other – Individuals	0	0	0	0		0			0
c) Bodies Corporate	0	0	0	0		0			0
d) Banks / FI	0	0	0	0		0			0
e) Any Other....	0	0	0	0		0			0
Sub-Total (A)(2):	**24,38,540**	**0**	**24,38,540**	**1.32**	**24,38,540**	**0**	**24,38,540**	**1.33**	**0.01**
Total Shareholding of Promoters (A) = (A) (1)+(A)(2)	**8,92,49,320**	**0**	**8,92,49,320**	**48.38**	**8,90,81,645**	**0**	**8,90,81,645**	**48.71**	**0.33**
B. Public									
(1) Institutions									
a) Mutual Funds / UTI	1,04,53,487	500	1,04,53,987	5.66	1,07,63,368	500	1,07,63,868	5.89	0.23
b) Venture Capital Funds	0	0	0	0	0	0	0	0	0
c) Alternate Investment funds	4,54,344	0	4,54,344	0.25	4,77,645	0	4,77,645	0.26	0.01
d) Foreign Portfolio Investors – Corporate (FPI)	4,42,03,975	0	4,42,03,975	23.96	3,91,12,525	0	3,91,12,525	21.39	(2.57)
e) Banks / FI	7,35,641	1,000	7,36,641	0.40	18,12,725	1,000	18,13,725	0.99	0.59
f) Venture Capital Funds	0	0	0	0	0	0	0	0	0
g) Insurance Companies	0	0	0	0	0	0	0	0	0
h) Foreign Venture Capital Funds	0	0	0	0	0	0	0	0	0
i) Foreign Nation	0	0	0	0	0	0	0	0	0
Sub-Total (B)(1):	5,58,47,447	1,500	5,58,48,947	30.27	5,21,66,263	1,500	5,21,67,763	28.52	(1.74)
(2) Non-Institutions									
a) Bodies Corporate									
i) Indian	44,53,565	17,400	44,70,965	2.42	53,33,167	17,400	53,50,567	2.93	0.51
ii) Overseas	0	0	0						
b) Individuals									
i) Individual Shareholders holding nominal share capital upto ₹ 2 lakh	2,00,54,695	11,63,030	2,12,17,725	11.50	2,14,73,120	8,97,108	2,23,70,228	12.23	0.73
ii) Individual Shareholders holding nominal share capital in excess of ₹2 lakh	1,15,42,319	0	1,15,42,319	6.31	1,13,80,477	0	1,13,80,477	6.22	0.09
(C) Others (specify)									
i) Non-Resident Indians	10,23,790	45,900	10,69,690	0.58	15,25,270	11,600	15,36,870	0.84	0.26
ii) Clearing Members	3,77,796	0	3,77,796	0.20	3,66,836	0	3,66,836	0.20	0.00
iii) Trusts	90,837	0	90,837	0.05	5,108	0	5,108	0	(0.05)
iv) Investor Education Protection Fund	6,25,801	0	6,25,801	0.34	6,25,001	0	6,25,001	0.34	0.00
Sub-Total (B)(2):	3,81,68,803	12,26,330	3,93,95,133	21.35	4,07,08,979	9,26,108	4,16,35,087	22.77	1.42
Total Public Shareholding (B)=(B)(1)+(B)(2)	9,40,16,250	12,27,830	9,52,44,080	51.62	9,28,75,242	9,27,608	9,38,02,850	51.29	0.33
C. Shares held by Custodian for GDRs & ADRs	0	0	0	0	0	0	0	0	0
Grand Total (A+B+C)	18,32,65,570	12,27,830	18,44,93,400	100.00	18,19,56,887	9,27,608	18,28,84,495	100.00	0.88

(ii) Shareholding of Promoters:

Category of shareholder		No. of Shares held at the beginning of the Financial year			No. of Shares held at the end of the Financial year			% of change in share holding during the year
		No of Shares	% of total Shares	% shares Pledged / encumbered to total shares	No of Shares	% of total Shares	% shares Pledged / encumbered to total shares	
A	**Promoter**							
1	V C NANNAPANENI	3,53,11,270	19.14	Nil	3,53,11,270	19.31	Nil	0.17
2	VENKAIAH CHOWDARY NANNAPANENI HUF	54,40,045	2.95	Nil	54,40,045	2.97	Nil	0.02
3	DURGA DEVI NANNAPANENI	35,39,100	1.92	Nil	35,39,100	1.94	Nil	0.02
4	Vistra ITCL (India) Limited (Account Durga Devi Nannapanei FamilyTrust)	6,00,000	0.33	Nil	6,00,000	0.33	Nil	0.00
5	RAJEEV NANNAPANENI	11,26,175	0.61	Nil	11,28,000	0.62	Nil	0.01
6	NEELIMA SITA NANNAPANENI	1,82,960	0.10	Nil	1,82,960	0.10	Nil	0.00
7	VISTRA ITCL (INDIA) LTD A/c Neelima Nannapaneni Trust	40,82,750	2.21	Nil	40,82,750	2.23	Nil	0.02
B	**Promoter Group**							
1	N RAMAKRISHNA RAO	7,46,410	0.40	Nil	7,46,910	0.41	Nil	0.01
2	T ANILA	6,29,920	0.34	Nil	6,29,920	0.34	Nil	0.00
3	T ANANDA BABU	4,73,205	0.26	Nil	4,73,205	0.26	Nil	0.00
4	VIDYADHARI TUMMALA	4,42,200	0.24	Nil	4,42,200	0.24	Nil	0.00
5	JHANSI TUMMALA	2,47,100	0.13	Nil	77,100	0.04	Nil	(0.09)
6	ALAPATI BAPANNA	18,300	0.01	Nil	18,300	0.01	Nil	0.00
7	DEVENDRANATH ALAPATI	15,000	0.01	Nil	15,000	0.01	Nil	0.00
8	VENKATA SATYA SWATHI KANTAMANI	32,60,000	1.77	Nil	32,60,000	1.78	Nil	0.01
9	T BAPINEEDU	415	0.00	Nil	415	0.00	Nil	0.00
10	KANTAMANI RATNAKUMAR	1,00,000	0.05	Nil	1,00,000	0.05	Nil	0.00
11	TIME CAP PHARMA LABS LTD	1,71,57,220	9.30	Nil	1,71,57,220	9.38	Nil	0.08
12	NATSOFT INFORMATION SYSTEMS PVT LTD	1,57,67,500	8.55	Nil	1,57,67,500	8.62	Nil	0.07
13	NATCO AQUA LTD	16,000	0.01	Nil	16,000	0.01	Nil	0.00
14	NDL INFRA TECH PVT LTD	93,750	0.05	Nil	93,750	0.05	Nil	0.00
	Total	**8,92,49,320**	**48.38**	**Nil**	**890,81,645**	**48.71**	**Nil**	**0.32**

(iii) Change in Promoters' shareholding:

Category of shareholder		Shareholding at the beginning of the year		No. of Shares held at the end of the Financial year	
		No of shares	% of Total Share of the company	No of shares	% of Total Share of the company
1	At the beginning of the year	8,92,49,320	48.38		
	Add: Bought by Rajeev Nannapaneni (on 9th February, 2018)	1,825	0.00	8,92,51,145	48.80
	Bought by N Ramakrishna Rao (on 21st February, 2018)	500	0.00	8,92,51,645	48.80
Less:	Off Market Transfer by T Jhansi on 3rd October, 2018	1,70,000	0.09	8,90,81,645	48.71
2	At the ending of the year			8,90,81,645	48.71

(iv) Shareholding pattern of top ten shareholders (other than Directors, Promoters and Holders of GDRs & ADRs):

Sl. No.	Name of the Share holder	Shareholding at the beginning of financial year		Shareholding at the beginning of financial year	
		No of shares	% of Total Share of the company	No of shares	% of Total Share of the company
1	DILIP.S.SHANGHVI	57,50,000	3.12	57,28,460	3.13
2	PLENTY PRIVATE EQUITY FII I LIMITED	31,66,178	1.72	31,66,178	1.73
3	NOMURA SINGAPORE LIMITED	17,87,500	0.97	30,87,500	1.69
4	MATTHEWS INDIA FUND	Nil	0.00	29,22,192	1.60
5	NOMURA INDIA INVESTMENT FUND MOTHER FUND	42,84,700	2.32	25,48,756	1.39
6	FRANKLIN TEMPLETON MUTUAL FUND A/C FRANKLIN INDIA FOCUSED EQUITY FUND	Nil	0.00	23,00,000	1.26
7	ADITYA BIRLA SUN LIFE TRUSTEE PRIVATE LIMITED A/C ADITYA BIRLA SUN LIFE EQUITY ADVANTAGE FUND	24,30,197	1.32	19,48,397	1.07
8	STICHTING DEPOSITARY APG EMERGING MARKETS EQUITY POOL	19,24,105	1.04	19,24,105	1.05
9	STEADVIEW CAPITAL MAURITIUS LIMITED	26,25,581	1.42	18,06,109	0.99
10	TATA AIA LIFE INSURANCE CO LTD-WHOLE LIFE MID CAP EQUITY FUND-ULIF 009 04/01/07 WLE 110	5,09,454	0.28	15,59,454	0.85

Note: 1. The Shares of the Company are traded on a daily basis (i.e. on trading days) on the Stock Exchanges and hence date wise increase / decrease shareholding is not provided.

2. The details of date-wise increase / decrease will be provided at the request of shareholder

V. Shareholding of Directors and Key Managerial Personnel:

Sl. No.	For Each of the Directors	Shareholding at the beginning of financial year		Cumulative shareholding during the financial year	
		No of shares	% of total shares of the Company	No of shares	% of total shares of the Company
1	**V C Nannapaneni (including HUF) Chairman & Managing Director**				
	At the beginning of the year	4,07,51,315	23.38		
	At the end of the year			4,07,51,315	22.29
2	**Rajeev Nannapaneni (including NRI) Vice Chairman & Chief Executive officer**				
	At the beginning of the year	11,26,175	0.96		
	Add: Shares bought during the year	1,825	0.00		
	At the end of the year			11,28,000	0.62
3	**P S R K Prasad Director & Executive Vice President (Corporate Engineering Services)**				
	At the beginning of the year	47,150	0.03		
	Add: Shares bought during the year	1500	0.00		
	At the end of the year			48,650	0.03
4	**Dr.D Linga Rao Director & President (Technical Affairs)**				
	At the beginning of the year	56,655	0.03		
	At the end of the year			56,655	0.03
5	**Dr M U R Naidu Director - Independent**				
	At the beginning of the year	15,000	0.01		
	At the end of the year			15,000	0.01

Sl. No.	For Each of the Directors	Shareholding at the beginning of financial year		Cumulative shareholding during the financial year	
		No of shares	% of total shares of the Company	No of shares	% of total shares of the Company
6	**CS M Adinarayana Company Secretary & Vice president (Legal & Corp Affairs)**				
	At the beginning of the year	32,450	0.02		
	Add: Shares bought during the year	800	0.00		
	At the end of the year			33,250	0.018
7	**Mr. S V V N Appa Rao Chief Financial Officer**				
	At the beginning of the year	1,750	0.00		
	At the end of the year			1,750	0.00

Note: Shareholding of only those Directors who hold shares in the Company is provided.

VI. INDEBTEDNESS:

Indebtedness of the Company including interest outstanding/ accrued but not due for payment

(₹ in Lakhs)

Particulars	Secured Loans excluding deposits	Unsecured Loans	Deposits	Total Indebtedness
Indebtedness at the beginning of the year				
i) Principal Amount	9,857.85	7,440.03	0.00	17,297.88
ii) Interest due but not paid	0.00	0.00	0.00	0.00
iii) Interest accrued but not due	0.00	0.00	0.00	0.00
Total (i+ii+iii)	**9,857.85**	**7,440.03**	**0.00**	**17,297.88**
Change in Indebtedness during the financial year				
Addition	354.38	20,853.36	0.00	21,207.74
Reduction	0.00	0.00	0.00	0.00
Net Change	354.38	20,853.36	0.00	21,207.74
Indebtedness at the end of the financial year				
i) Principal Amount	10,212.23	28,232.90	0.00	38,445.13
ii) Interest due but not paid	0.00	0.00	0.00	0.00
iii) Interest accrued but not due	0.00	60.49	0.00	60.49
Total (i+ii+iii)	**10,212.23**	**28,293.39**	**0.00**	**38,505.62**

VII. REMUNERATION OF DIRECTORS AND MANAGERIAL PERSONNEL

A. Remuneration of Managing Director, Whole-time Directors and/or Manager:

(₹ In Lakhs)

S. No.	Particulars of Remuneration	Name of MD/WTD/Manager				Total Amount
		Mr. V C Nannapaneni	Mr. Rajeev Nannapaneni	Mr. P.S.R.K Prasad	Dr. D Linga Rao	
1	Gross Salary					
	a. Salary as per provisions contained in Section 17(1) of the IT Act, 1961	174.96	159.96	138.19	138.19	**611.30**
	b. Value of Perquisites U/s 17(2) of IT Act, 1961	-	-	-	-	
	c. Profits in lieu of Salary under section 17(3) of It Act, 1961	-	-	-	-	
2	Stock Options	-	-	-	-	
3	Sweat Equity	-	-	-	-	
4	Commission* -% of profits	-	-	-	-	
5	Others, Provident Fund	20.16	18.21	17.81	17.81	**73.99**
6	EL encashment	8.40	7.59	4.38	4.38	**24.75**
	Total (A)	**203.52**	**185.76**	**160.38**	**160.38**	**710.04**
	Ceiling as per the Act	₹ 8,402.07 lakhs (being 10% of the net profits of the Company calculated as per Section 198 of the Companies Act, 2013)				

B. Remuneration to other Directors:

(₹ In Lakhs)

S. No.	Particulars of Remuneration	Name of the Independent directors					Total Amount
		Mr. G S Murthy	Mr. T V Rao	Mr. D G Prasad	Dr. Mrs. Leela Digumarti	Dr M U R Naidu	
1	Fee for attending Board / Committee Meeting	3.70	2.10	2.60	1.00	1.60	**11.00**
2	Commission			-	-	-	**-**
3	Other, please specify	-	-	-	-	-	
	Total (B)	**3.70**	**2.10**	**2.60**	**1.00**	**1.60**	**11.00**
	Ceiling as per the Act	₹ 840.20 lakhs (being 1% of the net profits of the Company calculated as per Section 198 of the Companies Act, 2013)					
	Total Managerial Remuneration (A+B)						**721.04**
	Overall Ceiling As Per The Act	₹ 9,242.27 lakhs (being 11% of the net profits of the Company calculated as per Section 198 of the Companies Act, 2013)					

* Total remuneration to Managing Director, Whole-Time Directors and other Directors (being the total of A and B).
Note: Mr. Sridhar Sankararaman, Non-Executive and Non-Independent Director is not taking any Sitting fees.

C. Remuneration to Key Managerial Personnel

(₹ In Lakhs)

S. No.	Particulars of Remuneration	Name of KMP		Total Amount
		CS M Adinarayana	Mr. S V V N Appa Rao	
1	Gross Salary			
	a. Salary as per provisions contained in Section 17(1) of the IT Act, 1961	41.71	53.11	94.82
	b. Value of Perquisites U/s 17(2) of IT Act, 1961	-	-	-
	c. Profits in lieu of Salary under section 17(3) of It Act, 1961	-	-	-
2	Stock Options	-	-	-
3	Sweat Equity	-	-	-
4	Commission	-	-	-
5	Others, Please Specify	5.29	6.89	12.18
6	Arrears	-	-	-
	Incentive	0.20	0.08	0.28
	EL encashment	1.30	1.69	2.99
	Total (A)	**48.5**	**61.77**	**110.27**

VIII PENALTIES / PUNISHMENT / COMPOUNDING OF OFFENCES:

Type		Section of the Companies Act	Brief Description	Details of Penalty/ Punishment/ Compounding fees imposed	Authority (RD/NCLT/COURT)	Appeal made, if any
A.	COMPANY					
	Penalty					
	Punishment			None		
	Compounding					
B.	DIRECTORS					
	Penalty					
	Punishment			None		
	Compounding					
C.	OTHER OFFICERS IN DEFAULT					
	Penalty					
	Punishment			None		
	Compounding					

Annexure VIII to the Board's Report

NATCO Dividend Distribution Policy

The Board of Directors (the "Board") of NATCO Pharma Limited (the "Company") has adopted the NATCO Dividend Distribution Policy (the "Policy") of the Company as required in terms of Regulation 43A of the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 (the "Listing Regulations") in its meeting held on 11 November 2016.

Effective Date
The Policy shall become effective from the date of its adoption by the Board i.e. 11 November 2016.

Purpose
To help the investors in taking well informed investment decisions.

Definitions
Any term used in this policy shall have the meaning ascribed to it in the Companies Act, 2013 or Rules made thereunder, SEBI Act, 1992 or Rules and Regulations made thereunder or any other relevant legislation/law applicable to the Company

Statutory Provisions:
Chapter VIII of the Companies Act, 2013 and rules made there under contain the provisions pertaining to declaration and payment of dividend. The following points set out the statutory obligations of a Company with respect to declaration / payment of dividend:

- Company shall declare or pay dividend, for any financial year, only out of the profits of the Company for that financial year.
- Such profits shall be after providing for depreciation in accordance with the provisions of the law.
- In case of inadequacy or absence of profits in any year, a maximum of 10% of paid-up capital can be declared as dividend, subject to other provisions contained in the Companies (Declaration and Payment of Dividend) Rules, 2014.

The SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 also specify certain conditions as to declaration of dividend such as prior intimation to the stock exchanges, record date etc.

A. General Policy of the Company and other Considerations as Regards Dividend
The Board shall consider the following, while taking decisions of a dividend pay-out during a particular year–

1. **Statutory requirements**
   The Company shall observe the relevant statutory requirements which may be applicable to the Company at the time of taking decision with regard to dividend declaration or retention of profit.

2. **Prudential requirements**
   Prior to declaration / recommendation of any dividend as per this policy, the Company may consider any applicable covenants / conditions or restrictions imposed by any lenders, JV partners of the Company or its subsidiaries. The Company may decide to retain earnings in entirety for a particular year(s) for its growth / expansion, consequently resulting in shareholders' wealth creation.

3. **Extent of realized profits as a part of the IND AS profits of the Company**
   The extent of realized profits out of its profits calculated as per IND AS, affects the Board's decision of determination of dividend for a particular year. The Board is required to consider such factors before taking any dividend or retention decision.

4. **Expectations of stakeholders, including small shareholders**
   The Board, while considering the decision of dividend pay-out or retention of a certain amount or entire profits of the Company, shall, as far as possible, consider the expectations of the stakeholders including the small shareholders of the Company who generally expects for a regular dividend payout.

B. Other Financial Parameters

In addition to the aforesaid parameters such as realised profits and proposed major capital expenditures, the decision of dividend payout or retention of profits shall also be based the following-

1) Current earnings of the Company
2) Operating cash flow of the Company
3) Dividend History
4) Repayment/Pre-payment of Borrowings
5) Future Earnings Expectation
6) Capital Expenditure Requirements requiring ploughing back of profits i.e. future capital expenditure program including
   - Market expansion plan;
   - Product expansion plan;
   - Increase in production capacity;
   - Modernization plan;
   - Diversification of business;
   - Long-term strategic plans;
   - Acquiring new businesses/products
7) Crystallization of contingent liabilities, if any
8) Exchange Risk
9) Sale of businesses
10) Economic / Geo-political factors / risks
11) Regulatory requirements

C. Interim/Final Dividend Payout

Pursuant to the provisions of applicable laws and the Policy, interim dividend approved by the Board of Directors will be confirmed by the shareholders and final dividend, if any, recommended by the Board of Directors, will be subject to shareholders approval, at the relevant Annual General Meeting of the Company. The Company shall ensure compliance of provisions of Applicable Laws and this Policy in relation to Dividend declared by the Company.

D. Classes of Shares

At present, the issued and paid-up share capital of the Company comprises only of equity shares. As and when the Company issues any other class(es) of shares, the Board of Directors may suitably declare dividend on such class(es) in accordance with the provisions of the Companies Act, 2013 and this policy.

E. Disclosures

Company is required to disclose this policy on its website and also in the Annual Report of the Company. The Company shall make other appropriate disclosures pertaining to declaration of dividend as required under the Companies Act, 2013 and the rules made thereunder, the SEBI Act, 1992 or the rules and regulations made thereunder and any other law applicable.

F. Amendment

The Board shall have the power to amend any of the provisions of this Policy, substitute any of the provisions with a new provision or replace this Policy entirely with a new Policy in conformity with the provisions of Companies Act, 2013 and the rules made thereunder, the SEBI Act, 1992 or the rules and regulations made thereunder and any other law applicable.

G. Declaration of Dividend on Parameters not Mentioned in the Policy

If the Company proposes to declare dividend on the basis of parameters in addition to those mentioned in the policy it shall disclose such changes along with the rationale for the same in its annual report and on its website.

H. Limitations

The Policy shall not apply to:

- Special dividend, if any, to be outside the scope of this policy but would be governed by the provisions under the Companies Act, 2013.
- Distribution of dividend in kind, i.e. by issue of fully or partly paid bonus shares or other securities, subject to applicable law.
- Buyback of equity shares.

Corporate Governance Report

Philosophy on Corporate Governance

NATCO Pharma Limited believes that transparency in the form of disclosures, presence of strong Board with adequate composition of Independent Directors, compliance of law in letter and spirit, responsible corporate conduct and being accountable ensures good Corporate Governance and enhances the reputation of the Company globally without hindering with the shareholder's faith in the Company.

At NATCO, we consider stakeholders as our partners in success, and we remain committed to maximising stakeholder value and their interest is taken into account before taking any business decision.

Your Company is a law abiding responsible corporate citizen and believes that to achieve success in business, highest standard of Corporate Governance behaviour is required. This is our road path to consistent, competitive, profitable and responsible growth which creates a long term value to our shareholders/stakeholders.

Materially Significant related party transactions

There have been no materially significant related party transactions, monetary transactions or relationship between the Company and its directors, the management, subsidiaries or relatives, except for those disclosed in the Board's Report. Detailed information related to related party transactions is enclosed in Annexure-2 to the Board's Report.

Management Discussion and analysis

Management discussion and analysis is provided as a separate chapter in the Annual Report.

Disclosure of Accounting Treatments:

The Company has followed the Indian Accounting Standards and accounting principles generally accepted in India in preparation of its Financial Statements for the financial year 2018-19.

Board of Directors

The Board of your Company is a combination of ten (10) eminent personnel from varied fields having immense knowledge in the relevant subjects which provides strategic guidance to the Company in arriving at judicious decisions by exercising independent judgement.

(a) Board Meetings

Proper decision-making is vital for the success of any Company and we at NATCO believe that the Board Meetings are of high significance to achieve this .

During the financial year 2018-19, four (4) board meetings were held on 23rd May, 2018, 8th August, 2018, 5th November, 2018 and 12th February, 2019 within the time limits stipulated under the Companies Act, 2013 ("Act") and the SEBI (Listing Obligations and Disclosure Requirements), Regulations, 2015 ("Listing Regulations"). However, proper care is being taken to see that adequate time is provided for the meetings for thorough discussions for arriving at consensus and better decision making. Prior intimation and outcome of Board Meeting is duly informed to the Board in compliance with the Act and the Listing Regulations.

(b) Board Composition

The Composition of the Board is made keeping in view the growth of the company and compliance with the statutory requirements under the Act and the rules made thereunder and the Listing Regulations.

Composition of the Board of Directors of NATCO is as follows:

Sl. No.	Name	DIN	Category	Number of Board meetings during FY 2018-19		Attendance at the last AGM Held on 15th September, 2018	No. of Directorships in other companies	Name of other listed entities holding directorship	Category of directorship in other listed entities	No. of Committee positions held in other listed entities	
				Held	Attended					Chairman	Member
1.	Mr. V.C.Nannapaneni [a]	00183315	Executive Director	4	4	Yes	3	NIL	NIL	NIL	NIL
2.	Mr. G.S.Murthy	00122454	Independent Director	4	4	Yes	NIL	NA	NA	NA	NA
3.	Mr. T.V.Rao	05273533	Independent Director	4	3	No	8	Ladderup Finance Ltd.	Independent Director	NIL	2

Sl. No.	Name	DIN	Category	Number of Board meetings during FY 2018-19		Attendance at the last AGM Held on 15th September, 2018	No. of Directorships in other companies	Name of other listed entities holding directorship	Category of directorship in other listed entities	No. of Committee positions held in other listed entities	
				Held	Attended					Chairman	Member
4.	Mr. Rajeev Nannapaneni[a]	00183872	Executive Director	4	4	Yes	2	NIL	NIL	NIL	NIL
5	Mr. D.G.Prasad	00160408	Independent Director	4	4	Yes	4	(i) Gokak Textiles Limited	Independent Director	1	NIL
								(ii) Moschip Technologies Limited	Independent Director	NIL	1
								(iii) Suven Life Sciences Limited	Independent Director	2	NIL
6.	Dr.Mrs.Leela Digumarti	06980440	Independent Director	4	2	No	NIL	NA	NA	NA	NA
7.	Mr. P.S.R.K.Prasad	07011140	Executive Director	4	4	No	NIL	NA	NA	NA	NA
8.	Dr.MUR Naidu	05111014	Independent Director	4	2	No	NIL	NA	NA	NA	NA
9.	Dr.D.Linga Rao	07088404	Executive Director	4	4	Yes	NIL	NA	NA	NA	NA
10.	Mr.Sridhar Sankararaman[b]	06794418	Non-Executive and Non-Independent Director	4	2	No	NIL	NA	NA	NA	NA

Note:

(a) Mr.V.C.Nannapaneni and Mr. Rajeev Nannapaneni are related to each other.
The company doesn't have pecuniary relationship with any of the non-executive Directors.

(b) Mr.Vivek Chhachhi resigned w.e.f. 23rd May, 2018 and Mr. Sridhar Sankararaman joined the Board as an Additional Director w.e.f. 23rd May, 2018. In Annual General Meeting held on 15th September, 2018 with member's approval, appointed as a Non- Executive and Non- Independent Director who is liable to retirement by rotation.

(c) Independent Directors

NATCO is always of the belief that an independent eye makes a difference to the way the Board functions. The presence of Independent Directors on the Board ensures that decision making of the Board is unbiased and the interests of the stakeholders are best safeguarded. There is no instance of Resignation of Independent Director(s) during the financial year before the expiry of their term. Your company is in strict compliance of the several conditions in respect of Independent Directors prescribed under the Act and the Listing Regulations.

Separate Meeting for Independent Directors

The Independent Directors of your company met on 12th February, 2019 and considered those items of business as required under Schedule IV to the Act as well as the Listing Regulations. The Company Secretary of your company facilitated the convening and holding of the meeting of Independent Directors.

Familiarisation Programme for Independent Directors

The Company has organised Familiarisation Programmes for the Independent Directors of the Company to familiarise them with the Company with regard to their roles, rights, responsibilities in the Company, nature of the industry in which the Company operates, business model of the Company etc. The details regarding the programme is available on our website www.natcopharma.co.in.

(d) Board Evaluation

A formal annual evaluation has been made by the Board of its own performance, Chairman of the board, its Committees and individual Directors. The performance evaluation has been done by the entire Board of Directors, excluding the Director being evaluated. Various evaluation techniques are used to assess the performance of the Directors. All the Directors have participated in this evaluation process. The Independent Directors in their separate meeting have also evaluated the performance of the Chairman of the Company, Non-Independent Directors and the Board as a whole.

(e) The following is the Criteria for evaluation of performance of Independent Director:

I. Participation at Board/ Committee Meetings:

a) Director comes well prepared and informed for the Board / committee meeting(s)

b) Director demonstrates a willingness to devote time and effort to understand the Company and its business and a readiness to participate in events outside the meeting room, such as site visits?

c) Director has ability to remain focused at a governance level in Board/ Committee meetings.

d) Director's contributions at Board / Committee meetings are of high quality and innovative.

e) Director's proactively contributes in to development of strategy and to risk management of the Company.

II. Managing Relationship:

a) Director's performance and behaviour promotes mutual trust and respect within the Board / Committee.

b) Director is effective and successful in managing relationships with fellow Board members and senior management?

III. Knowledge and Skill:

a) Director understands governance, regulatory, financial, fiduciary and ethical requirements of the Board / Committee.

b) Director actively and successfully refreshes his/ her knowledge and skills and up to date with the latest developments in areas such as corporate governance framework, financial reporting and the industry and market conditions

c) Director is able to present his/ her views convincingly yet diplomatically.

d) Director listens and takes on Board the views of other members of Board.

e) Director exercises objective independent judgment in the best interest of Company

f) Director has effectively assisted the Company is implementing best corporate governance practices and then monitors the same.

g) Director helps in bringing independent judgment during board deliberations on strategy, performance, risk management etc.

h) Director keeps himself/ herself well informed about the Company and external environment in which it operates.

i) Director acts within his/her authority and assists in protecting the legitimate interest of the Company, Shareholders and employees.

j) Director adheres to the applicable code of conduct for independent directors.

(f) Key skills/expertise/competence identified by the Board:

Leadership& Management	Leadership experience, strategic decision making, risk management. Skilled and expertise in driving change, planning succession and long term growth.
Finance/Accounting Knowledge	Knowledge on financial reporting, accounting principles, internal controls, auditing process and related considerations and issues.
Governance	Experience as a board member and aware of corporate governance principles.
Industry knowledge	Knowledge of one or more important business lines of the organisations in the same industry.
Legal/Regulatory knowledge	Experience in working in legal firms, regulatory organisations and Aware of legal matters relevant to the industry.
Sales, Distribution & Brand Marketing	Experience in developing strategies to grow sales, and market share, create distribution models and build brand awareness to enhance company's reputation.
International / Global Knowledge	Awareness about relevant markets at global level and diversification of Company's business, global trends.
Operations	Expertise in managing the operations of the Company
Technology	Experience with information technology systems and developments and recent trends in technology.

The above key skills/expertise/competence stated above are adequate to function efficiently and effectively in managing the affairs of the company.

Committees

(i) Committees of Board

The Board currently has eight (8) committees, namely, Audit Committee, Stakeholders Relationship Committee, Nomination and Remuneration Committee, Compensation Committee, Allotment Committee,

Corporate Social Responsibility Committee, Risk Management Committee and Buy back Committee.

Other Committees

Other Committees includes Share Transfer Committee, Internal Complaints Committee and Land Committee. Board at its meeting held on 27th May, 2019 has constituted Risk management committee as per the SEBI (Listing obligations and Disclosure Requirements) (Amendment) Regulations, 2018, as it is mandatory for top 500 listed entities, (Our Company ranked 213 as on 31st March, 2019) as per NSE website determined based on market capitalization. The membership in committees is decided based on the traits of the Directors keeping in view the statutory requirement of composition of directors in the committees. The brief description of terms of reference, composition, meetings and attendance of the committee(s) during the financial year 2018-19 are provided below:

(a) Audit Committee

The Audit Committee is vested with the responsibility to review, inter alia, the financial reporting, internal control systems, risk management systems and the internal and external audit functions. The qualifications of the directors, composition, quorum, frequency of meetings and the terms of reference of the Audit Committee are in line with the requirements under the Act and the Listing Regulations. During the year, all the recommendations made by the committee were accepted by the board.

During the financial year 2018-19, four (4) audit committee meetings were held on 23rd May, 2018, 8th August, 2018, 5th November, 2018 and 12th February, 2019.

Details of Composition of the Audit Committee and attendance at the meetings are given below :

Name of the Director	Category	Audit Committee attendance	
		Held	Attended
Mr. G.S.Murthy (Chairman)	Independent Director	4	4
Mr. T.V.Rao	Independent Director	4	3
Mr. D.G.Prasad	Independent Director	4	4
Mr. V.C.Nannapaneni	Executive Director	4	4
Mr. Vivek Chhachhi*	Non-Executive and Non-Independent Director	4	0
Dr.M.U.R.Naidu	Independent Director	4	2
Mr.Sridhar Sankararaman*	Non-Executive and Non- Independent Director	4	2

* In the Board Meeting held on 23rd May, 2018 committee was re-constituted by inclusion of Mr.Sridhar Sankararaman as a member of the Committee in place of Mr. Vivek Chhachhi who has resigned as a Director with effect from the 23rd May, 2018.

(b) Stakeholders Relationship Committee

The Stakeholders Relationship Committee is constituted by the Board to consider and resolve the grievances of security holders of the company. The qualifications of the Directors, composition, quorum, frequency of meetings and the terms of reference of the Stakeholders Relationship Committee are in line with the requirements under the Act and the Listing Regulations. During the financial year 2018-19, two (2) stakeholder relationship committee meetings were held on 23rd May, 2018 and 5th November, 2018. Details of composition of the Stakeholders Relationship Committee and attendance of the meetings are as given below:

Name of the Director	Category	Stakeholders Relationship Committee Attendance	
		Held	Attended
Mr. G.S.Murthy (Chairman)	Independent Director	2	2
Mr. V.C.Nannapaneni	Executive Director	2	2
Mr. Rajeev Nannapaneni	Executive Director	2	2
Dr.M.U.R.Naidu	Independent Director	2	1

(c) Nomination and Remuneration Committee

The Nomination and Remuneration Committee is empowered to oversee the company's policies relating to the nomination and evaluation of every Director's performance and to determine the company's policies relating to remuneration of the Directors, senior management of the Company and one level below the Board of Directors. The qualifications of the Directors, composition, quorum, frequency of meetings and the terms of reference of the Nomination and Remuneration Committee are in line with the requirements under the Act and the Listing Regulations.

During the financial year 2018-19, two (2) Nomination and Remuneration Committee meetings were held on 23rd May, 2018 and 12th February, 2019.

The details of composition of Nomination and Remuneration Committee and attendance of the meeting are given below:

Name of the Director	Category	Nomination and Remuneration Committee Attendance	
		Held	Attended
Mr. G.S.Murthy (Chairman)	Independent Director	2	2
*Mr.Vivek Chhachhi	Non-Executive and non-independent Director	2	0
*Mr.Sridhar Sankararaman	Non-Executive and Non-independent Director	2	1
Mr. V.C.Nannapaneni	Executive Director (Chairman of the Board)	2	2
Dr.M.U.R.Naidu	Independent Director	2	2

* In the Board Meeting held on 23rd May, 2018 committee was re-constituted by inclusion of Mr.Sridhar Sankararaman as a member of the Committee in place of Mr. Vivek Chhachhi who has resigned as a Director with effect from the 23rd May 2018.

(d) Compensation Committee

The Compensation Committee is constituted, inter alia, to consider recommendation of any share based employee benefit schemes for the approval of the Board and for grant of options / allotment of shares approved under such schemes. During the financial year 2018-19 the Compensation Committee meeting was held on 27th September, 2018 and all the members attended wherein it had allotted the third tranche of options under NATCO Employee Stock Option Scheme, 2015 (NATSOP 2015) to the eligible employees of the Company. The qualifications of the Directors, composition, quorum, frequency of meetings and the terms of reference of the Compensation Committee are in line with the requirements under the Act, the Listing Regulations and the SEBI (Share Based Employee Benefits) Regulations, 2014 and consists of Mr. G.S.Murthy, Mr. V.C.Nannapaneni, Mr. Rajeev Nannapaneni and Dr.M.U.R.Naidu as members of the Compensation Committee.

(e) Allotment Committee

The Allotment Committee is constituted to facilitate allotment of securities of the Company after obtaining requisite approvals, if any. There was no Allotment Committee meeting held during the financial year 2018-19. Mr. V.C. Nannapaneni, Mr. G. S. Murthy, Dr. M.U.R. Naidu and Mr. Rajeev Nannapaneni are the members of the Allotment Committee.

(f) Corporate Social Responsibility Committee

The Corporate Social Responsibility Committee is vested with the responsibility to, inter alia, monitor the compliance of Corporate Social Responsibility Policy of the Company and to recommend any changes to the same.

The qualifications of the Directors, composition, quorum, frequency of meetings and the terms of reference of the Corporate Social Responsibility Committee are in line with the requirements under the Act and the Listing Regulations.

During the financial year 2018-19, two (2) Corporate Social Responsibility Committee meetings were held on 23rd May, 2018 and 5th November, 2018.

The details of composition of Corporate Social Responsibility Committee and attendance of the meeting are given below:

Name of the Director	Category	Corporate Social responsibility committee attendance	
		Held	Attended
Mr. G.S.Murthy	Independent Director	2	2
Mr. V.C.Nannapaneni	Executive Director	2	2
Mr. Rajeev Nannapaneni	Executive Director	2	2

(g) Risk Management Committee

The Board has constituted Risk management committee in the Board meeting held on 27th May, 2019 according to listing regulations amended from time to time. The terms of the reference, quorum, and frequency of the committee meetings etc. are in line with the requirements of the Listing Regulations. No meetings were held during the year. The composition of the committee is as follows:

DIRECTORS

1) Mr.V.C. Nannapaneni (DIN: 00183315), Chairman & Managing Director
2) Mr.Rajeev Nannapaneni (DIN: 00183872), Vice Chairman &Chief Executive Officer
3) Mr.P.S.R.K.Prasad (DIN:07011140), Director & Executive Vice President (Corporate Engineering Services)
4) Dr.D.Linga Rao (DIN: 07088404), Director & President (Technical Affairs)

OTHER MEMBERS

5) Mr. A. Lakshminarayana, Vice President – HR & OD
6) Mr.S.V.V.N.Appa Rao – Chief Financial Officer
7) Dr.B.Rami Reddy, Director – Formulations
8) Dr. M. Pulla Reddy – Executive Vice President – R&D

h) Buyback Committee

Buy- back Committee is constituted by the Board to deal with matters relating to the buy-back of equity shares of the Company. The Buy-back Committee comprises of Mr. V.C. Nannapaneni, Chairman and Managing Director, Mr. Rajeev Nannapaneni, Vice Chairman and Chief Executive Officer, Mr. M. Adinarayana, Company Secretary and Vice President (Legal & Corp. Affairs) and Mr. S.V.V.N Appa Rao, Chief Financial Officer as its members. The details of the meetings of the Buy-back committee are as follows:

S. No.	Date of the Meeting	Purpose
1.	14th March, 2019	Approval of Corrigendum to the Public Announcement
2.	16th May, 2019	Public Announcement for Closure of Buyback

(ii) Other Committees

(a) Share Transfer Committee

The transfer/transmission of equity shares of the Company are approved by the Share Transfer Committee, the power of which has been delegated to the Share Transfer Agents/Registrars of the Company. The Company Secretary approves share transfers/transmissions and related matters. Physical shares lodged for transfer either at Company's Registered Office or at the Company's Registrars are processed within 15 days from the date of lodgement, if the documents are valid in all respects. All requests for dematerialisation of shares are processed and the confirmation(s) thereto are given to depositories within 15 days.

During the financial year 2018-19, 134 (One hundred and thirty four only) instruments of transfer for 64,625 (Sixty Four thousand six hundred and twenty five only) equity shares and 15 (fifteen only) instruments of transmission for 2,800 (Two thousand eight hundred only) equity shares were received and the same were effected.

(b) Internal Complaints Committee – Committee constituted under Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013

Your Company has in place Internal Complaints Committee at each of its offices and factories to resolve any issues related to sexual harassment of women at workplace. The composition of the Committees is strictly as per the statutory requirement in the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013. During the financial year 2018-19, there were no complaints received.

The Committee comprises of one Presiding Officer who is a woman employed at a senior level, two members from amongst the employees and one member from a non-governmental organisation at each place of work. It was ensured that the committee constitutes with at least half of the total members are women.

(c) Land Committee

The Board has constituted Land committee in the Board meeting held on 27th May, 2019. The composition of the committee consists of Mr. V. C. Nannapaneni, Chairman and Managing Director, Mr. Rajeev Nannapaneni, Vice Chairman and Chief Executive Officer, Mr. M. Adinarayana, Company Secretary & Vice President (Legal & Corp. Affairs) and Mr. S.V.V.N. Appa Rao, Chief Financial Officer.

The Committee is authorised to approve purchase / sale of land property for / by the Company, to approve mortgage of land property owned by the Company, to approve execution of Agreement of Sale, Memorandum of Understanding, Sale Deed, Exchange Deed, Gift Settlement Deed, Mortgage Deed and such other documents as may be required and necessary and to do all such things that are necessary and incidental thereto.

GENERAL MEETINGS

(a) Annual General Meetings

The following are the details of the previous three Annual General Meetings of your Company:

Financial Year	Date of the AGM	Venue	Time	Special Resolution(s) passed, if any
2017-18	15th September, 2018	Daspalla Hotel, Road No.37, Jubilee Hills, Hyderabad - 500 033	10.30 A.M.	4
2016-17	28th September, 2017	Daspalla Hotel, Road No.37, Jubilee Hills, Hyderabad - 500 033	10.30 A.M.	7
2015-16	30th September, 2016	Daspalla Hotel, Road No.37, Jubilee Hills, Hyderabad - 500 033	10.00 A.M.	5

(b) Postal ballot

i) No resolution was passed through postal ballot for the financial year 2018-19.

ii) No special resolution is proposed to be conducted through postal ballot.

REMUNERATION OF DIRECTORS

a) Executive Directors

The remuneration of Executive Directors of the Company is fixed based on the remuneration policy of the Company and as recommended by NRC and the remuneration paid to them for the financial year 2018-19 is as below and are in line with the applicable provisions of the Act.

S. No.	Name	Designation	Total amount (₹ in Lakhs per annum)
1.	Mr. V. C. Nannapaneni	Chairman & Managing Director	₹203.52
2.	Mr. Rajeev Nannapaneni	Vice Chairman & CEO	₹185.76
3.	Mr. P.S.R.K. Prasad	Director & Executive Vice President (Corp. Engg. Services)	₹160.38
4.	Dr. D. Linga Rao	Director & President (Tech. Affairs)	₹160.38
TOTAL			**₹710.04**

b) Non-Executive Directors

Sitting fees is paid for the non-executive directors for attending the Board meetings and the Committee Meetings and such amounts are paid within the ceiling limits under Act. Criteria for making payments to Non-executive directors are available at company's website www.natcopharma.co.in

The details of the sitting fees paid to Non-Executive Directors for the Financial Year 2018-19 is given below:

S. No.	Name	Designation	Total amount (₹ in Lakhs per annum)
1.	Mr. G.S.Murthy	Independent Director	3.70
2.	Mr. T.V.Rao	Independent Director	2.10
3.	Mr. D.G.Prasad	Independent Director	2.60
4.	Dr.Mrs.Leela Digumarti	Independent Director	1.00
5.	Dr.M.U.R.Naidu	Independent Director	1.60
6.	Mr.Sridhar Sankararaman*	Non-Executive and Non-independent Director	Nil
TOTAL			**11.00**

* Mr Sridhar Sankararaman has voluntarily opted not to take any sitting fee.

Shareholding of Non-Executive Directors

As on 31st March, 2019, Dr.M.U.R Naidu is holding 15,000 equity shares of ₹ 2/-each which amounts to 0.008% of equity shares of the Company as on 31st March, 2019. None of the other Non- Executive Directors are holding any shares of the company.

Prevention of insider trading

Your company has in place Code of Conduct to Regulate, Monitor and Report Trading by Designated Persons and Code of Practices and Procedures for Fair Disclosure of Unpublished Price Sensitive Information which is in adherence to the SEBI (Prohibition of Insider Trading) Regulations, 2015 as amended from time to time.The policy on Insider trading was amended during the Financial Year 2018-19 in line with SEBI (Prohibition of Insider Trading) (Amendment) Regulations, 2018. The disclosures received pursuant to this code and the regulations are disseminated to the Stock Exchanges within the prescribed time limit. Report of compliance officer was duly placed before the Board meetings. The Code is available on the Company's website at the following link:

https://www.natcopharma.co.in/wp-content/uploads/2019/04/Code-of-Conduct-_PIT-2015-Natco.pdf

Compliances

a. Reconciliation of Share Capital Audit Report

The Reconciliation of Share Capital Audit Report was prepared on a quarterly basis by Mrs. P.Renuka, Practising Company Secretary (ACS No.11963; CP No. 3460) as required under Regulation 55A of SEBI (Depositories and Participants) Regulations, 1996 and the same was filed with the Stock Exchanges within the statutory time limits.

b. Compliance Report on Corporate Governance

Your Company submits compliance report on Corporate Governance to the Stock Exchanges on quarterly, half-yearly and annual basis within the statutory time limits.

c. Secretarial Standards

Your company's practices and procedures meet with the Secretarial Standards issued by the Institute of Company Secretaries of India (ICSI).

Legal Compliance

The Company follows a formal management policy and system of legal compliance and reporting to facilitate periodical review by the Board of the Compliance of laws applicable to the Company and steps taken to rectify non-compliance, if any. There were no instances of material non-compliance and strictures imposed on the Company either by SEBI, Stock Exchange or any statutory authority, on any matter related to capital markets, tax / excise matters, and such other related matters during the last three years.

Whistle Blower Policy

The Company has a Whistle Blower Policy to deal with instances of fraud and mismanagement, if any. The policy ensures that strict confidentiality is maintained whilst dealing with concerns and also that no discrimination will be meted out to any person for a genuinely raised concern. Pursuant thereto, anyone can directly approach the Chairman of the Audit Committee or through Company Secretary to report any suspected or confirmed incident of fraud / misconduct. It is affirmed that no personnel has been denied access to the Audit Committee.

Environmental Policy

Our Company complies with all the applicable environmental legislations and regulations, by incorporating suitable modern techniques for combating the environmental pollutants and to ensure the compliance. We have adopted state of the art technologies for treatment and recycling of effluents, recycling of wastes, converting wastes to by-products and energy, conservation of natural resources, energy efficiency, rain water harvesting, etc. A number of initiatives and programs conducted to create awareness among our employees & all our stake holders. Our well defined policy over the year built a frame work for setting

and reviewing of environmental objectives and targets for continual improvement.

Non-Mandatory Requirements

- **Separate posts of Chairperson and Chief Executive Officer**

The Chairman of the Board and the Chief Executive Officer are two different persons

Related Party Transactions

All related party transactions with related parties during the financial year 2018-19 were done in accordance with the provisions of the Act and the Listing Regulations. No materially significant transactions with related parties were entered during the financial year which was in conflict with the interest of the Company. None of the Non-Executive Directors have any pecuniary material relationship or material transactions with the Company for the year ended 31st March, 2019. The Company had formulated a Related Party Transactions Policy which is available on the Company's Website at the following link:

http://natcopharma.co.in/wp-content/uploads/2015/03/RPT-Policy.pdf)

EMPLOYEE STOCK OPTION SCHEMES

Based on the recommendation of the Compensation Committee, the Board and members of the Company approved the following Employee Stock Option Schemes, which are currently in force, for which your company had received in-principle approval from both the stock exchanges (NSE and BSE) to list the shares issued pursuant to the schemes as and when alloted:

Scheme	Particulars	No of Options
NATSOP2015	Opening Balance as on 1st April, 2018	4,38,945
	Options vested and Exercised (allotted on 27th September, 2018)	1,40,965
	Closing Balance of Options as 31st March, 2019	**2,97,980***
NATSOP2016	Opening Balance as on 1st April, 2018	1,65,630
	Options Vested	18,350
	Options Exercised (allotted on 5th November, 2018)	17,500
	Closing Balance of Options as on 31st March, 2019	**1,47,280***
NATSOP2017	Opening balance as on 1st April, 2018	6,00,000
	Options vested and Exercised (allotted on 5th November, 2018)	1,10,270
	Closing balance of Options as on 31st March, 2019	**4,89,730***

* includes forfeited shares

UNCLAIMED DIVIDEND

Section 124 of the Companies Act, 2013 read with Investor Education and Protection Fund Authority (Accounting, Audit, Transfer and Refund) Rules, 2016 ("the Rules"), mandates that companies transfer dividend that has remained unclaimed for a period of seven years from the unpaid dividend account to the Investor Education and Protection Fund (IEPF). Further, the Rules mandate that the shares on which dividend has not been paid or claimed for seven consecutive years or more also be transferred to the IEPF.

The following table provides list of years and dividend amount for which unclaimed dividends would become eligible to be transferred to the IEPF on the dates mentioned below as on 31st March, 2019:

Year	Type of Dividend	Dividend per share(₹)	Date of declaration	Due date of transfer	Amount (₹)
2012-13	Interim	4.00	13th February, 2013	22nd March, 2020	15,75,460.00
2013-14	Interim	5.00	13th February, 2014	22nd March, 2021	13,51,385.00
2014-15	Interim	5.00	11th February, 2015	20th March, 2022	11,99,860.00
2015-16	Interim	1.25*	11th February, 2016	19th March, 2023	15,65,690.00
2016-17	1st Interim	0.75*	9th August, 2016	15th September, 2023	9,41,386.00
	2nd Interim	6.00*	14th February, 2017	23rd March, 2024	54,97,518.00
2017-18	1st Interim	1.25*	7th August, 2017	13th September, 2024	15,11,508.75
	2nd Interim	7.00*	6th February, 2018	15th March, 2025	45,64,966.00
2018-19	1st interim	1.50*	8th August, 2018	14th September, 2025	10,95,196.00
	2nd interim	3.50*	12th February, 2019	21st March, 2026	25,19,296.50

*On Equity share of₹ 2/- each

The company sends intimation to the shareholder(s) concerned, advising them to lodge their claims with respect to unclaimed dividends. Shareholder(s) may note that both the unclaimed dividend and corresponding shares transferred to IEPF, including all benefits accruing on such shares, if any, can be claimed from IEPF by following the procedure prescribed in the Rules. The details of which are available at your Company's website. No claim (s) of whatsoever nature shall lie in respect thereof with the company.

Dividend remitted to IEPF during the last five years

Year	Dividend declared on	Amount transferred to IEPF (₹)	Date of transfer
2007-2008	25th October, 2007	4,64,055.00	18th November, 2014
2008-2009	25th May, 2009	5,79,399.00	21st June, 2016
2009-2010	27th January, 2010	9,18,554.00	28th February, 2017
2010-2011	14th February, 2011	7,80,368.00	9th March, 2018
2011-2012	9th February, 2012	10,68,983.00	14th March, 2019

Transfer of shares to IEPF

Pursuant to Section 124(6) all shares in respect of which dividend has not been paid or claimed for seven consecutive years or more shall be transferred by the Company in the name of Investor Education and Protection Fund (IEPF). During the year there are no transfer of equity shares to IEPF made by the Company.

Means of Communication

At NATCO, dissemination of information is considered crucial since many stakeholders are interested in the affairs of the Company. The Company is in strict compliance of the Listing Regulations pertaining to disclosure of Audited/Unaudited quarterly, half-yearly and annual financial results of the Company both on standalone and consolidated basis within thirty (30) minutes of the conclusion of the Board Meeting to the Stock Exchanges and publication of the same in both Vernacular and National newspapers and disclosure of presentations on Financial Results made to Institutional investors / analysts to the Stock Exchanges. The same disclosures are also published on the website of the Company (www.natcopharma.co.in).

It is ensured that any material information under Regulation 30 of the Listing Regulations is promptly intimated to the Stock Exchanges and updated on the Company's website (www.natcopharma.co.in) as well as made part of press releases. Any price sensitive information is brought to the notice of both the Stock Exchanges (NSE and BSE), Press and Electronic Media in order to avoid any possible insider trading practices with such information.

The following table provides the details regarding the publishing of quarterly results in the newspapers:

For Quarter ended	Date of Board meeting	Date of Publication	Name of the English Daily	Name of the Regional Daily
30th June, 2018	8th August, 2018	9th August, 2018	• Business Line	• Eenadu
30th September, 2018	5th November, 2018	6th November, 2018	• Business Standard • Financial Express	• Eenadu
31st December, 2018	12th February, 2019	13th February, 2019	• Business line	• Eenadu
31st March, 2019	27th May, 2019	28th May, 2019	• Business Line	• Eenadu

General shareholder information

(a) Details regarding Annual General Meeting

Date	5th September, 2019
Time	10.30 a.m.
Venue	Daspalla Hotel, Road No.37, Jubilee Hills, Hyderabad - 500 033
Book Closure Dates	3rd September, 2019 to 5th September, 2019 (both days inclusive)

(b) Financial Year

The Company adopted the financial year beginning on 1st April of every year and ending on 31st March of the following year. Accordingly, all the quarterly, half yearly and annual compliance are taken care of in accordance with the Act, Listing Regulations and other applicable Acts, rules and regulations.

(c) Listing on Stock Exchanges

The ISIN of the Company is INE987B01026. Details of the Stock Exchanges in which the equity shares of the Company are listed are as below:

Name of the Stock Exchange	Address	Scrip Code
BSE Limited	Phiroze Jeejeebhoy Towers, Dalal Street, Mumbai - 400001	524816
National Stock Exchange of India Limited	Exchange Plaza, C-1, Block G, Bandra-Kurla Complex, Bandra (E), Mumbai – 400051	NATCOPHARM

The Company confirms that it has duly paid the annual listing fee for the year 2018-19 to the above mentioned Stock Exchanges and the custodial fee for the year 2018-19 to both the Depositories, namely National Securities Depository Limited (NSDL) and the Central Depository Services (India) Limited (CDSL).

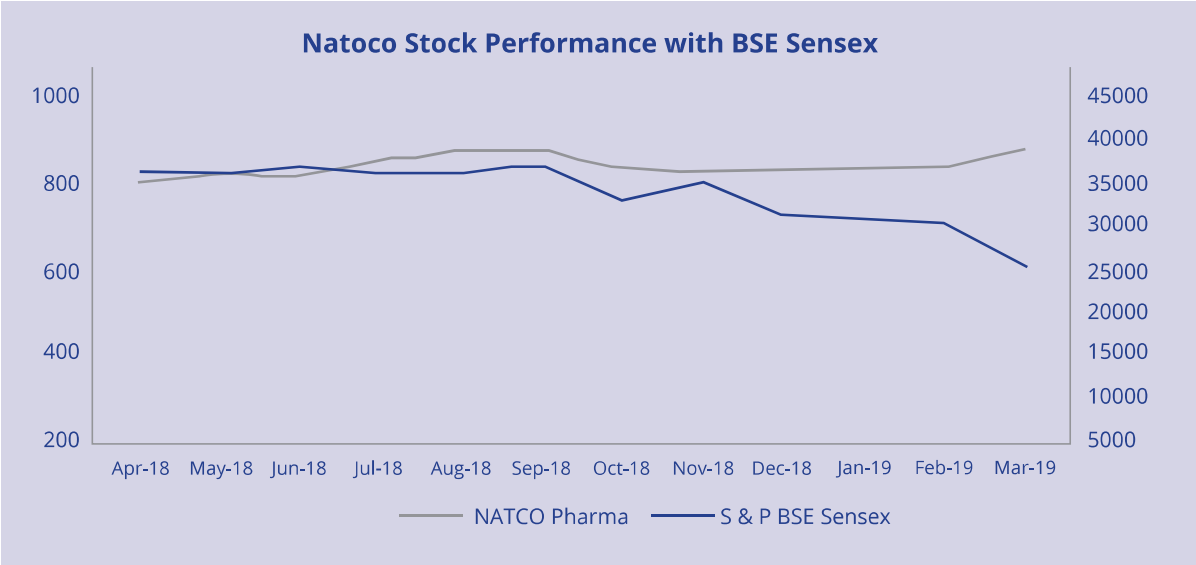
(d) Market Price Data

The market price data (high and low closing prices during each month) for the financial year 2018 -19 is as below:

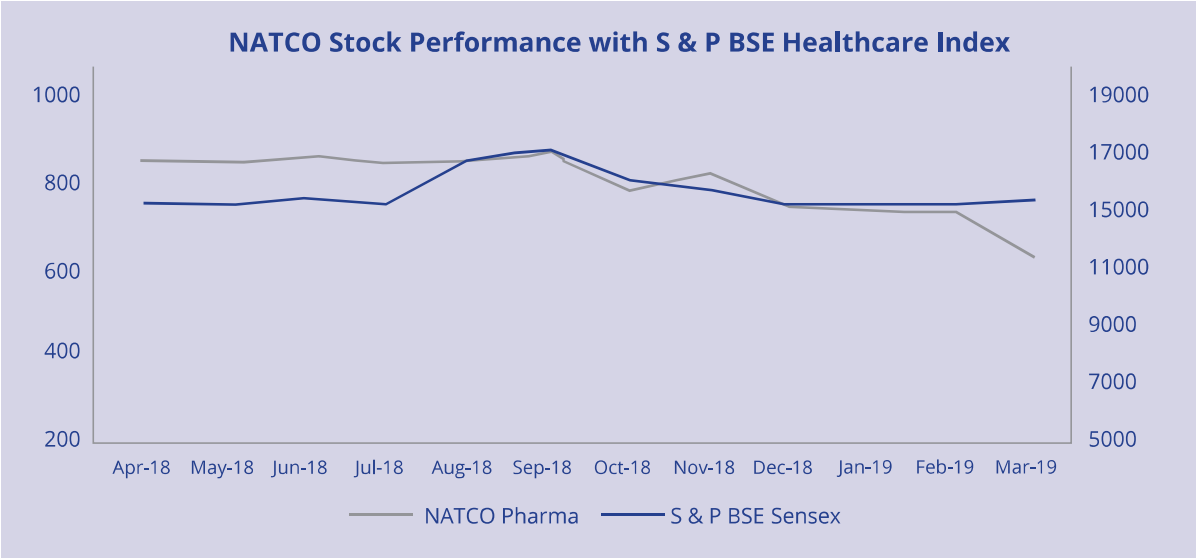
Month	Bombay Stock Exchange		National Stock Exchange	
	High ₹	Low ₹	High ₹	Low ₹
April 2018	829.55	751.00	830.00	750.00
May 2018	828.00	754.00	827.75	751.05
June 2018	841.70	735.00	843.85	732.00
July 2018	827.40	750.80	828.90	758.00
August 2018	825.00	749.10	824.00	748.00
September 2018	849.00	740.00	848.30	742.75
October 2018	763.30	637.40	763.40	636.00
November 2018	801.20	705.00	799.90	704.75
December 2018	725.75	666.40	728.80	669.70
January 2019	717.40	660.00	709.80	659.40
February 2019	707.00	563.15	709.75	562.00
March 2019	610.00	557.00	610.80	555.00

(e) Performance in comparison to broad-based indices

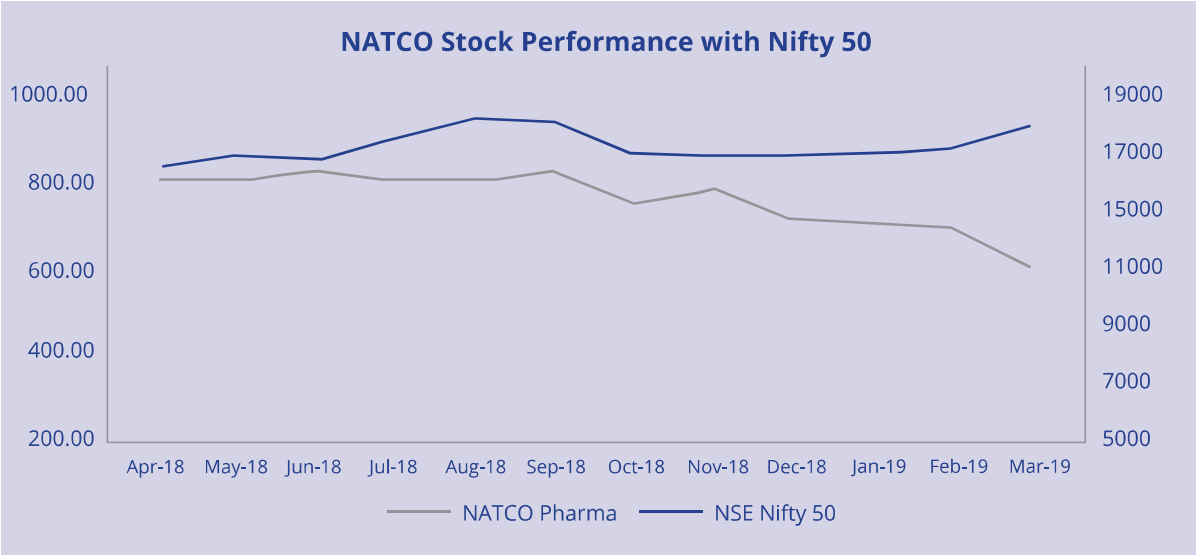
(i) Compared to S & P BSE Sensex



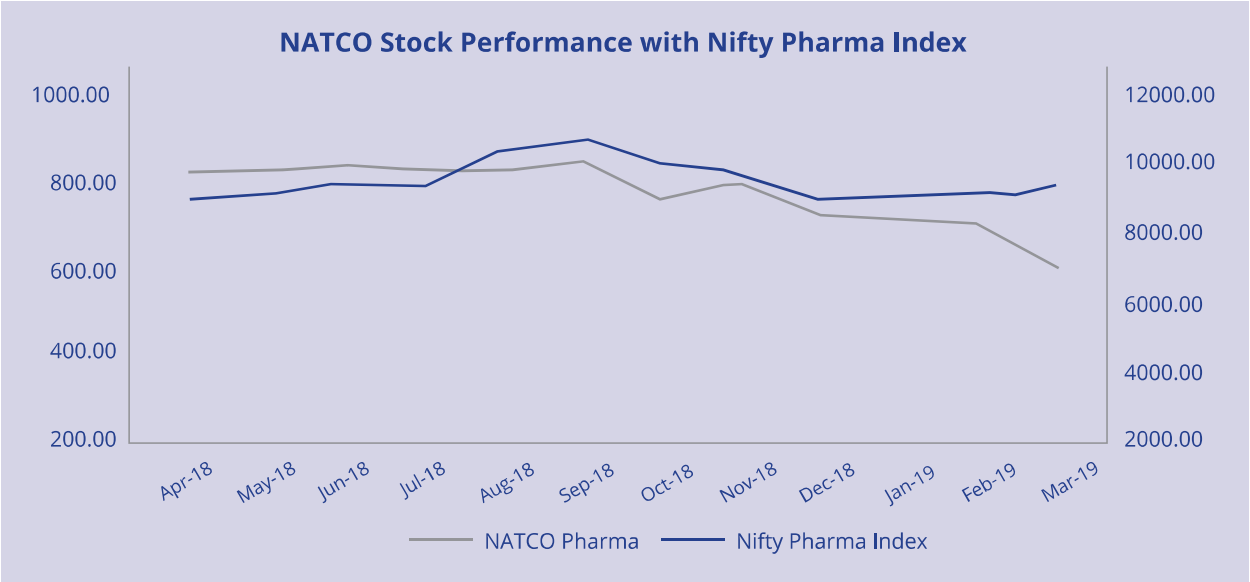
ii) Compared to S&P BSE HEALTHCARE INDEX



(iii) Compared to Nifty 50



(iv) **Compared to Nifty Pharma Index**



(f) Registrar and share transfer agent and share transfer system;

Venture Capital and Corporate Investments Pvt. Ltd. (VCCIPL) is the Registrar and Share Transfer Agent of the Company which undertakes the Share Transfer Work for both physical and electronic forms.

Address: 12-10-167, Bharat Nagar,
Hyderabad - 500 018, Telangana
Tel Nos.040-23818475/23818476/23868023
Fax No.040-23868024
Contact Person: Mr. P V Srinivas / Mr. E V S N Murthy
Email: info@vccilindia.com

(g) Dematerialization of shares and liquidity

As on March 31, 2019, 99.49% of the shares of your company is dematerialised. As the trading of your company's shares are being conducted only in electronic form all other members holding physical shares are requested to convert their shareholdings to electronic form at the earliest.

(h) Distribution of Shareholding

Nominal Value ₹	Shareholders		Amount ₹	
	Number	% To Total	In ₹	% To Total
Up to - 5000	75,122	97.7	2,45,57,320	6.71
5001 - 10000	837	1.09	62,69,342	1.71
10001 - 20000	406	0.53	59,34,098	1.62
20001 - 30000	127	0.17	31,50,560	0.86
30001 - 40000	67	0.09	23,01,796	0.63
40001 - 50000	51	0.07	23,45,318	0.64
50001 - 100000	97	0.13	69,38,040	1.9
100001 and above	184	0.24	31,42,72,516	85.92
Total	**76,891**	**100**	**36,57,68,990**	**100**

(i) Unclaimed Shares

The status of unclaimed shares of the Company transferred to a demat account "NATCO Pharma Limited – Unclaimed Suspense Account", in accordance with Listing Regulations, are given below:

Particulars	No. of Shareholders	No. of Shares
Aggregate number of shareholders and outstanding shares held in the Unclaimed Suspense Account as on 1st April, 2018	1,798	2,54,200
Number of shareholders and shares transferred to IEPF	0	0
Number of shareholders / legal heirs to whom the shares were transferred from the unclaimed suspense account upon receipt of and verification of necessary documents during the year 2018-19	85	8,300
Aggregate number of shareholders and outstanding shares held in the Unclaimed Suspense Account as on 31st March, 2019	1,713	2,45,900

(k) Plant Locations

i)	Pharma Division Kothur Post & Mandal, Rangareddy District -509 228 Telangana, India	ii)	Pharma Division - Parenterals Vijayapuri North, Nagarjunasagar, Peddavura Mandal, Nalgonda Dist.-508 202 Telangana, India
iii)	Chemical Division Mekaguda, Nandigama Mandal Rangareddy District - 509 228 Telangana, India	iv)	R & D Division (NATCO Research Centre) B-11, B-13 & B-14, Industrial Estate, Sanathnagar, Hyderabad - 500 018, Telangana, India.
v)	Formulations Division Plot No.19, Pharma City Selaqui Industrial Area Vikas Nagar, Dehradun 248 197 Uttarakhand, India	vi)	Formulations Division Plot No.A3, UPSIDC, Selaqui Industrial Area Dehradun 248 197. Uttarakhand, India
vii)	Chemical Division, Chennai No.74/7B, Vaikkadu TPP Salai, Manali Chennai - 600 103, Tamilnadu, India	viii)	Pharma Division DAG No.749, 750 Kokjhar Village, Revenue Circle - Mirza Kamrup (Rural) Guwahati Dist. 781 125, Assam, India
ix)	Formulations Division UNIT-10, Parawada, JNPC, Ramky SEZ Visakapatnam-531 019, Andhra Pradesh, India (Trail runs are on, ready to operate)		
	Units under Implementation		
x)	Crop Health Science (CHS) – Chemical Unit Plot No. 29,Sy . No. 56 (P) & 60 (P), APIIC Industrial Park-Attivaram Village, Ozili Mandal, SPSR Nellore District -524421, Andhra Pradesh	xi)	Crop Health Science (CHS) – Formulations Unit No. 3,8/1, Sy . No. 56 (P) & 60 (P), APIIC Industrial Park-Attivaram VIllage, Ozili Mandal, SPSR Nellore District - 524421, Andhra Pradesh

(l) Compliance Officer

CS M. Adinarayana, FCS 3808
Company Secretary &
Vice President (Legal & Corp. Affairs)
Email: man@natcopharma.co.in

(m) Address for correspondence

Registered Office:
Company Secretary Natco Pharma Limied
NATCO House, Road No. 2, Banjara Hills,
Hyderabad - 500034, Telangana
Tel. No.: 040-23547532, Fax No.: 040-23548243
Email: investors@natcopharma.co.in /
dasaradhi@natcopharma.co.in
Website: www.natcopharma.co.in

(n) Credit Ratings

The company has obtained credit ratings from ICRA on long term borrowings as "AA" and on short term borrowings as "A1+"

(o) Qualified Institutional Placement (QIP) utilisation:

Your Company had raised a sum of ₹ 915 Crores by allotment of 100,00,000 equity shares of ₹ 2/- each at a premium of ₹ 913 per share through Qualified Institutional Placement (QIP) pursuant to approval accorded by the shareholders in their Extra-ordinary Meeting held on 29th November, 2017. Following are the details of the utilisation of funds raised through QIP as on 31st March, 2019:

Particulars	Amount in Crores (₹)
(A) Amount received on allotment of 1,00,00,000 (One Crore Only) equity shares through QIP	₹ 915
(B) Utilisation Of Funds:	
Amount paid to lead Bankers including TDS	(18.50)
Loans Repaid to Bankers	(209.07)
Payments made to legal advisors,NSE,BSE etc. including TDS	(2.73)
Total	(230.30)
(C) Balance left (A - B)	684.70
(D) Capital expenditure incurred up to FY 18-19	(452.43)
(E) Balance of funds in fixed deposits	**232.27**

(p) Details of the fees paid to Statutory Auditors

The details of the total fees for all services paid by the company, on a consolidated basis, to the statutory auditor for the financial year

Particulars	Amount (₹)
Audit Fees	₹ 40,00,000
Out of pocket expenses	₹ 34,400
Total	**₹ 40,34,400**

(q) The disclosures of the compliance with corporate governance requirements specified in regulation 17 to 27 and clauses (b) to (i) of sub-regulation (2) of regulation 46 : Company is in compliance of the disclosures of corporate governance requirements specified in regulation 17 to 27 and clauses (b) to (i) of regulation 46(2) provided as separate section under the head "Investors" in the company's website www.natcopharma.co.in

Certificate on Compliance with Code of Conduct

The Members of
NATCO Pharma Limited

As required under SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015, I hereby confirm that the Company has adopted a code of conduct for all Board Members and Senior Management and the same has been placed on the Company's Website. All Board Members and Senior Management personnel have affirmed compliance with the Code of Conduct in respect of the Financial Year ended 31st March, 2019.

For **NATCO Pharma Limited**

Place: Hyderabad
Date: 27th May, 2019

V C Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

CEO / CFO Certification to the Board

(as per 17(8) of Listing Regulations)

To
The Board of Directors,
NATCO Pharma Limited

A. We have reviewed financial statements and the cash flow statement for the year ended 31st March 2019 and that to the best of our knowledge and belief:

   (1) these statements do not contain any materially untrue statement or omit any material fact or contain statements that might be misleading;

   (2) these statements together present a true and fair view of the Company's affairs and are in compliance with existing accounting standards, applicable laws and regulations.

B. There are, to the best of our knowledge and belief, no transactions entered into by the Company during the year which are fraudulent, illegal or violate the Company's code of conduct.

C. We accept responsibility for establishing and maintaining internal controls for financial reporting and that we have evaluated the effectiveness of internal control systems of the Company pertaining to financial reporting and we have disclosed to the auditors and the audit committee, deficiencies in the design or operation of such internal controls, if any, of which we are aware and the steps we have taken or propose to take to rectify these deficiencies.

D. We have indicated to the auditors and the Audit committee

   (1) significant changes in internal control over financial reporting during the year;

   (2) significant changes in accounting policies during the year and that the same have been disclosed in the notes to the financial statements; and

   (3) instances of significant fraud of which we have become aware and the involvement therein, if any, of the management or an employee having a significant role in the Company's internal control system over financial reporting

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

Place: Hyderabad
Date: 27th May, 2019

S V V N Appa Rao
CFO

CERTIFICATE OF COMPLIANCE

To
The Members of
NATCO Pharma Limited

I have examined the compliance of conditions of Corporate Governance by M/s. NATCO Pharma Limited, for the year ended 31st March 2019 as per the relevant provisions of Securities and Exchange Board of India (Listing Obligations and Disclosure Requirements) Regulations, 2015 ('Listing Regulations').

The Compliance of conditions of Corporate Governance is the responsibility of the management. My Examination has been limited to review of the procedure and implementation thereof adopted by the Company for ensuring compliance with the conditions of Corporate Governance as stipulated in the Listing Regulations. It is neither an audit nor an expression of opinion on the financial statements of the Company.

No Investor grievance(s) are pending for a period exceeding one month against the Company as per the records maintained by the Company.

In my opinion and to the best of my information and according to the explanations given to me, I certify that the Company has complied with conditions of Corporate Governance as stipulated in the Listing Regulations, as applicable.

I further state that such compliance is neither an assurance as to the further viability of the Company nor of the efficiency or effectiveness with which the management has conducted the affairs of the Company.

P Renuka
Company Secretary in Practice
C P No.3460

Place: Hyderabad
Date: 27th May, 2019

CERTIFICATE OF NON-DISQUALIFICATION OF DIRECTORS

(pursuant to Regulation 34(3) and Schedule V Para C clause (10)(i) of the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015)

To
The Members of
M/s. NATCO Pharma Limited
NATCO HOUSE, ROAD # 2
Banjara Hills, Hyderabad 500 034

I have examined the relevant registers, records, forms, returns and disclosures received from the Directors of M/s. NATCO Pharma Limited having CIN L24230TG1981PLC003201 and having registered office at NATCO House, Road # 2, Banjara Hills, Hyderabad 500 034 (hereinafter referred to as 'the Company'), produced before me by the Company for the purpose of issuing this Certificate, in accordance with Regulation 34(3) read with Schedule V Para-C Sub clause 10(i) of the Securities Exchange Board of India (Listing Obligations and Disclosure Requirements) Regulations, 2015.

In my opinion and to the best of my information and according to the verifications including Directors Identification Number (DIN) status at the portal www.mca.gov.in as considered necessary and explanations furnished to me by the Company & its officers, I hereby certify that none of the Directors on the Board of the Company as stated below for the Financial Year ending on 31st March, 2019 have been debarred or disqualified from being appointed or continuing as Directors of companies by the Securities and Exchange Board of India, Ministry of Corporate Affairs, or any such other Statutory Authority.

Sl No.	Name of Director	DIN	Date of Appointment in the company
1	SREERAMA MURTHY GUBBALA	00122454	31st January, 2000
2	RAJEEV NANNAPANENI	00183872	1st June, 2012
3	GOVINDA PRASAD DASU	00160408	13th February, 2014
4	VENKATESWARA RAO THALLAPAKA	05273533	25th August, 2014
5	LEELA DIGUMARTI	06980440	22nd September, 2014
6	VENKAIAH CHOWDARY NANNAPANENI	00183315	1st April, 2015
7	UMAMAHESHWARRAO NAIDU MADIREDDI	05111014	11th February, 2015
8	POTLURI PRASAD SIVARAMAKRISHNA	07011140	12th November, 2014
9	LINGARAO DONTHINENI	07088404	11th February, 2015
10	SRIDHAR SANKARARAMAN	06794418	23rd May, 2018

Ensuring the eligibility of for the appointment / continuity of every Director on the Board is the responsibility of the management of the Company. My responsibility is to express an opinion on these based on my verification. This certificate is neither an assurance as to the future viability of the Company nor of the efficiency or effectiveness with which the management has conducted the affairs of the Company.

P Renuka
Company Secretary in Practice
C P No.3460

Place: Hyderabad
Date: 27th May, 2019

Business Responsibility Report

Section – A: General Information about the Company

1.	Corporate Identity Number (CIN) of the Company	L24230TG1981PLC003201
2.	Name of the Company	NATCO Pharma Limited
3.	Registered Address	NATCO House Road # 2, Banjara Hills, Hyderabad - 500034, Telangana, India
4.	Website	www.natcopharma.co.in
5.	E-mail id Financial Year Reported	investors@natcopharma.co.in 1st April, 2018 to 31st March, 2019
6.	Sector(s) that the Company is engaged in (industrial activity code-wise)	NIC Code of product/service: 210 Description: Pharmaceuticals
7.	List three key products/services that the Company manufactures/provides (as in balance sheet)	Description: Pharmaceuticals Imatinib, Oseltamivir, Liposomal doxorubicin
8.	Total number of locations, where business activity is undertaken by the Company	Our business activity spreads over 40 countries through either sales or alliances. Our major products include Finished Dosage Formulations (FDF) and Active Pharmaceutical Ingredients (API). Number of locations in India (National) - eight manufacturing units, two R&D centres in addition to several distribution/ warehouse locations across India. International locations - The Company has 6 subsidiaries and one Step-down subsidiary
9.	Markets served by the Company – Local/ State/ National/ International	The Company sells its products in India, USA, Europe and several other emerging countries, totalling over 40 countries.

Section – B: Financial Details of the Company

1.	Paid-up Capital (INR)	₹ 365 million (As on 31st March, 2019).
2.	Total Turnover (INR)	Gross turnover of ₹ 22,247 million on a consolidated basis (As on 31st March 2019).
3.	Total profit after Taxes (INR)	₹ 6,444 million on a consolidated basis (As on 31st March 2019).
4.	Total Spending on Corporate Social Responsibility (CSR) as percentage of profit after tax (%)	Total percentage on CSR as a percentage of Profit after Tax of FY 2018-2019 is 1.74% on standalone basis. The Company spent over 2% of its average Profit before Tax of preceding 3 financial years. Additionally, the Company also made donations for CSR activities.
5.	List of activities in which the above expenditure has been incurred	The Company has undertaken several CSR Projects / Programmes during FY 2018-19: majority of the focus being in Education and Healthcare sectors. The detailed list of activities where the CSR expenditure was incurred is included in the Board's Report which forms a part of this Annual Report.

Section – C: Other Details

1. **Does the Company have any Subsidiary Company/ Companies?**
   Yes, the Company has six subsidiaries and one step-down subsidiary, all are located overseas.

2. **Does the Subsidiary Company/ Companies participate in the Business Responsibility (BR) initiatives of the parent Company? If yes, then indicate the number of such subsidiary Company(s):**
   The parent company undertakes majority of the BR initiatives.

3. **Do any other entity/entities (e.g. suppliers, distributors etc.) that the Company does business with, participate in the BR initiatives of the Company? If yes, then indicate the percentage of such entity/ entities? [Less than 30%, 30%-60%, More than 60%]:**
   Entities like suppliers, distributors did not participate in the Company's BR initiatives in the reporting period.

Section – D: Business Responsibility Information

1. **Details of Director/Directors responsible for BR**

(a) Details of the Director responsible for the implementation of BR policy/policies

- DIN Number: 00183872
- Name: Mr. Rajeev Nannapaneni
- Designation: Vice-Chairman and Chief Executive Officer

(b) Details of the BR Head

Sr. No.	Particulars	Details	
1	DIN Number (if applicable)	07011140	-
2	Name	Mr. P. S. R. K. Prasad	Mr. Rajesh Chebiyam
3	Designation Director	Director and Executive VP, Corporate Engineering Services	VP-Acquisitions, Institutional Investor Management and Corporate Communications
4	Telephone number	+91 8542 226611	+91 40 23547532
5	E-mail ID	psrk@natcopharma.co.in	rajesh.chebiyam@natcopharma.co.in

2. Disclosures on the nine principles as charted by the Ministry of Corporate Affairs in the "National Voluntary Guidelines (NVG) on Social, Environmental and Economic Responsibilities of Business".

Principle 1	Principle 2	Principle 3
Ethics,Transparency & Accountability Businesses should conduct and govern themselves with Ethics, Transparency and Accountability	**Product Life Cycle Sustainability** Businesses should provide goods and services that are safe and contribute to sustainability throughout their lifecycle	**Employee Well–Being** Businesses should promote the well-being of all employees
Principle 4	**Principle 5**	**Principle 6**
Stakeholder Management Businesses should respect the interests of and be responsive towards all stakeholders, especially those who are disadvantaged, vulnerable and marginalised	**Human Rights** Businesses should respect and promote human rights	**Environment** Businesses should respect, protect and make efforts to restore the environment
Principle 7	**Principle 8**	**Principle 9**
Policy Advocacy Businesses, when engaged in influencing public regulatory policy, should do so in a responsible manner	**Equitable Development** Businesses should support inclusive growth and equitable development	**Customer Value** Businesses should engage with and provide value to their customers and consumers in a responsible manner

Table: Principle-wise (as per NVGs) BR Policy/policies (Reply in Y/N)

S. No.	Questions	P1	P2	P3	P4	P5	P6	P7	P8	P9
1.	Do you have a policy/policies for....	Y	Y	Y	Y	Y	Y	NA	Y	Y
2.	Has the policy being formulated in consultation with the relevant stakeholders?	Y	Y	Y	Y	Y	Y	NA	Y	Y
3.	Does the policy conform to any national/ international standards? If yes, specify? (50 words)	The Company is abiding by the various laws while framing the policies, the best practices are taken into account. (P7 Not applicable)								
4.	Has the policy being approved by the Board? If yes, has it being signed by the MD/Owner/CEO/ appropriate Board Director?	The policies have been approved by the CEO (P7 not applicable)								
5.	Does the Company have a specified committee of the Board/ Director/ Official to oversee the implementation of the policy?	Y	Y	Y	Y	Y	Y	NA	Y	Y
6.	Indicate the link for the policy to be viewed online?	Policies are available on the website of the Company www. natcopharma.co.in and the policies which are internal to the Company are available on the Intranet of the Company. (P7 not applicable)								
7.	Has the policy been formally communicated to all relevant internal and external stakeholders?	Y	Y	Y	Y	Y	Y	NA	Y	Y
8.	Does the Company have in-house structure to implement the policy/policies?	Y	Y	Y	Y	Y	Y	NA	Y	Y
9.	Does the Company have a grievance redressal mechanism related to the policy/policies to address stakeholders' grievances related to the policy/ policies?	Y	Y	Y	Y	Y	Y	NA	Y	Y
10.	Has the Company carried out independent audit/ evaluation of the working of this policy by an internal or external agency?	Y	Y	Y	Y	Y	Y	NA	Y	Y

2(a) If answer to S. No. 1 against any principle, is 'No', please explain why: (Tick up to 2 options)
NA

3. Governance related to BR

- **Indicate the frequency with which the Board of Directors, Committees of the Board or CEO to assess the BR performance of the Company.**
  Half yearly

- **Does the Company publish a BR or a Sustainability Report? What is the hyperlink for viewing this report? How frequently it is published?**
  The Company's Annual Report includes a Business Responsibility Report which is available on the website. This year we have come out with our first sustainability report. The copy of the same will be available on the website of the Company at www.natcopharma.co.in

Principle 1 Ethics, Transparency and Accountability

1. **Does the policy relating to ethics, bribery and corruption cover only the Company? Yes/No. Does it extend to the Group/ Joint Ventures/ Suppliers/ Contractors/ NGOs/ Others?**
   Yes. The Company firmly believes and adheres to transparent, fair and ethical governance practices to foster professionalism, honesty, integrity and ethical behaviour. The company extends the policy with respect to ethics, bribery and corruption to the Group and Joint ventures.

2. **How many stakeholder complaints have been received in the past financial year and what percentage was satisfactorily resolved by the management?**
   The company encourages all its stakeholders to freely share their concerns and grievances. The Company has received 19 complaints from various stakeholders during the FY 2018-19, which were 100% promptly resolved.

Principle 2 Products Life Cycle Sustainability

1. **List up to 3 of your products or services whose design has incorporated social or environmental concerns, risks and/or opportunities.**
   1. Doxorubicin Liposomal
   2. Lanthanum Carbonate
   3. Letrozole

   For all the above mentioned products, NATCO has done continuous improvement programs which has resulted in yield improvement without compromising on compliance requirements.

   For each such product, provide the following details in respect of resource use (energy, water, raw material, etc.) per unit of product (optional):
   (i) Reduction during sourcing/production/distribution achieved since the previous throughout the value chain?

   (ii) Reduction during usage by consumers (energy, water) has been achieved since the previous year?

   The company strives to improve its energy and water footprints by reducing the power and fuel consumption

   1. New water cooled chiller, air compressor and APFC panel installed. Resulting in reduction in electricity bill.
   2. Roof top rain water collection to enhance the ground water resources in factory.
   3. Energy Saving in plant area lighting facility – Lamp watts reduced from 0.4 KW/bulb to 0.09 KW/bulb without compromising the Illumination level.

2. **Does the Company have procedures in place for sustainable sourcing (including transportation)?**
   Sustainable sourcing, production and distribution practices are followed ensuring quality and safety of raw materials and packaging materials procured from suppliers as well as of products manufactured, stored and distributed throughout the value chain. The Company has in place a robust vendor selection and vendor evaluation mechanism and promotes local suppliers, where adequate. The Company lays emphasis on safe transportation, optimisation of logistics, lowering of transportation costs, and reduction of vehicular air emission.

3. **Has the Company taken any steps to procure goods and services from local and small producers, including communities surrounding their place of work? If yes, what steps have been taken to improve their capacity and capability of local and small vendors?**
   The Company consciously endeavours to source its procurement of goods and services from medium and small vendors from local areas where feasible and if it meets the quality standards of the Company. For example, Local vendors were developed and vendor qualification activities are initiated for development of suitable cost effective materials of primary, secondary and tertiary packing material.

4. **Does the Company have a mechanism to recycle products and wastes? If yes, what is the percentage of recycling the products and waste (separately as 10%). Also, provide details thereof, in about 50 words or so.**
The company is committed to recycle wastes - both process and non-process. The initiatives around recycling are:
   1. Converting spent Sulphuric acid into gypsum and supplying it to cement companies.
   2. In four of our manufacturing facilities, we are converting non-process organic waste into compostable material using organic waste converter.
   3. RO reject is recycled for non-process application.
   4. Implemented condensate recovery system.

   In the pharmaceutical business, it is not recommended to recycle products and therefore, we responsibly destroy products that do not meet quality requirements.

Principle 3 Employee Well-Being

1. **Please indicate the total number of employees.**
The total number of employees is 4957 as on 31st March, 2019.

2. **Please indicate the total number of employees hired on temporary/contractual/casual basis.**
The total number of employees hired on temporary/ contractual/casual basis is 78 as on 31st March, 2019.

3. **Please indicate the number of permanent women employees.**
The total number of permanent women employees is 553 as on 31st March, 2019.

4. **Please indicate the number of permanent employees with disabilities.**
The total number of permanent employees with disabilities is 5 as on 31st March, 2019.

5. **Do you have an employee association that is recognised by management?**
Yes. The Company does have employee associations at certain manufacturing locations, which encourage the employees to participate freely in constructive dialogue with the management. Moreover, workers' wages are decided through Collective Bargaining System.

6. **What percentage of your permanent employees are members of this recognised employee association?**
33% of permanent employees at our manufacturing locations are members of employee associations.

7. **Please indicate the number of complaints relating to child labor, forced labor, involuntary labor, sexual harassment in the last financial year and pending, as on the end of the financial year.**
The Company does not employ any child labor. No case of sexual harassment at work place was reported during the year 2018-19 and we have an Internal Complaints Committee at all our locations under SHWW Act, 2013.

8. **What percentage of your under mentioned employees were given safety & skill up-gradation training in the last year?**
We continue to devote resources and efforts to continuously upgrade the skills of employees and they are given regular safety training. All Employees including casuals working in manufacturing facilities are given regular safety training, conflict management and Learning Development programs.

Principle 4 Stakeholder Management

1. **Has the Company mapped its internal and external stakeholders? Yes/No.**
Yes, we recognise stakeholders relevant to the Company's operations.

2. **Out of the above, has the Company identified the disadvantaged, vulnerable & marginalized stakeholders?**
Yes.

3. **Are there any special initiatives taken by the Company to engage with the disadvantaged, vulnerable and marginalized stakeholders. If so, provide details thereof, in about 50 words or so.**
Various initiatives have been taken by the Company to engage with marginalised stakeholders at locations in and around its operations in the areas of: Community Health Care, Sanitation and Hygiene, Education and Knowledge Enhancement. For details of projects undertaken during the FY 2018-19, please refer the 'Annual Report on CSR Activities' titled "Strengthening our community connect"

Principle 5 Human Rights

1. **Does the policy of the Company on human rights cover only the Company or extend to the Group/Joint Ventures/Suppliers/Contractors/NGOs/Others?**
The Company's policy is extended only to the Group.

2. **How many stakeholder complaints have been received in the past financial year and what percent was satisfactorily resolved by the management?**
No complaints were received during the year in this regard.

Principle 6 Environment

1. **Does the policy related to Principle 6 cover only the Company or extends to the Group/Joint Ventures/ Suppliers/Contractors/NGOs/others.**
NATCO's EHS policy is applicable to all subsidiaries and manufacturing locations within the group. For suppliers and contractors, we include EHS requirements as part of the contract and service agreement. We also ensure that contractor staff deployed on our premises are part of safety training and safety pep talks. While sourcing critical raw materials, we select suppliers keeping in perspective their environmental compliance.

2. **Does the Company have strategies/ initiatives to address global environmental issues such as climate change, global warming, etc.? Y/N. If yes, please give hyperlink for webpage etc.**
The company is proactive in addressing greenhouse gas emissions. We have installed solar energy facility in two of our manufacturing facilities with a total capacity of 4.15MW, with another 500KW rooftop solar facility ready for commissioning in another manufacturing facility and have also invested in a 2.1 MW wind energy facility in Chennai. For our recently commissioned manufacturing facility in Vishakhapatnam, we have installed a 2.1 MW wind energy facility.

3. **Does the Company identify and assess potential environmental risks? Y/N**
Yes. We continually identify and assess potential environmental risks in our manufacturing process. This is not a onetime process and we ensure that the risks are addressed through environment management programs and continual improvement initiatives. In two of our API facilities, we have instituted the Environment Management Systems which periodically have a mechanism to identify and address environmental risks. At R&D, we evaluate process development on the basis of effluent load generated, minimise wherever possible and plan for appropriate actions to recycle, reuse and treat wastes.

4. **Does the Company have any project related to Clean Development Mechanism? If so, provide details thereof, in about 50 words or so. Also, if Yes, whether any environmental compliance report is filed?**
Yes. We have invested in renewable energy capacities in the past few years. Currently two of the API facilities and two of the Formulation facilities have renewable energy plants (solar/ wind). A solar roof top facility is being commissioned at a formulations facility which will be operational in the current year. However, we have not applied these project as per CDM.

5. **Has the Company undertaken any other initiatives on – clean technology, energy efficiency, renewable energy, etc. Y/N. If yes, please give hyperlink for web page etc.**
The following are efforts taken towards renewable energy:

    1. 3MW solar power plant at our API Mekaguda facility.

    2. 1.15MW solar power plant at our Formulation Nagarjuna Sagar facility.

3. 500KW roof top solar power facility (under commissioning) at our formulations facility at Kothur.
4. 2.1MW wind power plant at our API Chennai facility.
5. 2.1 MW wind power plant at our API Vishakhapatnam facility.

In addition, we have initiatives driving the message on energy conservation through all our facilities:

1. Replacement of reciprocating compressors for refrigeration units with screw compressors fitted with VFD modulators. As a practice we are incorporating during plant design for installation of new refrigeration units.
2. Installation of VFDs (Variable Frequency Drive) for all motors rating 15HP and above, for all continuously running motors rating 5HP and above and all HVAC units.
3. Plug type blowers in place of belt drive blowers for AHU units.
4. LED based lighting instead of CFL based lighting.

6. Are the Emissions/Waste generated by the Company within the permissible limits given by CPCB/SPCB for the financial year being reported?
Yes, All the emissions or waste generated by the company are within the permissible limits given by CPCB/SPCB and we have made all the mandatory submissions in this regard.

7. Number of show cause/legal notices received from CPCB/SPCB which are pending (i.e. not resolved to satisfaction) as on end of Financial Year.
During the FY 2018-2019, the Company has not received any show cause/ legal notices from CPCB / SPCB.

Principle 7 Policy Advocacy

1. Is your Company a member of any trade and chamber or association? If Yes, Name only those major ones that your business deals with:
Yes. The Company is a member of various trade/industry associations like Federation of Indian Chambers of Commerce & Industry (FICCI), Federation of Telangana and Andhra Pradesh Chambers of Commerce and Industry (FTAPCI), Bulk Drug Manufacturers Association (India) (BDMA), Indian Pharmaceutical Alliance (IPA), Indian Drug Manufacturing Association (IDMA), Pharmaexcil, confederation of Indian Industry (CII) etc.

2. Have you advocated/lobbied through above associations for the advancement or improvement of public good?
Yes, we have advocated for reforms through these associations for the advancement of public good.

Principle 8 Equitable Development

1. Does the Company have specified programmes/ initiatives/projects in pursuit of the policy related to Principle 8? If yes details thereof.
Yes, the Company has identified specified programmes / projects in the pursuit of the policy related to Principle 8. For details of projects undertaken during the FY 2018-19, please refer the 'Annual Report on CSR Activities' under "Strengthening our community connect".

2. Are the programmes/projects undertaken through in-house team/own foundation/external NGO/ government structures/any other organization?
NATCO Pharma Ltd., is implementing the CSR programmes through NATCO Trust, a non-profit entity registered under Trust Act. NATCO Trust is based in Hyderabad and employs coordinators, executives, doctors, nurses, pharmacists & volunteers to implement & supervise day to day activities. The team at corporate office is involved in design & development of programmes, monitoring progress & supporting the field teams for progressive implementation of the activities.

3. **Have you done any impact assessment of your initiative?**
Yes, the Company undertakes timely impact assessments of projects under implementation for ensuring their desired impact and continued sustenance. The impact assessment is also presented to the CSR committee.

4. **What is your Company's direct contribution to community development projects- Amount in INR and the details of the projects undertaken?**
During the year under review the Company had contributed ₹ 116 million to various community development programmes / projects as part of its CSR initiatives. The details of projects undertaken are mentioned in the Annexure IV of the Board's Report.

5. **Have you taken steps to ensure that this community development initiative is successfully adopted by the community? Please explain in 50 words or so,**
All the community development initiatives are planned based on need assessment studies done with target communities to make sure projects are successfully adopted by the community. We involve stakeholders right from identifying a project until implementation and monitoring.

Principle 9 Customer Value

1. **What percentage of customer complaints / consumer cases are pending as on the end of financial year?**
No significant complaints are pending as on the end of the financial year.

2. **Does the Company display product information on the product label, over and above what is mandated as per local laws? Yes/No/N.A./Remarks (additional information).**
The Company displays all the product information on the product label, which is mandatory. Besides, the Company also displays general information for patients in order to guide them with respect to usage of the certain products.

3. **Is there any case filed by any stakeholder against the Company regarding unfair trade practices, irresponsible advertising and/or anti-competitive behaviour during the last five years and pending as on end of financial year. If so, provide details thereof, in about 50 words or so.**
No.

4. **Did your Company carry out any consumer survey/ consumer satisfaction trends?**
The marketing and sales team of the Company regularly interacts with doctors and other Healthcare professionals and takes their feedback on the Company's products.

Independent Auditor's Report

To the Members of
NATCO Pharma Limited

Report on the Audit of the Standalone Financial Statements

Opinion

1. We have audited the accompanying standalone financial statements of NATCO Pharma Limited ('the Company'), which comprise the Standalone Balance Sheet as at 31st March, 2019, the Standalone Statement of Profit and Loss (including Other Comprehensive Income), the Standalone Cash Flow Statement and the Standalone Statement of Changes in Equity for the year then ended, and a summary of significant accounting policies and other explanatory information.

2. In our opinion and to the best of our information and according to the explanations given to us, the aforesaid standalone financial statements give the information required by the Companies Act, 2013 ('Act') in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India including Indian Accounting Standards ('Ind AS') specified under section 133 of the Act, of the state of affairs (financial position) of the Company as at 31st March, 2019, and its profit (financial performance including other comprehensive income), its cash flows and the changes in equity for the year ended on that date.

Basis for Opinion

3. We conducted our audit in accordance with the Standards on Auditing specified under section 143(10) of the Act. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the Company in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India ('ICAI') together with the ethical requirements that are relevant to our audit of the financial statements under the provisions of the Act and the rules thereunder, and we have fulfilled our other ethical responsibilities in accordance with these requirements and the Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Key Audit Matter

4. Key audit matters are those matters that, in our professional judgment, were of most significance in our audit of the standalone financial statements of the current period. These matters were addressed in the context of our audit of the financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters.

5. We have determined the matter described below to be the key audit matters to be communicated in our report.

Key audit matter	How our audit addressed the key audit matter
Carrying value of investment in a group entity Refer note 4 (I) for the accounting policy and note 8 for the financial disclosures in the standalone financial statements. The Company through its subsidiary Timecap Overseas Limited ("Timecap") has made investments in NATCO farma Do Brasil Ltda. ('NATCO Brazil'), which is engaged in marketing of pharmaceutical products in Brazil. 90.90% of NATCO Brazil's stake is indirectly held through Timecap and NATCO Pharma Inc., by the Company as at 31st March, 2019. During the year ended 31st March, 2019 NATCO Brazil has reported loss of ₹ 226 million and as at that date its accumulated losses aggregating ₹ 817 million have significantly eroded its capital.	Our audit procedures in relation to assessing the carrying value of investments included but were not limited to, the following: • Obtained an understanding of management's processes and controls for determining the value-in-use of investments; • Evaluated the design of and tested the operating effectiveness of the key controls around determining the value-in-use; • Evaluated the appropriateness of the valuation methodology used to arrive at the estimated fair value of the investments using an auditor's expert;

Key audit matter	How our audit addressed the key audit matter
Equity investments in subsidiaries are measured at cost less impairment. As at 31 March 2019, management has assessed that the recoverable amount computed using value in use method is higher than the carrying value of the investment in Timecap. However, there is a risk that the investment in Timecap may be impaired if the projections used in computation of value in use method are not met. The aforesaid investments were valued as at 31 March 2019 by an independent valuation specialist in the capacity of a management's expert using Discounted Cash Flow (DCF) valuation method. Management's assessment of value in use requires estimation and judgement around assumptions used. The key assumptions underpinning management's assessment include, but are not limited to, projections of future cash flows, growth rates, discounts rates, estimated future operating expenditure. Accordingly, considering the materiality, complexity and significance of judgement involved, the valuation of aforesaid investment has been considered as a key audit matter for the current year's audit.	• Tested the accuracy of the input data provided by the management to the valuation specialist by reconciling the projected cash flows to approved business plans of the investee entity; • Evaluated the reasonableness of the key assumptions used in the cash flow projections, such as growth rates, discount rate, etc. considering our understanding of the business, industry and relevant market factors. • Obtained and evaluated sensitivity analysis performed by the management on aforesaid key assumptions and performed further independent sensitivity analysis to determine impact of estimation uncertainty on the valuation; • Tested the mathematical accuracy of the cash flow projections and fair valuation computation; and • Evaluated the appropriateness and adequacy of the related disclosures made in the standalone financial statements in accordance with the applicable accounting standards.

Information other than the Financial Statements and Auditor's Report thereon

6. The Company's Board of Directors is responsible for the other information. The other information comprises the information included in the Annual Report, but does not include the financial statements and our auditor's report thereon.

   Our opinion on the financial statements does not cover the other information and we will not express any form of assurance conclusion thereon.

   In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Responsibilities of Management for the Standalone Financial Statements

7. The Company's Board of Directors is responsible for the matters stated in section 134(5) of the Act with respect to the preparation of these standalone financial statements that give a true and fair view of the state of affairs (financial position), profit or loss (financial performance including other comprehensive income), cash flows and changes in equity of the Company in accordance with the accounting principles generally accepted in India, including the Ind AS specified under section 133 of the Act. This responsibility also includes maintenance of adequate accounting records in accordance with the provisions of the Act for safeguarding of the assets of the Company and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies; making judgments and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls, that were operating effectively for ensuring the accuracy and completeness of the accounting records, relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

8. In preparing the financial statements, management is responsible for assessing the Company's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Company or to cease operations, or has no realistic alternative but to do so.

9. Those Board of Directors are also responsible for overseeing the Company's financial reporting process.

Auditor's Responsibilities for the Audit of the Financial Statements

10. Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report

that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Standards on Auditing will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

11. As part of an audit in accordance with Standards on Auditing, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

    - Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

    - Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances. Under section 143(3)(i) of the Act, we are also responsible for explaining our opinion on whether the company has adequate internal financial controls system in place and the operating effectiveness of such controls.

    - Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

    - Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Company's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Company to cease to continue as a going concern.

    - Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

12. We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

13. We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

14. From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditor's report unless law or regulation precludes public disclosure about the matter or when, in extremely rare circumstances, we determine that a matter should not be communicated in our report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.

Report on Other Legal and Regulatory Requirements

15. As required by section 197(16) of the Act, we report that the Company has paid remuneration to its directors during the year in accordance with the provisions of and limits laid down under section 197 read with Schedule V to the Act.

16. As required by the Companies (Auditor's Report) Order, 2016 ('the Order') issued by the Central Government of India in terms of section 143(11) of the Act, we give in the Annexure A a statement on the matters specified in paragraphs 3 and 4 of the Order.

17. Further to our comments in Annexure A, as required by section 143(3) of the Act, we report that:

    a) we have sought and obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purpose of our audit;

b) in our opinion, proper books of account as required by law have been kept by the Company so far as it appears from our examination of those books;

c) the standalone financial statements dealt with by this report are in agreement with the books of account;

d) in our opinion, the aforesaid standalone financial statements comply with Ind AS specified under section 133 of the Act;

e) on the basis of the written representations received from the directors and taken on record by the Board of Directors, none of the directors is disqualified as on 31 March 2019 from being appointed as a director in terms of section 164(2) of the Act;

f) we have also audited the internal financial controls over financial reporting (IFCoFR) of the Company as on 31 March 2019 in conjunction with our audit of the standalone financial statements of the Company for the year ended on that date and our report as per Annexure B expressed unmodified opinion; and

g) with respect to the other matters to be included in the Auditor's Report in accordance with rule 11 of the Companies (Audit and Auditors) Rules, 2014 (as amended), in our opinion and to the best of our information and according to the explanations given to us:

i. the Company has disclosed the impact of pending litigations on its financial position as at 31 March 2019;

ii. the Company did not have any long-term contracts including derivative contracts for which there were any material foreseeable losses as at 31 March 2019;

iii. there has been no delay in transferring amounts, required to be transferred, to the Investor Education and Protection Fund by the Company during the year ended 31 March 2019; and

iv. the disclosure requirements relating to holdings as well as dealings in specified bank notes were applicable for the period from 8 November 2016 to 30 December 2016, which are not relevant to these standalone financial statements. Hence, reporting under this clause is not applicable.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm's Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No.: 108840

Place: Hyderabad
Date: 27th May 2019

Annexure A to the Independent Auditor's Report of even date to the members of NATCO Pharma Limited, on the standalone financial statements for the year ended 31 March 2019

Based on the audit procedures performed for the purpose of reporting a true and fair view on the standalone financial statements of the Company and taking into consideration the information and explanations given to us and the books of account and other records examined by us in the normal course of audit, and to the best of our knowledge and belief, we report that:

(i) (a) The Company has maintained proper records showing full particulars, including quantitative details and situation of fixed assets.

(b) The Company has a regular program of physical verification of its fixed assets under which fixed assets are verified in a phased manner over a period of three years, which in our opinion, is reasonable having regard to the size of the Company and the nature of its assets. In accordance with this program, certain fixed assets were verified during the year and no material discrepancies were noticed on such verification.

(c) The title deeds of all the immovable properties (which are included under the head 'Property, plant and equipment') are held in the name of the Company except for the following properties which according to the information and explanation given to us, pertains to a land parcel which shall be registered in the name of the Company subsequent to fulfilment of certain conditions laid out by the Andhra Pradesh Industrial Infrastructure Corporation.

Nature of property	Total Number of Cases	Whether leasehold / freehold	Gross block as on 31 March 2019 (₹) in millions	Net block on 31 March 2019 (₹) in millions	Remarks
Land	One	Freehold	66	66	Land parcel which shall be registered in the name of the Company subsequent to fulfilment of certain conditions laid out by the Andhra Pradesh Industrial Infrastructure Corporation Limited.

(ii) In our opinion, the management has conducted physical verification of inventory at reasonable intervals during the year, except for goods-in-transit and stocks lying with third parties. For stocks lying with third parties at the year-end, written confirmations have been obtained by the management. No material discrepancies were noticed on the aforesaid verification.

(iii) The Company has granted unsecured loans to parties (foreign subsidiaries) covered in the register maintained under Section 189 of the Act; and with respect to the same:

a. in our opinion the terms and conditions of grant of such loans are not, prima facie, prejudicial to the company's interest.

b. the schedule of repayment of principal and payment of interest has been stipulated and the principal and interest amount is not due;

c. there is no overdue amount in respect of loans granted to such party.

(iv) In our opinion, the Company has complied with the provisions of Section 186 in respect of investments and loans. Further, in our opinion, the Company has not entered into any transaction covered under Section 185 and Section 186 of the Act in respect of guarantees and security.

(v) In our opinion, the Company has not accepted any deposits within the meaning of Sections 73 to 76 of the Act and the Companies (Acceptance of Deposits) Rules, 2014 (as amended). Accordingly, the provisions of clause 3(v) of the Order are not applicable.

(vi) We have broadly reviewed the books of account maintained by the Company pursuant to the Rules made by the Central Government for the maintenance of cost records under sub-section (1) of Section 148 of the Act in respect of Company's products and are of

the opinion that, prima facie, the prescribed accounts and records have been made and maintained. However, we have not made a detailed examination of the cost records with a view to determine whether they are accurate or complete.

(vii) (a) Undisputed statutory dues including provident fund, employees' state insurance, income-tax, goods and service tax, duty of customs, cess and other material statutory dues, as applicable, have generally been regularly deposited with the appropriate authorities, though there has been a slight delay in a few cases. Further, no undisputed amounts payable in respect thereof were outstanding at the year-end for a period of more than six months from the date they became payable.

(b) The dues outstanding in respect of sales-tax, service-tax, duty of customs on account of disputes, are as follows:

Name of the statute	Nature of dues	Amount (₹ in millions)		Period to which the amount relates	Forum where dispute is pending
		Total Claim	Amount paid under protest		
The Central Sales Tax, 1956	Central Sales Tax	9	3	Financial Year ("FY") 1997-98	High Court for the State of Telangana
The Customs Act, 1962	Customs Duty	2	-	July 2006 to 2010	The Customs Excise and Service Tax Appellate Tribunal
The Finance Act, 1994	Service Tax	2	1	FY 2011-12	The Customs Excise and Service Tax Appellate Tribunal
The Finance Act, 1994	Service Tax	15	1	FY 2007-11	The Customs Excise and Service Tax Appellate Tribunal

There were no disputed dues in respect of income-tax, duty of excise and value added taxes

(viii) The Company has not defaulted in repayment of loans or borrowings to any bank during the year. The Company has no loans or borrowings payable to financial institutions or government and does not have any outstanding debentures during the year.

(ix) The Company did not raise moneys by way of initial public offer or further public offer (including debt instruments) and did not have any term loans outstanding during the year. Accordingly, the provisions of lause 3(ix) of the Order are not applicable.

(x) No fraud by the Company or on the Company by its officers or employees has been noticed or reported during the period covered by our audit.

(xi) Managerial remuneration has been paid / provided by the Company in accordance with the requisite approvals mandated by the provisions of Section 197 of the Act read with Schedule V to the Act.

(xii) In our opinion, the Company is not a Nidhi Company. Accordingly, provisions of clause 3(xii) of the Order are not applicable.

(xiii) In our opinion all transactions with the related parties are in compliance with Sections 177 and 188 of Act, where applicable, and the requisite details have been disclosed in the standalone financial statements etc., as required by the applicable Ind AS.

(xiv) During the year, the Company has not made any preferential allotment or private placement of shares or fully or partly convertible debentures. Accordingly, provisions of the clause 3(xiv) of the order are not applicable.

(xv) In our opinion, the Company has not entered into any non-cash transactions with the directors or persons connected with them covered under Section 192 of the Act. Accordingly, the provisions of clause 3(xv) of the order are not applicable.

(xvi) The Company is not required to be registered under Section 45-IA of the Reserve Bank of India Act, 1934.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm's Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No.: 108840

Place: Hyderabad
Date: 27st May, 2019

Annexure B to the Independent Auditor's Report of even date to the members of NATCO Pharma Limited, on the standalone financial statements for the year ended 31 March 2019

Independent Auditor's Report on the Internal Financial Controls under Clause (i) of Sub-section 3 of Section 143 of the Companies Act, 2013 ('the Act')

1. In conjunction with our audit of the standalone financial statements of NATCO Pharma Limited ('the Company') as at and for the year ended 31 March 2019, we have audited the internal financial controls over financial reporting ('IFCoFR') of the Company as at that date.

Management's Responsibility for Internal Financial Controls

2. The Company's Board of Directors is responsible for establishing and maintaining internal financial controls based on the internal control over financial reporting criteria established by the Company considering the essential components of internal control stated in the Guidance Note on Audit of Internal Financial Controls over Financial Reporting ('the Guidance Note') issued by the Institute of Chartered Accountants of India ('ICAI'). These responsibilities include the design, implementation and maintenance of adequate internal financial controls that were operating effectively for ensuring the orderly and efficient conduct of the Company's business, including adherence to the Company's policies, the safeguarding of its assets, the prevention and detection of frauds and errors, the accuracy and completeness of the accounting records, and the timely preparation of reliable financial information, as required under the Act.

Auditor's Responsibility

3. Our responsibility is to express an opinion on the Company's IFCoFR based on our audit. We conducted our audit in accordance with the Standards on Auditing issued by the ICAI and deemed to be prescribed under Section 143(10) of the Act, to the extent applicable to an audit of IFCoFR, and the Guidance Note issued by the ICAI. Those Standards and the Guidance Note require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether adequate IFCoFR were established and maintained and if such controls operated effectively in all material respects.

4. Our audit involves performing procedures to obtain audit evidence about the adequacy of the IFCoFR and their operating effectiveness. Our audit of IFCoFR includes obtaining an understanding of IFCoFR, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error.

5. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion on the Company's IFCoFR.

Meaning of Internal Financial Controls over Financial Reporting

6. A company's IFCoFR is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's IFCoFR include those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorisations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorised acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Inherent Limitations of Internal Financial Controls over Financial Reporting

7. Because of the inherent limitations of IFCoFR, including the possibility of collusion or improper management override of controls, material misstatements due to error or fraud may occur and not be detected. Also, projections of any evaluation of the IFCoFR to future periods are subject to the risk that the IFCoFR may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Opinion

8. In our opinion, the Company has, in all material respects, adequate internal financial controls over financial reporting and such controls were operating effectively as at 31 March 2019, based on the internal control over financial reporting criteria established by the company considering the essential components of internal control stated in the Guidance Note issued by the ICAI.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm's Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No.: 108840

Place: Hyderabad
Date: 27th May, 2019

Balance Sheet

as at 31st March, 2019

(All amounts in ₹ millions, except share data and where otherwise stated)

	Notes	31 March 2019	31 March 2018
ASSETS			
Non-current assets			
(a) Property, plant and equipment	6	12,067	10,096
(b) Capital work-in-progress		6,375	4,800
(c) Intangible assets	7	82	57
(d) Investment in subsidiaries	8	977	932
(e) Financial assets			
Investments	9	199	81
Loans	10	496	78
Other financial assets	11	164	149
(f) Current tax assets (net)		-	18
(g) Other non-current assets	12	527	609
Total non-current assets		**20,887**	**16,820**
Current assets			
(a) Inventories	13	5,084	4,258
(b) Financial assets			
Investments	9	1,268	483
Trade receivables	14	4,916	6,060
Cash and cash equivalents	15	115	101
Bank balances other than cash and cash equivalents	16	2,512	1,620
Loans	10	70	46
Other financial assets	11	6,959	6,140
(c) Other current assets	12	1,750	1,834
Total current assets		**22,674**	**20,542**
Total assets		**43,561**	**37,362**
EQUITY AND LIABILITIES			
Equity			
(a) Equity share capital	17	365	369
(b) Other equity	18	35,267	30,885
Total equity		**35,632**	**31,254**
Liabilities			
Non-current liabilities			
(a) Financial liabilities			
Other financial liabilities	20	8	8
(b) Provision for employee benefits	21	710	324
(c) Deferred tax liabilities (net)	22	113	138
Total non-current liabilities		**831**	**470**
Current liabilities			
(a) Financial liabilities			
Borrowings	19	3,845	1,730
Trade payables	24		
- total outstanding dues of micro and small enterprises		79	41
- total outstanding dues of creditors other than micro and small enterprises		1,939	2,413
Other financial liabilities	20	771	1,009
(b) Other current liabilities	23	314	308
(c) Provision for employee benefits	21	90	137
(d) Current tax liabilities (net)		60	-
Total current liabilities		**7,098**	**5,638**
Total liabilities		**7,929**	**6,108**
Total equity and liabilities		**43,561**	**37,362**

The accompanying notes form an integral part of the standalone financial statements.

This is the Standalone Balance Sheet referred to in our report of even date.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No. 108840

Place: Hyderabad
Date: 27th May, 2019

For and on behalf of the Board of Directors
NATCO Pharma Limited

V.C. Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

M. Adinarayana
Company Secretary & Vice President
(Legal & Corporate Affairs)

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 27th May, 2019

Statement of Profit and Loss

for the year ended 31st March, 2019

(All amounts in ₹ millions, except share data and where otherwise stated)

	Notes	31 March 2019	31 March 2018
Income			
Revenue from operations	25	19,863	21,085
Other income	26	1,298	394
Total income		**21,161**	**21,479**
Expenses			
Cost of materials consumed	27	3,331	3,905
Excise duty		-	172
Purchases of stock-in-trade		315	227
Changes in inventories of finished goods, stock-in -trade and work-in-progress	28	(255)	(247)
Employee benefits expense	29	3,402	3,122
Finance costs	30	188	147
Depreciation and amortisation expense	6 & 7	801	655
Other expenses	31	4,905	4,622
Total expenses		**12,687**	**12,603**
Profit before tax		**8,474**	**8,876**
Tax expense/(credit)	32		
Current tax		1,863	2,173
Deferred tax		(60)	(279)
Profit for the year		**6,671**	**6,982**
Other comprehensive income (net of taxes)			
Items that will not be reclassified to profit or loss			
Re-measurement gains/(losses) on defined benefit plans		(85)	(42)
Net (loss)/gain on FVTOCI equity securities		(6)	(5)
Total comprehensive income for the year		**6,580**	**6,935**
Earnings per equity share (₹) (Nominal value per share ₹2)	33		
Basic		36.22	39.38
Diluted		36.10	39.24

The accompanying notes form an integral part of the standalone financial statements.

This is the Standalone Statement of Profit and Loss referred to in our report of even date.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No. 108840

Place: Hyderabad
Date: 27th May, 2019

For and on behalf of the Board of Directors
NATCO Pharma Limited

V.C. Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

M. Adinarayana
Company Secretary & Vice President
(Legal & Corporate Affairs)

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 27th May, 2019

Cash Flow Statement

for the year ended 31st March 2019

(All amounts in ₹ millions, except share data and where otherwise stated)

		31 March 2019	31 March 2018
Cash flows from operating activities			
Profit before tax		8,474	8,876
Adjustments :			
Depreciation and amortisation expense		801	655
Finance cost		188	147
Employee share-based payment expense		253	180
Interest income		(911)	(248)
Bad debts written - off		20	133
Dividend income		(0)	(2)
Gain on sale of investments		-	(0)
Gain on sale of property,plant and equipment		(135)	(103)
Unrealised foreign exchange gain, net		(95)	(13)
Liabilities no longer required, written back		-	(5)
Operating profit before working capital changes		**8,595**	**9,620**
Changes in working capital:			
Changes in trade payables		(428)	(60)
Changes in employee benefit obligations		254	171
Changes in other financial liabilities		(64)	25
Changes in other liabilities		6	59
Changes in other financial assets		(73)	(25)
Changes in loans		(25)	(11)
Changes in other assets		85	(591)
Changes in inventories		(825)	(889)
Changes in trade receivables		1,212	(1,491)
Cash generated from operating activities		**8,737**	**6,808**
Income taxes paid (net)		(1,749)	(2,044)
Net cash generated from operating activities	A	**6,988**	**4,764**
Cash flows from investing activities			
Purchase of property, plant and equipment		(4,470)	(4,224)
Proceeds from sale of property, plant and equipment		178	177
Purchase of intangible assets		(48)	(18)
Investments in subsidiaries		(45)	(74)
Loans given to subsidiary companies, net		(398)	(46)
Loans given to others		(20)	-
Payments for purchase of investments other than subsidiaries		(908)	(481)
Movement in other bank balances, net		(892)	(1,496)
Interest received		525	98
Deposits with financial institutions		(374)	(5,249)
Dividends received		0	2
Net cash used in investing activities	B	**(6,452)**	**(11,311)**

Cash Flow Statement

for the year ended 31st March 2019

(All amounts in ₹ millions, except share data and where otherwise stated)

		31 March 2019	31 March 2018
Cash flows from financing activities			
Proceeds from issue of shares		0	8,959
Buy-back of shares, including transaction costs		(1,347)	-
(Repayments) / proceeds from current borrowings, net		2,115	(476)
Dividends paid to Company's shareholders		(1,106)	(1,811)
Changes in the unclaimed dividend bank balances		(2)	(3)
Interest paid		(182)	(149)
Net cash (used in) / from financing activities	C	**(522)**	**6,520**
Net increase / (decrease) in cash and cash equivalents	(A+B+C)	**14**	**(27)**
Cash and cash equivalents as at the beginning of the year		101	128
Cash and cash equivalents as at the end of the year [Refer Note 15]		**115**	**101**

This is the Standalone Cash Flow Statement referred to in our report of even date.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No. 108840

Place: Hyderabad
Date: 27th May, 2019

For and on behalf of the Board of Directors
NATCO Pharma Limited

V.C. Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

M. Adinarayana
Company Secretary & Vice President
(Legal & Corporate Affairs)

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 27th May, 2019

Statement of Changes in Equity

for the year ended 31st March 2019

(All amounts in ₹ millions, except share data and where otherwise stated)

A Equity Share Capital

	Notes	Number of shares	Amount
As at 1 April 2017		**17,43,07,800**	**349**
Changes in equity share capital	17	1,01,85,600	20
As at 31 March 2018		**18,44,93,400**	**369**
Changes in equity share capital	17	(17,46,921)	(4)
As at 31 March 2019		**18,27,46,479**	**365**

B Other equity

	Reserves and Surplus						Other comprehensive income		
	Securities premium	Capital reserve	Capital redemption reserve	General reserve	Share options outstanding account	Retained earnings	Gain/(loss) on FVTOCI equity securities	Remeasurement of defined benefit plans	Total
Balance as at 1 April 2017	**6,178**	**207**	**5**	**595**	**154**	**9,544**	**42**	**(77)**	**16,648**
Profit for the year	-	-	-	-	-	6,982	-	-	6,982
Other comprehensive income (net of taxes)	-	-	-	-	-	-	(5)	(42)	(47)
Issue of equity shares	9,130	-	-	-	-	-	-	-	9,130
Share issue expenses	(191)	-	-	-	-	-	-	-	(191)
Employee stock option expense	-	-	-	-	180	-	-	-	180
Dividend paid	-	-	-	-	-	(1,509)	-	-	(1,509)
Tax on distributed profits	-	-	-	-	-	(308)	-	-	(308)
Share options exercised	92	-	-	-	(92)	-	-	-	-
Balance as at 31 March 2018	**15,209**	**207**	**5**	**595**	**242**	**14,709**	**37**	**(119)**	**30,885**
Profit for the year	-	-	-	-	-	6,671	-	-	6,671
Other comprehensive income (net of taxes)	-	-	-	-	-	-	(6)	(85)	(91)
Employee stock option expense	-	-	-	-	253	-	-	-	253
Dividend paid	-	-	-	-	-	(919)	-	-	(919)
Tax on distributed profits	-	-	-	-	-	(189)	-	-	(189)
Share options exercised	186	-	-	-	(186)	-	-	-	-
Buyback of shares	(1,325)	-	-	-	-	-	-	-	(1,325)
Share buyback expenses	(18)	-	-	-	-	-	-	-	(18)
Transfer from securities premium on account of buyback of equity shares	(4)	-	4	-	-	-	-	-	-
Balance as at 31 March 2019	**14,048**	**207**	**9**	**595**	**309**	**20,272**	**31**	**(204)**	**35,267**

This is the Standalone Statement of Changes in Equity referred to in our report of even date.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No. 108840

Place: Hyderabad
Date: 27th May, 2019

For and on behalf of the Board of Directors
NATCO Pharma Limited

V.C. Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

M. Adinarayana
Company Secretary & Vice President
(Legal & Corporate Affairs)

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 27th May, 2019

Notes

Summary of significant accounting policies and other explanatory information

1. General information

NATCO Pharma Limited ("the Company") is a public limited company domiciled and incorporated in India in accordance with the provisions of the Companies Act, 1956. The registered office of the Company is at NATCO House, Road No. 2, Banjara Hills, Hyderabad – 500034. The equity shares of the Company are listed on the National Stock Exchange and Bombay Stock Exchange.

The Company is engaged in the business of pharmaceuticals which comprises research and development, manufacturing and selling of bulk drugs and finished dosage formulations. The Company has manufacturing facilities in India which caters to both domestic and international markets including regulated markets like United States of America and Europe.

These financial statements for the year ended 31st March 2019 were authorized and approved for issue by the Board of Directors on 27th May, 2019.

2. Basis of preparation

The financial statements of the Company have been prepared in accordance with the Indian Accounting Standards ("Ind AS") as notified under section 133 of the Companies Act 2013 ("the Act") read with the Companies (Indian Accounting Standards) Rules 2015 issued by Ministry of Corporate Affairs ('MCA'), as amended from time to time. The Company has uniformly applied the accounting policies during the periods presented.

These financial statements have been prepared for the Company as a going concern on the basis of relevant Ind AS that are effective at the Company's annual reporting date 31st March, 2019.

These financial statements have been prepared on the historical cost convention and on an accrual basis except for the following material items in the balance sheet:

- Certain financial assets and liabilities which are measured at fair value; and
- Share based payments which are measured at fair value of the options.
- Defined benefit plan assets which are measured at fair value.

3. Standards, not yet effective and have not been adopted early by the Company

a) Ind AS 12, Appendix C, Uncertainty over Income Tax Treatments:

On 30th March, 2019, the Ministry of Corporate Affairs has notified Ind AS 12, Appendix C, Uncertainty over Income Tax Treatments which is to be applied while performing the determination of taxable profit (or loss), tax bases, unused tax losses, unused tax credits and tax rates, when there is uncertainty over income tax treatments under Ind AS 12. According to the appendix, companies need to determine the probability of the relevant tax authority accepting each tax treatment, or group of tax treatments, that the companies have used or plan to use in their income tax filing which has to be considered to compute the most likely amount of the expected value of the tax treatment when determining taxable profit (tax loss), tax bases, unused tax losses, unused tax credits and tax rates.

The standard permits two possible methods of transition:

- Full retrospective approach – Under this approach Appendix C will be applied retrospectively to each prior reporting period presented in accordance with Ind AS 8, Accounting Policies, Changes in Accounting Estimates and Errors, without using hindsight, and
- Retrospectively with cumulative effect of initially applying Appendix C recognised by adjusting equity on initial application, without adjusting comparatives

The Company is currently assessing the detailed financial impact of this standard on its standalone financial statements.

b) Ind AS 116, Leases:

Ind AS 116 removes the current distinction between operating and finance leases and requires recognition of an asset (the right to

Notes

Summary of significant accounting policies and other explanatory information

use the leased item) and a financial liability (the obligation to pay rentals). An optional exemption exists for short-term and low value leases. The standard may not have a significant impact on the Company's financial statements considering the number of assets under operating lease arrangement as at 31st March, 2019. On implementation of Ind AS 116, the operating lease charges will be replaced with interest and depreciation expenses. These changes will affect key ratios like profit margin, operating margin, EBITDA margin etc. Further, operating cash flows will be higher as cash payments for the principal portion of the lease liability will be classified within financing activities.

The effect on adoption of Ind AS 116 would be insignificant in the standalone financial statements.

c) Amendment to Ind AS 12, Income Taxes:
On 30 March 2019, the Ministry of Corporate Affairs issued amendments to the guidance in Ind AS 12, Income Taxes, in connection with accounting for dividend distribution taxes.

The amendment clarifies that an entity shall recognise the income tax consequences of dividends in profit or loss, other comprehensive income or equity according to where the entity originally recognised those past transactions or events.

Effective date for application of this amendment is annual period beginning on or after 1st April, 2019. The Company is currently evaluating the effect of this amendment on the standalone financial statements.

4. Summary of significant accounting policies

The financial statements have been prepared using the accounting policies and measurement basis summarized below:

a. Current versus non-current classification
The Company presents assets and liabilities in the balance sheet based on current/ non-current classification.

An asset is classified as current when it is:

- Expected to be realised or intended to sold or consumed in normal operating cycle
- Held primarily for the purpose of trading
- Expected to be realised within twelve months after the reporting period, or
- Cash or cash equivalent unless restricted from being exchanged or used to settle a liability for at least twelve months after the reporting period

All other assets are classified as non-current.

A liability is classified as current when:

- It is expected to be settled in normal operating cycle
- It is held primarily for the purpose of trading
- It is due to be settled within twelve months after the reporting period, or
- There is no unconditional right to defer the settlement of the liability for at least twelve months after the reporting period

All other liabilities are classified as non-current.

Deferred tax assets and liabilities are classified as non-current assets and liabilities.

b. Foreign currency

Functional and presentation currency
The financial statements are presented in Indian Rupee ('INR' or '₹') which is also the functional and presentation currency of the Company.

Transactions and balances
Foreign currency transactions are recorded in the functional currency, by applying to the exchange rate between the functional currency and the foreign currency at the date of the transaction.

Foreign currency monetary items are converted to functional currency using the closing rate. Non-monetary items denominated in a foreign currency which are carried at historical cost are reported using the exchange rate at the date of

Notes

Summary of significant accounting policies and other explanatory information

the transaction; and non-monetary items which are carried at fair value or any other similar valuation denominated in a foreign currency are reported using the exchange rates that existed when the values were determined.

Exchange differences arising on monetary items on settlement, or restatement as at reporting date, at rates different from those at which they were initially recorded, are recognized in the statement of profit and loss in the year in which they arise.

c. Revenue recognition

The Company derives revenues primarily from sale of finished dosage formulations, active pharmaceutical ingredients (APIs), including niche and technically complex molecules.

The Company has adopted Ind AS 115 - Revenue from Contracts with Customers, using modified retrospective application method with effect from 1st April 2018 and accordingly these financial statements are prepared in accordance with the recognition and measurement principles laid down in Ind AS 115. Also, the application of Ind AS 115 did not have any significant impact on recognition and measurement of revenue and related items in the financial statements of the Company.

Revenue is recognized on satisfaction of performance obligation upon transfer of control of promised products or services to customers for an amount that reflects the consideration the Company expects to receive in exchange for those products or services.

The Company does not expect to have any contracts where the period between the transfer of the promised goods or services to the customer and payment by the customer exceeds one year. As a consequence, it does not require to adjust any of the transaction prices for the time value of money.

Income from profit-sharing arrangements with collaboration partners is recognised as underlying sales and cost of sales are recorded by the collaboration partners.

Other operating revenue - Export incentives

Export Incentives under various schemes are accounted in the year of export.

Other income - Interest income

Interest income is recognized on time proportion basis taking into account the amount outstanding and rate applicable. For all debt instruments measured at amortised cost, interest income is recorded using the effective interest rate (EIR) method.

Other income - Dividend income

Dividend income is recognised when the Company's right to receive the payment is established, which is generally, when shareholders approve the dividend.

d. Borrowing costs

Borrowing costs directly attributable to the acquisition, construction or production of a qualifying asset are capitalized during the period of time that is necessary to complete and prepare the asset for its intended use or sale. A qualifying asset is one that necessarily takes substantial period of time to get ready for its intended use. All other borrowing costs are charged to the Statement of Profit and Loss as incurred.

e. Property, plant and equipment (PPE)

Recognition and initial measurement

Property, plant and equipment are stated at their cost of acquisition. The cost comprises purchase price, borrowing cost if capitalization criteria are met and directly attributable cost of bringing the asset to its working condition for the intended use. Any trade discount and rebates are deducted in arriving at the purchase price.

Subsequent costs are included in the asset's carrying amount or recognised as a separate asset, as appropriate, only when it is probable that future economic benefits associated with the item will flow to the Company. All other

Notes

Summary of significant accounting policies and other explanatory information

repair and maintenance costs are recognised in statement of profit or loss as incurred.

Subsequent measurement (depreciation and useful lives)
Depreciation on property, plant and equipment is provided on the straight-line method, computed on the basis of useful lives as estimated by management which coincides with rates prescribed in Schedule II to the Companies Act, 2013.

Cost of the leasehold land is amortized on a straight-line basis over the term of the lease.

The residual values, useful lives and method of depreciation are reviewed at each financial year end and adjusted prospectively, if appropriate.

Depreciation
Depreciation on the addition/disposals is charged on pro-rata basis from/until the date of such addition/disposal.

De-recognition
An item of property, plant and equipment and any significant part initially recognised is derecognised upon disposal or when no future economic benefits are expected from its use or disposal. Any gain or loss arising on de-recognition of the asset (calculated as the difference between the net disposal proceeds and the carrying amount of the asset) is included in the statement of profit and loss, when the asset is derecognised.

f. Intangible assets

Recognition and initial measurement
Intangible assets (software) are stated at their cost of acquisition. The cost comprises purchase price, borrowing cost if capitalization criteria are met and directly attributable cost of bringing the asset to its working condition for the intended use.

Subsequent measurement (amortisation)
The cost of capitalized software is amortized over a period of 6 years, on a straight line basis. Amortisation on the addition/disposals is charged on pro-rata basis from/until the date of such addition/disposal.

g. Government grants
The Company recognises government grants only when there is reasonable assurance that the conditions attached to them will be complied with, and the grants will be received. Government grants received in-relation to assets are presented as a reduction to the carrying amount of the related asset. Grants related to reimbursement of expenses incurred are recognized in statement of profit and loss as other income.

h. Operating leases
Where the lessor effectively retains all risk and benefits of ownership of the leased items, such leases are classified as operating leases. Operating lease payments are recognised as an expense in the Statement of profit and loss on a straight line basis. (Refer 3b. above)

i. Impairment of non-financial assets
At each reporting date, the Company assesses whether there is any indication that an asset may be impaired, based on internal or external factors. If any such indication exists, the Company estimates the recoverable amount of the asset or the cash generating unit. If such recoverable amount of the asset or cash generating unit to which the asset belongs is less than its carrying amount, the carrying amount is reduced to its recoverable amount. The reduction is treated as an impairment loss and is recognized in the statement of profit and loss. If, at the reporting date there is an indication that a previously assessed impairment loss no longer exists, the recoverable amount is reassessed and the asset is reflected at the recoverable amount. Impairment losses previously recognized

Notes

Summary of significant accounting policies and other explanatory information

are accordingly reversed in the statement of profit and loss.

j. Financial instruments

Financial assets

Initial recognition and measurement

All financial assets are recognised initially at fair value and transaction cost that is attributable to the acquisition of the financial asset is also adjusted.

Subsequent measurement

i. Debt instruments at amortised cost – A 'debt instrument' is measured at the amortised cost if both the following conditions are met:

- The asset is held within a business model whose objective is to hold assets for collecting contractual cash flows, and
- Contractual terms of the asset give rise on specified dates to cash flows that are solely payments of principal and interest (SPPI) on the principal amount outstanding.

After initial measurement, such financial assets are subsequently measured at amortised cost using the effective interest rate (EIR) method.

ii. Equity investments – All equity investments in scope of Ind-AS 109 are measured at fair value. Equity instruments which are held for trading are generally classified at fair value through profit and loss (FVTPL). For all other equity instruments, the Company decides to classify the same either as at fair value through other comprehensive income (FVOCI) or fair value through profit and loss (FVTPL). The Company makes such election on an instrument by instrument basis. The classification is made on initial recognition and is irrevocable.

iii. Mutual funds – All mutual funds in scope of Ind-AS 109 are measured at fair value through other comprehensive income (FVTOCI).

De-recognition of financial assets

A financial asset is primarily de-recognised when the rights to receive cash flows from the asset have expired or the Company has transferred its rights to receive cash flows from the asset.

Financial liabilities

Initial recognition and measurement

All financial liabilities are recognised initially at fair value and transaction cost that is attributable to the acquisition of the financial liabilities is also adjusted. These liabilities are classified as amortised cost.

Subsequent measurement

These liabilities include borrowings and deposits. Subsequent to initial recognition, these liabilities are measured at amortised cost using the effective interest method.

De-recognition of financial liabilities

A financial liability is de-recognised when the obligation under the liability is discharged or cancelled or expires. When an existing financial liability is replaced by another from the same lender on substantially different terms, or the terms of an existing liability are substantially modified, such an exchange or modification is treated as the de-recognition of the original liability and the recognition of a new liability. The difference in the respective carrying amounts is recognised in the statement of profit or loss.

Financial guarantee contracts

Financial guarantee contracts are those contracts that require a payment to be made to reimburse the holder for a loss it incurs because the specified party fails to make a payment when due in accordance with the terms of a debt instrument. Financial guarantee contracts are recognised initially as a liability at fair value, adjusted for transaction costs that are directly attributable to the issuance of the guarantee. Subsequently, the liability is measured at the higher of the amount of expected loss allowance determined as per impairment requirements of Ind-AS 109 and the amount recognised less cumulative amortisation.

Notes

Summary of significant accounting policies and other explanatory information

Offsetting of financial instruments

Financial assets and financial liabilities are offset and the net amount is reported in the balance sheet if there is a currently enforceable legal right to offset the recognised amounts and there is an intention to settle on a net basis, to realise the assets and settle the liabilities simultaneously.

k. Impairment of financial assets

In accordance with Ind-AS 109, the Company applies expected credit loss (ECL) model for measurement and recognition of impairment loss for financial assets.

ECL is the difference between all contractual cash flows that are due to the Company in accordance with the contract and all the cash flows that the Company expects to receive. When estimating the cash flows, the Company is required to consider –

- All contractual terms of the financial assets (including prepayment and extension) over the expected life of the assets.
- Cash flows from the sale of collateral held or other credit enhancements that are integral to the contractual terms.

Trade receivables

The Company applies approach permitted by Ind AS 109 Financial Instruments, which requires expected lifetime losses to be recognised from initial recognition of receivables.

Other financial assets

For recognition of impairment loss on other financial assets and risk exposure, the Company determines whether there has been a significant increase in the credit risk since initial recognition and if credit risk has increased significantly, impairment loss is provided.

l. Investment in instruments of subsidiaries

Investments in subsidiaries are recognised at cost as per Ind AS 27. Such investments are accounted for in accordance with Ind AS 105, Non-current Assets Held for Sale and Discontinued Operations, when they are classified as held for sale. Impairment in the cost of these investments is recognised in accordance with the principles given under para 4(i) above.

m. Inventories

Raw material, packaging material, stores and spare parts are carried at cost or net realisable value, whichever is lower. Cost includes purchase price excluding taxes those are subsequently recoverable by the Company from the concerned authorities, freight inwards and other expenditure incurred in bringing such inventories to their present location and condition. Cost of inventories is determined using the weighted average cost method.

The carrying cost of raw materials, packing materials, stores and spare parts are appropriately written down when there is a decline in replacement cost of such materials and finished products in which they will be incorporated are expected to be sold below cost.

Finished goods and work in progress are also valued at the lower of cost and net realizable value. Cost of work in progress and manufactured finished goods is determined on weighted average basis and comprises cost of direct material, cost of conversion and other costs incurred in bringing these inventories to their present location and condition. Cost of traded goods is determined on weighted average basis.

n. Income taxes

Tax expense recognized in statement of profit or loss comprises the sum of deferred tax and current tax except the ones recognized in other comprehensive income or directly in equity.

Calculation of current tax is based on tax rates and tax laws that have been enacted for the reporting period. Current income tax relating to items recognised outside profit or loss is recognised outside profit or loss (either in other comprehensive income or in equity). Current tax items are recognised in correlation to the underlying transaction either in other comprehensive income or directly in equity.

Notes

Summary of significant accounting policies and other explanatory information

Deferred tax is provided using the liability method on temporary differences between the tax bases of assets and liabilities and their carrying amounts for financial reporting purposes at the reporting date. Deferred tax assets are recognized to the extent that it is probable that the underlying tax loss or deductible temporary difference will be utilized against future taxable income. This is assessed based on the Company's forecast of future operating results, adjusted for significant non-taxable income and expenses and specific limits on the use of any unused tax loss or credit. The carrying amount of deferred tax assets is reviewed at each reporting date and reduced to the extent that it is no longer probable that sufficient taxable profit will be available to allow all or part of the deferred tax asset to be utilised. Unrecognised deferred tax assets are re-assessed at each reporting date and are recognised to the extent that it has become probable that future taxable profits will allow the deferred tax asset to be recovered. Deferred tax assets and liabilities are measured at the tax rates that are expected to apply in the year when the asset is realised or the liability is settled, based on tax rates (and tax laws) that have been enacted or substantively enacted at the reporting date. Deferred tax relating to items recognised outside profit or loss is recognised outside profit or loss (either in other comprehensive income or in equity).

o. Cash and cash equivalents

Cash and cash equivalents comprise cash on hand, demand deposits, other short-term highly liquid investments (original maturity of 3 months or less) that are readily convertible into known amounts of cash and which are subject to an insignificant risk of changes in value.

p. Post-employment, long term and short term employee benefits

Defined contribution plan

The Company's contribution to provident fund and employee state insurance schemes is charged to the statement of profit and loss. The Company's contributions towards Provident Fund are deposited with the Regional Provident Fund Commissioner under a defined contribution plan.

Defined benefit plan

The Company has gratuity as defined benefit plan where the amount that an employee will receive on retirement is defined by reference to the employee's length of service and final salary. The liability recognised in the balance sheet for defined benefit plans is the present value of the defined benefit obligation (DBO) at the reporting date net of fair value of plan assets. Management estimates the DBO annually with the assistance of independent actuaries, by adopting the projected unit credit method. Actuarial gains and losses resulting from re-measurements of the liability are included in other comprehensive income.

The Company has subscribed to a group gratuity scheme of Life Insurance Corporation of India (LIC). Under the said policy, the eligible employees are entitled for gratuity upon their resignation, retirement or in the event of death in lumpsum after deduction of necessary taxes upto a maximum limit of ₹ 2. Liabilities in respect of the Gratuity Plan are determined by an actuarial valuation, based upon which the Company makes contributions to the Gratuity Fund.

Other long-term employee benefits

The Company also provides benefit of compensated absences to its employees which are in the nature of long -term benefit plan. Liability in respect of compensated absences becoming due and expected to be availed more than one year after the balance sheet date is estimated on the basis of an actuarial valuation performed by an independent actuary using the projected unit credit method as on the reporting date. Actuarial gains and losses arising from experience adjustments and changes in actuarial assumptions are recorded in the statement of profit and loss in the year in which such gains or losses arise.

Short-term employee benefits

Short-term employee benefits comprise of employee costs such as salaries, bonus etc. is recognized on the basis of the amount paid or payable for the period during which services are rendered by the employee.

Notes

Summary of significant accounting policies and other explanatory information

q. Share based payments

Certain employees of the Company are entitled to remuneration in the form of equity settled instruments, for rendering services over a defined vesting period. Equity instruments granted are measured by reference to the fair value of the instrument at the date of grant. The fair value determined at the grant date is expensed over the vesting period of the respective tranches of such grants. The stock compensation expense is determined based on the Company's estimate of equity instruments that will eventually vest using fair value in accordance with Ind AS 102, Share based payment.

The employee benefits expense is measured using the fair value of the employee stock options and is recognised over vesting period with a corresponding increase in equity. The vesting period is the period over which all the specified vesting conditions are to be satisfied.

r. Provisions, contingent liabilities and contingent assets

Provisions are recognized only when there is a present obligation, as a result of past events, and when a reliable estimate of the amount of obligation can be made at the reporting date. These estimates are reviewed at each reporting date and adjusted to reflect the current best estimates. Provisions are discounted to their present values, where the time value of money is material.

Contingent liability is disclosed for:

- Possible obligations which will be confirmed only by future events not wholly within the control of the Company; or
- Present obligations arising from past events where it is not probable that an outflow of resources will be required to settle the obligation or a reliable estimate of the amount of the obligation cannot be made.

Contingent assets are neither recognized nor disclosed. However, when realization of income is virtually certain, related asset is recognized.

s. Earnings per share

Basic earnings per share is calculated by dividing the net profit or loss for the period attributable to equity shareholders (after deducting attributable taxes) by the weighted average number of equity shares outstanding during the period. The weighted average number of equity shares outstanding during the period is adjusted for events including a bonus issue.

For the purpose of calculating diluted earnings per share, the net profit or loss for the period attributable to equity shareholders and the weighted average number of shares outstanding during the period are adjusted for the effects of all dilutive potential equity shares.

5. Estimates and assumptions

The key assumptions concerning the future and other key sources of estimation uncertainty at the reporting date, that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year, are described below. The Company based its assumptions and estimates on parameters available when the financial statements were prepared. Existing circumstances and assumptions about future developments, however, may change due to market changes or circumstances arising that are beyond the control of the Company.

Recognition of deferred tax assets – The extent to which deferred tax assets can be recognized is based on an assessment of the probability of the Company's future taxable income against which the deferred tax assets can be utilized. In addition, significant judgement is required in assessing the impact of any legal or economic limits or uncertainties in various tax jurisdictions.

Recognition of deferred tax liability on undistributed profits: The extent to which the Company can control the timing of reversal of deferred tax liability on undistributed profits of its subsidiaries requires judgement.

Evaluation of indicators for impairment of assets: The evaluation of applicability of indicators of impairment of assets requires assessment of several

Notes

Summary of significant accounting policies and other explanatory information

external and internal factors which could result in deterioration of recoverable amount of the assets.

Recoverability of advances/receivables: At each balance sheet date, based on historical default rates observed over expected life, the management assesses the expected credit loss on outstanding receivables and advances.

Useful lives of depreciable/amortisable assets: Management reviews its estimate of the useful lives of depreciable/amortisable assets at each reporting date, based on the expected utility of the assets. Uncertainties in these estimates relate to technical and economic obsolescence that may change the utility of certain software, customer relationships, IT equipment and other plant and equipment.

Defined benefit obligation (DBO): Management's estimate of the DBO is based on a number of critical underlying assumptions such as standard rates of inflation, mortality, discount rate and anticipation of future salary increases. Variation in these assumptions may significantly impact the DBO amount and the annual defined benefit expenses.

Fair value measurements: Management applies valuation techniques to determine the fair value of financial instruments (where active market quotes are not available) and non-financial assets. This involves developing estimates and assumptions consistent with how market participants would price the instrument. Management uses the best information available. Estimated fair values may vary from the actual prices that would be achieved in an arm's length transaction at the reporting date.

Provisions: At each balance sheet date basis the management judgment, changes in facts and legal aspects, the Company assesses the requirement of provisions against the outstanding warranties and guarantees. However, the actual future outcome may be different from this judgement.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

6. Property, plant and equipment

	Freehold land	Leasehold land	Buildings	Plant and equipment	Office equipment	Furniture	Vehicles	Computers	Total
Gross carrying amount									
At 1 April 2017	1,456	262	2,987	6,222	32	114	170	139	11,382
Additions	376	-	596	1,510	3	36	33	21	2,575
Disposals/retirement	63	-	-	40	-	0	4	-	107
Balance as at 31 March 2018	**1,769**	**262**	**3,583**	**7,692**	**35**	**150**	**199**	**160**	**13,850**
Additions	363	-	789	1,547	1	39	35	18	2,792
Disposals/retirement	41	-	-	3	-	-	10	-	54
Balance as at 31 March 2019	**2,091**	**262**	**4,372**	**9,236**	**36**	**189**	**224**	**178**	**16,588**
Accumulated depreciation									
Up to 1 April 2017	-	5	614	2,271	27	41	80	110	3,148
Charge for the year	-	3	109	473	2	11	22	18	638
Adjustments for disposals/retirement	-	-	-	29	-	-	3	-	32
Balance as at 31 March 2018	**-**	**8**	**723**	**2,715**	**29**	**52**	**99**	**128**	**3,754**
Charge for the year	-	3	126	588	2	16	24	19	778
Adjustments for disposals/retirement	-	-	-	2	-	-	9	-	11
Balance as at 31 March 2019	**-**	**11**	**849**	**3,301**	**31**	**68**	**114**	**147**	**4,521**
Net book value as at 31 March 2018	1,769	254	2,860	4,977	6	98	100	32	10,096
Net book value as at 31 March 2019	**2,091**	**251**	**3,523**	**5,935**	**5**	**121**	**110**	**31**	**12,067**

(i) Contractual obligations

Refer to note 39 for disclosure of contractual commitments for the acquisition of property, plant and equipment.

(ii) Leasehold land includes land acquired from the State Industrial Development Corporation of Uttarakhand Limited, Uttar Pradesh State Industrial Development Corporation Limited for a period of 90 years and 87 years respectively. Further the Company has also acquired land from Ramky Pharma City (India) Limited under a lease arrangement for a period of 33 years which is renewable for a further period of 2 terms of 33 years each.

(iii) During the year, the Company was provisionally alloted a parcel of land from Andhra Pradesh Industrial Infrastructure Corporation Limited ('APIIC') in Attivaram, Nellore Disctrict, Andhra Pradesh for a consideration of ₹ 66 which shall be registered in the name of the Company based on fulfillment of certain conditions laid down by APIIC.

(iv) Capital work-in-progress^

31 March 2019	6,375
31 March 2018	4,800

^Capital-work-in-progress mainly relates to expansion projects on-going at Company's existing facilities and new projects under implementation.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

7. Intangible assets

	Computer Software	Total
Gross carrying amount		
As at 1 April 2017	128	128
Additions	18	18
As at 31 March 2018	**146**	**146**
Additions	48	48
As at 31 March 2019	**194**	**194**
Accumulated amortization		
Up to 1 April 2017	72	72
Charge for the year	17	17
Up to 31 March 2018	**89**	**89**
Charge for the year	23	23
Up to 31 March 2019	**112**	**112**
Net carrying amount		
As at 31 March 2018	57	57
As at 31 March 2019	**82**	**82**

8. Investment in subsidiaries (At cost)

	31 March 2019	31 March 2018
Non-current		
Investment in equity instruments, unquoted		
1,000 (31 March 2018: 1,000) fully paid-up, common shares of US$1,000 each in NATCO Pharma Inc., Delaware, United States of America.	42	42
1,061,612 (31 March 2018: 1,061,612) equity shares of US$10 each, fully paid-up in Time Cap Overseas Limited * Mauritius	638	638
Share application money pending allotment in Time Cap Overseas Limited	2	-
2,783,813 (31 March 2018: 2,783,813) equity shares of Canadian Dollar 1 each, fully paid-up in NATCO Pharma (Canada) Inc. Canada	145	145
1,845,000 (31 March 2018: 1,370,000) equity shares of Singapore Dollar 1 each, fully paid-up in NATCO Pharma Asia PTE Ltd. Singapore	89	65
978,572 (31 March 2018: 853,572) equity shares of Australian Dollar 1 each, fully paid-up in NATCO Pharma Australia PTY Ltd	49	42
103,995 (31 March 2018: Nil) equity shares of 100PHP each fully paid-up in NATCO Lifesciences Philippines Inc.	12	-
	977	**932**
Aggregate book value of unquoted investments	977	932
Aggregate amount of impairment in the value of investments	-	-

*The Company through its subsidiary Timecap Overseas Limited ("Timecap") has made investments in NATCO farma Do Brasil Ltda. ('NATCO Brazil'), which is engaged in marketing of pharmaceutical products in Brazil. The Company indirectly holds 90.90% of NATCO Brazil through Timecap and NATCO Pharma Inc. During the year ended 31st March, 2019, NATCO Brazil reported a loss of ₹ 226 and as at that date its accumulated losses aggregating ₹ 817 have substantially eroded its net worth which indicates a possible impairment in the carrying value of the investment. Accordingly, the management with the help of a valuation specialist, has carried out an impairment assessment and concluded that the estimated recoverable amount computed using value-in-use method, is higher than the carrying value of the investment in Timecap and accordingly, there is no impairment. Determination of recoverable amount using Discounted Cash Flow (DCF) valuation method by the independent valuer involved consideration of key assumptions including, but are not limited to, projections of future cash flows, growth rates, discounts rates, estimated future operating expenditure. The planning horizon reflects the assumptions for short-to-mid term market developments which are based on key assumptions such as margins, expected growth rates based on past experience and management's

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Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

expectations / extrapolation of normal increase / steady terminal growth rate. Discount rate reflects the current market assessment of the risks. The discount rate is estimated based on the weighted average cost of capital for NATCO Brazil. The management based on sensitivity analysis performed believes that any reasonable possible change in the key assumptions would not cause the aggregate carrying amount to exceed the aggregate recoverable amount of the investment.

Details of proportion of ownership and voting rights

Name of the subsidiaries	Country of Incorporation	Percentage holding/interest (%)	
		31 March 2019	31 March 2018
NATCO Pharma, Inc.,	United States of America	100.00	100.00
Time Cap Overseas Limited	Mauritius	90.36	89.81
NATCO Farma Do Brazil	Brazil	90.90	88.30
NATCO Pharma (Canada), Inc.	Canada	99.04	99.04
NATCO Pharma Asia Pte. Ltd.	Singapore	99.73	100.00
NATCO Pharma Australia PTY Ltd.	Australia	100.00	100.00
NATCO Lifesciences Philippines Inc.	Philippines	100.00*	-

* includes the shares held by the nominee shareholders of the subsidiaries on behalf of the Company.

9. Investments

		31 March 2019	31 March 2018
I.	**Non-current (At fair value through other comprehensive income)**		
	Investment in equity instruments		
	Unquoted		
	4,054 (31 March 2018: 4,054) shares of 1BYR NATIVITA Joint Limited Liability Company	0	0
	30 (31 March 2018: Nil) shares of Euro 0.5 per share of Pharnasanta B.V	0	-
	750 (31 March 2018: 750) equity shares of ₹ 100 each, fully paid-up, in Jeedimetla Effluent Treatment Limited	0	0
	139,451 (31 March 2018: 109,569) equity shares of ₹ 10 each, fully paid-up in OMRV Hospital Private Limited	105	74
	21,769 (31 March 2018: Nil) equity shares of ₹ 10 each, in Veda Seedsciences Private Limited	79	-
	1,060 (31 March 2018: 588) units of ₹ 10,000 each, fully paid-up in Endiya Trust	11	6
	34,400 (31 March 2018: 34,400) equity shares of ₹ 10 each, fully paid-up, in Pattancheru Enviro-Tech Limited	0	0
	27,000 (31 March 2018: 27,000) equity shares of ₹ 10 each, fully paid-up in Jayalakshmi Spinning Mills Limited	0	0
	Total investments in equity instruments (A)	**196**	**81**
	Government securities, unquoted		
	National savings certificates	0	0
	Total investments in government securities (B)	**0**	**0**
	Other investments, unquoted		
	Advance towards investment in Kotak Alternate Investment Plan	3	-
	Total investments in other non-current investments (C)	**3**	**0**
	Total non-current investments (A+B+C)	**199**	**81**
	Less: Provision for diminution in value of investments	0	0
	Aggregate book value of unquoted investments	199	81
	Aggregate amount of impairment in the value of investments	0	0

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

	31 March 2019	31 March 2018
II. Current		
Investments in equity instruments, Quoted (At fair value through other comprehensive income)		
10,000 (31 March 2018: 10,000) equity shares of ₹ 10 each, fully paid-up in Neuland Laboratories Limited	7	7
5,500 (31 March 2018: 5,500) equity shares of ₹ 1 each, fully paid-up in Sun Pharmaceuticals Industries Limited	3	3
778 (31 March 2018: 778) equity shares of ₹ 2 each, fully paid-up in Alkem Laboratories Limited	1	2
15,000 (31 March 2018: 15,000) equity shares of ₹ 1 each, fully paid-up in Cadila Healthcare Limited	5	6
100,000 (31 March 2018: 100,000) equity shares of ₹ 10 each, fully paid-up in Laurus Labs Limited	40	50
150,000(31 March 2018: 150,000) equity shares of ₹ 1 each, fully paid-up in Lanco Infratech Limited	0	0
22,700 (31 March 2018: 22,700) equity shares of ₹ 1 each, fully paid-up in GMR Infrastructure Limited	0	0
50,400 (31 March 2018: 50,400) equity shares of ₹ 1 each, fully paid-up in GVK Power & Infrastructure Limited	0	1
50,000 (31 March 2018: 50,000) equity shares of ₹ 1 each, fully paid-up in Panacea Biotech Limited	10	13
3,176 (31 March 2018: 3,176) equity shares of ₹ 10 each, fully paid-up in ICICI Prudential Life Insurance Company Limited	1	1
Investments in Debentures, unquoted (At amortised cost)		
12,000 (31 March 2018: 2,000) non-convertible debentures of ₹ 100,000 in Citicorp Finance India Limited	1,200	200
Nil (31 March 2018: 200) non-convertible debentures of ₹ 1,000,000 in Citicorp Finance India Limited	-	200
Total current investments	**1,268**	**483**
Aggregate book value of unquoted investments	1,200	400
Aggregate book value of quoted investments	68	83
Aggregate market value of quoted investments	68	83
Aggregate amount of impairment in the value of investments	-	-

10. Loans

(Unsecured, considered good)

	31 March 2019	31 March 2018
Non-current		
Loans to related parties*	476	78
Loans to others	20	-
	496	**78**
* The above loans have been given to the subsidaries solely in connection with its business operations.		
Current		
Loans to employees	70	46
	70	**46**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

11. Other financial assets

	31 March 2019	31 March 2018
Non-current		
Security deposits	99	87
Restricted deposits*	60	57
Interest accrued on deposits	5	5
	164	**149**
*Given against bank guarantees/performance guarantees		
Current		
Deposits with financial institutions	6,316	5,942
Interest accrued on fixed deposits and loans	565	179
Other advances	78	19
	6,959	**6,140**

12. Other assets

	31 March 2019	31 March 2018
Non-current		
Capital advances	492	575
Prepaid leasehold	18	18
Balances with statutory authorities	17	16
	527	**609**
Current		
Advances to material/service providers	564	193
Prepaid expenses	137	125
Export incentives receivable	304	228
Balances with statutory authorities	745	1,288
	1,750	**1,834**

13. Inventories

	31 March 2019	31 March 2018
Raw materials [including goods-in-transit of ₹ 4 (31 March 2018: ₹ 16)]	2,111	1,587
Packing materials	258	193
Work-in-progress	1,405	1,239
Finished goods	735	621
Stores and spares [including goods-in-transit of ₹ 44 (31 March 2018: ₹ 26)]	562	580
Stock-in-trade	13	38
	5,084	**4,258**

During the year, ₹ 2 (31st March , 2018: ₹ 87) was recognised as an expense for valuing the inventories at net realisable value.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

14. Trade receivables

	31 March 2019	31 March 2018
Trade receivables		
- Unsecured, receivables considered good	4,916	6,060
- Unsecured, receivables with significant increase in credit risk	-	-
	4,916	**6,060**
Less: Allowance for trade receivables	-	-
	4,916	**6,060**

15. Cash and cash equivalents

	31 March 2019	31 March 2018
Balances with banks in current accounts	96	86
Cash on hand	19	15
	115	**101**

There are no repatriation restrictions with regard to cash and cash equivalents as at the end of the reporting period.

16. Bank balances other than cash and cash equivalents

	31 March 2019	31 March 2018
Bank deposits		
- With maturity of more than three months and upto twelve months	2,490	1,600
- In unclaimed dividend accounts	22	20
	2,512	**1,620**

17. Equity share capital

i. Authorised share capital

	31 March 2019		31 March 2018	
	Number	Amount	Number	Amount
Equity shares of ₹ 2 each	20,00,00,000	400	20,00,00,000	400

ii. Issued, subscribed and fully paid up

	31 March 2019		31 March 2018	
	Number	Amount	Number	Amount
Equity shares of ₹ 2 each	18,27,46,479	365	18,44,93,400	369
	18,27,46,479	**365**	**18,44,93,400**	**369**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

iii. Reconciliation of number of equity shares outstanding at the beginning and at the end of the year

	31 March 2019		31 March 2018	
	Number	Amount	Number	Amount
Equity shares				
Balance at the beginning of the year	18,44,93,400	369	17,43,07,800	349
Add: Issued during the year	2,68,735	0	1,01,85,600	20
Less: Bought back during the year and extinguished before year-end*	(18,77,640)	(4)	-	-
	18,28,84,495	**365**	**18,44,93,400**	**369**
Less: Bought back during the year and extinguished after year-end*	(1,38,016)	(0)	-	-
Balance at the end of the year	**18,27,46,479**	**365**	**18,44,93,400**	**369**

*During the year ended 31 March 2019, the Company bought back 2,015,656 equity shares of ₹ 2 each for an aggregate purchase value of ₹ 1,329 at an average price of ₹ 659 per share, excluding transaction costs. Out of the total shares bought back, 1,877,640 equity shares of ₹ 2 each were extinguished before 31 March 2019 and the balance 138,016 equity shares were extinguished in two tranches on 5th April, 2019 and 22nd April, 2019.

iv. Rights, preferences and restrictions attached to equity shares

The Company has only one class of equity shares having a par value of ₹ 2 per share. Each holder of equity shares is entitled to one vote per share. The dividend proposed by the Board of Directors (except interim dividend) is subject to the approval of the shareholders in the ensuing general meeting. In the event of liquidation of the Company, the holders of equity shares will be entitled to receive the remaining assets of the Company, after distribution of all preferential amounts in proportion of their shareholding.

v. Details of shareholder holding more than 5% share capital as at the end of the year

Name of the equity shareholder	31 March 2019		31 March 2018	
	Number	% holding	Number	% holding
V C Nannapaneni*	4,07,51,315	22.30%	4,07,51,315	22.09%
Time Cap Pharma Labs Limited	1,71,57,220	9.39%	1,71,57,220	9.30%
Natsoft Information Systems Private Limited	1,57,67,500	8.63%	1,57,67,500	8.55%

*including shares held in the capacity of Karta of Hindu Undivided Family (HUF) aggregating 5,440,045 (31 March 2018: 5,440,045)

vi. Shares reserved for issue under options

(a) The Company has instituted the NATCO Employee Stock Option Plan 'ESOP-2015', NATCO Employee Stock Option Plan 'ESOP-2016' and NATCO Employee Stock Option Plan 'ESOP-2017' ("the ESOP Schemes"). The ESOP Schemes were formulated in accordance with the Securities Exchange Board of India (Share Based Employee Benefits) Regulations, 2014 issued by the Securities and Exchange Board of India ("SEBI"). Pursuant to the terms of the ESOP Schemes, the Board of Directors of the Company have granted 750,000 options (post split), 174,330 options and 600,000 options to eligible employees on 12th August, 2015, 11th November, 2016 and 2nd November, 2017 respectively. The terms of the ESOP Schemes provide that each option entitles the holder to one equity share of ₹ 2 each (post split) and that the options can be settled only by way of issue of equity shares. The options vest on an annual basis over a period of 4-5 years from the date of grant and the options are entirely time-based with no performance conditions.

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Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

(b) During the year ended 31st March 2019, the Company had accrued stock compensation cost of ₹ 253 (31st March, 2018: ₹ 180) in respect of the ESOP Schemes. The details of options are as follows:

	31 March 2019		31 March 2018	
	Number of options	Weighted average exercise price	Number of options	Weighted average exercise price
Outstanding at the beginning of the year	11,44,380	2	7,90,775	2
Granted during the year	-	-	6,00,000	2
Exercised during the year	2,68,735	2	1,85,600	2
Forfeited during the year	27,330	2	60,795	2
Outstanding at the end of the year	8,48,315	2	11,44,380	2
Exercisable at the end of the year	-	-	-	-

The weighted average remaining contractual life of unvested options is 16.83 months (31st March, 2018: 22.98 months).

The fair value of options was estimated at the date of grant using the Black-Scholes-Merton formula with the following assumptions:

	ESOP 2017	ESOP 2016	ESOP 2015
Risk-free interest rate	6.14% - 6.61%	6.82% - 8.05%	7.14% - 8.18%
Expected life	1-4 years	1-5 years	1-5 years
Expected volatility	39.82%-43.28%	37.28%-43.76%	40.59%- 49.91%
Expected dividend yield	0.75%	0.20%	0.20%

vii. Details of shares issued pursuant to contract without payment being received in cash during the last 5 years, immediately preceding the balance sheet date:

	Number of shares	
	1 April 2014 to 31 March 2019	1 April 2013 to 31 March 2018
Aggregate number of equity shares allotted*	13,96,765	11,28,030

*Equity shares allotted pursuant to contract without payment being received in cash comprise of:

(a) During the year ended 31st March, 2015, the Company has issued 808,875 equity shares (post split) of ₹ 2 each to the erstwhile shareholders of NATCO Organic Limited ('NOL') in exchange of their holding of 19,310,000 equity shares of ₹ 10 each in NOL.

(b) Balance equity shares comprising of 587,890 (31st March, 2018: 319,155) (post split) were allotted during the period of five years, on exercise of the options granted under the employee stock option plan wherein part consideration was received in the form of employee services.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

viii. Dividends declared

	31 March 2019	31 March 2018
First interim dividend of ₹ 1.5 (31 March 2018: ₹ 1.25) per share	277	218
Second interim dividend of ₹ 3.5 (31 March 2018: ₹ 7) per share	642	1,291
Dividend distribution tax on above	189	308
Dividends not recognised at the end of the reporting period		
Third interim dividend of ₹ 1.25 approved by the Board of Directors in the meeting held on 27 May 2019	227	-
Dividend distribution tax on above	47	-

18. Other equity

	31 March 2019	31 March 2018
Reserves and surplus		
Securities premium	14,048	15,209
Capital reserve	207	207
Capital redemption reserve	9	5
General reserve	595	595
Share options outstanding account	309	242
Retained earnings	20,272	14,709
Total reserves and surplus	**35,440**	**30,967**
Other comprehensive income		
Gain/(loss) on FVTOCI equity securities (net of taxes)	31	37
Remeasurement of defined benefit plans (net of taxes)	(204)	(119)
	(173)	**(82)**
	35,267	**30,885**

(i) Nature and purpose of other reserves

Securities premium

Securities premium is used to record the premium on issue of shares. It is utilised in accordance with provisions of the Act.

Capital reserve

Capital reserve was created on amalgamation of certain entities into the Company in the earlier years. The Company uses capital reserve for transactions in accordance with the provisions of the Act.

Capital redemption reserve

In accordance with the requirements of the Act, the Company has created capital redemption reserve on buyback of shares. The Company uses capital redemption reserve for transactions in accordance with the provisions of the Act.

General reserve

The Company generally appropriates a portion of its earnings to the general reserve to be used for contingencies. These reserves are freely available for use by the Company.

Share options outstanding account

The reserve represents the excess of the fair value of the options on the grant date over the exercise price which is accumulated by the Company in respect of all options that have been granted. The Company transfers the proportionate amounts, outstanding in this account, in relation to options exercised to securities premium account on the date of exercise of such options.

Gain/(loss) on FVTOCI equity securities

The Company has elected to recognise the change in fair value of certain investments in equity shares in other comprehensive income. These changes are accumulated within the FVOCI equity instruments reserve within equity. The Company transfers amounts from this reserve to retained earnings when the relevant equity instruments are derecognised.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

Remeasurement of defined benefit obligations
The reserve represents the remeasurement gains/(losses) arising from the actuarial valuation of the defined benefit obligations of the Company. The remeasurement gains/(losses) are recognized in other comprehensive income and accumulated under this reserve within equity. The amounts recognized under this reserve are not reclassified to profit or loss.

19. Borrowings

	31 March 2019	31 March 2018
Current		
Loans repayable on demand		
Working capital loans from banks (secured)	1,021	986
Working capital loans from banks (unsecured)	1,495	744
Other loans		
Working capital loans from banks (unsecured)	1,329	-
	3,845	**1,730**

(i) Working capital loans (secured) represents cash credit, bills purchased and discounted with various banks.

(ii) Working capital loans (unsecured) represents overdraft, commercial paper, bills purchased and discounted with various banks.

(iii) Working capital loans are secured by joint pari-passu first charge on all the current assets (carrying value: ₹ 22,674 [31st March, 2018: ₹ 20,542]) and identified property, plant and equipment (carrying value: ₹ 1,171 [31st March ,2018: ₹ 1,099]) of the Company. During the current year, the Company has obtained approval for waiver of personal guarantees of Mr. V.C. Nannapaneni, Chairman and Managing Director and relatives of Chairman and Managing Director, Ms. Durga Devi Nannapaneni and Dr. N. Ramakrishna Rao.

20. Other financial liabilities

	31 March 2019	31 March 2018
Non-current		
Security deposits	8	8
	8	**8**
Current		
Interest accrued but not due on borrowings	6	-
Capital creditors	483	666
Unpaid dividend on equity shares	22	20
Employee related payables	258	321
Other payables	2	2
	771	**1,009**

21. Provision for employee benefits

	31 March 2019	31 March 2018
Non-current		
Gratuity (refer note (a))	439	229
Compensated absences	271	95
	710	**324**
Current		
Gratuity (refer note (a))	47	58
Compensated absences	43	79
	90	**137**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

(a) Gratuity

The Company has subscribed to a group gratuity scheme of Life Insurance Corporation of India (LIC). Under the said policy, the eligible employees are entitled for gratuity upon their resignation, retirement or in the event of death in lumpsum after deduction of necessary taxes upto a maximum limit of ₹ 2 (31st March, 2018: ₹ 2). Liabilities in respect of the Gratuity Plan are determined by an actuarial valuation, based upon which the Company makes contributions to the Gratuity Fund. The following table set out the status of the gratuity plan and the reconciliation of opening and closing balances of the present value and defined benefit obligation.

		31 March 2019	31 March 2018
(i)	**Change in projected benefit obligation**		
	Projected benefit obligation at the beginning of the year	370	213
	Past service cost	-	60
	Service cost	69	38
	Interest cost	29	17
	Actuarial (gain) / loss	107	51
	Benefits paid	(21)	(9)
	Projected benefit obligation at the end of the year	**554**	**370**
(ii)	**Change in plan assets**		
	Fair value of plan assets at the beginning of the year	83	61
	Expected return on plan assets	7	5
	Employer contributions	-	26
	Return on plan assets (gain)/loss	(1)	-
	Benefits paid	(21)	(9)
	Fair value of plan assets at the end of the year	**68**	**83**
(iii)	**Reconciliation of present value of obligation on the fair value of plan assets**		
	Present value of projected benefit obligation at the end of the year	554	370
	Funded status of the plans	(68)	(83)
	Net liability recognised in the balance sheet	**486**	**287**
(iv)	**Expense recognized in the profit and loss**		
	Service cost	69	38
	Past service cost	-	60
	Interest cost	29	17
	Expected returns on plan assets	(7)	(5)
	Net gratuity costs in profit and loss	**91**	**110**
(v)	**Expense recognized in other comprehensive income**		
	Recognized net actuarial (gain)/ loss	107	51
	Return on plan assets (gain)/loss	1	1
	Net gratuity costs in other comprehensive income	**108**	**52**
(vi)	**Key actuarial assumptions**		
	Discount rate	7.70%	8.00%
	Salary escalation rate	10.00% for first 2 years and 7.00% thereafter	10.00%

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

Assumptions regarding future mortality experience are set in accordance with the published rates under the Indian Assured Lives Mortality (2006-08) Ult table.

Plan assets does not comprise any of the Company's own financial instruments or any assets used by the Company. The Company has the plan covered under a policy with the Life Insurance Corporation of India Limited.

The significant actuarial assumptions for the determination of the defined benefit obligation are the discount rate and the salary growth rate. The calculation of the net defined benefit liability is sensitive to these assumptions. However, the impact of these changes is not ascertained to be material by the management.

		31 March 2019	31 March 2018
(vi)	**Sensitivity analysis:**		
	Defined benefit obligation without effect of projected salary growth	554	370
	Salary escalation up by 1%	58	25
	Salary escalation down by 1%	(50)	(23)
	Discount rate up by 1%	(55)	(23)
	Discount rate down by 1%	64	26

		31 March 2019
(vii)	**Maturity profile of defined benefit obligation (valued on undiscounted basis):**	
	1 year	47
	2 to 5 years	142
	6 to 10 years	274
	More than 10 years	1,188

(viii) The Company expects to contribute around ₹ 549 to the funded plans in the financial year 2019-20 (2018-19: ₹ 143) for gratuity.

22. Deferred tax liabilities (net)

	31 March 2019	31 March 2018
Deferred tax liabilities/(asset) arising on account of :		
Property, plant and equipment	144	144
Provision for employee benefits	(20)	3
Investments	(11)	(9)
	113	**138**

(a) The Company has not recognized deferred tax assets in respect of unused tax credits (minimum alternate tax credits) of ₹ 1,608 (31 March 2018: ₹ 1,737). The above MAT credit expires at various dates ranging from 2023 through 2032.

(b) Movement in deferred tax liabilities (net)

	As at 31 March 2018	Profit and loss *	Other comprehensive income	As at 31 March 2019
Property, plant and equipment	144	-	-	144
Provision for employee benefits	3	-	(23)	(20)
Investments	(9)	-	(2)	(11)
	138	**-**	**(25)**	**113**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

	As at 31 March 2017	Profit and loss *	Other comprehensive income	As at 31 March 2018
Property, plant and equipment	144	-	-	144
Provision for employee benefits	13	-	(10)	3
Investments	(7)	-	(2)	(9)
	150	**-**	**(12)**	**138**

* Defered tax credit recognized in the profit and loss represents utilization of unrecognised tax credits in the nature of minimum alternate tax. (Refer Note 32)

23. Other liabilities

	31 March 2019	31 March 2018
Current		
Payable to statutory authorities	92	124
Advance from customers	189	184
Others	33	-
	314	**308**

24. Trade payables

	31 March 2019	31 March 2018
Total outstanding dues of micro and small enterprises*	79	41
Total outstanding dues of creditors other than micro and small enterprises	1,939	2,413
	2,018	**2,454**

*Disclosure under the Micro, Small and Medium Enterprises Development Act, 2006 ("MSMED Act") as at 31 March 2019 and 31 March 2018:

Particulars		31 March 2019	31 March 2018
i)	the principal amount and the interest due thereon remaining unpaid to any supplier as at the end of each accounting year;	79	41
ii)	the amount of interest paid by the buyer in terms of section 16, along with the amounts of the payment made to the supplier beyond the appointed day during each accounting year;	-	-
iii)	the amount of interest due and payable for the period of delay in making payment (which have been paid but beyond the appointed day during the year) but without adding the interest specified under this MSMED Act;	-	-
iv)	the amount of interest accrued and remaining unpaid at the end of each accounting year; and	1	0
v)	the amount of further interest remaining due and payable even in the succeeding years, until such date when the interest dues as above are actually paid to the small enterprise, for the purpose of disallowance as a deductible expenditure under section 23.	-	-

The above information regarding Micro, Small and Medium Enterprises has been determined to the extent such parties have been identified on the basis of information available with the Company.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

25. Revenue from operations

	For the year ended 31 March 2019	For the year ended 31 March 2018
Sale of products	19,317	20,675
Sale of services	68	66
	19,385	**20,741**
Other operating revenues		
Job work charges	150	62
Export and other incentives	297	263
Scrap sales	31	19
	19,863	**21,085**

Disaggregation of revenue

	31 March 2019
Revenue based on Geography	
India	8,256
USA	8,741
Rest of the world	2,866
	19,863

	31 March 2019
Timing of revenue recognition	
Goods transferred at a point in time	19,317
Services transferred over time	68
	19,385

	31 March 2019
Reconciliation of Revenue from operations with contract price	
Contract price	21,764
Less:	
Sales returns	(257)
Trade discounts	(1,644)
Total Revenue from operations	**19,863**

26. Other income

	For the year ended 31 March 2019	For the year ended 31 March 2018
Interest income from fixed deposits and loans	911	248
Dividend income from investments designated at FVOCI	0	2
Liabilities no longer required, written back	-	5
Gain on sale of property, plant and equipment	135	103
Gain on sale of investment	-	0
Foreign exchange - gain (net)	250	33
Other non-operating income	2	3
	1,298	**394**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

27. Cost of material consumed

	For the year ended 31 March 2019	For the year ended 31 March 2018
Raw material and packing material at the beginning of the year	1,780	1,368
Add: Purchases during the year	3,920	4,317
Less: Raw material and packing material at the end of the year	2,369	1,780
	3,331	**3,905**

28. Changes in inventories of finished goods, stock-in-trade and work-in-progress

	31 March 2019	31 March 2018
Opening balance		
- Finished goods	621	613
- Work-in-progress	1,239	1,021
- Stock-in-trade	38	17
	1,898	**1,651**
Closing balance		
- Finished goods	735	621
- Work-in-progress	1,405	1,239
- Stock-in-trade	13	38
	2,153	**1,898**
	(255)	**(247)**

29. Employee benefits expense

	31 March 2019	31 March 2018
Salaries, wages and bonus	2,717	2,525
Contribution to provident fund and other funds (note (a) below)	199	172
Gratuity expense	91	110
Employee stock compensation expenses	253	180
Staff welfare expenses	142	135
	3,402	**3,122**

(a) During the year ended 31st March, 2019, the Company contributed ₹ 187 (31st March, 2018: ₹ 159) to provident fund and ₹ 12 (31st March, 2018: ₹ 13) towards employee state insurance fund.

30. Finance costs

	For the year ended 31 March 2019	For the year ended 31 March 2018
Interest on borrowings	162	126
Other borrowing costs	26	21
	188	**147**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

31. Other expenses

	For the year ended 31 March 2019	For the year ended 31 March 2018
Consumption of stores and spares	372	383
Power and fuel	596	561
Rent	13	12
Repairs and maintenance		
- Buildings	50	78
- Plant and equipment	192	256
- Others	33	52
Insurance	101	97
Rates and taxes	280	208
Factory maintenance expenses	196	251
Analysis charges	283	122
Carriage and freight outwards	46	56
Donations #	287	99
Corporate social responsibility (CSR) expenses (refer note (i) below)	116	69
Communication expenses	47	59
Office maintenance and other expenses	71	60
Travelling and conveyance	246	248
Legal and professional fees	324	192
Auditors remuneration*		
- As auditors	4	3
- For reimbursement of expenses	0	0
Directors sitting fee	1	1
Bad debts written off	20	133
Royalty expense	226	222
Sales promotion expenses including sales commission	760	924
Research and development expenses	536	387
Printing and stationery	41	80
Miscellaneous expenses	64	69
	4,905	**4,622**

*Excludes ₹ Nil (31st March, 2018: ₹ 5) charged to securities premium in respect of share issue expenses incurred for shares issued through Qualified Institutional Placement.

Includes political contributions of ₹ 233 (31st March, 2018: ₹ Nil) made in accordance with Section 182 of the Act.

(i) Details of CSR expenditure :

	31 March 2019	31 March 2018
(a) Gross amount required to be spent by the Company during the year	116	69
(b) Amount spent on eligible activities	116	69

32. Income tax

	For the year ended 31 March 2019	For the year ended 31 March 2018
Tax expense/(credit) comprises of:		
Current income tax	1,863	2,173
Deferred tax	(60)	(279)
Income tax expense reported in the statement of profit or loss	**1,803**	**1,894**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

The major components of income tax expense and the reconciliation of expected tax expense based on the domestic effective tax rate of the Company at 34.944% (31 March 2018: 34.608%) and the reported tax expense in profit or loss are as follows:

Reconciliation of tax expense and the accounting profit multiplied by India's tax rate		
Profit before tax	8,474	8,876
Tax at the Indian tax rate (34.944%) (31 March 2018: 34.608%)	2,961	3,072
Adjustments:		
CSR expenses and other donations	50	40
Weighted deduction on research and development expenses	(446)	(288)
Tax incentives	(685)	(632)
Capital gain tax	(17)	(19)
MAT credit utilisation	(60)	(279)
Income tax expense	**1,803**	**1,894**

33. Earnings per share (EPS)

	31 March 2019	31 March 2018
Profit attributable to equity shareholders	6,671	6,982
Weighted average number of equity shares outstanding during the year	18,42,05,422	17,73,13,783
Effect of dilution:		
Employee stock options	5,71,121	6,28,391
Weighted average number of equity shares adjusted for the effect of dilution	18,47,76,543	17,79,42,175
Earnings per equity share:		
Basic (in ₹)	36.22	39.38
Diluted (in ₹)	36.10	39.24
Nominal Value per equity share (in ₹)	2	2

34. Fair value measurements

(i) Fair value hierarchy

Financial assets and financial liabilities measured at fair value in the statement of financial position are grouped into three levels of a fair value hierarchy. The three levels are defined based on the observability of significant inputs to the measurement, as follows:

Level 1: Quoted prices (unadjusted) in active markets for financial instruments.

Level 2: The fair value of financial instruments that are not traded in an active market is determined using valuation techniques which maximise the use of observable market data rely as little as possible on entity specific estimates.

Level 3: If one or more of the significant inputs is not based on observable market data, the instrument is included in level 3.

(ii) Financial assets and financial liabilities measured at fair value

	31 March 2019		31 March 2018	
	Level 1	Level 3	Level 1	Level 3
Financials assets				
Equity instruments (other than subsidaries)	68	196	83	81
Government securities	-	0	-	0
Other investments	-	3	-	-

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

Financial instruments by category

For amortised cost instruments, carrying value represents the best estimate of fair value.

	31 March 2019		31 March 2018	
	FVOCI	Amortised cost	FVOCI	Amortised cost
Financial assets				
Investments				
- Equity instruments	264	-	164	-
- Government securities	0	-	0	-
- Debentures	-	1,200	-	400
- Other investments	3	0	-	0
Trade receivables	-	4,916	-	6,060
Loans	-	566	-	124
Cash and cash equivalents	-	115	-	101
Bank balances other than cash and cash equivalents	-	2,512	-	1,620
Other financial assets	-	7,123		6,289
Total financial assets	**267**	**16,432**	**164**	**14,594**

	31 March 2019		31 March 2018	
	FVOCI	Amortised cost	FVOCI	Amortised cost
Financial liabilities				
Borrowings	-	3,845	-	1,730
Trade payables	-	2,018	-	2,454
Other financial liabilities	-	779	-	1,017
Total financial liabilities	**-**	**6,642**	**-**	**5,201**

The Company's principal financial liabilities comprise borrowings, trade payables and other financial liabilities. The main purpose of these financial liabilities is to finance the Company's operations. The Company's principal financial assets include loans, trade and other receivables, cash and cash equivalents and other bank balances that derive directly from its operations. The Company also holds FVOCI investments and investment in its subsidiary.

The carrying amounts of trade receivables, trade payables and cash and cash equivalents are considered to be the same as their fair values, due to their short-term nature. Difference between carrying amounts and fair values of bank deposits, other financial assets, other financial liabilities and borrowings subsequently measured at amortised cost is not significant in each of the years presented. For all other amortised cost instruments, carrying value represents the best estimate of fair value.

For financial assets measured at fair values, the carrying amounts are equal to the fair values.

35. Financial instruments risk management

A. Market risk:

Market risk is the risk that the fair value of future cash flows of a financial instrument will fluctuate because of changes in market prices. Market risk comprises two types of risk: interest rate risk and currency risk. Financial instruments affected by market risk include borrowings, deposits, trade receivables and other financial instruments.

The sensitivity analyses in the following sections relate to the position as at 31 March 2019 and 31 March 2018. The analysis exclude the impact of movements in market variables on the carrying values of gratuity and other post retirement obligations; provisions; and non-financial assets and liabilities.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

i. Interest rate risk:

The Company's entire borrowings carried at amortised cost are variable rate instruments and are subject to fluctuation because of a change in market interest rates. The Company considers the impact of fair value interest rate risk on variable rate borrowings as not material.

The Company's variable rate borrowing is subject to interest rate risk. Below is the details of exposure to fixed rate and variable rate instruments:

Particulars	31 March 2019	31 March 2018
Fixed rate instruments		
Financial assets	10,562	8,077
Financial liabilities	-	-
Variable rate instruments		
Financial assets	-	-
Financial liabilities	3,845	1,730

ii. Foreign currency risk:

Foreign currency risk is the risk that the fair value or future cash flows of an exposure will fluctuate because of changes in foreign exchange rates. The Company's exposure to the risk of changes in foreign exchange rates relates primarily to the Company's operating activities (when revenue or expense is denominated in a foreign currency).

The Company's exposure to foreign currency financial assets and financial liabilities expressed in ₹ in million are as follows:

Financial assets

	31 March 2019			31 March 2018		
	Trade receivables	Loans	Other financial assets	Trade receivables	Loans	Other financial assets
- USD	2,038	368	11	3,759	78	0
- EUR	55	-	-	79	-	-
- CAD	147	-	-	135	-	-
- SGD	3	108	1	1	-	-

Financial liabilities

	31 March 2019		31 March 2018	
	Borrowings	Trade payables	Borrowings	Trade payables
- USD	-	158	-	135
- EUR	-	45	-	47
- GBP	-	1	-	-
- CAD	-	-	-	1
- AUD	-	-	-	1
- JPY	-	-	-	2

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

Foreign currency sensitivity

The following table demonstrates the sensitivity to a reasonably possible change in USD. The Company's exposure to foreign currency changes for all other currencies is not material.

Particulars	Impact on profit after tax	
	31 March 2019	31 March 2018
USD sensitivity		
₹ /USD - Increase by 10%	226	370
₹ /USD - Decrease by 10%	(226)	(370)

iii. Equity price risk:

The Company's exposure to equity securities price risk arises from investments held by the Company and classified in the balance sheet as FVOCI.

To manage its price risk arising from investments in equity securities, the Company diversifies its portfolio.

The Company has equity investments in publicly traded instruments which are listed on the National Stock Exchange (NSE) and other privately held companies.

The table below summarises the impact of increase/decrease of the index on the Company's equity and profit for the period. The analysis is based on the assumption that the equity index had increased/decreased by 10% with all other variables held constant, and that off the Company's equity instruments moved in line with the index.

Particulars	Impact on other components of equity	
	31 March 2019	31 March 2018
NSE Nifty 50 - Increase by 10%	26	16
NSE Nifty 50 - Decrease by 10%	(26)	(16)

B. Credit risk

Credit risk is the risk that a counterparty fails to discharge an obligation to the Company, leading to a financial loss. The Company is mainly exposed to the risk of its balances with the bankers and trade and other receivables. None of the Company's cash equivalents, other bank balances, loans and security deposits were past due or impaired as at 31 March 2019 and 31 March 2018.

Ageing of receivable is as follows:

	31 March 2019	31 March 2018
Neither past due nor impaired	3,620	5,499
Past due not impaired:		
0-30 days	772	325
31-60 days	288	76
61-90 days	104	25
91-180 days	19	84
Greater than 180 days	113	51
	4,916	**6,060**

C. Liquidity risk

Prudent liquidity risk management implies maintaining sufficient cash and marketable securities and the availability of funding through an adequate amount of committed credit facilities to meet obligations when due.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

Due to the nature of the business, the Company maintains flexibility in funding by maintaining availability under committed facilities.

Management monitors rolling forecasts of the Company's liquidity position and cash and cash equivalents on the basis of expected cash flows. The Company takes into account the liquidity of the market in which the entity operates. In addition, the Company's liquidity management policy involves projecting cash flows in major currencies and considering the level of liquid assets necessary to meet these, monitoring balance sheet liquidity ratios against internal and external regulatory requirements and maintaining debt financing plans.

The Company's principal sources of liquidity are the cash flows generated from operations. The Company has no long term borrowings and believes that the working capital is sufficient for its current requirments. Accordingly, no liquidity risk is perceived.

Maturities of financial liabilities

The tables below analyse the Company's financial liabilities into relevant maturity groupings based on their contractual maturities for all non-derivative financial liabilities. The amounts disclosed in the table are the contractual undiscounted cash flows. Balances due within 12 months equal their carrying balances as the impact of discounting is insignificant.

31 March 2019	Up to 1 year	From 1 to 3 years	More than 3 years	Total
Non-derivatives				
Borrowings	3,845	-	-	3,845
Trade and other payables	2,018	-	-	2,018
Other financial liabilities	771	8	-	779
Total	**6,634**	**8**	**-**	**6,642**

31 March 2018	Up to 1 year	From 1 to 3 years	More than 3 years	Total
Non-derivatives				
Borrowings	1,730	-	-	1,730
Trade payable	2,454	-	-	2,454
Other financial liabilities	1,009	8	-	1,017
Total	**5,193**	**8**	**-**	**5,201**

36. Capital risk management

The Company's objective when managing capital is to safeguard the Company's ability to continue as a going concern in order to provide returns for shareholders and benefits for stakeholders. The Company also proposes to maintain an optimal capital structure to reduce the cost of capital. Hence, the Company may adjust any dividend payments, return capital to shareholders or issue new shares. Total capital is the equity as shown in the statement of financial position. Currently, the Company primarily monitors its capital structure on the basis of gearing ratio. Management is continuously evolving strategies to optimize the returns and reduce the risks. It includes plans to optimize the financial leverage of the Company.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

The capital for the reporting year under review is summarized as follows:

	31 March 2019	31 March 2018
Total borrowings (note 19)	3,845	1,730
Less: Cash and cash equivalents (note 15)	(115)	(101)
Net debt	**3,730**	**1,629**
Total equity	35,632	31,254
Total capital	**39,362**	**32,883**
Gearing ratio (%)	9%	5%

37. Related party disclosures

(a) Names of the related parties and nature of relationship (to the extent transactions have taken place during the year, except for control relationships where all the names are disclosed)

Names of related parties	Nature of relationship
NATCO Pharma Inc., United States of America	Subsidiary company
Time cap Overseas Limited, Mauritius	
NATCO Pharma (Canada) Inc., Canada	
NATCO Pharma Asia PTE Ltd., Singapore	
NATCO Pharma Australia PTY Ltd., Australia	
NATCO Lifesciences Philippines Inc., Philippines	
NATCO farma Do Brasil Ltda., Brazil	Step-down subsidiary company
Time Cap Pharma Labs Limited	Entities in which KMP have control or have significant influence
NATCO Trust	
Mr. V.C.Nannapaneni	Key management personnel ("KMP")
Mr. Rajeev Nannapaneni	
Mr. Sreerama Murthy Gubbala	
Mr. Govinda Prasad Dasu	
Mr. Umamaheshwarrao Naidu Madireddi	
Mr. Venkateswara Rao Thallapaka	
Mr. Sridhar Sankararaman	
Mrs. Leela Digumarti	
Mr. Potluri Prasad Sivaramakrishna	
Mr. Lingarao Donthineni	
Ms. Durga Devi Nannapaneni	Relative of KMP
Dr. N. Ramakrishna Rao	

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

(b) Transactions with related parties

	For the year ended 31 March 2019	For the year ended 31 March 2018
Time cap Overseas Limited, Mauritius		
Investment in equity shares	-	28
Share application money pending allotment	2	-
Loan given	165	77
Interest on loans	10	1
Interest received	3	-
NATCO Pharma (Canada) Inc., Canada		
Investment in equity shares		-
Sale of products	150	118
Loan repaid	-	32
NATCO Pharma Asia PTE Ltd., Singapore		
Investment in equity shares	24	22
Loan given	108	-
Interest on loans	1	-
Loan repaid	-	80
Sale of products	7	4
NATCO farma Do Brasil Ltda., Brazil		
Sale of products	48	4
NATCO Pharma Australia PTY Ltd., Australia		
Investment in equity shares	7	17
Time Cap Pharma Labs Limited		
Sales promotion expenses	6	7
Purchase of Land	49	-
Rental expense	5	5
NATCO Pharma Inc., United States of America		
Loan given	114	-
Interest on loans	2	-
NATCO Lifesciences Philippines Inc., Philippines		
Investment in equity shares	12	-
Loan given	7	-
Interest on loans	0	-
NATCO Trust		
Donations	24	82
CSR activities	116	69
Mr. V.C. Nannapaneni		
Short-term employee benefits*	17	19
Leave encashment paid	1	1
Rental expenses	2	2
Commission on profits	-	70
Mr. Rajeev Nannapaneni		
Short-term employee benefits*	16	17
Leave encashment paid	1	1
Rental expenses	1	1

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

	For the year ended 31 March 2019	For the year ended 31 March 2018
Mr. Lingarao Donthineni		
Short-term employee benefits*	14	12
Leave encashment paid	0	0
Mr. Potluri Prasad Sivaramakrishna		
Short-term employee benefits*	14	12
Leave encashment paid	0	0
Mr. Govinda Prasad Dasu		
Sitting fees	0	0
Mrs. Leela Digumarti		
Sitting fees	0	0
Mr. Umamaheshwarrao Naidu Madireddi		
Sitting fees	0	0
Mr. Sreerama Murthy Gubbala		
Sitting fees	0	0
Mr. Venkateswara Rao Thallapaka		
Sitting fees	0	0

(c) Balances receivable / (payable) #

	31 March 2019	31 March 2018
NATCO Pharma Inc., United States of America	116	-
Time Cap Pharma Labs Limited	0	(3)
Time cap Overseas Limited, Mauritius	256	78
NATCO Pharma (Canada) Inc., Canada	132	109
NATCO farma Do Brasil Ltda., Brazil	47	-
NATCO Pharma Asia PTE Ltd., Singapore	112	0
NATCO Lifesciences Philippines Inc., Philippines	7	-
Mr. V.C. Nannapaneni	(2)	(71)
Mr. Rajeev Nannapaneni	(1)	(1)
Mr. Lingarao Donthineni	(1)	(1)
Mr. Potluri Prasad Sivaramakrishna	(1)	(1)
Mr. Venkateswara Rao Thallapaka	(0)	-

Notes:

(i) During the current year, the company has obtained approval of the waiver of personal guarantees of Mr. V.C. Nannapaneni, Chairman and Managing Director and relatives of Chairman and Managing Director, Ms. Durga Devi Nannapaneni and Dr. N. Ramakrishna Rao. Refer note 19.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

(ii) *This aforesaid amount does not include amounts in respect of gratuity and compensated absences as the same are determined on actuarial basis for the Company as a whole.

(iii) #The aforesaid balances receivable from / (payable to) subsidiaries, includes adjustment on account of restatement of outstanding balances receivable / (payable) in foreign currency.

(d) Transaction with related parties - Transfer pricing

In accordance with the applicable provisions of the Income Tax Act, 1961, the Company is required to use certain specified methods in assessing that certain transactions with the related parties, are carried at an arm's length price and is also required to maintain prescribed information and documents to support such assessment. The appropriate method to be adopted will depend on the nature of transactions / class of transactions, class of associated persons, functions performed and other factors as prescribed. Based on certain internal analysis carried out, management believes that transactions entered into with the related parties were carried out at arm's length prices. The Company is in the process of updating the transfer pricing documentation for the financial year ended 31 March 2019. In opinion of the management, the same would not have an impact on these standalone financial statements. Accordingly, these standanlone financial statements do not include the effect of the transfer pricing implications, if any.

38. Segment reporting

In accordance with Ind AS 108 - 'Operating Segments', segment information has been given in the consolidated financial statements of the Company and therefore no separate disclosure on segment information is given in these standalone financial statements.

39. Contingent liabilities and commitments

		31 March 2019	31 March 2018
(a)	**Commitments**		
	Estimated amount of contracts remaining to be executed on capital account and not provided for (net of advances)	753	1,067

(b) The Company has agreed to provide necessary financial support for the continuing operations of it's subsidiaries as to enable them to meet their liabilities as they fall due and carry on its business over the next 12 months from the balance sheet date.

(c) Contingent liabilities

		31 March 2019	31 March 2018
(i)	**Matters under appeal with tax authorities:**		
	Disputed sales tax liabilities	9	9
	Disputed service tax liabilities	17	2
	Disputed customs liability	2	2

(ii) The Company is contesting certain patent infringement cases filed against it by the innovators. A few of these cases pertain to products already launched by the Company in the market. These cases are pending before different authorities / courts and the outcome cannot be ascertained with reasonable certainty. Accordingly, a reliable estimate of the liability towards damages/penalties, if any, cannot be made at present. These amounts

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

will be recognised during the periods in which such liabilities can be reasonably measured. Further, at present, the management does not expect such liabilities to be significant.

(iii) The Hon'ble Supreme Court (SC) has clarified in the case of Vivekananda Vidyamandir and Others Vs. The Regional Provident Fund Commissioner (II) West Bengal that various allowances like conveyance allowance, special allowance, education allowance, medical allowance etc., paid uniformly and universally by an employer to its employees shall form part of basic wages for computation of the provident fund contribution. On the basis of internal evaluation, supported by a legal opinion from an independent legal expert, management has determined that the aforesaid ruling is applicable prospectively and, therefore there is no impact of such ruling on the financial statements of the Company.

40. Amounts incurred on research and development expenses

	31 March 2019	31 March 2018
Salaries and wages	501	462
Consumption of materials, spares	314	278
Power and fuel	29	26
Other research and development expenses	844	513
Capital equipments	288	386
	1,976	**1,665**

The aforementioned expenditure, other than capital equipments, are included under the respective heads of the Statement of Profit and Loss.

41. Net debt reconciliation

The following table sets out an analysis of the movements in net debt for the year:

	Current borrowings	Interest accrued	Cash and cash equivalents	Net debt
Net debt as at 31 March 2018	**1,730**	**-**	**101**	**1,629**
Cash flows	2,115	-	14	2,101
Finance cost	-	188	-	188
Interest paid	-	(182)	-	(182)
Net debt as at 31 March 2019	**3,845**	**6**	**115**	**3,736**

	Current borrowings	Interest accrued	Cash and cash equivalents	Net debt
Net debt as at 31 March 2017	**2,206**	**2**	**128**	**2,080**
Cash flows	(476)	-	(27)	(449)
Finance cost	-	147	-	147
Interest paid	-	(149)	-	(149)
Net debt as at 31 March 2018	**1,730**	**-**	**101**	**1,629**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

42. Expenditure during construction period (pending allocation)

	31 March 2019	31 March 2018
Opening Balance	**69**	**-**
Add:		
Cost of materials consumed, net	1	-
Employee benefits expense	54	1
Power and fuel	39	7
Factory maintenance	88	60
Rates and taxes	3	0
Legal and professional chargers	1	-
Others	23	1
Less:		
Capitalized during the year	-	-
	278	**69**

43. Events after reporting period

The Board of Directors, at the meeting held on 27 May 2019, had recommended an interim dividend of ₹ 1.25 per equity share of face value of ₹ 2/- each (excluding applicable dividend distribution tax).

44. Corresponding previous period's figures have been regrouped/reclassified wherever necessary.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No. 108840

Place: Hyderabad
Date: 27th May, 2019

For and on behalf of the Board of Directors
NATCO Pharma Limited

V.C. Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

M. Adinarayana
Company Secretary & Vice President
(Legal & Corporate Affairs)

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 27th May, 2019

Independent Auditor's Report

To the Members of
NATCO Pharma Limited

Report on the Audit of the Consolidated Financial Statements

Opinion

1. We have audited the accompanying consolidated financial statements of NATCO Pharma Limited ('the Holding Company') and its subsidiaries (the Holding Company and its subsidiaries together referred to as 'the Group'), which comprise the Consolidated Balance Sheet as at 31 March 2019, the Consolidated Statement of Profit and Loss (including Other Comprehensive Income), the Consolidated Cash Flow Statement and the Consolidated Statement of Changes in Equity for the year then ended, and a summary of significant accounting policies and other explanatory information.

2. In our opinion and to the best of our information and according to the explanations given to us the aforesaid consolidated financial statements give the information required by the Companies Act, 2013 ('Act') in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India including Indian Accounting Standards ('Ind AS') specified under section 133 of the Act, of the consolidated state of affairs (consolidated financial position) of the Group as at 31 March 2019, and its consolidated profit (consolidated financial performance including other comprehensive income), its consolidated cash flows and the consolidated changes in equity for the year ended on that date.

Basis for Opinion

3. We conducted our audit in accordance with the Standards on Auditing specified under section 143(10) of the Act. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Consolidated Financial Statements section of our report. We are independent of the Company in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India ('ICAI') together with the ethical requirements that are relevant to our audit of the financial statements under the provisions of the Act and the rules thereunder, and we have fulfilled our other ethical responsibilities in accordance with these requirements and the Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Key Audit Matter

4. Key audit matters are those matters that, in our professional judgment and based on the consideration of the reports of the other auditors on separate financial statements of the subsidiaries, were of most significance in our audit of the consolidated financial statements of the current period. These matters were addressed in the context of our audit of the consolidated financial statements as a whole, and in forming our opinion thereon, and we do not provide a separate opinion on these matters.

5. We have determined that there are no key audit matters to communicate in our report.

Information other than the Consolidated Financial Statements and Auditor's Report thereon

6. The Holding Company's Board of Directors is responsible for the other information. The other information comprises the information included in the Annual Report, but does not include the consolidated financial statements and our auditor's report thereon.

   Our opinion on the consolidated financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

   In connection with our audit of the consolidated financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the consolidated financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Responsibilities of Management for the Consolidated Financial Statements

7. The Holding Company's Board of Directors is responsible for the matters stated in section 134(5) of the Act with respect to the preparation of these

consolidated financial statements that give a true and fair view of the consolidated state of affairs (consolidated financial position), consolidated profit or loss (consolidated financial performance including other comprehensive income), consolidated changes in equity and consolidated cash flows of the Group in accordance with the accounting principles generally accepted in India, including the Ind AS specified under section 133 of the Act. The Holding Company's Board of Directors is also responsible for ensuring accuracy of records including financial information considered necessary for the preparation of consolidated Ind AS financial statements. Further, in terms of the provisions of the Act, the respective Board of Directors /management of the companies included in the Group covered under the Act are responsible for maintenance of adequate accounting records in accordance with the provisions of the Act for safeguarding the assets and for preventing and detecting frauds and other irregularities; selection and application of appropriate accounting policies; making judgments and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal financial controls, that were operating effectively for ensuring the accuracy and completeness of the accounting records, relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error. These financial statements have been used for the purpose of preparation of the consolidated financial statements by the Directors of the Holding Company, as aforesaid.

8. In preparing the consolidated financial statements, the respective Board of Directors of the companies included in the Group are responsible for assessing the ability of the Group to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the Board of Directors either intends to liquidate the Group or to cease operations, or has no realistic alternative but to do so.

9. Those Board of Directors are also responsible for overseeing the financial reporting process of the Group.

Auditor's Responsibilities for the Audit of the Consolidated Financial Statements

10. Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Standards on Auditing will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

11. As part of an audit in accordance with Standards on Auditing, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances. Under section 143(3)(i) of the Act, we are also responsible for expressing our opinion on whether the Group has adequate internal financial controls system in place and the operating effectiveness of such controls.

- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the ability of the Group to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the consolidated financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

12. We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

13. We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

14. From the matters communicated with those charged with governance, we determine those matters that were of most significance in the audit of the consolidated financial statements of the current period and are therefore the key audit matters. We describe these matters in our auditor's report unless law or regulation precludes public disclosure about the matter or when, in extremely rare circumstances, we determine that a matter should not be communicated in our report because the adverse consequences of doing so would reasonably be expected to outweigh the public interest benefits of such communication.

Other Matter

15. We did not audit the financial statements of 7 subsidiaries, whose financial statements reflect total assets of ₹ 1,599 million and net assets of ₹ 512 million as at 31 March 2019, total revenues of ₹ 1,317 million and net cash inflows amounting to ₹ 52 million for the year ended on that date, as considered in the consolidated financial statements. These financial statements have been audited by other auditors whose reports have been furnished to us by the management and our opinion on the consolidated financial statements, in so far as it relates to the amounts and disclosures included in respect of these subsidiaries, and our report in terms of sub-section (3) of Section 143 of the Act, in so far as it relates to the aforesaid subsidiaries is based solely on the reports of the other auditors.

    Further, all of these subsidiaries are located outside India, whose financial statements have been prepared in accordance with accounting principles generally accepted in their respective countries and which have been audited by other auditors under generally accepted auditing standards applicable in their respective countries. The Holding Company's management has converted the financial statements of such subsidiaries located outside India from accounting principles generally accepted in their respective countries to accounting principles generally accepted in India. We have audited these conversion adjustments made by the Holding Company's management. Our opinion, and matters identified and disclosed under key audit matters section above, in so far as it relates to the balances and affairs of such subsidiaries located outside India is based on the report of other auditors and the conversion adjustments prepared by the management of the Holding Company and audited by us.

    Our opinion above on the consolidated financial statements, and our report on other legal and regulatory requirements below, are not modified in respect of the above matters with respect to our reliance on the work done by and the reports of the other auditors.

Report on Other Legal and Regulatory Requirements

16. As required by section 197(16) of the Act, based on our audit and on the consideration of the reports of the other auditors, referred to in paragraph 15, on separate financial statements of the subsidiaries, we report that the Holding Company covered under the Act, paid remuneration to their respective directors during the year in accordance with the provisions of and limits laid down under section 197 read with Schedule V to the Act. Further, we report that the provisions of section 197 read with Schedule V to the Act are not applicable to the subsidiary companies as they are not covered under the Act.

17. As required by Section 143 (3) of the Act, based on our audit and on the consideration of the reports of the other auditors on separate financial statements of the subsidiaries we report, to the extent applicable, that:

    a) we have sought and obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purpose of our audit of the aforesaid consolidated financial statements;

    b) In our opinion, proper books of account as required by law relating to preparation of the aforesaid consolidated financial statements have been kept so far as it appears from our

examination of those books and the reports of the other auditors;

c) the consolidated financial statements dealt with by this report are in agreement with the relevant books of account maintained for the purpose of preparation of the consolidated financial statements;

d) in our opinion, the aforesaid consolidated financial statements comply with Ind AS specified under section 133 of the Act;

e) on the basis of the written representations received from the directors of the Holding company and taken on record by the Board of Directors of the Holding Company, none of the directors of the Holding Company, are disqualified as on 31 March 2019 from being appointed as a director in terms of Section 164(2) of the Act;

f) With respect to the adequacy of the internal financial controls over financial reporting of the Holding Company, and the operating effectiveness of such controls, refer to our separate report in 'Annexure A';

g) With respect to the other matters to be included in the Auditor's Report in accordance with rule 11 of the Companies (Audit and Auditors) Rules, 2014 (as amended), in our opinion and to the best of our information and according to the explanations given to us and based on the consideration of the report of the other auditors on separate financial statements as also the other financial information of the subsidiaries:

i. The consolidated financial statements disclose the impact of pending litigations on the consolidated financial position of the Group;

ii. the Group did not have any long-term contracts including derivative contracts for which there were any material foreseeable losses as at 31 March 2019;

iii. there has been no delay in transferring amounts, required to be transferred, to the Investor Education and Protection Fund by the Holding Company during the year ended 31 March 2019;

iv. the disclosure requirements relating to holdings as well as dealings in specified bank notes were applicable for the period from 8 November 2016 to 30 December 2016, which are not relevant to these consolidated financial statements. Hence, reporting under this clause is not applicable.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm's Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No.: 108840

Place: Hyderabad
Date: 27th May, 2019

Annexure A to the Independent Auditor's Report of even date to the members of NATCO Pharma Limited on the consolidated financial statements for the year ended 31 March 2019

Independent Auditor's Report on the Internal Financial Controls under Clause (i) of Sub-section 3 of Section 143 of the Companies Act, 2013 ('the Act')

1. In conjunction with our audit of the consolidated financial statements of NATCO Pharma Limited ('the Holding Company') and its subsidiaries (the Holding Company and its subsidiaries together referred to as 'the Group'), as at and for the year ended 31 March 2019, we have audited the internal financial controls over financial reporting ('IFCoFR') of the Holding Company as at that date. Further, as all the subsidiaries of the Holding Company are located outside India, the provisions of clause (i) of sub-section 3 of Section 143 of the Act are not applicable to them.

Management's Responsibility for Internal Financial Controls

2. The Board of Directors of the Holding Company are responsible for establishing and maintaining internal financial controls based on the internal control over financial reporting criteria established by the Company considering the essential components of internal control stated in the Guidance Note on Audit of Internal Financial Controls over Financial Reporting issued by the Institute of Chartered Accountants of India ('the Guidance Note'). These responsibilities include the design, implementation and maintenance of adequate internal financial controls that were operating effectively for ensuring the orderly and efficient conduct of the company's business, including adherence to the company's policies, the safeguarding of its assets, the prevention and detection of frauds and errors, the accuracy and completeness of the accounting records, and the timely preparation of reliable financial information, as required under the Act.

Auditor's Responsibility

3. Our responsibility is to express an opinion on the IFCoFR of the Holding Company based on our audit. We conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India ('ICAI') and deemed to be prescribed under Section 143(10) of the Act, to the extent applicable to an audit of IFCoFR, and the Guidance Note. Those Standards and the Guidance Note require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether adequate IFCoFR were established and maintained and if such controls operated effectively in all material respects.

4. Our audit involves performing procedures to obtain audit evidence about the adequacy of the IFCoFR and their operating effectiveness. Our audit of IFCoFR includes obtaining an understanding of IFCoFR, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error.

5. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion on the IFCoFR of the Holding Company.

Meaning of Internal Financial Controls over Financial Reporting

6. A company's IFCoFR is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's IFCoFR include those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorisations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorised acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Inherent Limitations of Internal Financial Controls over Financial Reporting

7. Because of the inherent limitations of IFCoFR, including the possibility of collusion or improper management override of controls, material misstatements due to error or fraud may occur and not be detected. Also, projections of any evaluation of the IFCoFR to future periods are subject to the risk that the IFCoFR may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Opinion

8. In our opinion the Holding Company, has in all material respects, adequate internal financial controls over financial reporting and such controls were operating effectively as at 31 March 2019, based on the internal control over financial reporting criteria established by the Company considering the essential components of internal control stated in the Guidance Note issued by the ICAI.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm's Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No.: 108840

Place: Hyderabad
Date: 27th May, 2019

Consolidated Balance Sheet

as at 31st March, 2019

(All amounts in ₹ millions, except share data and where otherwise stated)

	Notes	31 March 2019	31 March 2018
ASSETS			
Non-current assets			
(a) Property, plant and equipment	6	12,185	10,127
(b) Capital work-in-progress		6,376	4,800
(c) Intangible assets	7	87	59
(d) Financial assets			
Investments	8	199	81
Loans	9	20	-
Other financial assets	10	165	150
(e) Current tax assets (net)		-	18
(e) Other non-current assets	11	527	609
Total non-current assets		**19,559**	**15,844**
Current assets			
(a) Inventories	12	5,290	4,384
(b) Financial assets			
Investments	8	1,487	684
Trade receivables	13	5,062	6,375
Cash and cash equivalents	14	283	217
Bank balances other than cash and cash equivalents	15	2,512	1,620
Loans	9	71	45
Other financial assets	10	6,947	6,142
(c) Other current assets	11	1,820	1,840
Total current assets		**23,472**	**21,307**
Total assets		**43,031**	**37,151**
EQUITY AND LIABILITIES			
Equity			
(a) Equity share capital	16	365	369
(b) Other equity	17	34,525	30,353
Equity attributable to owners		34,890	30,722
Non-controlling interest		20	38
Total equity		**34,910**	**30,760**
Liabilities			
Non-current liabilities			
(a) Financial liabilities			
Other financial liabilities	19	8	8
(b) Provision for employee benefits	20	710	324
(c) Deferred tax liabilities (net)	21	116	139
Total non-current liabilities		**834**	**471**
Current liabilities			
(a) Financial liabilities			
Borrowings	18	3,863	1,732
Trade payables	23		
- total outstanding dues of micro and small enterprises		79	41
- total outstanding dues of creditors other than micro and small enterprises		2,091	2,650
Other financial liabilities	19	782	1,024
(b) Other current liabilities	22	316	310
(c) Provision for employee benefits	20	90	137
(d) Current tax liabilities (net)		66	26
Total current liabilities		**7,287**	**5,920**
Total liabilities		**8,121**	6,391
Total equity and liabilities		**43,031**	**37,151**

The accompanying notes form an integral part of the consolidated financial statements.

This is the Consolidated Balance Sheet referred to in our report of even date.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No. 108840

Place: Hyderabad
Date: 27th May, 2019

For and on behalf of the Board of Directors
NATCO Pharma Limited

V.C. Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

M. Adinarayana
Company Secretary & Vice President
(Legal & Corporate Affairs)

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 27th May, 2019

Consolidated Statement of Profit and Loss

for the year ended 31st March, 2019

(All amounts in ₹ millions, except share data and where otherwise stated)

	Notes	31 March 2019	31 March 2018
Income			
Revenue from operations	24	20,945	22,020
Other income	25	1,302	404
Total income		**22,247**	**22,424**
Expenses			
Cost of materials consumed	26	3,331	3,905
Excise duty		-	172
Purchases of stock-in-trade		550	459
Changes in inventories of finished goods, stock-in -trade and work-in-progress	27	(339)	(253)
Employee benefits expense	28	3,559	3,256
Finance costs	29	193	154
Depreciation and amortisation expense	6 & 7	810	662
Other expenses	30	5,896	5,197
Total expenses		**14,000**	**13,552**
Profit before tax		8,247	8,872
Tax expense/(credit)	31		
Current tax		1,883	2,199
Deferred tax		(60)	(279)
Profit after tax		**6,424**	**6,952**
Other comprehensive income (net of taxes)			
Items that will not be reclassified to profit or loss			
Re-measurement gains (losses) on defined benefit plans		(85)	(42)
Net (loss)/gain on FVTOCI equity securities		0	(2)
Items that will be reclassified to profit or loss			
Exchange differences on translation of foreign operations		9	(8)
Total comprehensive income for the year		**6,348**	**6,900**
Profit for the year attributable to:			
Owners of the parent		6,444	6,962
Non-controlling interests		(20)	(10)
Total comprehensive income for the year attributable to:			
Owners of the parent		6,368	6,910
Non-controlling interests		(20)	(10)
Earnings per share (Nominal value per share ₹ 2)	32		
Basic (in ₹)		34.98	39.26
Diluted (in ₹)		34.87	39.13

The accompanying notes form an integral part of the consolidated financial statements.

This is the Consolidated Statement of Profit and Loss referred to in our report of even date.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No. 108840

Place: Hyderabad
Date: 27th May, 2019

For and on behalf of the Board of Directors
NATCO Pharma Limited

V.C. Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

M. Adinarayana
Company Secretary & Vice President
(Legal & Corporate Affairs)

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 27th May, 2019

Consolidated Cash Flow Statement

for the year ended 31st March 2019

(All amounts in ₹ millions, except share data and where otherwise stated)

		31 March 2019	31 March 2018
Cash flows from operating activities			
Profit before tax		8,247	8,872
Adjustments :			
Depreciation and amortisation expense		810	662
Finance cost		193	154
Employee share-based payment expense		253	180
Interest income		(898)	(249)
Bad debts written - off		20	133
Liabilities no longer required written back		-	(5)
Dividend Income		-	(2)
Gain on sale of property,plant and equipment		(135)	(103)
Gain on sale of investments		-	(0)
Unrealised foreign exchange gain, net		(102)	(14)
Operating profit before working capital changes		**8,388**	**9,628**
Changes in working capital:			
Changes in trade payables		(512)	64
Changes in employee benefit obligations		254	171
Changes in other financial liabilities		(67)	6
Changes in other liabilities		7	53
Changes in other financial assets		(71)	(10)
Changes in loans		(25)	(10)
Changes in other assets		20	(583)
Changes in inventories		(906)	(895)
Changes in trade receivables		1,388	(1,742)
Cash generated from operating activities		**8,476**	**6,681**
Income taxes paid (net)		(1,788)	(2,045)
Net cash generated from operating activities	A	**6,688**	**4,636**
Cash flows from investing activities			
Purchase of property, plant and equipment		(4,566)	(4,225)
Proceeds from sale of property, plant and equipment		178	178
Purchase of intangible assets		(51)	(18)
Payments for purchase of investments		(921)	(445)
Movement in other bank balances, net		(892)	(1,497)
Loans given to others		(20)	-
Interest received		524	99
Deposits with financial institutions		(374)	(5,249)
Dividends received		-	2
Net cash used in investing activities	B	**(6,122)**	**(11,155)**

Consolidated Cash Flow Statement

for the year ended 31st March 2019

(All amounts in ₹ millions, except share data and where otherwise stated)

		31 March 2019	31 March 2018
Cash flows from financing activities			
Proceeds from issue of shares		0	8,956
Buyback of shares		(1,347)	-
Movement in non-controlling interest		2	7
(Repayments) / proceeds from current borrowings, net		2,131	(484)
Changes in unclaimed dividend bank balances		(2)	(3)
Dividends paid to Company's shareholders		(1,106)	(1,811)
Interest paid		(187)	(156)
Net cash (used in) / from financing activities	C	**(509)**	**6,509**
Effect of currency translation adjustment	D	**9**	**(8)**
Net increase / (decrease) in cash and cash equivalents	(A+B+C+D)	**66**	**(18)**
Cash and cash equivalents as at the beginning of the year		217	235
Cash and cash equivalents as at the end of the year [Refer Note 14]		**283**	**217**

This is the Consolidated Cash Flow Statement referred to in our report of even date.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No. 108840

Place: Hyderabad
Date: 27th May, 2019

For and on behalf of the Board of Directors
NATCO Pharma Limited

V.C. Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

M. Adinarayana
Company Secretary & Vice President
(Legal & Corporate Affairs)

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 27th May, 2019

Consolidated Statement of Changes in Equity

for the year ended 31st March 2019

(All amounts in ₹ millions, except share data and where otherwise stated)

A Equity Share Capital

	Notes	Number of shares	Amount
As at 1 April 2017		**17,43,07,800**	**349**
Changes in equity share capital	16	1,01,85,600	20
As at 31 March 2018		**18,44,93,400**	**369**
Changes in equity share capital	16	(17,46,921)	(4)
As at 31 March 2019		**18,27,46,479**	**365**

B Other equity

	Reserves and Surplus						Other comprehensive income				
	Securities premium	Capital reserve	Capital redemption reserve	General reserve	Share options outstanding account	Retained earnings	Gain/(loss) on FVTOCI equity securities	Foreign currency translation reserve	Remeasurement of defined benefit plans	Non-controlling interest	Total
Balance as at 1 April 2017	**6,178**	**207**	**5**	**595**	**154**	**9,094**	**42**	**(54)**	**(77)**	**41**	**16,185**
Profit for the year	-	-	-	-	-	6,962	-	-	-	(10)	6,952
Other comprehensive income (net of taxes)	-	-	-	-	-	-	(2)	(8)	(42)	-	(52)
Issue of equity shares	9,130	-	-	-	-	-	-	-	-	-	9,130
Share issue expenses	(191)	-	-	-	-	-	-	-	-	-	(191)
Employee stock option expense	-	-	-	-	177	-	-	-	-	-	177
Dividend paid	-	-	-	-	-	(1,509)	-	-	-	-	(1,509)
Tax on distributed profits	-	-	-	-	-	(308)	-		-		(308)
Share options exercised	92	-	-	-	(92)	-	-	-	-	-	-
Changes in controlling interest	-	-	-	-	-	-	-	-	-	7	7
Balance as at 31 March 2018	**15,209**	**207**	**5**	**595**	**239**	**14,239**	**40**	**(62)**	**(119)**	**38**	**30,391**
Profit for the year	-	-	-	-	-	6,444	-	-	-	(20)	6,424
Other comprehensive income (net of taxes)	-	-	-	-	-	-	0	9	(85)	-	(76)
Buyback of shares	(1,325)	-	-	-	-	-	-	-	-	-	(1,325)
Share buyback expenses	(18)	-	-	-	-	-	-	-	-	-	(18)
Employee stock option expense	-	-	-	-	255	-	-	-	-	-	255
Dividend paid	-	-	-	-	-	(919)	-	-	-	-	(919)
Tax on distributed profits	-	-	-	-	-	(189)	-	-	-	-	(189)
Share options exercised	186	-	-	-	(186)	-	-	-	-	-	-
Changes in controlling interest	-	-	-	-	-	-	-	-	-	2	2
Transfer from securities premium on account of buyback of equity shares	(4)	-	4	-	-	-	-	-	-	-	-
Balance as at 31 March 2019	**14,048**	**207**	**9**	**595**	**308**	**19,575**	**40**	**(53)**	**(204)**	**20**	**34,545**

This is the Consolidated Statement of Changes in Equity referred to in our report of even date.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No. 108840

Place: Hyderabad
Date: 27th May, 2019

For and on behalf of the Board of Directors
NATCO Pharma Limited

V.C. Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

M. Adinarayana
Company Secretary & Vice President
(Legal & Corporate Affairs)

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 27th May, 2019

Notes

Summary of significant accounting policies and other explanatory information

1. General information

NATCO Pharma Limited ("the Company" or "the Parent") is a public limited company domiciled and incorporated in India in accordance with the provisions of the Companies Act, 1956. The registered office of the Company is at NATCO House, Road No. 2, Banjara Hills, Hyderabad – 500034. The equity shares of the Company are listed on the National Stock Exchange and Bombay Stock Exchange.

The Company along with its subsidiaries ("the Group") is engaged in the business of pharmaceuticals which comprises research and development, manufacturing and selling of bulk drugs and finished dosage formulations. The Group has manufacturing facilities in India which caters to both domestic and international markets including regulated markets like United States of America and Europe.

These consolidated financial statements for the year ended 31 March 2019 were authorized and approved for issue by the Board of Directors on 27 May 2019.

2. Basis of preparation

(i) Compliance with Ind AS

The consolidated financial statements of the Group have been prepared in accordance with the Indian Accounting Standards as notified under section 133 of the Companies Act 2013 ("the Act") read with the Companies (Indian Accounting Standards) Rules 2015 issued by Ministry of Corporate Affairs ('MCA'), as amended time to time. The Group has uniformly applied the accounting policies during the periods presented.

Transactions and balances with values below the rounding off norm adopted by the Group have been reflected as "0" in the relevant notes in these consolidated financial statements.

These financial statements have been prepared for the Group as a going concern on the basis of relevant Ind AS that are effective at the Group's annual reporting date 31 March 2019.

These financial statements have been prepared on the historical cost convention and on an accrual basis except for the following material items in the balance sheet:

- Certain financial assets and liabilities which are measured at fair value;
- Share based payments which are measured at fair value of the options;
- Defined benefit plan assets which are measured at fair value; and

(ii) Principles of consolidation

a. Subsidiaries

Subsidiaries are all entities (including structured entities) over which the Group has control. The Group controls an entity when the Group is exposed to, or has rights to, variable returns from its involvement with the entity and has the ability to affect those returns through its power to direct the relevant activities of the entity. Subsidiaries are fully consolidated from the date on which control is transferred to the Group. They are deconsolidated from the date that control ceases.

The acquisition method of accounting is used to account for business combinations by the Group.

The Group combines the separate financial statements of the parent and its subsidiaries line by line adding together like items of assets, liabilities, contingent liabilities, equity, income and expenses. Intercompany transactions, balances and unrealised gains on transactions between group companies are eliminated. Unrealised losses are also eliminated unless the transaction provides evidence of an impairment of the transferred asset. Accounting policies of subsidiaries have been changed where necessary and practicable to ensure consistency with the policies adopted by the Group.

Non-controlling interests in the results and equity of subsidiaries are shown separately in the consolidated statement of profit and loss, consolidated statement of changes in equity and balance sheet, respectively.

The financial statements are prepared using uniform accounting policies for like transactions and other events in similar circumstances. If a

Notes

Summary of significant accounting policies and other explanatory information

member of the Group uses accounting policies other than those adopted in the financial statements for like transactions and events in similar circumstances, appropriate adjustments are made to that Group member's separate financial statements in preparing the financial statements to ensure conformity with the Group's accounting policies, wherever necessary and practicable.

Notes to the financial statements represent notes involving items which are considered material and are accordingly disclosed. Materiality for the purpose is assessed in relation to the information contained in the consolidated financial statements.

The following subsidiaries have been considered for the purpose of preparation of the consolidated financial statements:

Name of the subsidiaries	Country of Incorporation	Percentage holding/interest (%) As at 31 March	
		2019	2018
NATCO Pharma, Inc.,	United States of America	100.00	100.00
Time Cap Overseas Limited	Mauritius	90.36	89.81
NATCO farma Do Brazil	Brazil	90.90	88.30
NATCO Pharma (Canada), Inc.	Canada	99.04	99.04
NATCO Pharma Asia Pte. Ltd.	Singapore	99.73	100.00
NATCO Pharma Australia PTY Ltd.	Australia	100.00	100.00
NATCO Lifesciences Philippines Inc.	Philippines	100.00*	NA

*includes the shares held by the nominee shareholders of the subsidiaries on behalf of the company

Note 1: Interest in NATCO Farma Do Brazil represent effective holding of the Company.

Note 2: Principal activity of all subsidiaries except Time Cap Overseas Limited is marketing of pharmaceutical products. Time Cap Overseas Limited is an intermediate investment holding company.

b. Change in ownership interests

The Group treats transactions with non-controlling interests that do not result in a loss of control as transactions with equity owners of the Group. A change in ownership interest results in an adjustment between the carrying amounts of the controlling and non-controlling interests to reflect their relative interests in the subsidiary. Any difference between the amount of the adjustment to non-controlling interests and any consideration paid or received is recognised within equity.

3. Standards, not yet effective and have not been adopted early by the Group

Information on new standards, amendments and interpretations that are expected to be relevant to the consolidated financial statements is provided below.

a) Ind AS 116, Leases:

Ind AS 116 removes the current distinction between operating and finance leases and requires recognition of an asset (the right to use the leased item) and a financial liability (the obligation to pay rentals). An optional exemption exists for short-term and low value leases. The standard may not have a significant impact on the Group's financial statements considering the number of assets under operating lease arrangement as at 31 March 2019. On implementation of Ind AS 116, the operating lease charges will be replaced with interest and depreciation expenses. These changes will affect key ratios like profit margin, operating margin, EBITDA margin etc. Further, operating cash flows will be higher as cash payments for the principal

Notes

Summary of significant accounting policies and other explanatory information

portion of the lease liability will be classified within financing activities.

The effect on adoption of Ind AS 116 would be insignificant in the consolidated financial statements.

b) Ind AS 12, Appendix C, Uncertainty over Income Tax Treatments:

On 30 March 2019, the Ministry of Corporate Affairs has notified Ind AS 12, Appendix C, Uncertainty over Income Tax Treatments which is to be applied while performing the determination of taxable profit (or loss), tax bases, unused tax losses, unused tax credits and tax rates, when there is uncertainty over income tax treatments under Ind AS 12. According to the appendix, companies need to determine the probability of the relevant tax authority accepting each tax treatment, or group of tax treatments, that the companies have used or plan to use in their income tax filing which has to be considered to compute the most likely amount of the expected value of the tax treatment when determining taxable profit (tax loss), tax bases, unused tax losses, unused tax credits and tax rates.

The standard permits two possible methods of transition:

- Full retrospective approach – Under this approach Appendix C will be applied retrospectively to each prior reporting period presented in accordance with Ind AS 8, Accounting Policies, Changes in Accounting Estimates and Errors, without using hindsight, and
- Retrospectively with cumulative effect of initially applying Appendix C recognised by adjusting equity on initial application, without adjusting comparatives

The Group is currently assessing the detailed financial impact of this standard on its consolidated financial statements.

c) Amendment to Ind AS 12, Income Taxes:

On 30 March 2019, the Ministry of Corporate Affairs issued amendments to the guidance in Ind AS 12, Income Taxes, in connection with accounting for dividend distribution taxes.

The amendment clarifies that an entity shall recognise the income tax consequences of dividends in profit or loss, other comprehensive income or equity according to where the entity originally recognised those past transactions or events.

Effective date for application of this amendment is annual period beginning on or after 1 April 2019. The Group is currently evaluating the effect of this amendment on the consolidated financial statements.

4. Summary of significant accounting policies

The consolidated financial statements have been prepared using the accounting policies and measurement basis summarized below.

a. Current versus non-current classification

The Group presents assets and liabilities in the balance sheet based on current/ non-current classification.

An asset is classified as current when it is:

- Expected to be realised or intended to sold or consumed in normal operating cycle
- Held primarily for the purpose of trading
- Expected to be realised within twelve months after the reporting period, or
- Cash or cash equivalent unless restricted from being exchanged or used to settle a liability for at least twelve months after the reporting period

Notes

Summary of significant accounting policies and other explanatory information

All other assets are classified as non-current.

A **liability** is classified as current when:

- It is expected to be settled in normal operating cycle
- It is held primarily for the purpose of trading
- It is due to be settled within twelve months after the reporting period, or
- There is no unconditional right to defer the settlement of the liability for at least twelve months after the reporting period

All other liabilities are classified as non-current.

Deferred tax assets and liabilities are classified as non-current assets and liabilities.

b. Foreign currency

Functional and presentation currency

The consolidated financial statements are presented in Indian Rupee ('INR' or '₹') which is also the functional and presentation currency of the Group.

Transactions and balances

Foreign currency transactions are recorded in the functional currency, by applying to the exchange rate between the functional currency and the foreign currency at the date of the transaction.

Foreign currency monetary items are converted to functional currency using the closing rate. Non-monetary items denominated in a foreign currency which are carried at historical cost are reported using the exchange rate at the date of the transaction; and non-monetary items which are carried at fair value or any other similar valuation denominated in a foreign currency are reported using the exchange rates that existed when the values were determined.

Exchange differences arising on monetary items on settlement, or restatement as at reporting date, at rates different from those at which they were initially recorded, are recognized in the statement of profit and loss in the year in which they arise.

Group companies

The results and financial position of foreign operations (none of which has the currency of a hyperinflationary economy) that have a functional currency different from the presentation currency are translated into the presentation currency as follows:

1. assets and liabilities are translated at the closing rate at the date of the balance sheet,
2. income, expenses and cash flow items are translated at average exchange rates for the respective periods; and
3. All resulting exchange differences are recognised in OCI.

When a subsidiary is disposed off, in full, the relevant amount is transferred to the Statement of Profit and Loss. However, when change in the parent's ownership does not result in loss of control of a subsidiary, such changes are recorded through equity. On consolidation, exchange differences arising from the translation of any net investment in foreign entities, and borrowings and other financial instrument designated as hedges of such investment, are recognised in OCI. When a foreign operation is sold, the associated exchange differences are reclassified to profit or loss, as part of the gain or loss on sale.

Goodwill and fair value adjustments arising on the acquisition of a foreign operation are treated as assets and liabilities of the foreign operation and translated at the closing exchange rate.

c. Revenue recognition

The Group derives revenues primarily from sale of finished dosage formulations, active pharmaceutical ingredients (APIs), including niche and technically complex molecules.

The Group has adopted Ind AS 115 - Revenue from Contracts with Customers, using modified

Notes

Summary of significant accounting policies and other explanatory information

retrospective application method with effect from 1 April 2018 and accordingly these financial statements are prepared in accordance with the recognition and measurement principles laid down in Ind AS 115. Also, the application of Ind AS 115 did not have any significant impact on recognition and measurement of revenue and related items in the financial statements of the Group.

Revenue is recognized on satisfaction of performance obligation upon transfer of control of promised products or services to customers for an amount that reflects the consideration the Group expects to receive in exchange for those products or services.

The Group does not expect to have any contracts where the period between the transfer of the promised goods or services to the customer and payment by the customer exceeds one year. As a consequence, it does not require to adjust any of the transaction prices for the time value of money.

Income from profit-sharing arrangements with collaboration partners is recognised as underlying sales and cost of sales are recorded by the collaboration partners.

Other operating revenue - Export incentives
Export Incentives under various schemes are accounted in the year of export.

Other income - Interest income
Interest income is recognized on time proportion basis taking into account the amount outstanding and rate applicable. For all debt instruments measured at amortised cost, interest income is recorded using the effective interest rate (EIR) method.

Other income - Dividend income
Dividend income is recognised when the Group's right to receive the payment is established, which is generally, when shareholders approve the dividend.

d. Borrowing costs
Borrowing costs directly attributable to the acquisition, construction or production of a qualifying asset are capitalized during the period of time that is necessary to complete and prepare the asset for its intended use or sale. A qualifying asset is one that necessarily takes substantial period of time to get ready for its intended use. All other borrowing costs are charged to the Statement of Profit and Loss as incurred.

e. Property, plant and equipment (PPE)
Recognition and initial measurement
Property, plant and equipment are stated at their cost of acquisition. The cost comprises purchase price, borrowing cost if capitalization criteria are met and directly attributable cost of bringing the asset to its working condition for the intended use. Any trade discount and rebates are deducted in arriving at the purchase price.

Subsequent costs are included in the asset's carrying amount or recognised as a separate asset, as appropriate, only when it is probable that future economic benefits associated with the item will flow to the Group. All other repair and maintenance costs are recognised in statement of profit or loss as incurred.

Subsequent measurement (depreciation and useful lives)
Depreciation on property, plant and equipment is provided on the straight-line method, computed on the basis of useful lives as estimated by management which coincides with rates prescribed in Schedule II to the Companies Act, 2013.

Cost of leasehold land is amortized on a straight-line basis over the term of the lease.

The residual values, useful lives and method of depreciation are reviewed at each financial year end and adjusted prospectively, if appropriate.

Depreciation
Depreciation on the addition/disposals is charged on pro-rata basis from/until the date of such addition/disposal.

Notes

Summary of significant accounting policies and other explanatory information

De-recognition

An item of property, plant and equipment and any significant part initially recognised is derecognised upon disposal or when no future economic benefits are expected from its use or disposal. Any gain or loss arising on de-recognition of the asset (calculated as the difference between the net disposal proceeds and the carrying amount of the asset) is included in the statement of profit and loss when the asset is derecognised.

f. Intangible assets

Recognition and initial measurement

Intangible assets (software) are stated at their cost of acquisition. The cost comprises purchase price, borrowing cost if capitalization criteria are met and directly attributable cost of bringing the asset to its working condition for the intended use. Any trade discount and rebates are deducted in arriving at the purchase price.

Subsequent measurement (amortisation)

The cost of capitalized software is amortized over a period of 6 years, on a straight line basis. Amortisation on the addition/disposals is charged on pro-rata basis from/until the date of such addition/disposal.

g. Government grants

The Group recognises government grants only when there is reasonable assurance that the conditions attached to them will be complied with, and the grants will be received. Government grants received in-relation to assets are presented as a reduction to the carrying amount of the related asset. Grants related to reimbursement of expenses incurred are recognized in statement of profit and loss as other income.

h. Operating leases

Where the lessor effectively retains all risk and benefits of ownership of the leased items, such leases are classified as operating leases. Operating lease payments are recognised as an expense in the Statement of profit and loss on a straight line basis. Refer 3a. above

i. Impairment of non-financial assets

At each reporting date, the Group assesses whether there is any indication that an asset may be impaired, based on internal or external factors. If any such indication exists, the Group estimates the recoverable amount of the asset or the cash generating unit. If such recoverable amount of the asset or cash generating unit to which the asset belongs is less than its carrying amount, the carrying amount is reduced to its recoverable amount. The reduction is treated as an impairment loss and is recognized in the statement of profit and loss. If, at the reporting date there is an indication that a previously assessed impairment loss no longer exists, the recoverable amount is reassessed and the asset is reflected at the recoverable amount. Impairment losses previously recognized are accordingly reversed in the statement of profit and loss.

j. Financial instruments

Financial assets

Initial recognition and measurement

All financial assets are recognised initially at fair value and transaction cost that is attributable to the acquisition of the financial asset is also adjusted.

Subsequent measurement

i. **Debt instruments at amortised cost –** A 'debt instrument' is measured at the amortised cost if both the following conditions are met:

- The asset is held within a business model whose objective is to hold assets for collecting contractual cash flows, and
- Contractual terms of the asset give rise on specified dates to cash flows that are solely payments of principal and interest (SPPI) on the principal amount outstanding.

After initial measurement, such financial assets are subsequently measured at amortised cost using the effective interest rate (EIR) method.

Notes

Summary of significant accounting policies and other explanatory information

ii. **Equity investments –** All equity investments in scope of Ind-AS 109 are measured at fair value. Equity instruments which are held for trading are generally classified as at fair value through profit and loss (FVTPL). For all other equity instruments, the Group decides to classify the same either as at fair value through other comprehensive income (FVOCI) or fair value through profit and loss (FVTPL). The Group makes such election on an instrument by instrument basis. The classification is made on initial recognition and is irrevocable.

iii. **Mutual funds –** All mutual funds in scope of Ind-AS 109 are measured at fair value through profit and loss (FVTPL).

De-recognition of financial assets

A financial asset is primarily de-recognised when the rights to receive cash flows from the asset have expired or the Group has transferred its rights to receive cash flows from the asset.

Financial liabilities

Initial recognition and measurement

All financial liabilities are recognised initially at fair value and transaction cost that is attributable to the acquisition of the financial liabilities is also adjusted. These liabilities are classified as amortised cost.

Subsequent measurement

These liabilities include borrowings and deposits. Subsequent to initial recognition, these liabilities are measured at amortised cost using the effective interest method.

De-recognition of financial liabilities

A financial liability is de-recognised when the obligation under the liability is discharged or cancelled or expires. When an existing financial liability is replaced by another from the same lender on substantially different terms, or the terms of an existing liability are substantially modified, such an exchange or modification is treated as the de-recognition of the original liability and the recognition of a new liability. The difference in the respective carrying amounts is recognised in the statement of profit or loss.

Financial guarantee contracts

Financial guarantee contracts are those contracts that require a payment to be made to reimburse the holder for a loss it incurs because the specified party fails to make a payment when due in accordance with the terms of a debt instrument. Financial guarantee contracts are recognised initially as a liability at fair value, adjusted for transaction costs that are directly attributable to the issuance of the guarantee. Subsequently, the liability is measured at the higher of the amount of expected loss allowance determined as per impairment requirements of Ind-AS 109 and the amount recognised less cumulative amortisation.

Offsetting of financial instruments

Financial assets and financial liabilities are offset and the net amount is reported in the balance sheet if there is a currently enforceable legal right to offset the recognised amounts and there is an intention to settle on a net basis, to realise the assets and settle the liabilities simultaneously.

k. Impairment of financial assets

In accordance with Ind-AS 109, the Group applies expected credit loss (ECL) model for measurement and recognition of impairment loss for financial assets.

ECL is the difference between all contractual cash flows that are due to the Group in accordance with the contract and all the cash flows that the Group expects to receive. When estimating the cash flows, the Group is required to consider –

- All contractual terms of the financial assets (including prepayment and extension) over the expected life of the assets.
- Cash flows from the sale of collateral held or other credit enhancements that are integral to the contractual terms.

Trade receivables

The Group applies approach permitted by Ind AS 109 Financial Instruments, which requires expected lifetime losses to be recognised from initial recognition of receivables.

Notes

Summary of significant accounting policies and other explanatory information

Other financial assets

For recognition of impairment loss on other financial assets and risk exposure, the Group determines whether there has been a significant increase in the credit risk since initial recognition and if credit risk has increased significantly, impairment loss is provided.

l. Inventories

Raw material, packaging material, stores and spare parts are carried at cost or net realisable value which is lower. Cost includes purchase price excluding taxes those are subsequently recoverable by the Group from the concerned authorities, freight inwards and other expenditure incurred in bringing such inventories to their present location and condition. Cost of inventories is determined using the weighted average cost method.

The carrying cost of raw materials, packing materials, stores and spare parts are appropriately written down when there is a decline in replacement cost of such materials and finished products in which they will be incorporated are expected to be sold below cost.

Finished goods and work in progress are also valued at the lower of cost and net realizable value. Cost of work in progress and manufactured finished goods is determined on weighted average basis and comprises cost of direct material, cost of conversion and other costs incurred in bringing these inventories to their present location and condition. Cost of traded goods is determined on weighted average basis. Excise duty liability is included in the valuation of closing inventory of finished goods.

m. Income taxes

Tax expense recognized in statement of profit or loss comprises the sum of deferred tax and current tax except the ones recognized in other comprehensive income or directly in equity.

Calculation of current tax is based on tax rates and tax laws that have been enacted for the reporting period. Current income tax relating to items recognised outside profit or loss is recognised outside profit or loss (either in other comprehensive income or in equity). Current tax items are recognised in correlation to the underlying transaction either in other comprehensive income or directly in equity.

Deferred tax is provided using the liability method on temporary differences between the tax bases of assets and liabilities and their carrying amounts for financial reporting purposes at the reporting date. Deferred tax assets are recognized to the extent that it is probable that the underlying tax loss or deductible temporary difference will be utilized against future taxable income. This is assessed based on the Group's forecast of future operating results, adjusted for significant non-taxable income and expenses and specific limits on the use of any unused tax loss or credit. The carrying amount of deferred tax assets is reviewed at each reporting date and reduced to the extent that it is no longer probable that sufficient taxable profit will be available to allow all or part of the deferred tax asset to be utilised. Unrecognised deferred tax assets are re-assessed at each reporting date and are recognised to the extent that it has become probable that future taxable profits will allow the deferred tax asset to be recovered. Deferred tax assets and liabilities are measured at the tax rates that are expected to apply in the year when the asset is realised or the liability is settled, based on tax rates (and tax laws) that have been enacted or substantively enacted at the reporting date. Deferred tax relating to items recognised outside profit or loss is recognised outside profit or loss (either in other comprehensive income or in equity).

n. Cash and cash equivalents

Cash and cash equivalents comprise cash on hand, demand deposits, other short-term highly liquid investments (original maturity of 3 months or less) that are readily convertible into known amounts of cash and which are subject to an insignificant risk of changes in value.

o. Post-employment, long term and short term employee benefits

Defined contribution plan

The Group's contribution to provident fund and employee state insurance schemes is charged to the statement of profit and loss. The Group's

Notes

Summary of significant accounting policies and other explanatory information

contributions towards Provident Fund are deposited with the Regional Provident Fund Commissioner under a defined contribution plan.

Defined benefit plan

The Group has gratuity as defined benefit plan where the amount that an employee will receive on retirement is defined by reference to the employee's length of service and final salary. The liability recognised in the balance sheet for defined benefit plans is the present value of the defined benefit obligation (DBO) at the reporting date net of fair value of plan assets. Management estimates the DBO annually with the assistance of independent actuaries, by adopting the projected unit credit method. Actuarial gains and losses resulting from re-measurements of the liability are included in other comprehensive income.

The Company has subscribed to a group gratuity scheme of Life Insurance Corporation of India (LIC). Under the said policy, the eligible employees are entitled for gratuity upon their resignation, retirement or in the event of death in lump sum after deduction of necessary taxes upto a maximum limit of ₹ 2. Liabilities in respect of the Gratuity Plan are determined by an actuarial valuation, based upon which the Company makes contributions to the Gratuity Fund.

Other long-term employee benefits

The Group also provides benefit of compensated absences to its employees which are in the nature of long -term benefit plan. Liability in respect of compensated absences becoming due and expected to be availed more than one year after the balance sheet date is estimated on the basis of an actuarial valuation performed by an independent actuary using the projected unit credit method as on the reporting date. Actuarial gains and losses arising from experience adjustments and changes in actuarial assumptions are recorded in the statement of profit and loss in the year in which such gains or losses arise.

Short-term employee benefits

Short-term employee benefits comprise of employee costs such as salaries, bonus etc. is recognized on the basis of the amount paid or payable for the period during which services are rendered by the employee.

p. Share based payments

Certain employees of the Group are entitled to remuneration in the form of equity settled instruments, for rendering services over a defined vesting period. Equity instruments granted are measured by reference to the fair value of the instrument at the date of grant. The fair value determined at the grant date is expensed over the vesting period of the respective tranches of such grants. The stock compensation expense is determined based on the Company's estimate of equity instruments that will eventually vest using fair value in accordance with Ind AS 102, Share based payment.

The employee benefits expense is measured using the fair value of the employee stock options and is recognised over vesting period with a corresponding increase in equity. The vesting period is the period over which all the specified vesting conditions are to be satisfied.

q. Provisions, contingent liabilities and contingent assets

Provisions are recognized only when there is a present obligation, as a result of past events, and when a reliable estimate of the amount of obligation can be made at the reporting date. These estimates are reviewed at each reporting date and adjusted to reflect the current best estimates. Provisions are discounted to their present values, where the time value of money is material.

Contingent liability is disclosed for:

- Possible obligations which will be confirmed only by future events not wholly within the control of the Group; or
- Present obligations arising from past events where it is not probable that an outflow of resources will be required to settle the obligation or a reliable estimate of the amount of the obligation cannot be made.

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Summary of significant accounting policies and other explanatory information

Contingent assets are neither recognized nor disclosed. However, when realization of income is virtually certain, related asset is recognized.

r. Earnings per share

Basic earnings per share is calculated by dividing the net profit or loss for the period attributable to equity shareholders (after deducting attributable taxes) by the weighted average number of equity shares outstanding during the period. The weighted average number of equity shares outstanding during the period is adjusted for events including a bonus issue.

For the purpose of calculating diluted earnings per share, the net profit or loss for the period attributable to equity shareholders and the weighted average number of shares outstanding during the period are adjusted for the effects of all dilutive potential equity shares.

5. Estimates and assumptions

The key assumptions concerning the future and other key sources of estimation uncertainty at the reporting date, that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year, are described below. The Group based its assumptions and estimates on parameters available when the consolidated financial statements were prepared. Existing circumstances and assumptions about future developments, however, may change due to market changes or circumstances arising that are beyond the control of the Group.

Recognition of deferred tax assets – The extent to which deferred tax assets can be recognized is based on an assessment of the probability of the Group's future taxable income against which the deferred tax assets can be utilized. In addition, significant judgement is required in assessing the impact of any legal or economic limits or uncertainties in various tax jurisdictions (see note 21).

Recognition of deferred tax liability on undistributed profits: The extent to which the Group can control the timing of reversal of deferred tax liability on undistributed profits of its subsidiaries requires judgement.

Evaluation of indicators for impairment of assets: The evaluation of applicability of indicators of impairment of assets requires assessment of several external and internal factors which could result in deterioration of recoverable amount of the assets.

Recoverability of advances/receivables: At each balance sheet date, based on historical default rates observed over expected life, the management assesses the expected credit loss on outstanding receivables and advances.

Useful lives of depreciable/amortisable assets: Management reviews its estimate of the useful lives of depreciable/amortisable assets at each reporting date, based on the expected utility of the assets. Uncertainties in these estimates relate to technical and economic obsolescence that may change the utility of certain software, customer relationships, IT equipment and other plant and equipment.

Defined benefit obligation (DBO): Management's estimate of the DBO is based on a number of critical underlying assumptions such as standard rates of inflation, mortality, discount rate and anticipation of future salary increases. Variation in these assumptions may significantly impact the DBO amount and the annual defined benefit expenses.

Fair value measurements: Management applies valuation techniques to determine the fair value of financial instruments (where active market quotes are not available) and non-financial assets. This involves developing estimates and assumptions consistent with how market participants would price the instrument. Management uses the best information available. Estimated fair values may vary from the actual prices that would be achieved in an arm's length transaction at the reporting date.

Provisions: At each balance sheet date basis the management judgment, changes in facts and legal aspects, the Group assesses the requirement of provisions against the outstanding warranties and guarantees. However, the actual future outcome may be different from this judgement.

(All amounts in ₹ millions, except share data and where otherwise stated)

6. Property, plant and equipment

	Freehold land	Leasehold land	Buildings	Plant and equipment	Office equipment	Furniture	Vehicles	Computers	Total
Gross carrying amount									
As at 1 April 2017	1,456	277	2,979	6,232	58	140	171	143	11,456
Additions	376	-	596	1,509	4	36	33	21	2,575
Disposals/retirement	63	-	-	40	-	-	4	-	107
Foreign exchange adjustments	-	1	-	-	1	1	-	-	3
Balance as at 31 March 2018	**1,769**	**278**	**3,575**	**7,701**	**63**	**177**	**200**	**164**	**13,927**
Additions	363	-	864	1,565	2	43	35	21	2,893
Disposals/assets written off	41	-	1	3	-	-	10	-	55
Foreign exchange adjustments	-	-	(3)	(1)	-	-	-	-	(4)
Balance as at 31 March 2019	**2,091**	**278**	**4,435**	**9,262**	**65**	**220**	**225**	**185**	**16,761**
Accumulated depreciation									
Up to 1 April 2017	-	15	614	2,275	31	56	82	111	3,184
Charge for the year	-	5	109	473	5	12	23	18	645
Adjustments for disposals	-	-	-	29	-	-	3	-	32
Foreign exchange translation	-	1	-	-	1	1	-	-	3
Balance as at 31 March 2018	**-**	**21**	**723**	**2,719**	**37**	**69**	**102**	**129**	**3,800**
Charge for the year	-	3	127	593	2	17	25	20	787
Adjustments for disposals	-	-	-	2	-	-	9	-	11
Foreign exchange translation	-	-	0	0	0	0	0	0	0
Balance as at 31 March 2019	**-**	**24**	**850**	**3,310**	**39**	**86**	**118**	**149**	**4,576**
Net book value as at 31 March 2018	1,769	257	2,852	4,982	26	108	98	35	10,127
Net book value as at 31 March 2019	**2,091**	**254**	**3,585**	**5,952**	**26**	**134**	**107**	**36**	**12,185**

(i) Contractual obligations

Refer to note 38 for disclosure of contractual commitments for the acquisition of property, plant and equipment.

(ii) Leasehold land includes land acquired from the State Industrial Development Corporation of Uttarakhand Limited, Uttar Pradesh State Industrial Development Corporation Limited for a period of 90 years and 87 years respectively. Further the Company has also acquired land from Ramky Pharma City (India) Limited under a lease arrangement for a period of 33 years which is renewable for a further period of 2 terms of 33 years each.

(iii) During the year, the Company was provisionally alloted a parcel of land from Andhra Pradesh Industrial Infrastructure Corporation Limited ('APIIC') in Attivaram, Nellore Disctrict, Andhra Pradesh for a consideration of ₹ 66 which shall be registered in the name of the Company based on fulfillment of certain conditions laid down by APIIC.

(iv) Capital work-in-progress^

31 March 2019	6,376
31 March 2018	4,800

^Capital-work-in-progress mainly relates to expansion projects on-going at Company's existing facilities and new projects under implementation.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

7. Intangible assets

	Computer Software	Total
Gross carrying amount		
As at 1 April 2017	131	131
Additions	18	18
As at 31 March 2018	**149**	**149**
Additions	51	51
Foreign exchange adjustments	0	0
As at 31 March 2019	**200**	**200**
Accumulated amortization		
Up to 1 April 2017	73	73
Charge for the year	17	17
Foreign exchange adjustment	(0)	(0)
Up to 31 March 2018	**90**	**90**
Charge for the year	23	23
Foreign exchange adjustment	(0)	(0)
Up to 31 March 2019	**113**	**113**
Net carrying amount		
As at 31 March 2018	59	59
As at 31 March 2019	**87**	**87**

8. Investments

		31 March 2019	31 March 2018
I.	**Non-current (At fair value through other comprehensive income)**		
	Investment in equity instruments		
	Unquoted		
	4,054 (31 March 2018: 4,054) shares of 1BYR NATIVITA Joint Limited Liability Company	0	0
	30 (31 March 2018: Nil) shares of Euro 0.5 per share of Pharnasanta B.V	0	-
	750 (31 March 2018: 750) equity shares of ₹ 100 each, fully paid-up, in Jeedimetla Effluent Treatment Limited	0	0
	139,451 (31 March 2018: 109,569) equity shares of ₹ 10 each, fully paid-up in OMRV Hospital Private Limited	105	74
	21,769 (31 March 2018: Nil) equity shares of ₹ 10 each, in Veda Seedsciences Private Limited	79	-
	1060 (31 March 2018: 588) units of ₹ 10,000 each, fully paid-up in Endiya Trust	11	6
	34,400 (31 March 2018: 34,400) equity shares of ₹ 10 each, fully paid-up, in Pattancheru Enviro-Tech Limited	0	0
	27,000 (31 March 2016: 27,000) equity shares of ₹ 10 each, fully paid-up in Jayalakshi Spinning Mills Limited	0	0
	Total investments in equity instruments (A)	**196**	**81**
	Government securities, unquoted		
	National savings certificates	0	0
	Total investments in government securities (B)	**0**	**0**
	Other investments, unquoted		
	Advance towards investment in Kotak Alternate Investment Plan	3	-
	Total investments in other non-current investments (C)	**3**	**-**
	Total non-current investments (A+B+C)	**199**	**81**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

	31 March 2019	31 March 2018
Less: provision for diminution in value of investments	0	0
	199	**81**
Aggregate book value of unquoted investments	199	81
Aggregate amount of impairment in the value of investments	0	0

	31 March 2019	31 March 2018
II. Current		
Investments in equity instruments, Quoted (At fair value through other comprehensive income)		
10,000 (31 March 2018: 10,000) equity shares of ₹ 10 each, fully paid-up in Neuland Laboratories Limited	7	7
5,500 (31 March 2018: 5,500) equity shares of ₹ 1 each, fully paid-up in Sun Pharmaceuticals Industries Limited	3	3
778 (31 March 2018: 778) equity shares of ₹ 2 each, fully paid-up in Alkem Laboratories Limited	1	2
15,000 (31 March 2018: 15,000) equity shares of ₹ 1 each, fully paid-up in Cadila Healthcare Limited	5	6
100,000 (31 March 2018: 100,000) equity shares of ₹ 1 each, fully paid-up in Laurus Labs Limited	40	50
150,000(31 March 2018: 150,000) equity shares of ₹ 1 each, fully paid-up in Lanco Infratech Limited	0	0
22,700 (31 March 2018: 22,700) equity shares of ₹ 1 each, fully paid-up in GMR Infrastructure Limited	0	0
50,400 (31 March 2018: 50,400) equity shares of ₹ 1 each, fully paid-up in GVK Power & Infrastructure Limited	0	1
50,000 (31 March 2018: 50,000) equity shares of ₹ 1 each, fully paid-up in Panacea Biotech Limited	10	13
3,176 (31 March 2018: 3,176) equity shares of ₹ 1 each, fully paid-up in ICICI Prudential Life Insurance Company Limited	1	1
Unquoted, (At amortised cost)		
Investments in Debentures	1,200	400
Investments in Global Dynamic Opportunities Fund Limited	219	201
Total current investments	**1,487**	**684**
Aggregate book value of unquoted investments	1,419	601
Aggregate book value of quoted investments	68	83
Aggregate market value of quoted investments	68	83
Aggregate amount of impairment in the value of investments	-	-

9. Loans

(Unsecured, considered good)

	31 March 2019	31 March 2018
Non-current		
Loans to others	20	-
	20	**-**
Current		
Loans to employees	71	45
	71	**45**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

10. Other financial assets

	31 March 2019	31 March 2018
Non-current		
Security deposits	99	87
Restricted deposits*	61	58
Interest accrued on deposits	5	5
	165	**150**
*Given against bank guarantees/performance guarantees		
Current		
Deposits with financial institution	6,316	5,942
Interest accrued on fixed deposits	553	179
Other advances	78	21
	6,947	**6,142**

11. Other assets

	31 March 2019	31 March 2018
Non-current		
Capital advances	492	575
Prepaid leasehold	18	18
Balances with statutory authorities	17	16
	527	**609**
Current		
Advance to material/service providers	618	193
Prepaid expenses	139	125
Export incentives receivable	304	228
Balances with statutory authorities	750	1,294
Other advances	9	-
	1,820	**1,840**

12. Inventories

	31 March 2019	31 March 2018
Raw materials [including goods-in-transit of ₹ 4 (31 March 2018: ₹ 16)]	2,111	1,587
Packing materials	258	193
Work-in-progress	1,406	1,239
Finished goods	735	621
Stores and spares [including goods-in-transit of ₹ 44 (31 March 2018: ₹ 26)]	561	580
Stock-in-trade	219	164
	5,290	**4,384**

During the year, ₹ 2 (31 March 2018: ₹ 87) was recognised as an expense for valuing the inventories at net realisable value.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

13. Trade receivables

	31 March 2019	31 March 2018
Trade receivables		
- Unsecured, receivables considered good	5,062	6,375
- Unsecured, receivables with significant increase in credit risk	-	-
	5,062	**6,375**
Less: Allowance for trade receivables	-	-
	5,062	**6,375**

14. Cash and cash equivalents

	31 March 2019	31 March 2018
Balances with banks		
- in current accounts	134	202
- in deposit accounts	131	-
Cash on hand	18	15
	283	**217**

There are no repatriation restrictions with regard to cash and cash equivalents as at the end of the reporting period.

15. Bank balances other than cash and cash equivalents

	31 March 2019	31 March 2018
Bank deposits		
- With maturity of more than three months and upto twelve months	2,490	1,600
- In unclaimed dividend accounts	22	20
	2,512	**1,620**

16. Equity share capital

i. Authorised share capital

	31 March 2019		31 March 2018	
	Number	Amount	Number	Amount
Equity shares of ₹ 2 each	20,00,00,000	400	20,00,00,000	400

ii. Issued, subscribed and fully paid up

	31 March 2019		31 March 2018	
	Number	Amount	Number	Amount
Equity shares of ₹ 2 each	18,27,46,479	365	18,44,93,400	369
	18,27,46,479	**365**	**18,44,93,400**	**369**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

iii. Reconciliation of number of equity shares outstanding at the beginning and at the end of the year

	31 March 2019		31 March 2018	
	Number	Amount	Number	Amount
Equity shares				
Balance at the beginning of the year	18,44,93,400	369	17,43,07,800	349
Add: Issued during the year	2,68,735	0	1,01,85,600	20
Less: Bought back during the year and extinguished before 31 March 2019*	(18,77,640)	(4)	-	-
	18,28,84,495	**365**	**18,44,93,400**	**369**
Less: Bought back during the year and extinguished after 31 March 2019*	(1,38,016)	(0)	-	-
Balance at the end of the year	**18,27,46,479**	**365**	**18,44,93,400**	**369**

*During the year ended 31 March 2019, the Company bought back 2,015,656 equity shares of ₹ 2 each for an aggregate purchase value of ₹ 1,329 at an average price of ₹ 659 per share, excluding transaction costs. Out of the total shares bought back, 1,877,640 equity shares of ₹ 2 each were extinguished before 31 March 2019 and the balance 138,016 equity shares were extinguished in two tranches on 5 April 2019 and 22 April 2019.

iv. Rights, preferences and restrictions attached to equity shares

The Company has only one class of equity shares having a par value of ₹ 2 per share. Each holder of equity shares is entitled to one vote per share. The dividend proposed by the Board of Directors (except interim dividend) is subject to the approval of the shareholders in the ensuing general meeting. In the event of liquidation of the Company, the holders of equity shares will be entitled to receive the remaining assets of the Company, after distribution of all preferential amounts in proportion of their shareholding.

v. Details of shareholder holding more than 5% share capital as at the end of the year

Name of the equity shareholder	31 March 2019		31 March 2018	
	Number	% holding	Number	% holding
V C Nannapaneni *	4,07,51,315	22.30%	4,07,51,315	22.09%
Time Cap Pharma Labs Limited	1,71,57,220	9.39%	1,71,57,220	9.30%
Natsoft Information Systems Private Limited	1,57,67,500	8.63%	1,57,67,500	8.55%

*including shares held in the capacity of Karta of Hindu Undivided Family (HUF) aggregating 5,440,045 (31 March 2018: 5,440,045)

vi. Shares reserved for issue under options

(a) The Company has instituted the NATCO Employee Stock Option Plan 'ESOP-2015', NATCO Employee Stock Option Plan 'ESOP-2016' and NATCO Employee Stock Option Plan 'ESOP-2017' ("the ESOP Schemes"). The ESOP Schemes were formulated in accordance with the Securities Exchange Board of India (Share Based Employee Benefits) Regulations, 2014 issued by the Securities and Exchange Board of India ("SEBI"). Pursuant to the terms of the ESOP Schemes, the Board of Directors of the Company have granted 750,000 options (post split), 174,330 options and 600,000 options to eligible employees on 12 August 2015, 11 November 2016 and 2 November 2017 respectively. The terms of the ESOP Schemes provide that each option entitles the holder to one equity share of ₹ 2 each (post split) and that the options can be settled only by way of issue of equity shares. The options vest on an annual basis over a period of 4-5 years from the date of grant and the options are entirely time-based with no performance conditions.

(b) During the year ended 31 March 2019, the Company had accrued stock compensation cost of ₹ 253 (31 March 2018: ₹ 180) in respect of the ESOP Schemes.

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Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

The details of options are as follows :

	31 March 2019		31 March 2018	
	Number of options	Weighted average exercise price	Number of options	Weighted average exercise price
Outstanding at the beginning of the year	11,44,380	2	7,90,775	2
Granted during the year	-	2	6,00,000	2
Exercised during the year	2,68,735	2	1,85,600	2
Expired during the year	27,330	2	60,795	2
Outstanding at the end of the year	8,48,315	2	11,44,380	2
Exercisable at the end of the year	-	-	-	-

The weighted average remaining contractual life of unvested options is 16.83 months (31 March 2018: 22.98 months).

The fair value of options was estimated at the date of grant using the Black-Scholes-Merton formula with the following assumptions:

	ESOP 2017	ESOP 2016	ESOP 2015
Risk-free interest rate	6.14% - 6.61%	6.82% - 8.05%	7.14% - 8.18%
Expected life	1-4 years	1-5 years	1-5 years
Expected volatility	39.82%-43.28%	37.28%-43.76%	40.59%- 49.91%
Expected dividend yield	0.75%	0.20%	0.20%

vii. Details of shares issued pursuant to contract without payment being received in cash during the last 5 years, immediately preceding the balance sheet date:

	Number of shares	
	1 April 2014 to 31 March 2019	1 April 2013 to 31 March 2018
Aggregate number of equity shares allotted *	13,96,765	11,28,030

* Equity shares allotted pursuant to contract without payment being received in cash comprise of:

(a) During the year ended 31 March 2015, the Company has issued 808,875 equity shares (post split) of ₹ 2 each to the erstwhile shareholders of NATCO Organic Limited ('NOL') in exchange of their holding of 19,310,000 equity shares of ₹ 10 each in NOL.

(b) Balance equity shares comprising of 587,890 (31 March 2018: 319,155) (post split) were allotted during the period of five years, on exercise of the options granted under the employee stock option plan wherein part consideration was received in the form of employee services.

viii. Dividends declared

	31 March 2019	31 March 2018
First interim dividend of ₹ 1.5 (31 March 2018: ₹ 1.25) per share	277	218
Second interim dividend of ₹ 3.5 (31 March 2018: ₹ 7) per share	642	1,291
Dividend distribution tax on above	189	308
Dividends not recognised at the end of the reporting period		
Third interim dividend of ₹ 1.25 approved by the Board of Directors in the meeting held on 27 May 2019	227	-
Dividend distribution tax on above	47	-

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Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

17. Other equity

	31 March 2019	31 March 2018
Reserves and surplus		
Securities premium	14,048	15,209
Capital reserve	207	207
Capital redemption reserve	9	5
General reserve	595	595
Share options outstanding account	308	239
Retained earnings	19,575	14,239
Total reserves and surplus	**34,742**	**30,494**
Other comprehensive income		
Gain/(loss) on FVTOCI equity securities (net of taxes)	40	40
Remeasurement of defined benefit plans (net of taxes)	(204)	(119)
Foreign currency translation reserve	(53)	(62)
	(217)	**(141)**
	34,525	**30,353**

(i) Nature and purpose of other reserves

Securities premium

Securities premium is used to record the premium on issue of shares. It is utilised in accordance with provisions of the Act.

Capital reserve

Capital reserve was created on amalgamation of certain entities into the Company in the earlier years. The Company uses capital reserve for transactions in accordance with the provisions of the Act.

Capital redemption reserve

In accordance with the requirements of the Act, the Company has created capital redemption reserve on buyback of shares. The Company uses capital redemption reserve for transactions in accordance with the provisions of the Act.

General reserve

The Company generally appropriates a portion of its earnings to the general reserve to be used for contingencies. These reserves are freely available for use by the Company.

Share options outstanding account

The reserve represents the excess of the fair value of the options on the grant date over the strike price which is accumulated by the Company in respect of all options that have been granted. The Company transfers the proportionate amounts, outstanding in this account, in relation to options exercised to securities premium account on the date of exercise of such options.

Gain/(loss) on FVTOCI equity securities

The Group has elected to recognise the change in fair value of certain investments in equity shares in other comprehensive income. These changes are accumulated within the gain/(loss) on FVTOCI equity securities reserve within equity. The Group transfers amounts from this reserve to retained earnings when the relevant equity instruments are derecognised.

Remeasurement of defined benefit obligations

The reserve represents the remeasurement gains/(losses) arising from the actuarial valuation of the defined benefit obligations of the Company. The remeasurement gains/(losses) are recognized in other comprehensive income and accumulated under this reserve within equity. The amounts recognized under this reserve are not reclassified to profit or loss.

Foreign currency translation reserve

Exchange differences arising on translation of the foreign operations are recognised in other comprehensive income as described in accounting policy and accumulated in a separate reserve within equity. The cumulative amount is reclassified to profit or loss when the net investment is disposed-off.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

18. Borrowings

	31 March 2019	31 March 2018
Current		
Loan repayable on demand		
Working capital loans from banks (secured)	1,039	988
Working capital loans from banks (unsecured)	1,495	744
Other loans		
Working capital loans from banks (unsecured)	1,329	-
	3,863	**1,732**

(i) Working capital loans (secured) represents cash credit, bills purchased and discounted with various banks.

(ii) Working capital loans (unsecured) represents overdraft, commercial paper, bills purchased and discounted with various banks.

(iii) Working capital loans are secured by joint pari-passu first charge on all the current assets (carrying value: ₹ 22,674 [31st March 2018: ₹ 20,542]) and identified property, plant and equipment (carrying value: ₹ 1,171 [31 March 2018: ₹ 1,099]) of the Company. During the current year, the Company has obtained approval for waiver of personal guarantees of Mr. V.C. Nannapaneni, Chairman and Managing Director and relatives of Chairman and Managing Director, Ms. Durga Devi Nannapaneni and Dr. N. Ramakrishna Rao.

19. Other financial liabilities

	31 March 2019	31 March 2018
Non-current		
Security deposits from customers	8	8
	8	**8**
Current		
Interest accrued but not due on borrowings	6	-
Capital creditors	482	666
Unpaid dividend on equity shares	22	20
Employee related payables	265	332
Other payables	7	6
	782	**1,024**

20. Provision for employee benefits

	31 March 2019	31 March 2018
Non-current		
Gratuity	439	229
Compensated absences	271	95
	710	**324**
Current		
Gratuity	47	58
Compensated absences	43	79
	90	**137**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

(a) Gratuity

The Company has subscribed to a group gratuity scheme of Life Insurance Corporation of India (LIC). Under the said policy, the eligible employees are entitled for gratuity upon their resignation, retirement or in the event of death in lump sum after deduction of necessary taxes upto a maximum limit of ₹ 2 (31st March, 2018: ₹ 2). Liabilities in respect of the Gratuity Plan are determined by an actuarial valuation, based upon which the Company makes contributions to the Gratuity Fund.

The following table set out the status of the gratuity plan and the reconciliation of opening and closing balances of the present value and defined benefit obligation.

		31 March 2019	31 March 2018
(i)	**Change in projected benefit obligation**		
	Projected benefit obligation at the beginning of the year	370	213
	Past service cost	-	60
	Service cost	69	38
	Interest cost	29	17
	Actuarial (gain) / loss	107	51
	Benefits paid	(21)	(9)
	Projected benefit obligation at the end of the year	**554**	**370**
(ii)	**Change in plan assets**		
	Fair value of plan assets at the beginning of the year	83	61
	Expected return on plan assets	7	5
	Employer contributions	-	26
	Return on plan assets (gain)/loss	(1)	-
	Benefits paid	(21)	(9)
	Fair value of plan assets at the end of the year	**68**	**83**
(iii)	**Reconciliation of present value of obligation on the fair value of plan assets**		
	Present value of projected benefit obligation at the end of the year	554	370
	Funded status of the plans	(68)	(83)
	Net liability recognised in the balance sheet	**486**	**287**
(iv)	**Expense recognized in the profit and loss**		
	Service cost	69	38
	Past service cost	-	60
	Interest cost	29	17
	Expected returns on plan assets	(7)	(5)
	Net gratuity costs in the profit and loss	**91**	**110**
(v)	**Expense recognized in other comprehensive income**		
	Recognized net actuarial (gain)/ loss	107	51
	Return on Plan Assets	1	1
		108	**52**
(vi)	**Key actuarial assumptions**		
	Discount rate	7.70%	8.00%
	Salary escalation rate	10.00% for first 2 years and 7.00% thereafter	10.00%

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

Assumptions regarding future mortality experience are set in accordance with the published rates under the Indian Assured Lives Mortality (2006-08) Ult table.

Plan assets does not comprise any of the Company's own financial instruments or any assets used by the Company. The Company has the plan covered under a policy with the Life Insurance Corporation of India Limited.

The significant actuarial assumptions for the determination of the defined benefit obligation are the discount rate and the salary growth rate. The calculation of the net defined benefit liability is sensitive to these assumptions. However, the impact of these changes is not ascertained to be material by the management.

		31 March 2019	31 March 2018
(vii)	**Sensitivity analysis:**		
	Defined benefit obligation without effect of projected salary growth	554	370
	Salary escalation up by 1%	58	25
	Salary escalation down by 1%	(50)	(23)
	Discount rate up by 1%	(55)	(23)
	Discount rate down by 1%	64	26
(viii)	**Maturity profile of defined benefit obligation (valued on undiscounted basis):**		
	1 year		47
	2 to 5 years		142
	6 to 10 years		274
	More than 10 years		1,188

(ix) The Company expects to contribute around ₹ 549 to the funded plans in the financial year 2019-20 (2018-19: ₹ 143) for gratuity.

21. Deferred tax liabilities (net)

	31 March 2019	31 March 2018
Deferred tax liabilities/(asset) arising on account of :		
Property, plant and equipment	143	143
Provision for employee benefits	(20)	3
Investments	(7)	(7)
	116	**139**

(a) Deferred taxes have not been recognised on undistributed earnings of ₹ 289 (31st March, 2018: ₹ 234) of the subsidiaries, where it is expected that the profits of its subsidiaries will not be distributed in the foreseeable future. The Group reinvests the profits of its subsidiaries, and accordingly, has not recorded any defered tax for the same.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

(b) The Company has not recognized deferred tax assets in respect of unused tax credits (minimum alternate tax credits) of ₹ 1,608 (31st March, 2018: ₹ 1,737). The above MAT credit expires at various dates ranging from 2023 through 2032. Further, the Group has not recognised deferred tax asset in respect of unabsorbed tax losses aggregating to ₹ 171 (31st March, 2018: ₹ 143) which can be carried forward indefinitely.

(c) Movement in deferred tax liabilities (net)

	As at 31 March 2018	Profit and loss *	Other comprehensive income	As at 31 March 2019
Property, plant and equipment	143	-	-	143
Provision for employee benefits	3	-	(23)	(20)
Investments	(7)	-	0	(7)
	139	**-**	**(23)**	**116**

	As at 31 March 2017	Profit and loss *	Other comprehensive income	As at 31 March 2018
Property, plant and equipment	143	-	-	143
Provision for employee benefits	13	-	(10)	3
Investments	(6)	-	(1)	(7)
	150	**-**	**(11)**	**139**

* Deferred tax credit recognized in the profit and loss represents utilization of unrecognised tax credits in the nature of minimum alternate tax. (Refer Note 31)

22. Other liabilities

	31 March 2019	31 March 2018
Current		
Payable to statutory authorities	94	126
Advance from customers	189	184
Others	33	-
	316	**310**

23. Trade payables

	31 March 2019	31 March 2018
Current		
Due to micro and small enterprises*	79	41
Due to others	2,091	2,650
	2,170	**2,691**

*Disclosure under the Micro, Small and Medium Enterprises Development Act, 2006 ("MSMED Act") as at 31 March 2019 and 31 March 2018:

Particulars		31 March 2019	31 March 2018
i)	the principal amount and the interest due thereon remaining unpaid to any supplier as at the end of each accounting year;	79	41
ii)	the amount of interest paid by the buyer in terms of section 16, along with the amounts of the payment made to the supplier beyond the appointed day during each accounting year;	-	-
iii)	the amount of interest due and payable for the period of delay in making payment (which have been paid but beyond the appointed day during the year) but without adding the interest specified under this MSMED Act;	-	-

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

Particulars		31 March 2019	31 March 2018
iv)	the amount of interest accrued and remaining unpaid at the end of each accounting year; and	1	0
v)	the amount of further interest remaining due and payable even in the succeeding years, until such date when the interest dues as above are actually paid to the small enterprise, for the purpose of disallowance as a deductible expenditure under section 23.	-	-

The above information regarding Micro, Small and Medium Enterprises has been determined to the extent such parties have been identified on the basis of information available with the Company.

24. Revenue from operations

	For the year ended 31 March 2019	For the year ended 31 March 2018
Sale of products	20,400	21,611
Sale of services	68	66
	20,468	**21,677**
Other operating revenues		
Job work charges	150	62
Export and other incentives	297	263
Scrap sales	30	18
	20,945	**22,020**

Disaggregation of revenue

	31 March 2019
Revenue based on Geography	
India	8,256
USA	8,741
Rest of the world	3,948
	20,945

	31 March 2019
Timing of revenue recognition	
Goods transferred at a point in time	20,400
Services transferred over time	68
	20,468

	31 March 2019
Reconciliation of Revenue from operations with contract price	
Contract price	22,846
Less:	
Sales returns	(257)
Trade discounts	(1,644)
Total Revenue from operations	**20,945**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

25. Other income

	31 March 2019	31 March 2018
Interest income from fixed deposits and loans	898	249
Dividend income from investments designated at FVOCI	-	2
Liabilities no longer required written, back	-	5
Gain on sale of investments	-	0
Gain on disposal of property, plant and equipment	135	103
Foreign exchange - gain (net)	249	34
Other non-operating income	20	11
	1,302	**404**

26. Cost of material consumed

	For the year ended 31 March 2019	For the year ended 31 March 2018
Raw material and packing material at the beginning of the year	1,780	1,368
Add: Purchases during the year	3,920	4,317
Less: Raw material and packing material at the end of the year	2,369	1,780
	3,331	**3,905**

27. Changes in inventories of finished goods, stock-in -trade and work-in-progress

	31 March 2019	31 March 2018
Opening balance		
- Finished goods	621	613
- Work-in-progress	1,239	1,021
- Stock-in-trade	164	137
	2,024	**1,771**
Closing balance		
- Finished goods	735	621
- Work-in-progress	1,406	1,239
- Stock-in-trade	219	164
	2,360	**2,024**
Currency translation adjustment	3	0
	(339)	**(253)**

28. Employee benefits expense

	31 March 2019	31 March 2018
Salaries, wages and bonus	2,872	2,659
Contribution to provident fund and other funds (note (a) below)	200	172
Employee stock compensation expenses	255	177
Gratuity expense	91	110
Staff welfare expenses	141	138
	3,559	**3,256**

(a) During the year ended 31st March, 2019, the Company contributed ₹ 187 (31st March, 2018: ₹ 159) to provident fund and ₹ 12 (31st March, 2018: ₹ 13) towards employee state insurance fund.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

29. Finance costs

	For the year ended 31 March 2019	For the year ended 31 March 2018
Interest on borrowings	162	132
Other borrowing costs	31	22
	193	**154**

30. Other expenses

	For the year ended 31 March 2019	For the year ended 31 March 2018
Consumption of stores and spares	372	383
Power and fuel	596	562
Rent	37	28
Repairs and maintenance		
- Buildings	50	78
- Plant and equipment	192	256
- Others	34	52
Insurance	103	98
Rates and taxes	380	247
Factory maintenance expenses	196	251
Analysis charges	283	122
Carriage and freight outwards	53	62
Donations#	287	99
Corporate social responsibility (CSR) expenses	116	69
Communication expenses	68	61
Office maintenance and other expenses	75	63
Travelling and conveyance	257	255
Legal and professional fees	343	222
Directors sitting fee	1	1
Bad debts written off	20	133
Foreign exchange loss, net	22	-
Royalty expense	226	222
Sales promotion expenses including sales commission	1,319	1,307
Research and development expenses	724	462
Printing and stationery	41	80
Miscellaneous expenses	101	84
	5,896	**5,197**

*Excludes ₹ Nil (31st March, 2018: ₹ 5) charged to securities premium in respect of share issue expenses incurred for shares issued through Qualified Institutional Placement.

Includes political contributions of ₹ 233 (31st March, 2018: ₹ Nil) made in accordance with Section 182 of the Act.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

(i) Details of CSR expenditure :

	31 March 2019	31 March 2018
(a) Gross amount required to be spent by company during the year	116	68
(b) Amount spent on eligible activities	116	69

31. Income tax

	31 March 2019	31 March 2018
Tax expense/(credit) comprises of:		
Current income tax	1,883	2,199
Deferred tax	(60)	(279)
Income tax expense reported in the statement of profit or loss	**1,823**	**1,920**

The major components of income tax expense and the reconciliation of expected tax expense based on the domestic effective tax rate of the Company at 34.944% (31st March, 2018: 34.608%) and the reported tax expense in profit or loss are as follows:

Reconciliation of tax expense and the accounting profit multiplied by India's tax rate		
Profit before tax	8,247	8,872
Tax at the Indian tax rate (34.944%) (31 March 2018: 34.608%)	2,881	3,070
Adjustments:		
CSR expenses and other donations	50	40
Weighted deduction on research and development expense	(446)	(288)
Tax incentives	(685)	(632)
Capital gain tax	(17)	(19)
MAT credit utilisation	(60)	(279)
Deferred tax assets not recognized / (utilized)	28	(11)
Effect of change in tax laws and rate in jurisdictions outside India	72	39
Income tax expense	**1,823**	**1,920**

32. Earnings per share (EPS)

The following reflects the income and share data used in the basic and diluted EPS computations:

	For the year ended 31 March 2019	For the year ended 31 March 2018
Profit attributable to equity shareholders	6,444	6,962
Weighted average number of equity shares outstanding during the year	18,42,05,422	17,73,13,783
Effect of dilution:		
Employee stock options	5,71,121	6,28,391
Weighted average number of equity shares adjusted for the effect of dilution	18,47,76,543	17,79,42,174
Earnings per equity share		
Basic (in ₹)	34.98	39.26
Diluted (in ₹)	34.87	39.13
Nominal Value per equity share (in ₹)	2	2

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

33 Fair value measurements

(i) Fair value hierarchy

Financial assets and financial liabilities measured at fair value in the statement of financial position are grouped into three levels of a fair value hierarchy. The three levels are defined based on the observability of significant inputs to the measurement, as follows:

Level 1: Quoted prices (unadjusted) in active markets for financial instruments.

Level 2: The fair value of financial instruments that are not traded in an active market is determined using valuation techniques which maximise the use of observable market data rely as little as possible on entity specific estimates.

Level 3: If one or more of the significant inputs is not based on observable market data, the instrument is included in level 3.

(ii) Financial assets and financial liabilities measured at fair value

	31 March 2019		31 March 2018	
	Level 1	Level 3	Level 1	Level 3
Financials assets				
Equity instruments	68	196	83	81
Government securities	-	0	-	0
Other investments	-	3	-	-

Financial instruments by category

For amortised cost instruments, carrying value represents the best estimate of fair value.

	31 March 2019		31 March 2018	
	FVOCI	Amortised cost	FVOCI	Amortised cost
Financial assets				
Investments				
- Equity instruments	264	-	164	-
- Government securities	0	-	0	-
- Debentures	-	1,200	-	400
- Mutual funds	-	219	-	201
- Other investments	3	0	-	0
Trade receivables	-	5,062	-	6,375
Loans	-	91	-	45
Cash and cash equivalents	-	283	-	217
Bank balances other than cash and cash equivalents	-	2,512	-	1,620
Other financial assets	-	7,112	-	6,292
Total financial assets	**267**	**16,479**	**164**	**15,150**

	31 March 2019		31 March 2018	
	FVTPL	Amortised cost	FVTPL	Amortised cost
Financial liabilities				
Borrowings	-	3,863	-	1,732
Trade payables	-	2,170	-	2,691
Other financial liabilities	-	790	-	1,032
Total financial liabilities	**-**	**6,823**	**-**	**5,455**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

The Group's principal financial liabilities comprise borrowings, trade payables and other financial liabilities. The main purpose of these financial liabilities is to finance the Group's operations. The Group's principal financial assets include loans, trade and other receivables, cash and cash equivalents and other bank balances that derive directly from its operations. The Group also holds FVOCI investments.

The carrying amounts of trade receivables, trade payables and cash and cash equivalents are considered to be the same as their fair values, due to their short-term nature. Difference between carrying amounts and fair values of bank deposits, other financial assets, other financial liabilities and borrowings subsequently measured at amortised cost is not significant in each of the years presented. For all other amortised cost instruments, carrying value represents the best estimate of fair value.

For financial assets measured at fair values, the carrying amounts are equal to the fair values.

34. Financial instruments risk management

A. Market risk:

Market risk is the risk that the fair value of future cash flows of a financial instrument will fluctuate because of changes in market prices. Market risk comprises two types of risk: interest rate risk and currency risk. Financial instruments affected by market risk include borrowings, deposits, trade receivables and other financial instruments.

The sensitivity analyses in the following sections relate to the position as at 31st March, 2019 and 31st March, 2018. The analysis exclude the impact of movements in market variables on the carrying values of gratuity and other post retirement obligations; provisions; and non-financial assets and liabilities.

i. Interest rate risk

The Group's entire borrowings carried at amortised cost are variable rate instruments and are subject to fluctuation because of a change in market interest rates. The Group considers the impact of fair value interest rate risk on variable rate borrowings as not material.

The Group's variable rate borrowing is subject to interest rate risk. Below is the details of exposure to fixed rate and variable rate instruments:

	31 March 2019	31 March 2018
Fixed rate instruments		
Financial assets	10,086	7,999
Financial liabilities	-	-
Variable rate instruments		
Financial assets	-	-
Financial liabilities	3,863	1,732

ii. Foreign currency risk:

Foreign currency risk is the risk that the fair value or future cash flows of an exposure will fluctuate because of changes in foreign exchange rates. The Group's exposure to the risk of changes in foreign exchange rates relates primarily to the Group's operating activities (when revenue or expense is denominated in a foreign currency).

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

The Group's exposure to foreign currency financial assets and financial liabilities expressed in ₹ are as follows:

Financial assets

	31 March 2019			31 March 2018		
	Trade receivables	Loans	Other financial assets	Trade receivables	Loans	Other financial assets
- USD	2,038	368	11	3,759	78	0
- EUR	55	-	-	79	-	-
- CAD	147	-	-	135	-	-
- SGD	3	108	1	1	-	-

Financial liabilities

	31 March 2019		31 March 2018	
	Trade payables	Other financial liabilities	Trade payables	Other financial liabilities
- USD	158	-	135	-
- EUR	45	-	47	-
- GBP	1	-	1	-
- CAD	-	-	1	-
- JPY	-	-	2	-

Foreign currency sensitivity

The following table demonstrates the sensitivity to a reasonably possible change in USD. The Group's exposure to foreign currency changes for all other currencies is not material.

Particulars	Impact on profit after tax	
	31 March 2019	31 March 2018
USD sensitivity		
₹/USD - Increase by 10%	226	370
₹/USD - Decrease by 10%	(226)	(370)

iii. Equity price risk:

The Group's exposure to equity securities price risk arises from investments held by the Group and classified in the balance sheet as FVOCI.

To manage its price risk arising from investments in equity securities, the Company diversifies its portfolio.

The Group has equity investments in publicly traded instruments which are listed on the National Stock Exchange (NSE) and other privately held companies.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

The table below summarises the impact of increase/decrease of the index on the Group's equity and profit for the period. The analysis is based on the assumption that the equity index had increased/decreased by 10% with all other variables held constant, and that off the Group's equity instruments moved in line with the index.

Particulars	Impact on other components of equity	
	31 March 2019	31 March 2018
NSE Nifty 50 - Increase by 10%	26	16
NSE Nifty 50 - Decrease by 10%	(26)	(16)

B. Credit risk

Credit risk is the risk that a counterparty fails to discharge an obligation to the Group, leading to a financial loss. The Group is mainly exposed to the risk of its balances with the bankers and trade and other receivables. None of the Group's cash equivalents, other bank balances, loans and security deposits were past due or impaired as at 31st March, 2019 and 31st March, 2018.

Ageing of receivable is as follows:

	31 March 2019	31 March 2018
Neither past due nor impaired	3,886	5,809
Past due not impaired:		
0-30 days	750	327
31-60 days	207	76
61-90 days	83	25
91-180 days	20	84
Greater than 180 days	116	54
	5,062	**6,375**

C. Liquidity risk

Prudent liquidity risk management implies maintaining sufficient cash and marketable securities and the availability of funding through an adequate amount of committed credit facilities to meet obligations when due. Due to the nature of the business, the Group maintains flexibility in funding by maintaining availability under committed facilities.

Management monitors rolling forecasts of the Group's liquidity position and cash and cash equivalents on the basis of expected cash flows. The Group takes into account the liquidity of the market in which the entity operates. In addition, the Group's liquidity management policy involves projecting cash flows in major currencies and considering the level of liquid assets necessary to meet these, monitoring balance sheet liquidity ratios against internal and external regulatory requirements and maintaining debt financing plans.

The Group's principal sources of liquidity are the cash flows generated from operations. The Group has no long term borrowings and believes that the working capital is sufficient for its current requirments. Accordingly, no liquidity risk is perceived.

Maturities of financial liabilities

The tables below analyse the Group's financial liabilities into relevant maturity groupings based on their contractual maturities for all non-derivative financial liabilities. The amounts disclosed in the table are the contractual undiscounted cash flows. Balances due within 12 months equal their carrying balances as the impact of discounting is insignificant.

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

31 March 2019	Up to 1 year	From 1 to 3 years	More than 3 years	Total
Non-derivatives				
Borrowings	3,863	-	-	3,863
Trade payables	2,170	-	-	2,170
Other financial liabilities	782	8	-	790
Total	**6,815**	**8**	**-**	**6,823**

31 March 2018	Up to 1 year	From 1 to 3 years	More than 3 years	Total
Non-derivatives				
Borrowings	1,732	-	-	1,732
Trade payables	2,691	-	-	2,691
Other financial liabilities	1,024	8	-	1,032
Total	**5,447**	**8**	**-**	**5,455**

35. Capital risk management

The Group's objective when managing capital is to safeguard the Group's ability to continue as a going concern in order to provide returns for shareholders and benefits for stakeholders. The Group also proposes to maintain an optimal capital structure to reduce the cost of capital. Hence, the Group may adjust any dividend payments, return capital to shareholders or issue new shares. Total capital is the equity as shown in the consolidated statement of financial position. Currently, the Group primarily monitors its capital structure on the basis of gearing ratio. Management is continuously evolving strategies to optimize the returns and reduce the risks. It includes plans to optimize the financial leverage of the Group.

The capital for the reporting year under review is summarized as follows:

	31 March 2019	31 March 2018
Total borrowings (note 18)	3,863	1,732
Less: Cash and cash equivalents (note 14)	(283)	(217)
Net debt	**3,580**	**1,515**
Total equity	34,910	30,760
Total capital	**38,490**	**32,275**
Gearing ratio (%)	9%	5%

36. Related party disclosures, as per Ind AS 24

(a) Names of the related parties and nature of relationship (to the extent transactions have taken place during the year)

Names of related parties	Nature of relationship
Time Cap Pharma Labs Limited	Entities in which Directors have control or have significant influence
NATCO Trust	
Mr. V.C. Nannapaneni	Key management personnel ("KMP")
Mr. Rajeev Nannapaneni	
Mr. Sreerama Murthy Gubbala	
Mr. Govinda Prasad Dasu	
Mr. Umamaheshwarrao Naidu Madireddi	
Mr. Venkateswara Rao Thallapaka	
Mr. Sridhar Sankararaman	
Mrs. Leela Digumarti	
Mr. Potluri Prasad Sivaramakrishna	
Mr. Lingarao Donthineni	
Ms. Durga Devi Nannapaneni	Relative of KMP
Dr. N. Ramakrishna Rao	

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

(b) Transactions with related parties

	For the year ended 31 March 2019	For the year ended 31 March 2018
Transactions with entities where KMP have significant influence		
Time Cap Pharma Labs Limited		
Sales promotion expenses	6	7
Purchase of Land	49	-
Rental expense	5	5
NATCO Trust		
Donations	24	82
CSR activities	116	69
Transactions with KMP		
Mr. V.C. Nannapaneni		
Short-term employee benefits*	17	19
Leave encashment paid	1	1
Rental expenses	2	2
Commission on profits	-	70
Mr. Rajeev Nannapaneni		
Short-term employee benefits*	16	17
Leave encashment paid	1	1
Rental expenses	1	1
Mr. Potluri Prasad Sivaramakrishna		
Short-term employee benefits*	14	12
Leave Encashment	0	0
Mr. Lingarao Donthineni		
Short-term employee benefits*	14	12
Leave Encashment	0	0
Mr. Govinda Prasad Dasu		
Sitting fees	0	0
Mrs. Leela Digumarti		
Sitting fees	0	0
Mr. Umamaheshwarrao Naidu Madireddi		
Sitting fees	0	0
Mr. Sreerama Murthy Gubbala		
Sitting fees	0	0
Mr. Venkateswara Rao Thallapaka		
Sitting fees	0	0

(c) Balances receivable / (payable)

	As at 31 March 2019	As at 31 March 2018
Time Cap Pharma Labs Limited	(0)	(3)
Mr. V.C. Nannapaneni	(2)	(71)
Mr. Rajeev Nannapaneni	(1)	(1)
Mr. Lingarao Donthineni	(1)	(1)
Mr. Potluri Prasad Sivaramakrishna	(1)	(1)
Mr. Venkateswara Rao Thallapaka	(0)	-

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

Notes:

(i) During the current year, the company has obtained approval of the waiver of personal guarantees of Mr. V.C. Nannapaneni, Chairman and Managing Director, and relatives of Chairman and Managing Director, Ms. Durga Devi Nannapaneni and Dr. N. Ramakrishna Rao. Refer note 18.

(ii) *This aforesaid amount does not include amounts in respect of gratuity and compensated absences as the same are determined on actuarial basis for the Company as a whole.

(d) Transaction with related parties - Transfer pricing

In accordance with the applicable provisions of the Income Tax Act, 1961, the Company is required to use certain specified methods in assessing that the transactions with the related parties, are carried at an arm's length price and is also required to maintain prescribed information and documents to support such assessment. The appropriate method to be adopted will depend on the nature of transactions / class of transactions, class of associated persons, functions performed and other factors as prescribed. Based on certain internal analysis carried out, management believes that transactions entered into with the related parties were carried out at arm's length prices. The Company is in the process of updating the transfer pricing documentation for the financial year ended 31 March 2019. In opinion of the management, the same would not have an impact on these consolidated financial statements. Accordingly, these consolidated financial statements do not include the effect of the transfer pricing implications, if any.

37. Segment reporting

The management has assessed the identification of reportable segments in accordance with the requirements of Ind AS 108 'Operating Segment' and believes that the Group has only one reportable segment namely "Pharmaceuticals".

Geography-wise details of the Group's revenues from external customers and its non-current assets (other than financial instruments, investments accounted for using the equity method, deferred tax assets and post-employment benefit assets) and revenue from major customers are given below:

i. Income (excluding other income)

	31 March 2019	31 March 2018
India	8,256	8,161
USA	8,741	9,631
Rest of the world	3,948	4,228

ii. Non-current assets

	31 March 2019	31 March 2018
India	19,051	15,580
USA	-	-
Rest of the world	124	33

iii. Major customer

The Group has one customer who contributed more than 10% of the Group's total revenue during the current year and two in the previous year. The revenue from such major customer(s) during the year is ₹ 5,245 (31 March 2018: ₹ 8,456).

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

38. Contingent liabilities and commitments

		31 March 2019	31 March 2018
(a)	**Commitments**		
	Estimated amount of contracts remaining to be executed on capital account and not provided for (net of advances)	753	1,067
(b)	**Contingent liabilities**		
(i)	**Matters under appeal with tax authorities:**		
	Disputed sales tax liabilities	9	9
	Disputed service tax liabilities	17	2
	Disputed customs liability	2	2

(ii) The Company is contesting certain patent infringement cases filed against it by the innovators. A few of these cases pertain to products already launched by the Company in the market. These cases are pending before different authorities / courts and the outcome cannot be ascertained with reasonable certainty. Accordingly, a reliable estimate of the liability towards damages/penalties, if any, cannot be made at present. These amounts will be recognised during the periods in which such liabilities can be reasonably measured. Further, at present, the management does not expect such liabilities to be significant.

(ii) The Hon'ble Supreme Court (SC) has clarified in the case of Vivekananda Vidyamandir and Others Vs. The Regional Provident Fund Commissioner (II) West Bengal that various allowances like conveyance allowance, special allowance, education allowance, medical allowance etc., paid uniformly and universally by an employer to its employees shall form part of basic wages for computation of the provident fund contribution. On the basis of internal evaluation, supported by a legal opinion from an independent legal expert, management of the Company has determined that the aforesaid ruling is applicable prospectively and, therefore there is no impact of such ruling on the financial statements of the Group.

39. Amounts incurred on research and development expenses

	31 March 2019	31 March 2018
Salaries and wages	501	462
Consumption of materials, spares	314	278
Power and fuel	29	26
Other research and development expenses	844	513
Capital equipments	288	386
	1,976	**1,665**

The aforementioned expenditure, other than capital equipment, are included under the respective heads of the Statement of Profit and Loss.

40. Expenditure during construction period (pending allocation)

	31 March 2019	31 March 2018
Opening Balance	**69**	**-**
Add:		
Cost of materials consumed, net of trial run inventory recognized	1	-
Employee benefits expense	54	1
Power and fuel	39	7
Factory maintenance	88	60
Rates and taxes	3	0
Legal and professional chargers	1	-

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

	31 March 2019	31 March 2018
Others	23	1
Less:		
Capitalized during the year	-	-
	278	**69**

41. Additional disclosure as required under paragraph 2 of 'General Instructions for the preparation of Consolidated Financial Statements' of the Schedule III to the Act

For the year ended 31 March 2019

Name of the entity	Net assets		Share in profit or loss		Share in other comprehensive income		Share in total comprehensive income	
	As a % of consolidated net assets	Amount	As a % of consolidated profit or loss	Amount	As a % of consolidated other comprehensive income	Amount	As a % of consolidated total comprehensive income	Amount
Parent company								
NATCO Pharma Limited	97%	33,936	100%	6,442	120%	(91)	100%	6,351
Foreign subsidiaries								
NATCO Pharma Inc.	1%	221	0%	2	-30%	23	0%	25
Time Cap Overseas Limited	1%	301	-4%	(249)	11%	(8)	-4%	(257)
NATCO Pharma (Canada), Inc.	1%	401	4%	252	-8%	6	4%	258
NATCO Pharma Asia Pte. Ltd.	0%	17	0%	10	8%	(6)	0%	4
NATCO Pharma Australia PTY Ltd.	0%	0	0%	(7)	0%	-	0%	(7)
NATCO Lifesciences Philippines Inc.	0%	14	0%	(6)	0%	-	0%	(6)
Non-controlling interests								
Time Cap Overseas Limited	0%	17	0%	(21)	0%	-	0%	(21)
NATCO Pharma (Canada) Inc.	0%	3	0%	1	0%	-	0%	1
Total	**100%**	**34,910**	**100%**	**6,424**	**100%**	**(76)**	**100%**	**6,348**

For the year ended 31 March 2018

Name of the entity	Net assets		Share in profit or loss		Share in other comprehensive income		Share in total comprehensive income	
	As a % of consolidated net assets	Amount	As a % of consolidated profit or loss	Amount	As a % of consolidated other comprehensive income	Amount	As a % of consolidated total comprehensive income	Amount
Parent company								
NATCO Pharma Limited	98%	30,135	99%	6,858	90%	(47)	99%	6,811
Foreign subsidiaries								
NATCO Pharma Inc.	1%	210	0%	(1)	-8%	4	0%	3
Time Cap Overseas Limited	0%	53	-2%	(116)	37%	(19)	-2%	(135)
NATCO Pharma (Canada), Inc.	1%	320	3%	240	-6%	3	4%	243
NATCO Pharma Asia Pte. Ltd.	0%	3	0%	(17)	-13%	7	0%	(10)
NATCO Pharma Australia PTY Ltd.	0%	1	0%	(2)	0%	-	0%	(2)
Non-controlling interests								
Time Cap Overseas Limited	0%	36	0%	(11)	0%	-	0%	(11)
NATCO Pharma Australia PTY Ltd	0%	0	0%	0	0%	-	0%	-
NATCO Pharma (Canada) Inc.	0%	2	0%	1	0%	-	0%	1
Total	**100%**	**30,760**	**100%**	**6,952**	**100%**	**(52)**	**100%**	**6,900**

Notes

Summary of significant accounting policies and other explanatory information

(All amounts in ₹ millions, except share data and where otherwise stated)

42. Net debt reconciliation

The following table sets out an analysis of the movements in net debt for the year:

	Current borrowings	Interest accrued	Cash and cash equivalents	Net debt
Net debt as at 31 March 2018	**1,732**	**-**	**217**	**1,515**
Cash flows	2,131	-	66	2,065
Finance cost	-	193	-	193
Interest paid	-	(187)	-	(187)
Net debt as at 31 March 2019	**3,863**	**6**	**283**	**3,586**

	Current borrowings	Interest accrued	Cash and cash equivalents	Net debt
Net debt as at 31 March 2017	**2,216**	**2**	**235**	**1,983**
Cash flows	(484)	-	(18)	(466)
Finance cost	-	154	-	154
Interest paid	-	(156)	-	(156)
Net debt as at 31 March 2018	**1,732**	**-**	**217**	**1,515**

43. Events after reporting period

The Board of Directors, at the meeting held on 27 May 2019, had recommended an interim dividend of ₹ 1.25 per equity share of face value of ₹ 2/- each (excluding applicable dividend distribution tax).

44. Corresponding previous period's figures have been regrouped/reclassified wherever necessary.

For **Walker Chandiok & Co LLP**
Chartered Accountants
Firm Registration No.: 001076N/N500013

Adi P. Sethna
Partner
Membership No. 108840

Place: Hyderabad
Date: 27th May, 2019

For and on behalf of the Board of Directors
NATCO Pharma Limited

V.C. Nannapaneni
Chairman & Managing Director
(DIN: 00183315)

Rajeev Nannapaneni
Vice Chairman & CEO
(DIN: 00183872)

M. Adinarayana
Company Secretary & Vice President
(Legal & Corporate Affairs)

S.V.V.N. Appa Rao
Chief Financial Officer

Place: Hyderabad
Date: 27th May, 2019

Notice to Members

Notice is hereby given that the 36th Annual General Meeting of the members of the Company will be held on Thursday, the 5th day of September, 2019 at 10.30 a.m. IST at Convention Centre, Hotel Daspalla, Road No.37, Jubilee Hills, Hyderabad 500 033 to transact the following business:

ORDINARY BUSINESS:

1. **Adoption of audited Annual Financial Statements for the Financial Year 2018-19**
   To receive, consider and adopt the audited financial statements, both on standalone and consolidated basis, of the Company for the financial year ended 31st March, 2019, together with the reports of Board of Directors and the Auditors thereon.

2. **To confirm the already paid three interim dividends on equity shares during the Financial Year 2018-19 as final dividend**
   To consider and, if thought fit, to pass the following Resolution as an Ordinary Resolution:

   "**RESOLVED THAT** the interim dividend of ₹ 1.50 ps (Rupees one and paisa fifty only) per equity share of ₹ 2/- each declared in the Board Meeting held on 8th August, 2018 amounting to ₹ 27,67,40,100 (Rupees Twenty seven crores sixty seven lakhs forty thousand and one hundred only) on 18,44,93,400 equity shares of ₹ 2/- each, second interim dividend of ₹ 3.50 (Rupees three and paisa fifty only) per equity share of ₹ 2/- each declared in the Board Meeting held on 12th February, 2019 amounting to ₹ 64,20,27,736 (Rupees Sixty four crores twenty lakhs twenty seven thousand seven hundred and thirty six only) on 18,34,36,496 equity shares of ₹ 2/- each and third interim dividend of ₹1.25 (Rupees one and paisa twenty five only) per equity share of ₹ 2/- each declared in the Board Meeting held on 27th May, 2019 amounting to ₹ 22,72,02,668.75 (Rupees twenty two crores seventy two lakhs two thousand six hundred and sixty eight and paisa seventy five only) on 18,17,62,135 equity shares of ₹ 2/- each thus total aggregating to ₹ 114,59,70,504.75 (Rupees one hundred fourteen crores fifty nine lakhs seventy thousand five hundred and four and paisa seventy five only) be and is hereby approved as the final dividend for the financial year 2018-19."

3. **Reappointment of Sri Rajeev Nannapaneni (DIN:00183872) as a Director liable to retire by rotation**
   To consider and, if thought fit, to pass the following resolution as an Ordinary Resolution:

   "RESOLVED THAT Sri Rajeev Nannapaneni (DIN: 00183872) who retires by rotation and being eligible offers himself for re-appointment, be and is hereby reappointed as a Director of the Company, who shall be liable for retirement by rotation."

4. **Appointment of Statutory Auditors**
   To consider and, if thought fit, to pass the following resolution as an Ordinary Resolution:

   "RESOLVED THAT pursuant to the provisions of Sections 139, 141, 142 and other applicable provisions, if any, of the Companies Act, 2013 ("Act") and Companies (Audit and Auditors) Rules, 2014 thereunder, as amended from time to time, and pursuant to the recommendation of the Audit Committee and Board of Directors of the Company, M/s. B S R & Associates LLP (ICAI FRN: 116231W/W-100024) be and is hereby appointed as Statutory Auditors of the Company, in place of retiring auditors M/s. Walker Chandiok & Co. LLP (Firm Registration No.001076N/N500013) to hold office for a period of five (5) years i.e. from the conclusion of this Annual General Meeting till the conclusion of the 41st Annual General Meeting of the Company for the financial year 2023-2024 at such remuneration as may be mutually agreed upon between the Board of Directors and the Auditors.

   RESOLVED FURTHER THAT the Board be and is hereby authorised to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other officer(s) of the company for obtaining permissions and approvals, if any, in this connection."

SPECIAL BUSINESS:

5. Reappointment of Sri V.C. Nannapaneni (DIN: 00183315) as Chairman and Managing Director

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"RESOLVED THAT pursuant to the provisions of Sections 152, 196, 197, 198, and all other applicable provisions of the Companies Act, 2013 ("Act") read with the provisions of Schedule V thereto and the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014, (including any statutory modification(s) or re-enactment thereof, for the time being in force) and the SEBI (Listing obligations and disclosure Requirements) Regulations, 2015 as amended from time to time, Sri V.C. Nannapaneni (DIN: 00183315), whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act proposing his candidature for the office of Director, be and is hereby reappointed as Chairman and Managing Director of the Company for a period of one (1) year from 1st April, 2019 to 31st March, 2020 with the remuneration as detailed below:

a. Salary not exceeding ₹ 1,85,00,000 (Rupees one crore eighty five lakhs only) p.a. including dearness allowance and all other allowances.

b. Managerial commission not exceeding 0.5% of the net profits calculated as per Section 198 of the Act.

c. Perquisites:

   i. Reimbursement of Medical Expenses for major ailments not exceeding 50% of the salary.

   ii. Contribution to Provident Fund, Superannuation Fund or Annuity Fund to the extent either singly or put together are not taxable under Income Tax Act, 1961.

   iii. Gratuity payable at a rate not exceeding half month's salary for each completed year of service.

   iv. Encashment of leave at the end of the tenure and

   v. Special incentive not exceeding 20% of gross remuneration per annum.

RESOLVED FURTHER THAT the Board of Directors of the Company be and is hereby authorized to vary, alter or modify the remuneration as may be agreed by the Board of Directors and Sri V.C. Nannapaneni.

RESOLVED FURTHER THAT notwithstanding as above in the financial year closing on 31st March, 2020, if the Company has no profits or if its profits are inadequate, the Company shall pay to Sri V.C. Nannapaneni the remuneration by way of salary, allowances and perks not exceeding the limits specified under Schedule V of the Act or any statutory modification(s) or re-enactment thereof.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

6. Reappointment of Sri Rajeev Nannapaneni (DIN: 00183872) as Vice Chairman and Chief Executive officer

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"RESOLVED THAT pursuant to the provisions of Sections 152, 196, 197, 198, and all other applicable provisions of the Companies Act, 2013 ("Act") read with the provisions of Schedule V thereto and the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014, (including any statutory modification(s) or re-enactment thereof for the time being in force) and the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Sri Rajeev Nannapaneni (DIN: 00183872), whose reappointment is recommended by the Nomination and Remuneration Committee of the Company be and is hereby reappointed as the Vice Chairman and Chief Executive Officer of the Company for a period

of one (1) year from 1st April, 2019 to 31st March, 2020 with the remuneration as detailed below:

a. Salary not exceeding ₹ 1,70,00,000 (Rupees one crore seventy lakhs only) p.a including dearness allowance and all other allowances.

b. Managerial commission not exceeding 0.5% of the net profits calculated as per Section 198 of the Act.

c. Perquisites:

   i. Reimbursement of Medical Expenses for major ailments not exceeding 50% of the salary.

   ii. Contribution to Provident Fund, Superannuation Fund or Annuity Fund to the extent either singly or put together are not taxable under Income Tax Act, 1961.

   iii. Gratuity payable at a rate not exceeding half month's salary for each completed year of service.

   iv. Encashment of leave at the end of the tenure and

   v. Special incentive not exceeding 20% of gross remuneration per annum.

RESOLVED FURTHER THAT the Board of Directors of the Company be and is hereby authorized to vary, alter or modify the remuneration as may be agreed by the Board of Directors and Sri Rajeev Nannapaneni.

RESOLVED FURTHER THAT notwithstanding as above in the financial year closing on 31st March, 2020, if the Company has no profits or if its profits are inadequate, the Company shall pay to Sri Rajeev Nannapaneni the remuneration by way of salary, allowances and perks not exceeding the limits specified under Schedule V of the Act or any statutory modification(s) or re-enactment thereof.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

7. Reappointment of Sri P.S.R.K Prasad (DIN: 07011140) as Director and Executive Vice President (Corporate Engineering Services)

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"RESOLVED THAT pursuant to the provisions of Sections 152, 196, 197, 198, and all other applicable provisions of the Companies Act, 2013 ("Act") read with provisions of Schedule V thereto and the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014, (including any statutory modification(s) or re-enactment thereof for the time being in force) and the SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Sri P.S.R.K.Prasad, (DIN: 07011140), whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act, proposing his candidature for the office of Director, be and is hereby reappointed as Director and Executive Vice President (Corporate Engineering Services) of the Company for a period of one (1) year from 1st April, 2019 to 31st March, 2020 with the remuneration as detailed below:

a. Salary not exceeding ₹ 1,63,80,000 (Rupees one crore sixty three lakhs eighty thousand only) p.a including dearness allowance and all other allowances.

b. Perquisites:

   i. Reimbursement of Medical Expenses for major ailments not exceeding 50% of the salary.

   ii. Contribution to Provident Fund, Superannuation Fund or Annuity Fund to the extent either singly or put together are not taxable under Income Tax Act, 1961.

   iii. Gratuity payable at a rate not exceeding half month's salary for each completed year of service.

   iv. Encashment of leave at the end of the tenure and

   v. Special incentive not exceeding 20% of gross remuneration per annum.

RESOLVED FURTHER THAT the Board of Directors of the Company be and is hereby authorized to vary, alter or modify the remuneration as may be agreed by the Board of Directors and Sri P.S.R.K. Prasad.

RESOLVED FURTHER THAT notwithstanding as above in the financial year closing on 31st March , 2020, if the Company has no profits or if its profits are inadequate, the Company shall pay to Sri P.S.R.K. Prasad the remuneration by way of salary, allowances

and perks not exceeding the limits specified under Schedule V of the Act or any statutory modification(s) or re-enactment thereof.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

8. Reappointment of Dr.D.Linga Rao (DIN: 07088404) as Director and President (Tech. Affairs)

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"RESOLVED THAT pursuant to the provisions of Sections 152, 196, 197, 198, and all other applicable provisions of the Companies Act, 2013 ("Act") read with provisions of Schedule V thereto and the Companies (Appointment and Remuneration of Managerial Personnel) Rules, 2014, (including any statutory modification(s) or re-enactment thereof for the time being in force) and SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Dr. D. Linga Rao (DIN: 07088404) whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act proposing his candidature for the office of Director, be and is hereby reappointed as Director and President (Tech. Affairs) of the Company for a period of one (1) year from 1st April, 2019 to 31st March, 2020 with the remuneration as detailed below:

a. Salary not exceeding ₹ 1,63,80,000 (Rupees one crore sixty three lakhs eighty thousand only) p.a. including dearness allowance and all other allowances.

b. Perquisites:

   i. Reimbursement of Medical Expenses for major ailments not exceeding 50% of the salary.

   ii. Contribution to Provident Fund, Superannuation Fund or Annuity Fund to the extent either singly or put together are not taxable under Income Tax Act, 1961.

   iii. Gratuity payable at a rate not exceeding half month's salary for each completed year of service.

   iv. Encashment of leave at the end of the tenure and

   v. Special incentive not exceeding 20% of gross remuneration per annum.

RESOLVED FURTHER THAT the Board of Directors of the Company be and is hereby authorized to vary, alter or modify the remuneration as may be agreed by the Board of Directors and Dr. D. Linga Rao.

RESOLVED FURTHER THAT notwithstanding as above in the financial year closing on 31st March, 2020, if the Company has no profits or if its profits are inadequate, the Company shall pay to Dr.D. Linga Rao the remuneration by way of salary, allowances and perks not exceeding the limits specified under Schedule V of the Act or any statutory modification(s) or re-enactment thereof.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

9. Reappointment of Sri G.S.Murthy (DIN: 00122454) as an Independent Director

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"RESOLVED THAT pursuant to the provisions of Sections 149,152, and any other applicable provisions of the Companies Act, 2013 ("Act") read with the provisions of Schedule IV thereto and the Companies (Appointment and Qualification of Directors) Rules, 2014, (including any statutory modification(s) or re-enactment thereof for the time being in force) and SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Sri G. S. Murthy (DIN: 00122454), whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act proposing his candidature for the office of Director, be and is hereby reappointed as an Independent Director, who is not liable to retire by rotation, to hold office for a further term of 5 (five) years i.e. up to 41st Annual General Meeting of the Company to be held in the Calendar year 2024.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

10. Reappointment of Sri D.G.Prasad (DIN: 00160408) as an Independent Director

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"**RESOLVED THAT** pursuant to the provisions of Sections 149,152, and any other applicable provisions of the Companies Act, 2013 ("Act") read with the provisions of Schedule IV thereto and the Companies (Appointment and Qualification of Directors) Rules, 2014, (including any statutory modification(s) or re-enactment thereof for the time being in force) and SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Sri D.G.Prasad (DIN: 00160408) whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act proposing his candidature for the office of Director, be and is hereby reappointed as an Independent Director to hold office who is not liable to retire by rotation, to hold office for a further term of 5 (five) years i.e. up to 41st Annual General Meeting of the Company to be held in the Calendar year 2024.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

11. Reappointment of Sri T.V.Rao (DIN: 05273533) as an Independent Director

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"RESOLVED THAT pursuant to the provisions of Sections 149,152, and any other applicable provisions of the Companies Act, 2013 ("Act") read with the provisions of Schedule IV thereto and Companies (Appointment and Qualification of Directors) Rules, 2014 (including any statutory modification(s) or re-enactment thereof for the time being in force) and SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Sri T.V.Rao (DIN: 05273533) whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act proposing his candidature for the office of Director, be and is hereby reappointed as an Independent Director who is not liable to retire by rotation, to hold office for a further term of 5 (five) years i.e. up to 41st Annual General Meeting of the Company to be held in the Calendar year 2024.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

12. Reappointment of Dr. Mrs. Leela Digumarti (DIN: 06980440) as an Independent Director

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"RESOLVED THAT pursuant to the provisions of Sections 149,152, and any other applicable provisions of the Companies Act, 2013 ("Act") read with the provisions of Schedule IV thereto and Companies (Appointment and Qualification of Directors) Rules, 2014, (including any statutory modification(s) or re-enactment thereof for the time being in force) and SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Dr. Mrs. Leela Digumarti (DIN: 06980440) whose reappointment is recommended by the Nomination and Remuneration Committee of the Company and in respect of whom the Company has received a notice in writing from a member under Section 160 of the Act proposing her candidature for the office of Director, be and is hereby reappointed as an Independent Director who is not liable to retire by rotation, to hold office for a further term of 5 (five) years i.e. up to 41st Annual General Meeting of the Company to be held in the Calendar year 2024.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

13. Alteration of Articles of Association

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"RESOLVED THAT pursuant to Sections 5, 14, 15 and all other applicable provisions, if any, of the

Companies Act, 2013, (including any amendment thereto or re-enactment thereof) for the time being in force and as per Investment Agreement entered with CX securities Limited, the consent of the members of the Company be and is hereby accorded to alter the existing Articles of Association of the Company ("Articles") by deletion of Part II of the Articles containing provisions of Articles 1 to 16.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

14. Ratification of remuneration of Cost Auditors

To consider and, if thought fit, to pass the following resolution as a Special Resolution:

"**RESOLVED THAT** pursuant to Section 148 of the Companies Act, 2013 ('Act') and Rule 6 of the Companies (Cost Records and Audit) Rules, 2014 and all other applicable provisions, if any, of the Act and the rules made thereunder, as amended, the members be and hereby ratify the remuneration of ₹ 1,75,000/- (Rupees one lakh seventy five thousand only) and taxes as applicable plus out of pocket expenses payable to M/s. S.S. Zanwar & Associates (Firm Registration No.100283) Cost Auditors appointed by the Board of Directors of the Company to conduct the Cost Audit for the financial year ending 31st March, 2020.

RESOLVED FURTHER THAT the Board be and is hereby authorized to do all such acts, deeds, matters and things as it may deem fit, necessary and delegate to any Director(s) or any other Officer(s) of the Company for obtaining permissions and approvals, if any, in this connection."

By Order of the Board
For **NATCO Pharma Limited**

M.Adinarayana
Company Secretary and
Vice President (Legal & Corp. Affairs) (FCS:3808)

Date: 27th May, 2019
Place: Hyderabad

NOTES

1. An explanatory statement pursuant to Section 102(1) of the Companies Act, 2013 in respect of special businesses is annexed hereto.

2. **A MEMBER ENTITLED TO ATTEND AND VOTE AT THE ANNUAL GENERAL MEETING (AGM) IS ENTITLED TO APPOINT A PROXY TO ATTEND AND VOTE INSTEAD OF HIMSELF / HERSELF** and a proxy need not be a member of the Company.

3. The instrument of proxy in order to be valid must be deposited at the Registered Office of the Company duly completed, signed and stamped at least FORTY-EIGHT (48) hours before the commencement of the meeting.

4. A person may act as Proxy on behalf of members not exceeding fifty and holding in the aggregate not more than ten percent of the total voting share capital of the Company. However, a member holding more than ten percent of the total voting share capital may appoint a single person as proxy and such person shall not act as proxy for any other person or shareholder.

5. During the period beginning 24 hours before the time fixed for the commencement of the AGM and until the conclusion of the meeting, a member would be entitled to inspect the proxies lodged during the business hours of the Company, provided that not less than three days of notice in writing is given to the Company.

6. Corporate/Institutional Members are requested to send a duly certified copy of the Board Resolution / Power of Attorney authorizing their representative to attend and vote on their behalf at the AGM.

7. Members holding shares in physical form are requested to notify any change in their address or bank mandates immediately to the Registrars and Share Transfer Agents M/s. Venture Capital and Corporate Investments Pvt. Ltd., 12-10-167, Bharat Nagar, Hyderabad - 500 018 and members holding shares in electronic form are requested to notify any change in mailing address or bank mandates to their respective Depository Participants with whom they are maintaining their demat accounts.

8. The members, proxies and authorized representatives are requested to bring their copies of notice of the meeting and the Annual Report to the AGM and handover the attendance slips at the entrance hall of the meeting venue along with their Registered Folio No./ Client ID and DP ID numbers for easy identification.

9. Relevant documents referred to in Notice are open for inspection by the members at the Registered Office

of the Company on all working days, during business hours up to the date of the meeting.

10. Members who have not registered their e-mail addresses so far are requested to register their email addresses for receiving all communications including Annual Report, Notices and Circulars, etc. from the Company in electronic mode.

11. In case of Joint Holders attending the meeting, only such Joint Holder who is first in the order of names will be entitled to vote.

12. The Register of Members and Share Transfer Books will remain closed for 3 (Three) days i.e. from 3rd September, 2019 to 5th September, 2019, (both days inclusive).

13. Members holding shares in electronic form may note that the Bank particulars registered against their respective depository accounts will be used by the Company for payment of dividend, if any. The Company or its Registrars and share Transfer Agents cannot act on any request received directly from the members holding shares in electronic form for any changes of bank particulars or bank mandates. Such changes are to be advised only to the Depository Participants.

14. Members who wish to claim Dividends, which remain unclaimed within a period of seven (7) years are requested to either correspond with the Legal & Secretarial Department at the Company's registered office or the Company's Registrars and Share Transfer Agents (M/s. Venture Capital and Corporate Investments Private Limited). Members are requested to note that dividends not encashed or claimed within seven (7) years and 30 days from the date of declaration of, the dividend and shares will be transferred to the Investor Education and Protection Fund (IEPF) of Government of India as per Section 124(5) & 124(6) of the Companies Act, 2013. In view of this, members are advised to send the un-encashed dividend warrants to the Company or to our Registrars for issue of new warrants. The Unpaid Dividend, Shares & Dividend transferred to IEPF Authority are updated on our website of the company i.e. www.natcopharma.co.in

15. Information and other instructions relating to e-Voting and ballot paper voting are under:

    a) In Compliance with provisions of Section 108 of the Companies Act, 2013 and Rule 20 of the Companies (Management and Administration) Rules, 2014, the Company is pleased to provide its members facility to exercise their right to vote at the 36th Annual General Meeting by Electronic means and the business may be transacted through e-voting services provided by National Securities Depository Limited (NSDL).

    b) For the benefit of Members who do not have access to e-voting facility, a ballot paper is being sent along with the Notice of AGM, to enable them to send their assent or dissent by Post. Members may send the duly completed ballot paper so as to reach the Scrutinizer at the Registered Office of the Company not later than 4th September, 2019 (5.00 p.m. IST). Ballot paper received after this date will be treated as invalid. Detailed instructions on process, manner for voting through post are given in the ballot paper.

    c) The facility of voting is also available at the Meeting and the members attending the Meeting, who have not cast their vote by remote e-voting or through Ballot paper shall be able to exercise their right to vote at the Meeting by means of electronic voting at the AGM.

    d) A member can opt for only one mode of voting. In case of member(s) who cast their votes by both the modes, then voting done through e-voting only shall be treated as valid.

    e) The members who have cast their vote by remote e-voting may also attend the Meeting but shall not be entitled to cast their vote again at the meeting.

    f) The remote e-voting facility will begin on 2nd September, 2019 at 9.00 a.m. (IST) and ends on 4th September, 2019 by 5.00 p.m. (IST) E-Voting shall not be allowed beyond 5.00 p.m. on 4th September, 2019 and e-voting module shall be disabled by NSDL upon expiry of aforesaid period. During the e-voting period, shareholder of the company, holding shares either in physical form or in dematerialised form, as on the cut-off date being Friday, 30th August, 2019 only shall be entitled to avail the facility of remote e-voting/ballot paper/Voting at the AGM.

    g) Any person who acquires shares of the company and becomes a member of the company after the dispatch of AGM notices and hold shares as on the cut-off date i.e. Friday, 30th August, 2019 may obtain the login id and password

by sending a request at info@vccilindia.com / investors@natcopharma.co.in.

h) The way to vote electronically on NSDL e-Voting system consists of "Two Steps" which are mentioned below:

Step 1: Log-in to NSDL e-Voting system at https://www.evoting.nsdl.com/

i) Visit the e-Voting website of NSDL. Open web browser by typing the following URL: https://www.evoting.nsdl.com/ either on a Personal Computer or on a mobile.

ii) Once the home page of e-Voting system is launched, click on the icon "Login" which is available under 'Shareholders' section.

iii) A new screen will open. You will have to enter your User ID, your Password and a Verification Code as shown on the screen.

Alternatively, if you are registered for NSDL eservices i.e. IDEAS, you can log-in at https://eservices.nsdl.com/ with your existing IDEAS login. Once you log-in to NSDL eservices after using your log-in credentials, click on e-Voting and you can proceed to Step 2 i.e. Cast your vote electronically.

iv) Your User ID details are given below :

Manner of holding shares i.e. Demat (NSDL or CDSL) or Physical	Your User ID is:
a) For Members who hold shares in demat account with NSDL.	8 Character DP ID followed by 8 Digit Client ID For example if your DP ID is IN300*** and Client ID is 12****** then your user ID is IN300***12******.
b) For Members who hold shares in demat account with CDSL.	16 Digit Beneficiary ID For example if your Beneficiary ID is 12********** then your user ID is 12**********
c) For Members holding shares in Physical Form.	EVEN Number followed by Folio Number registered with the company For example if folio number is 001*** and EVEN is 101456 then user ID is 101456001***

v) Your password details are given below:

a) If you are already registered for e-Voting, then you can use your existing password to login and cast your vote.

b) If you are using NSDL e-Voting system for the first time, you will need to retrieve the 'initial password' which was communicated to you. Once you retrieve your 'initial password', you need to enter the 'initial password' and the system will force you to change your password.

c) How to retrieve your 'initial password'?

(i) If your email ID is registered in your demat account or with the company, your 'initial password' is communicated to you on your email ID. Trace the email sent to you from NSDL from your mailbox. Open the email and open the attachment i.e. a .pdf file. Open the .pdf file. The password to open the .pdf file is your 8 digit client ID for NSDL account, last 8 digits of client ID for CDSL account or folio number for shares held in physical form. The .pdf file contains your 'User ID' and your 'initial password'.

(ii) If your email ID is not registered, your 'initial password' is communicated to you on your postal address.

vi) If you are unable to retrieve or have not received the "Initial password" or have forgotten your password:

a) Click on "Forgot User Details/Password?" (If you are holding shares in your demat account with NSDL or CDSL) option available on www.evoting.nsdl.com.

b) Physical User Reset Password?" (If you are holding shares in physical mode) option available on www.evoting.nsdl.com.

c) If you are still unable to get the password by aforesaid two options, you can send a request at evoting@nsdl.co.in mentioning your demat account number/folio number,

your PAN, your name and your registered address.

d) Members can also use the OTP (One Time Password) based login for casting the votes on the e-voting system of NSDL

vii) After entering your password, tick on Agree to "Terms and Conditions" by selecting on the check box.

viii) Now, you will have to click on "Login" button.

ix) After you click on the "Login" button, Home page of e-Voting will open.

Step 2: Cast your vote electronically on NSDL e-Voting system

i) After successful login at Step 1, you will be able to see the Home page of e-Voting. Click on e-Voting. Then, click on Active Voting Cycles.

ii) After click on Active Voting Cycles, you will be able to see all the companies "EVEN" in which you are holding shares and whose voting cycle is in active status.

iii) Select "EVEN" of company for which you wish to cast your vote.

iv) Now you are ready for e-Voting as the Voting page opens.

v) Cast your vote by selecting appropriate options i.e. assent or dissent, verify/modify the number of shares for which you wish to cast your vote and click on "Submit" and also "Confirm" when prompted.

vi) Upon confirmation, the message "Vote cast successfully" will be displayed.

vii) You can also take the printout of the votes cast by you by clicking on the print option on the confirmation page.

viii) Once you confirm your vote on the resolution, you will not be allowed to modify your vote.

i. It is strongly recommended not to share your password with any other person and take utmost care to keep your password confidential. Login to the e-voting website will be disabled upon five unsuccessful attempts to key in the correct password. In such an event, you will need to go through the "Forgot User Details/Password?" or "Physical User Reset Password?" option available on www.evoting.nsdl.com to reset the password.

j. In case of any queries, you may refer the Frequently Asked Questions (FAQs) for Shareholders and e-voting user manual for Shareholders available at the download section of www.evoting.nsdl.com or call on toll free no.: 1800-222-990 or send a request at evoting@nsdl.co.in

k. Institutional shareholders (i.e. other than individuals, HUF, NRI etc.) are required to send scanned copy (PDF/JPG Format) of the relevant Board Resolution/ Authority letter etc. with attested specimen signature of the duly authorized signatory(ies) who are authorized to vote, to the Scrutinizer by e-mail to dvrao@dvraoassociates.com with a copy marked to evoting@nsdl.co.in

16. The Company has appointed Sri CS Vasudeva Rao Devaki, Practicing Company Secretary (C.P.No. 12123) as Scrutinizer to scrutinize the voting process in a fair and transparent manner.

a. The scrutinizer shall immediately after the conclusion of voting at the AGM, first unblock the votes cast at the meeting thereafter unblock the votes cast through e-voting / ballot paper in the presence of at least two (2) witnesses not in the employment of the Company and make a Scrutinizer's Report of the votes cast in favour or against, if any, forthwith to the Chairman of the Company as per the norms.

b. The Results shall be declared immediately after the receipt of Scrutinizer's Report. The Results declared along with the Scrutinizer's Report shall be available for inspection and also placed on the website of the Company and the results shall simultaneously be communicated to the Stock Exchanges where the shares of the Company are listed.

17. The Securities and Exchange Board of India (SEBI) has mandated the submission of Permanent Account Number (PAN) by every participant in securities market. Members holding shares in Physical form can submit their PAN details to the Company / Share Transfer Agents.

18. **Brief profile of statutory Auditors to be appointed as new Auditors of the company:**

M/s B S R & Associates ('the firm') was constituted on 1st December 1996 having firm registration no. as 116231W. It was converted into limited liability partnership i.e. B S R & Associates LLP on 14th October, 2013 thereby having a new firm registration no. 116231W/ W-100024. The registered office of the firm is at 5th Floor, Lodha Excelus, Apollo Mills Compound, N. M. Joshi Marg, Mahalaxmi, Mumbai, Maharashtra - 400 011.

B S R & Associates LLP is a member entity of B S R & Affiliates, a network registered with the Institute of Chartered Accountants of India. The other entities which are part of the B S R & Affiliates include B S R & Co. LLP, B S R & Company, B S R and Co, B S R and Associates, B S R and Company, B S S R & Co and B B S R & Co.

B S R & Associates LLP is registered in Mumbai, Gurgaon, Bangalore, Kolkata, Hyderabad, Pune, Chennai, Ahmedabad, Vadodara and Kochi.

19. Additional information pursuant to SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 in respect of the Directors seeking appointment at the AGM is furnished herewith and forms a part of the Notice. The Directors have furnished the requisite consents and declarations to that effect for their appointment.

19. (a) **Brief profile of Executive Directors seeking reappointment at the Annual General Meeting:**

Name of the Director	Sri V.C.Nannapaneni	Sri Rajeev Nannapaneni	Sri P.S.R.K Prasad	Dr.D.Linga Rao
Category	Chairman & Managing Director	Vice Chairman & Chief Executive Officer	Director & Executive Vice President (Corporate Engineering Services)	Director & President (Tech. Affairs)
DIN	00183315	00183872	07011140	07088404
Birth date and Age	30th November, 1945 73 years	22nd June, 1977; 41 years	15th January, 1958; 61 years	29th October, 1952; 66 years
Qualifications	M.S (Pharmacy) & M.S (Pharmaceutical Administration)	BA (Quantitative Economics) & B.A. (History)	B.E. Mechanical Engineering	M.Sc., Ph.D. in Chemistry (JNTU)
Past experience	Worked with a) Lit Drug Company, New Jersey, USA, b) Vitarine Fine Pharmaceuticals, New York, c) Time Cap Labs Inc., USA	Worked with a) Merrill lynch financial services, USA b) NATCO Systems LLC, USA	Worked with a) Ahmedabad Textile Industry's Research Association. b) Mehta Inorganic & Marine Chemical Industries, c) Coromandel Fertilizers Limited, d) Stiles India Limited, e) Saudi Ceramic Co., Riyadh.	Worked with a) Indian Drugs and Pharmaceuticals Limited, b) Novochem Laboratories Private Limited.
Date of appointment as Directors	19th September,1981	30th November, 2005	12th November, 2014	11th February, 2015

Nature of Appointment	Reappointment	Director liable for retire by rotation and eligible for reappointment.	Reappointment	Reappointment
Tenure of Appointment	1st April, 2019 to 31st March, 2020	1st April, 2019 to 31st March, 2020	1st April, 2019 to 31st March, 2020	1st April, 2019 to 31st March, 2020
Percentage of shares held	19.31%	0.62%	0.03%	0.03%
No. of board meetings attended out of 4 (Four) meetings held.	4 (Four)	4 (Four)	4 (Four)	4 (Four)
Relationship with other directors or KMP of the company	Father of Sri Rajeev Nannapaneni	Son of Sri V.C. Nannapaneni	None	None
Directorship in other companies	1. NATCO Aqua Limited 2. NDL Infratech Private Limited 3. NATCO Power Private Limited	1. NATCO Aqua Limited 2. Natsoft Information Systems Private Limited	None	None

19(b) Brief profile of independent Directors seeking reappointment at the Annual General Meeting:

Name of the Director	Sri G. S. Murthy	Sri D.G.Prasad	Sri T.V.Rao	Dr. Mrs. Leela Digumarti
Category	Independent Director	Independent Director	Independent Director	Independent Director
DIN	00122454	00160408	05273533	06980440
Birth date and Age	4th May,1937; 82 years	30th June, 1948 70 years	1st July, 1952 66 years	1st May, 1960 59 years
Qualifications	B.A (Economics), LL.M., FCS & C.A.I.I.B	B.Com. and Chartered Accountant	B.Com and C.A.I.I.B	MBBS, Diploma in Obstetrics & Gynaecology, MD (obstetrics & Gynaecology, Diplomate in National Boards in Obstetrics and Gynaecology.
Past experience	a) Practised as an advocate, later joined as officer in RBI, Mumbai. b) Retired as ED-(Legal), IDBI, Mumbai. c) While in service, he was deputed as the first Managing Director of Investor Services of India Ltd., Mumbai promoted by IDBI, LIC, UTI, SBI CAPS etc. d) Legal Consultant to Essar Group of Companies, Mumbai. e) Served as a Nominee Director on the Boards of several companies. f) Advisor/Senior Advisor for the Public Enterprises Dept., Government of undivided Andhra Pradesh, Hyderabad.	Worked with a) Exim bank as a Chief General Manager and was the head of corporate banking, Agri Business and SME Business groups. b) Guest faculty at leading business schools on International Finance and International Marketing.	a) Experience in General Banking, Corporate Finance, Mortgage backed securitisation and Treasury Management. b) He headed the Treasuries of National Housing Bank, Small Industries Development Bank of India (SIDBI) and Exim Bank.	a) At present, Assistant Professor of Gynaecological oncology at Homi Bhabha Cancer Hospital & Research Centre, Visakapatnam. b) She is a fellow member of Royal College of Obstetricians and Gynaecologists (FRCOG) (UK).

Name of the Director	Sri G. S. Murthy	Sri D.G.Prasad	Sri T.V.Rao	Dr. Mrs. Leela Digumarti
Date of appointment as Directors	31st January, 2000	13th February, 2014	25th August, 2014	22nd September, 2014
Nature of Appointment	Re- appointment as an Independent Director who is not liable to retire by rotation.	Re-appointment as an Independent Director who is not liable to retire by rotation.	Re-appointment as an Independent Director who is not liable to retire by rotation.	Re-appointment as an Independent Director who is not liable to retire by rotation.
Tenure of Appointment	5 years term up to 41st Annual General Meeting to be held in the calendar year 2024	5 years term up to 41st Annual General Meeting to be held in the calendar year 2024	5 years term up to 41st Annual General Meeting to be held in the calendar year 2024	5 years term up to 41st Annual General Meeting to be held in the calendar year 2024
Percentage of shares held	Nil	Nil	Nil	Nil
No. of Board meetings attended out of 4 (Four) meetings held.	4 (Four)	4 (Four)	3 (Three)	2 (Two)
Relationship with other directors or KMP of the company	None	None	None	None
Directorship in other companies	None	1. Gokak Textiles limited 2. Suven Life sciences Limited 3. Moschip Technologies Limited 4. Suven Pharmaceuticals limited	1. Electronica Finance Limited 2. Ladderup Finance Limited 3. STCI Finance Limited 4. Sanvira Industries Limited 5. STCI Primary Dealer Limited 6. Fidas Tech Private Limited 7. Easy Home Finance Limited 8. BGSE Financials Limited	None

Explanatory statement (Pursuant to Section 102(1) of the Companies Act, 2013)

Item No. 5

Reappointment of Sri V.C.Nannapaneni (DIN: 00183315) as Chairman and Managing Director

Sri V.C. Nannapaneni (DIN: 00183315) is associated with the Company as founder/promoter since its incorporation in the year 1981 and has rich and varied experience in the Industry and driving the company towards higher growth in terms of revenues as well as profitability. The company is poised for next level of growth.

Sri V.C.Nannapaneni attained the age of 73 years (DOB: 30-11-1945) as on 30th November, 2018. Services of Sri V.C.Nannapaneni are very much essential for the Company's future prospects and further growth of the Company. It would be in the interest of the Company to have his vast experience and professional services as Chairman and Managing Director to your company. The Board believes that the Company will benefit from his professional expertise and rich experience.

As recommended by the Nomination and Remuneration Committee, the Board of Directors at their meeting held on 12th February, 2019 after receiving the consent from Sri V.C. Nannapaneni, approved the reappointment of Sri V.C.Nannapaneni as Chairman & Managing Director of the Company for a period of one (1) year from 1st April, 2019 to 31st March, 2020 with such remuneration as specified in the resolution which is recommended by the Nomination and Remuneration Committee and approved by the Board of Directors in their respective meetings held on 27th May,

2019, subject to the consent of members which is just and reasonable to Sri V.C. Nannapaneni.

For Additional information relating to Sri V.C. Nannapaneni requested to refer to the section on "Brief Profile of the Executive Directors seeking Reappointment at the Annual General Meeting" in Note No. 19 (a).

Except Sri V.C. Nannapaneni & Sri Rajeev Nannapaneni, no other Director or Key managerial personnel or their relatives is/are concerned or interested in the said item of business.

The Board accordingly recommends the special resolution as set out in Item No.5 of the notice for approval of the members.

Item No. 6
Reappointment of Sri Rajeev Nannapaneni (DIN: 00183872) as Vice Chairman and Chief Executive officer
Sri Rajeev Nannapaneni, Vice Chairman and Chief Executive Officer is associated with the company for the past 19 years and he is looking after all the functional operations of the company including but not limited to Production, Financial, Legal & Secretarial, new drug launches, Domestic and International Marketing, Exports, Imports, etc.

Based on recommendation of the Nomination and Remuneration Committee, the Board of Directors at their meeting held on 12th February, 2019, after receiving consent from Sri Rajeev Nannapaneni, approved the reappointment of Sri Rajeev Nannapaneni (DIN: 00183872) as Vice Chairman and Chief Executive officer, for a period of one (1) year with effect from 1st April, 2019 to 31st March, 2020 with such remuneration as specified in the resolution which is recommended by the Nomination and Remuneration Committee and approved by the Board in their respective meetings held on 27th May, 2019, subject to the consent of members which is just and reasonable to Sri Rajeev Nannapaneni.

For Additional information relating to Sri Rajeev Nannapaneni requested to refer to the section on "Brief Profile of the Executive Directors seeking Reappointment at the Annual General Meeting" in Note No. 19(a).

Except Sri V.C. Nannapaneni & Sri Rajeev Nannapaneni, no other Director or Key managerial personnel or their relative is/are concerned or interested in the said item of business.

The Board accordingly recommends the special resolution as set out in Item No. 6 of the Notice for approval of the members.

Item No. 7
Reappointment of Sri P.S.R.K Prasad (DIN: 07011140) as a Director and Executive Vice President (Corporate Engineering Services)
Sri P.S.R.K.Prasad has over 30 years of experience in various sectors such as textile, chemicals and pharmaceuticals and working with our Company for the past 24 years. He has got vast and good knowledge in procuring right equipment(s) and machinery for production processes and to provide all utility services and to utilize the resources like manpower, material in an optimum way and to ensure safety of life and property.

In view of the highly competitive employee market, inflationary trends, and taking into consideration industry standards and other relevant factors and as recommended by the nomination and remuneration committee, the Board of Directors at their meeting held on 12th February, 2019, after receiving consent from Sri P.S.R.K Prasad, approved the reappointment of Sri P.S.R.K. Prasad, (DIN: 07011140) for a period of one (1) year on the Board of the Company with effect from 1st April, 2019 to 31st March, 2020 with such remuneration as specified in the resolution which is recommended by the Nomination and Remuneration Committee and approved by the Board in their respective meetings held on 27th May, 2019, subject to the consent of members which is just and reasonable to Sri P.S.R.K. Prasad.

For Additional information relating to Sri P.S.R.K.Prasad members are requested to refer to the section on "Brief Profile of the Executive Directors seeking Reappointment at the Annual General Meeting" in Note No.19 (a).

Except Sri P.S.R.K.Prasad, no Director or Key managerial personnel or their relatives is/are concerned or interested in the said item of business.

The Board accordingly recommends the special resolution as set out in Item No. 7 of the Notice for approval of the members.

Item No. 8
Reappointment of Dr. D. Linga Rao (DIN: 07088404) as a Director & President (Tech. Affairs)
Dr. D. Linga Rao is working as Director and President (Technical Affairs) of the Company. He has over 40 years of experience in the pharmaceutical industry and has been working with our Company for over 25 years. He has vast experience in various departments like R & D, Quality Control, Quality Assurance and Regulatory affairs.

In view of the job responsibilities, taking into consideration the industry standards and other relevant factors and as recommended by the nomination and remuneration Committee, the board of directors at its meeting held on 12th February, 2019, after receiving consent from Dr.D.Linga Rao approved the reappointment of Dr.D.Linga Rao (DIN: 07088404) for a period of one (1) year on the Board of the company with effect from 1st April, 2019 to 31st March, 2020 with such remuneration as specified in the resolution which is recommended by the Nomination and Remuneration Committee and approved by the Board in their respective meetings held on 27th May, 2019, subject to the consent of members which is just and reasonable to Dr. D. Linga Rao.

For Additional information relating to Dr. D. Linga Rao members are requested to refer to the section on "Brief Profile of the Executive Directors seeking Reappointment at the Annual General Meeting" in Note No. 19 (a).

Except Dr. D. Linga Rao, no Director or Key managerial personnel or their relatives is/are concerned or interested in the said item of business.

The Board accordingly recommends the special resolution as set out in Item No. 8 of the Notice for approval of the members.

Item No. 9
Reappointment of Sri G.S. Murthy (DIN: 00122454) as an Independent Director

At the Annual General Meeting held on 27th September, 2014, Sri G.S. Murthy (DIN: 00122454) was appointed as an Independent Director for a term of five (5) consecutive years i.e up to the 36th Annual General Meeting of the Company to be held in the calendar year 2019. He attained the age of 82 years (04-05-1937) as on 4th May, 2019. His vast professional experience in the past in various reputed offices are very essential for the company. It would be in the interest of the company to have his professional experience to act as an independent director of the company for a further term of five (5) years.

Based upon the recommendation of Nomination and Remuneration Committee and pursuant to Sections 149, 152, read with Schedule IV of the Act and other applicable provisions, if any, of the Companies Act, 2013 and the Companies (Appointment and qualification of Directors) Rules, 2014, and SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Board recommends to the members for their approval to reappoint Sri G.S. Murthy (DIN: 00122454) as an Independent Director for a further term of 5 (five) years i.e. up to 41st Annual General Meeting of the Company to be held in the Calendar year 2024.

In the opinion of the Board, Sri G.S. Murthy (DIN: 00122454), fulfil the conditions specified in the Act and rules framed thereunder for reappointment as Independent Director. SriG.S.Murthy meets the criteria of Independence as prescribed in the Act and under SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015.

For Additional information relating to SriG.S.Murthy members are requested to refer to the Section on "Brief Profile of the Independent Directors seeking Reappointment at the Annual General Meeting" in Note No.19 (b).

Except Sri G.S.Murthy, no Director or Key Managerial Personnel or their relatives is/are concerned or interested in the said item of the business.

The Board accordingly recommends the special resolution as set out in Item No. 9 of the Notice for approval of the members.

Item No. 10
Reappointment of Sri D.G.Prasad (DIN: 00160408) as an Independent Director

At the Annual General Meeting held on 27th September, 2014, Sri D.G.Prasad (DIN: 00160408) was appointed as an Independent Director for a term of five (5) consecutive years i.e up to the 36th Annual General Meeting of the Company to be held in the calendar year 2019.

Upon recommendation of Nomination and Remuneration Committee and pursuant to Sections 149, 152, Schedule IV of the Companies Act, 2013 read with Companies (Appointment and qualification of Directors) Rules, 2014 and SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Board recommends to the members for their approval to reappoint Sri D.G.Prasad (DIN: 00160408) as an Independent Director for a further term of 5 (five) years i.e. up to 41st Annual General Meeting of the Company to be held in the Calendar year 2024.

In the opinion of the Board, Sri D.G.Prasad (DIN: 00160408), fulfil the conditions specified in the Act and rules framed thereunder for appointment as Independent Director Sri D.G.Prasad meets the criteria of Independence as prescribed in the Act and under SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015.

For Additional information relating to Sri D.G.Prasad members are requested to refer to the Section on

"Brief Profile of the Independent Directors seeking Reappointment at the Annual General Meeting" in Note No.19 (b).

Except Sri D.G.Prasad, no Director or Key Managerial Personnel or their relatives is/are concerned or interested in the said item of the business.

The Board accordingly recommends the special resolution as set out in Item No. 10 of the Notice for approval of the members.

Item No. 11
Reappointment of Sri T.V.Rao (DIN: 05273533) as an Independent Director

At the Annual General Meeting held on 27th September, 2014 Sri T.V.Rao (DIN: 05273533) was appointed as an Independent Director for a term of five (5) consecutive years i.e up to the 36th Annual General Meeting of the Company to be held in the calendar year 2019.

Upon recommendation of Nomination and Remuneration Committee and pursuant to Sections 149, 152, Schedule IV of the Companies Act, 2013 read with Companies (Appointment and qualification of Directors) Rules, 2014 and SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015 as amended from time to time, Board recommends to the members for their approval to reappoint Sri T.V.Rao (DIN: 05273533) as an Independent Director for a further term of 5 (five) years i.e. up to 41st Annual General Meeting of the Company to be held in the Calendar year 2024.

In the opinion of the Board, Sri T.V.Rao (DIN: 05273533), fulfil the conditions specified in the Act and rules framed thereunder for appointment as an Independent Director. Sri T.V.Rao meets the criteria of Independence as prescribed in the Act and under SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015.

For Additional information relating to Sri T.V.Rao members are requested to refer to the Section on "Brief Profile of the Independent Directors seeking Reappointment at the Annual General Meeting" in Note No. 19 (b).

Except Sri T.V.Rao, no Director or Key Managerial Personnel or their relatives is/are concerned or interested in the said item of the business.

The Board accordingly recommends the special resolution as set out in Item No. 11 of the Notice for approval of the members.

Item No.12
Reappointment of Dr. Mrs. Leela Digumarti (DIN: 06980440) as an Independent Director

At the Annual General Meeting held on 27th September, 2014 Dr. Mrs. Leela Digumarti (DIN: 06980440) was appointed as an Independent Director for a term of five (5) consecutive years i.e up to the 36th Annual General Meeting of the Company to be held in the calendar year 2019.

Upon recommendation of Nomination and Remuneration Committee and pursuant to Sections 149, 152, Schedule IV of the Companies Act, 2013 read with Companies (Appointment and qualification of Directors) Rules, 2014 and SEBI (Listing Obligation and Disclosure Requirements) Regulations, 2015 as amended from time to time, Board recommends to the members for their approval to reappoint Dr. Mrs. Leela Digumarti (DIN: 06980440) as an Independent Director for a further term of 5 (five) years i.e. up to 41st Annual General Meeting of the Company to be held in the Calendar year 2024.

In the opinion of the Board, Dr. Mrs. Leela Digumarti (DIN: 06980440), fulfil the conditions specified in the Act and rules framed thereunder for appointment as Independent Director. Dr. Mrs. Leela Digumarti meets the criteria of Independence as prescribed in the Act and under SEBI (Listing Obligations and Disclosure Requirements) Regulations, 2015.

For Additional information relating to Dr. Leela Digumarti members are requested to refer to the Section on "Brief Profile of the Independent Directors seeking Reappointment at the Annual General Meeting" in Note No. 19(b).

Except Dr. Mrs. Leela Digumarti, no Director or Key Managerial Personnel or their relatives is/are concerned or interested in the said item of the business.

The Board accordingly recommends the special resolution as set out in Item No. 12 of the Notice for approval of the members.

Item No. 13
Alteration of Articles of Association

At the Extra Ordinary General Meeting held on 14th November, 2013, members approved the preferential allotment of equity shares to M/s. CX Securities Limited subsequent to which it subscribed to 17,00,000 (seventeen lakh only) equity shares of ₹ 10/- each of the Company ("Investor Shares") on preferential basis which were allotted on 29th November, 2013 by the Committee of Board of Directors of the Company at an issue price of

₹ 638.40/- per equity share (including securities premium of ₹ 628.40/- per equity share). On 28th November, 2013, Company entered into an Investment Agreement with M/s. CX Securities Limited, pursuant to which existing Part II of the Articles of Association of the Company was inserted after obtaining approval of the members of the Company at their Annual General Meeting held on 27th September, 2014.

In the above agreement entered with M/s. CX Securities Limited as per Clause 18.2, the agreement shall be terminated up on the aggregate shareholding of the investor i.e M/s. CX Securities Limited together with their Permitted Transferees in the Company falling below 51% of the subscription shares. The present shareholding of M/s. CX Securities Limited is below 51% of the subscribed shares and consequently the agreement will get terminated. Accordingly, the Board recommends to the members for their approval for deletion of existing Part II of the Articles of Association of the Company which are incorporated as per the above agreement.

None of the Directors/key managerial personnel / their relatives is/are concerned or interested in the said item of the business.

The Board accordingly recommends the special resolution as set out in Item No. 13 of the Notice for approval of the members.

Item No. 14
Ratification of remuneration of Cost Auditors

The Board, on the recommendation of the Audit Committee, had approved the appointment and remuneration of M/s S.S. Zanwar & Associates, (Firm Registration No. 100283) Cost Auditors to conduct the audit of the cost records of the Company for the financial year ending 31st March, 2020.

In accordance with the provisions of Section 148 of the Companies Act, 2013 read with Rules made thereunder, the remuneration payable to the Cost Auditors has to be ratified by the shareholders of the Company.

Accordingly, consent of the members is sought for passing an Ordinary Resolution for ratification of the remuneration payable to Cost Auditors to conduct Cost Audit for the financial year ending 31st March, 2020.

None of the Directors and key managerial personnel of the Company or their respective relatives is concerned or interested in the said item of business.

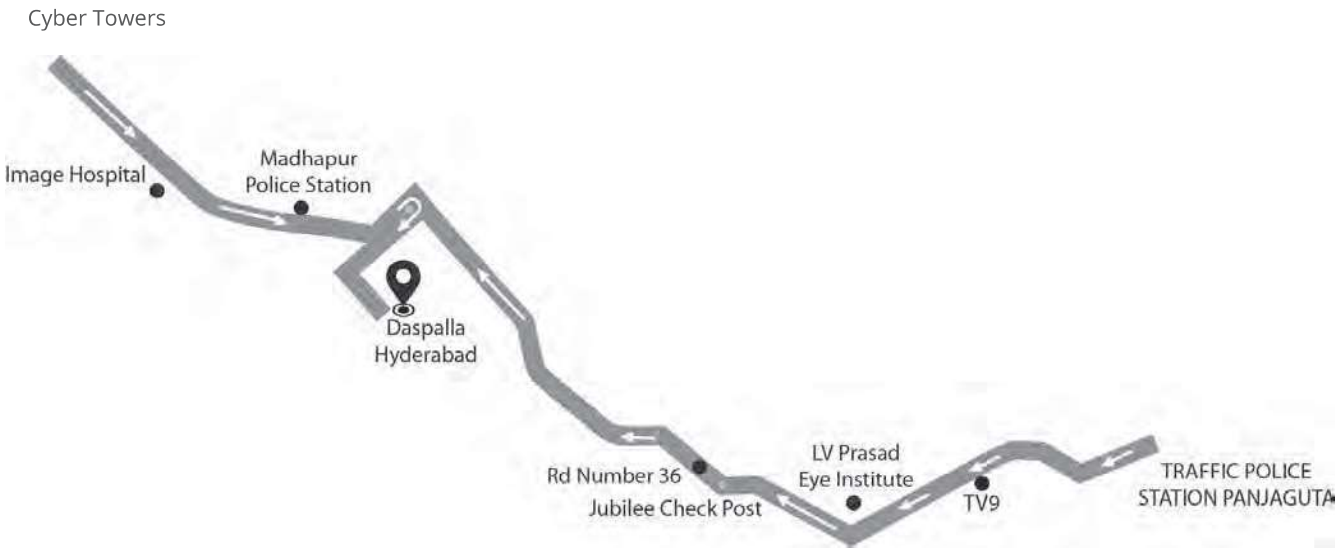
The Board accordingly recommends the resolution as set out in Item No.14 of the notice for approval of the members.

By Order of the Board
For **NATCO Pharma Limited**

M. Adinarayana
Company Secretary and
Vice President
(Legal & Corp. Affairs)
(FCS: 3808)

Date: 27th May, 2019
Place: Hyderabad

ROUTE MAP TO THE VENUE



VENUE:
Daspalla Hotel, Road No. 37,
Jubilee Hills, Hyderabad – 500033,
Telangana

PROMINENT LANDMARK:
Madhapur Police Station

NATCO Pharma Limited

Registered Office: NATCO House, Road # 2, Banjara Hills, Hyderabad 500034, Telangana
Email id: investors@natcopharma.co.in, website: www.natcopharma.co.in
Phone No.040-23547532 Fax No.040-23548243
CIN : L24230TG1981PLC003201

Form No. MGT-11

[Pursuant to Section 105(6) of the Companies Act, 2013 and rule 19(3) of the Companies (Management and Administration) Rules, 2014]

PROXY FORM

Name of the member(s)			
Registered Address			
Email ID			
Folio No./Client ID		DP ID	

I/We, being the member (s) of shares of _____ the above named company, hereby appoint

1	Name			
	Address			
	E-mail ID		Signature	
	or failing him			
2	Name			
	Address			
	E-mail ID		Signature	
	or failing him			
3	Name			
	Address			
	E-mail ID		Signature	

as my / our proxy to attend and vote (on a poll) for me / us and on my / our behalf at the **36th Annual General Meeting of the members of the Company to be held on Thursday, the 5th day of September, 2019 at 10.30 a.m. at Hotel Daspalla, Road No. 37, Jubilee Hills, Hyderabad - 500 033, Telangana, India** and at any adjournment thereof in respect of such resolutions as are indicated below:

Resolution No.	Description	I/We assent to the Resolution (FOR)	I/We dissent to the Resolution (AGAINST)
ORDINARY BUSINESS			
1	Adoption of audited Annual Financial Statements for the Financial Year 2018-19		
2	To confirm the already paid three interim dividends on equity shares during the Financial Year 2018-19 as final dividend		
3	Reappointment of Sri Rajeev Nannapaneni (DIN:00183872) as a Director liable to retire by rotation		
4	Appointment of Statutory Auditors		
SPECIAL BUSINESS			
5	Reappointment of Mr.V.C.Nannapaneni (DIN: 00183315) as Chairman and Managing Director		
6	Reappointment of Sri Rajeev Nannapaneni (DIN: 00183872) as Vice Chairman and Chief Executive officer		
7	Reappointment of Sri P.S.R.K Prasad (DIN: 07011140) as Director and Executive Vice President (Corporate Engineering Services)		
8	Reappointment of Dr.D.Linga Rao (DIN: 07088404) as Director and President (Tech. Affairs)		
9	Reappointment of Sri G.S.Murthy (DIN: 00122454) as an Independent Director		
10	Reappointment of Sri D.G.Prasad (DIN: 00160408) as an Independent Director		
11	Reappointment of Sri T.V.Rao (DIN: 05273533) as an Independent Director		
12	Reappointment of Dr. Mrs. Leela Digumarti (DIN: 06980440) as an Independent Director		
13	Alteration of Articles of Association		
14	Ratification of remuneration of Cost Auditors		

Signed this _____ day of _____ 2019.

Affix a 1 Rupee Revenue Stamp

Signature of shareholder: _____

Signature of Proxy holder(s): _____

Note: This form of proxy in order to be effective should be duly completed and deposited at the Registered Office of the Company, not less than 48 hours before the commencement of the Meeting.

BALLOT FORM (in lieu of remote e-voting)

I/We hereby exercise my/our vote in respect of the Ordinary / Special Resolution (s) passed for the business stated in the Notice of Annual General Meeting of the Company to be held on Thursday, the 5th day of September, 2019 by conveying my/our assent or dissent to the said Resolution(s) by placing (✓) mark at the appropriate box below

Sl No.	Description	I/We assent to the Resolution (FOR)	I/We dissent to the Resolution (AGAINST)
Ordinary Business			
1	Adoption of audited Annual Financial Statements for the Financial Year 2018-19		
2	To confirm the already paid three interim dividends on equity shares during the Financial Year 2018-19 as final dividend		
3	Reappointment of Sri. Rajeev Nannapaneni (DIN:00183872) as a Director liable to retire by rotation		
4	Appointment of Statutory Auditors		
Special Business			
5	Reappointment of Mr.V.C.Nannapaneni (DIN: 00183315) as Chairman and Managing Director		
6	Reappointment of Sri. Rajeev Nannapaneni (DIN: 00183872) as Vice Chairman and Chief Executive officer		
7	Reappointment of Sri. P.S.R.K Prasad (DIN: 07011140) as Director and Executive Vice President (Corporate Engineering Services)		
8	Reappointment of Dr.D.Linga Rao (DIN: 07088404) as Director and President (Tech. Affairs)		
9	Reappointment of Sri. G.S.Murthy (DIN: 00122454) as an Independent Director		
10	Reappointment of Sri. D.G.Prasad (DIN: 00160408) as an Independent Director		
11	Reappointment of Sri. T.V.Rao (DIN: 05273533) as an Independent Director		
12	Reappointment of Dr. Leela Digumarti (DIN: 06980440) as an Independent Director		
13	Alteration of Articles of Association		
14	Ratification of remuneration of Cost Auditors		

Instructions and other information relating to ballot paper voting:

i) Those members who are unable to cast their vote through remote e-voting mechanism, may fill up the Ballot Form printed above and submit the same in a sealed envelope to The Scrutinizer, M/s. NATCO Pharma Limited, NATCO House, Road No.2, Banjara Hills, Hyderabad 500 034, so as to reach latest by 5.00 p.m. on 4th September, 2019. Ballot Form received thereafter will strictly be treated as if not received.

ii) The Company will not be responsible if the envelope containing the Ballot Form is lost in transit.

iii) Unsigned, incomplete or incorrectly ticked forms are liable to be rejected and the decision of the Scrutinizer on the validity of the forms will be final.

iv) In the event member casts his/her votes through both the process i.e. e-voting and Ballot Form, the votes in the electronic system would be considered and the Ballot Form would be ignored.

v) The Proxy cannot vote through Ballot Form.

vi) In case of Joint holders, the Ballot Form should be signed by the first named Shareholder and in his/her absence by the next named shareholders can sign in Ballot Form.

vii) Ballot form has been signed by an authorised representative of the Body Corporate / Trust / Societies etc. should be accompanied by a certified copy of the relevant authorisation / Board Resolution.

Notes

Notes

Corporate information

Board of Directors

Mr. V C Nannapaneni
Chairman & Managing Director

Mr. G. S. Murthy
Independent Director

Mr. T. V. Rao
Independent Director

Mr. Rajeev Nannapaneni
Vice Chairman & CEO

Mr. D. G. Prasad
Independent Director

Dr. Leela Digumarti
Independent Director

Mr. P.S.R.K. Prasad
Director & Executive Vice President
(Corp. Engineering Services)

Dr. M. U. R. Naidu
Independent Director

Dr. D. Linga Rao Donthineni
Director & President
(Technical Affairs)

Mr. Sridhar Sankararaman
Non-Executive and
Non-Independent Director

CS M. Adinarayana
Company Secretary & Vice President
(Legal & Corp Affairs)

Mr. S. V. V. N. Appa Rao
Chief Financial Officer

Registered Office

NATCO House, Road # 2
Banjara Hills,
Hyderabad - 500 034, India
Ph: 040-23547532,
Fax: 040-23548243

Registrar and Share Transfer Agent

M/s. Venture Capital & Corporate Investments Pvt. Ltd.
12-10-167, Bharat Nagar,
Hyderabad - 500 018, India
Ph: 040-23818475, 23818476
Email: info@vccilindia.com,
Website: www.vccipl.com

Statutory Auditors

M/s. Walker Chandiok & Co. LLP,
7th Floor, Block III,
White House,
Kundan Bagh, Begumpet,
Hyderabad - 500 016, India

Internal Auditors

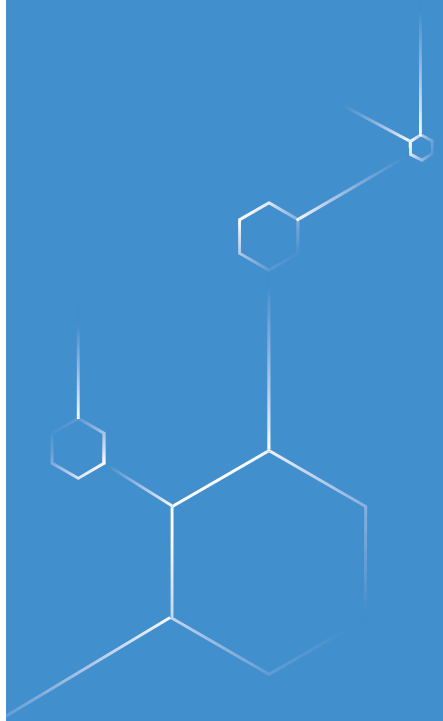
M/s. Seshachalam & Co
1-11-256, Street No. 1, Wall Street
Plaza, 6th Floor,
ICICI Building, Begumpet,
Hyderabad - 500 016, India

Cost Auditors

M/s. S. S. Zanwar & Associates
Office No. 802, 8th Floor
Raghava Ratna Towers
Chirag Ali Lane, Abids
Hyderabad - 500 001, India

Secretarial Auditor

CS Balachandra Sunku
Abhaya, 6-3-609/140/1
Ananda Nagar, Khairathabad
Hyderabad - 500 004, India



NATCO

NATCO PHARMA LIMITED

NATCO HOUSE, ROAD NO. 2, BANJARA HILLS,
HYDERABAD – 500 034.
www.natcopharma.co.in
Cin: L24230TG1981PLC003201

/Concept, content and design at AICL (hello@aicl.in) www.kalajyothi.com

HIGHLIGHTS OF PRESCRIBING INFORMATION
These highlights do not include all the information needed to use OLUMIANT safely and effectively. See full prescribing information for OLUMIANT.

OLUMIANT (baricitinib) tablets, for oral use
Initial U.S. Approval: 2018

WARNING: SERIOUS INFECTIONS, MALIGNANCY, AND THROMBOSIS

See full prescribing information for complete boxed warning.

- **Serious infections leading to hospitalization or death, including tuberculosis and bacterial, invasive fungal, viral, and other opportunistic infections, have occurred in patients receiving OLUMIANT. (5.1)**
- **If a serious infection develops, interrupt OLUMIANT until the infection is controlled. (5.1)**
- **Prior to starting OLUMIANT, perform a test for latent tuberculosis; if it is positive, start treatment for tuberculosis prior to starting OLUMIANT. (5.1)**
- **Monitor all patients for active tuberculosis during treatment, even if the initial latent tuberculosis test is negative. (5.1)**
- **Lymphoma and other malignancies have been observed in patients treated with OLUMIANT. (5.2)**
- **Thrombosis, including deep venous thrombosis, pulmonary embolism, and arterial thrombosis, some fatal, have occurred in patients treated with OLUMIANT. Patients with symptoms of thrombosis should be evaluated promptly. (5.3)**

----------INDICATIONS AND USAGE----------

OLUMIANT® is a Janus kinase (JAK) inhibitor indicated for the treatment of adult patients with moderately to severely active rheumatoid arthritis who have had an inadequate response to one or more TNF antagonist therapies. (1.1)

Limitation of Use: Use of OLUMIANT in combination with other JAK inhibitors, biologic DMARDs, or with potent immunosuppressants such as azathioprine and cyclosporine is not recommended. (1.1)

----------DOSAGE AND ADMINISTRATION----------

The recommended dose of OLUMIANT is 2 mg once daily. (2.1)

OLUMIANT may be used as monotherapy or in combination with methotrexate or other DMARDs. (2.1)

Anemia: Avoid initiation or interrupt OLUMIANT in patients with hemoglobin less than 8 g/dL. (2.2, 2.3, 5.5)

Lymphopenia: Avoid initiation or interrupt OLUMIANT in patients with an Absolute Lymphocyte Count less than 500 cells/mm^3. (2.2, 2.3, 5.5)

Neutropenia: Avoid initiation or interrupt OLUMIANT in patients with an Absolute Neutrophil Count less than 1000 cells/mm^3. (2.2, 2.3, 5.5)

----------DOSAGE FORMS AND STRENGTHS----------

Tablets (not scored): 2 mg (3)

----------CONTRAINDICATIONS----------

None.

----------WARNINGS AND PRECAUTIONS----------

- Serious Infections: Avoid use of OLUMIANT in patients with active, serious infection, including localized infections. If a serious infection develops, interrupt OLUMIANT therapy until the infection is controlled. Do not give OLUMIANT to patients with active tuberculosis. (5.1)
- Thrombosis: Use with caution in patients who may be at increased risk. (5.3)
- Gastrointestinal Perforations: Use with caution in patients who may be at increased risk. (5.4)
- Laboratory Assessment: Recommended due to potential changes in lymphocytes, neutrophils, hemoglobin, liver enzymes, and lipids. (5.5)
- Vaccinations: Avoid use of OLUMIANT with live vaccines. (5.6)

----------ADVERSE REACTIONS----------

Adverse reactions (greater than or equal to 1%) include: upper respiratory tract infections, nausea, herpes simplex, and herpes zoster. (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact Eli Lilly and Company at 1-800-LillyRx (1-800-545-5979) or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

----------DRUG INTERACTIONS----------

OLUMIANT is not recommended in patients taking strong Organic Anion Transporter 3 (OAT3) inhibitors (e.g., probenecid). (2.5, 7.1)

----------USE IN SPECIFIC POPULATIONS----------

- Hepatic Impairment: OLUMIANT is not recommended in patients with severe hepatic impairment. (2.4, 8.6)
- Renal Impairment: OLUMIANT is not recommended in patients with moderate or severe renal impairment. (2.4, 8.7)

See 17 for PATIENT COUNSELING INFORMATION and FDA-approved Medication Guide.

Revised: 05/2018

FULL PRESCRIBING INFORMATION: CONTENTS*

WARNING: SERIOUS INFECTIONS, MALIGNANCY, AND THROMBOSIS

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2 DOSAGE AND ADMINISTRATION
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2.2 General Considerations for Administration
2.3 Dose Modifications Due to Serious Infections and Cytopenias
2.4 Dose Modifications in Patients with Renal or Hepatic Impairment
2.5 Dose Modifications Due to Drug Interactions

3 DOSAGE FORMS AND STRENGTHS

4 CONTRAINDICATIONS

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5.1 Serious Infections
5.2 Malignancy and Lymphoproliferative Disorders
5.3 Thrombosis
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5.6 Vaccinations

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6.1 Clinical Trials Experience

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7.1 Strong OAT3 Inhibitors
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10 OVERDOSAGE

11 DESCRIPTION

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14 CLINICAL STUDIES

16 HOW SUPPLIED/STORAGE AND HANDLING
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* Sections or subsections omitted from the full prescribing information are not listed.

FULL PRESCRIBING INFORMATION

WARNING: SERIOUS INFECTIONS, MALIGNANCY, AND THROMBOSIS

SERIOUS INFECTIONS

Patients treated with OLUMIANT are at risk for developing serious infections that may lead to hospitalization or death *[see Warnings and Precautions (5.1) and Adverse Reactions (6.1)]*. Most patients who developed these infections were taking concomitant immunosuppressants such as methotrexate or corticosteroids.

If a serious infection develops, interrupt OLUMIANT until the infection is controlled.

Reported infections include:

- **Active tuberculosis, which may present with pulmonary or extrapulmonary disease. Patients should be tested for latent tuberculosis before initiating OLUMIANT and during therapy. Treatment for latent infection should be considered prior to OLUMIANT use.**
- **Invasive fungal infections, including candidiasis and pneumocystosis. Patients with invasive fungal infections may present with disseminated, rather than localized, disease.**
- **Bacterial, viral, and other infections due to opportunistic pathogens.**

The risks and benefits of treatment with OLUMIANT should be carefully considered prior to initiating therapy in patients with chronic or recurrent infection.

Patients should be closely monitored for the development of signs and symptoms of infection during and after treatment with OLUMIANT including the possible development of tuberculosis in patients who tested negative for latent tuberculosis infection prior to initiating therapy *[see Warnings and Precautions (5.1)]*.

MALIGNANCIES

Lymphoma and other malignancies have been observed in patients treated with OLUMIANT *[see Warnings and Precautions (5.2)]*.

THROMBOSIS

Thrombosis, including deep venous thrombosis and pulmonary embolism, has been observed at an increased incidence in patients treated with OLUMIANT compared to placebo. In addition, there were cases of arterial thrombosis. Many of these adverse events were serious and some resulted in death. Patients with symptoms of thrombosis should be promptly evaluated. *[See Warnings and Precautions (5.3)]*.

1 INDICATIONS AND USAGE

1.1 Rheumatoid Arthritis

OLUMIANT® (baricitinib) is indicated for the treatment of adult patients with moderately to severely active rheumatoid arthritis who have had an inadequate response to one or more tumor necrosis factor (TNF) antagonist therapies.

Limitation of Use: Use of OLUMIANT in combination with other JAK inhibitors, biologic disease-modifying antirheumatic drugs (DMARDs), or with potent immunosuppressants such as azathioprine and cyclosporine is not recommended.

2 DOSAGE AND ADMINISTRATION

2.1 Dosage in Rheumatoid Arthritis

The recommended dose of OLUMIANT is 2 mg once daily.

OLUMIANT may be used as monotherapy or in combination with methotrexate or other DMARDs.

OLUMIANT is given orally with or without food *[see Clinical Pharmacology (12.3)]*.

2.2 General Considerations for Administration

- OLUMIANT initiation is not recommended in patients with an absolute lymphocyte count (ALC) less than 500 cells/mm^3, absolute neutrophil count (ANC) less than 1000 cells/mm^3, or hemoglobin level less than 8 g/dL *[see Warnings and Precautions (5.5)]*.
- Avoid use of OLUMIANT in patients with active, serious infection, including localized infections *[see Warnings and Precautions (5.1)]*.

Prior to initiating OLUMIANT, test patients for latent tuberculosis (TB). If positive, consider treating for TB prior to OLUMIANT use *[see Warnings and Precautions (5.1)]*.

2.3 Dose Modifications Due to Serious Infections and Cytopenias

If a patient develops a serious infection, hold treatment with OLUMIANT until the infection is controlled.

Modify dosage in cases of lymphopenia, neutropenia or anemia (Tables 1, 2, and 3). For treatment initiation criteria *[see Dosage and Administration (2.2)]*.

Table 1: Dose Adjustments for Lymphopenia

Low Absolute Lymphocyte Count (ALC)	
Lab Value (cells/mm^3)	Recommendation
ALC greater than or equal to 500	Maintain dose
ALC less than 500	Interrupt OLUMIANT until ALC greater than or equal to 500

Table 2: Dose Adjustments for Neutropenia

Low Absolute Neutrophil Count (ANC)	
Lab Value (cells/mm^3)	Recommendation
ANC greater than or equal to 1000	Maintain dose
ANC less than 1000	Interrupt OLUMIANT until ANC greater than or equal to 1000

Table 3: Dose Adjustments for Anemia

Low Hemoglobin Value	
Lab Value (g/dL)	Recommendation
Greater than or equal to 8	Maintain dose
Less than 8	Interrupt OLUMIANT until hemoglobin greater than or equal to 8

2.4 Dose Modifications in Patients with Renal or Hepatic Impairment

- OLUMIANT is not recommended for use in patients with estimated GFR of less than 60 mL/min/1.73 m^2 *[see Use in Specific Populations (8.7) and Clinical Pharmacology (12.3)]*.
- OLUMIANT is not recommended for use in patients with severe hepatic impairment.

2.5 Dose Modifications Due to Drug Interactions

OLUMIANT is not recommended for use in patients taking strong Organic Anion Transporter 3 (OAT3) inhibitors, such as probenecid *[see Drug Interactions (7.1) and Clinical Pharmacology (12.3)]*.

3 DOSAGE FORMS AND STRENGTHS

OLUMIANT for oral administration is available as debossed, film-coated, immediate-release tablets:

- 2 mg tablet contains a recessed area on each face of the tablet surface, is light pink, oblong, debossed with “Lilly” on one side and “2” on the other.

4 CONTRAINDICATIONS

None.

5 WARNINGS AND PRECAUTIONS

5.1 Serious Infections

Serious and sometimes fatal infections due to bacterial, mycobacterial, invasive fungal, viral, or other opportunistic pathogens have been reported in rheumatoid arthritis patients receiving OLUMIANT. The most common serious infections reported with OLUMIANT included pneumonia, herpes zoster, and urinary tract infection *[see Adverse Reactions (6.1)]*. Among opportunistic infections, tuberculosis, multidermatomal herpes zoster, esophageal candidiasis, pneumocystosis, acute histoplasmosis, cryptococcosis, cytomegalovirus, and BK virus were reported with OLUMIANT. Some patients have presented with disseminated rather than localized disease, and were often taking concomitant immunosuppressants such as methotrexate or corticosteroids.

Avoid use of OLUMIANT in patients with an active, serious infection, including localized infections. Consider the risks and benefits of treatment prior to initiating OLUMIANT in patients:

- with chronic or recurrent infection
- who have been exposed to tuberculosis
- with a history of a serious or an opportunistic infection
- who have resided or traveled in areas of endemic tuberculosis or endemic mycoses; or
- with underlying conditions that may predispose them to infection.

Closely monitor patients for the development of signs and symptoms of infection during and after treatment with OLUMIANT. Interrupt OLUMIANT if a patient develops a serious infection, an opportunistic infection, or sepsis. A patient who develops a new infection during treatment with OLUMIANT should undergo prompt and complete diagnostic testing appropriate for an immunocompromised patient; appropriate antimicrobial therapy should be initiated, the patient should be closely monitored, and OLUMIANT should be interrupted if the patient is not responding to therapy. Do not resume OLUMIANT until the infection is controlled.

Tuberculosis

Evaluate and test patients for latent or active infection prior to administration of OLUMIANT. Patients with latent tuberculosis (TB) should be treated with standard antimycobacterial therapy before initiating OLUMIANT.

OLUMIANT should not be given to patients with active TB. Consider anti-TB therapy prior to initiation of OLUMIANT in patients with a history of latent or active TB in whom an adequate course of treatment cannot be confirmed, and for patients with a negative test for latent TB but who have risk factors for TB infection. Consultation with a physician with expertise in the treatment of TB is recommended to aid in the decision about whether initiating anti-TB therapy is appropriate for an individual patient.

Monitor patients for the development of signs and symptoms of TB, including patients who tested negative for latent TB infection prior to initiating therapy.

Viral Reactivation

Viral reactivation, including cases of herpes virus reactivation (e.g., herpes zoster), were reported in clinical studies with OLUMIANT. If a patient develops herpes zoster, interrupt OLUMIANT treatment until the episode resolves.

The impact of OLUMIANT on chronic viral hepatitis reactivation is unknown. Patients with evidence of active hepatitis B or C infection were excluded from clinical trials. Patients who were positive for hepatitis C antibody but negative for hepatitis C virus RNA were permitted to enroll. Patients with positive hepatitis B surface antibody and hepatitis B core antibody, without hepatitis B surface antigen, were permitted to enroll; such patients should be monitored for expression of hepatitis B virus (HBV) DNA. Should HBV DNA be detected, consult with a hepatologist. Perform screening for viral hepatitis in accordance with clinical guidelines before starting therapy with OLUMIANT.

5.2 Malignancy and Lymphoproliferative Disorders

Consider the risks and benefits of OLUMIANT treatment prior to initiating therapy in patients with a known malignancy other than a successfully treated non-melanoma skin cancer (NMSC) or when considering continuing OLUMIANT in patients who develop a malignancy. Malignancies were observed in clinical studies of OLUMIANT *[see Adverse Reactions (6.1)]*.

Non-melanoma skin cancers

Non-melanoma skin cancers (NMSCs) have been reported in patients treated with OLUMIANT. Periodic skin examination is recommended for patients who are at increased risk for skin cancer.

5.3 Thrombosis

Thrombosis, including deep venous thrombosis (DVT) and pulmonary embolism (PE), has been observed at an increased incidence in patients treated with OLUMIANT compared to placebo. In addition, arterial thrombosis events in the extremities have been reported in clinical studies with OLUMIANT. Many of these adverse events were serious and some resulted in death. There was no clear relationship between platelet count elevations and thrombotic events. OLUMIANT should be used with caution in patients who may be at increased risk of thrombosis. If clinical features of DVT/PE or arterial thrombosis occur, patients should be evaluated promptly and treated appropriately.

5.4 Gastrointestinal Perforations

Events of gastrointestinal perforation have been reported in clinical studies with OLUMIANT, although the role of JAK inhibition in these events is not known.

OLUMIANT should be used with caution in patients who may be at increased risk for gastrointestinal perforation (e.g., patients with a history of diverticulitis). Patients presenting with new onset abdominal symptoms should be evaluated promptly for early identification of gastrointestinal perforation.

5.5 Laboratory Abnormalities

Neutropenia – Treatment with OLUMIANT was associated with an increased incidence of neutropenia (ANC less than 1000 cells/mm^3) compared to placebo. Avoid initiation or interrupt OLUMIANT treatment in patients with an ANC less than 1000 cells/mm^3. Evaluate at baseline and thereafter according to routine patient management. For recommended modifications based on ANC *[see Dosage and Administration (2.3) and Adverse Reactions (6.1)]*.

Lymphopenia – ALC less than 500 cells/mm^3 were reported in OLUMIANT clinical trials. Lymphocyte counts less than the lower limit of normal were associated with infection in patients treated with OLUMIANT, but not placebo.

Avoid initiation or interrupt OLUMIANT treatment in patients with an ALC less than 500 cells/mm^3. Evaluate at baseline and thereafter according to routine patient management. For recommended modifications based on ALC results *[see Dosage and Administration (2.3)]*.

Anemia – Decreases in hemoglobin levels to less than 8 g/dL were reported in OLUMIANT clinical trials. Avoid initiation or interrupt OLUMIANT treatment in patients with hemoglobin less than 8 g/dL. Evaluate at baseline and thereafter according to routine patient management. For recommended modifications based on hemoglobin results *[see Dosage and Administration (2.3)]*.

Liver Enzyme Elevations – Treatment with OLUMIANT was associated with increased incidence of liver enzyme elevation compared to placebo. Increases to greater than or equal to 5x and greater than or equal to 10x upper limit of normal (ULN) were observed for both ALT and AST in patients in OLUMIANT clinical trials.

Evaluate at baseline and thereafter according to routine patient management. Prompt investigation of the cause of liver enzyme elevation is recommended to identify potential cases of drug-induced liver injury. If increases in ALT or AST

are observed and drug-induced liver injury is suspected, interrupt OLUMIANT until this diagnosis is excluded *[see Adverse Reactions (6.1)]*.

Lipid Elevations – Treatment with OLUMIANT was associated with increases in lipid parameters, including total cholesterol, low-density lipoprotein (LDL) cholesterol, and high-density lipoprotein (HDL) cholesterol. Assessment of lipid parameters should be performed approximately 12 weeks following OLUMIANT initiation *[see Adverse Reactions (6.1)]*.

Manage patients according to clinical guidelines for the management of hyperlipidemia.

5.6 Vaccinations

Avoid use of live vaccines with OLUMIANT.

Update immunizations in agreement with current immunization guidelines prior to initiating OLUMIANT therapy.

6 ADVERSE REACTIONS

6.1 Clinical Trials Experience

Because clinical studies are conducted under widely varying conditions, adverse reaction rates observed in the clinical studies of a drug cannot be directly compared to rates in the clinical studies of another drug and may not predict the rates observed in a broader patient population in clinical practice.

The following data include six randomized double-blind placebo-controlled studies (three Phase 2, three Phase 3) and a long-term extension study. All patients had moderately to severely active RA. Patients were randomized to placebo (1070 patients), OLUMIANT 2 mg (479 patients), or baricitinib 4 mg (997 patients).

Patients could be switched to baricitinib 4 mg from placebo or OLUMIANT 2 mg from as early as Week 12 depending on the study design. All patients initially randomized to placebo were switched to baricitinib 4 mg by Week 24.

During the 16-week treatment period, adverse events leading to discontinuation of treatment were reported by 35 patients (11.4 events per 100 patient-years) treated with placebo, 17 patients (12.1 events per 100 patient-years) with OLUMIANT 2 mg, and 40 patients (13.4 events per 100 patient-years) treated with baricitinib 4 mg.

During 0 to 52 week exposure, adverse events leading to discontinuation of treatment were reported by 31 patients (9.2 events per 100 patient-years) with OLUMIANT 2 mg, and 92 patients (10.2 events per 100 patient-years) treated with baricitinib 4 mg.

Overall Infections – During the 16-week treatment period, infections were reported by 253 patients (82.1 events per 100 patient-years) treated with placebo, 139 patients (99.1 events per 100 patient-years) treated with OLUMIANT 2 mg, and 298 patients (100.1 events per 100 patient-years) treated with baricitinib 4 mg.

During 0 to 52 week exposure, infections were reported by 200 patients (59.6 events per 100 patients-years) treated with OLUMIANT 2 mg, and 500 patients (55.3 events per 100 patient-years) treated with baricitinib 4 mg.

In the 0 to 52 week exposure population, the most commonly reported infections with OLUMIANT were viral upper respiratory tract infection, upper respiratory tract infection, urinary tract infection, and bronchitis.

Serious Infections – During the 16-week treatment period, serious infections were reported in 13 patients (4.2 events per 100 patient-years) treated with placebo, 5 patients (3.6 events per 100 patient-years) treated with OLUMIANT 2 mg, and 11 patients (3.7 events per 100 patient-years) treated with baricitinib 4 mg.

During 0 to 52 week exposure, serious infections were reported in 14 patients (4.2 events per 100 patient-years) treated with OLUMIANT 2 mg and 32 patients (3.5 events per 100 patient-years) treated with baricitinib 4 mg.

In the 0 to 52 week exposure population, the most commonly reported serious infections with OLUMIANT were pneumonia, herpes zoster, and urinary tract infection *[see Warnings and Precautions (5.1)]*.

Tuberculosis – During the 16-week treatment period, no events of tuberculosis were reported.

During 0 to 52 week exposure, events of tuberculosis were reported in 0 patients treated with OLUMIANT 2 mg and 1 patient (0.1 per 100 patient-years) treated with baricitinib 4 mg *[see Warnings and Precautions (5.1)]*.

Cases of disseminated tuberculosis were also reported.

Opportunistic Infections (excluding tuberculosis) – During the 16-week treatment period, opportunistic infections were reported in 2 patients (0.6 per 100 patient-years) treated with placebo, 0 patients treated with OLUMIANT 2 mg and 2 patients (0.7 per 100 patient-years) treated with baricitinib 4 mg.

During 0 to 52 week exposure, opportunistic infections were reported in 1 patient (0.3 per 100 patient-years) treated with OLUMIANT 2 mg and 5 patients (0.6 per 100 patient-years) treated with baricitinib 4 mg *[see Warnings and Precautions (5.1)]*.

Malignancy – During the 16-week treatment period, malignancies excluding non-melanoma skin cancers (NMSC) were reported in 0 patients treated with placebo, 1 patient (0.7 per 100 patient-years) treated with OLUMIANT 2 mg, and 1 patient (0.3 per 100 patient-years) treated with baricitinib 4 mg.

During the 0 to 52 week treatment period, malignancies excluding NMSC were reported in 2 patients (0.6 per 100 patient-years) treated with OLUMIANT 2 mg and 6 patients (0.7 per 100 patient-years) treated with baricitinib 4 mg *[see Warnings and Precautions (5.2)]*.

Venous Thrombosis – During the 16-week treatment period, venous thromboses (deep vein thrombosis or pulmonary embolism) were reported in 0 patients treated with placebo, 0 patients treated with OLUMIANT 2 mg, and 5 patients (1.7 per 100 patient-years) treated with baricitinib 4 mg.

During the 0 to 52 week treatment period, venous thromboses were reported in 2 patients (0.6 per 100 patient-years) treated with OLUMIANT 2 mg and 7 patients (0.8 per 100 patient-years) treated with baricitinib 4 mg.

Arterial Thrombosis – During the 16-week treatment period, arterial thromboses were reported in 1 patient treated with placebo (0.3 per 100 patient-years), 2 patients (1.4 per 100 patient-years) treated with OLUMIANT 2 mg, and 2 patients (0.7 per 100 patient-years) treated with baricitinib 4 mg.

During the 0 to 52 week treatment period, arterial thromboses were reported in 3 patients (0.9 per 100 patient-years) treated with OLUMIANT 2 mg and 3 patients (0.3 per 100 patient-years) treated with baricitinib 4 mg.

Laboratory Abnormalities

Neutropenia – During the 16-week treatment period, neutrophil counts below 1000 cells/mm^3 occurred in 0% of patients treated with placebo, 0.6% of patients treated with OLUMIANT 2 mg, and 0.3% of patients treated with baricitinib 4 mg. There were no neutrophil counts below 500 cells/mm^3 observed in any treatment group *[see Warnings and Precautions (5.1, 5.5)]*.

Platelet Elevations – During the 16-week treatment period, increases in platelet counts above 600,000 cells/mm^3 occurred in 1.1% of patients treated with placebo, 1.1% of patients treated with OLUMIANT 2 mg, and 2.0% of patients treated with baricitinib 4 mg. Mean platelet count increased by 3000 cells/mm^3 at 16 weeks in patients treated with placebo, by 15,000 cells/mm^3 at 16 weeks in patients treated with OLUMIANT 2 mg and by 23,000 cells/mm^3 in patients treated with baricitinib 4 mg.

Liver Enzyme Elevations – Events of increases in liver enzymes greater than or equal to 3x ULN were observed in patients treated with OLUMIANT *[see Warnings and Precautions (5.5)]*.

- During the 16-week treatment period, ALT elevations greater than or equal to 3x ULN occurred in 1.0% of patients treated with placebo, 1.7% of patients treated with OLUMIANT 2 mg, and 1.4% of patients treated with baricitinib 4 mg.
- During the 16-week treatment period, AST elevations greater than or equal to 3x ULN occurred in 0.8% of patients treated with placebo, 1.3% of patients treated with OLUMIANT 2 mg, and 0.8% of patients treated with baricitinib 4 mg.
- In a phase 3 study of DMARD naive patients, during the 24-week treatment period, ALT and AST elevations ≥3x ULN occurred in 1.9% and 0% of patients treated with methotrexate monotherapy, 1.9% and 1.3% of patients treated with baricitinib 4 mg monotherapy, and 4.7% and 1.9% of patients treated with baricitinib 4 mg plus methotrexate.

Lipid Elevations – In controlled clinical trials, OLUMIANT treatment was associated with dose-related increases in lipid parameters including total cholesterol, triglycerides, LDL cholesterol, and HDL cholesterol. Elevations were observed at 12 weeks and remained stable thereafter. During the 12-week treatment period, changes in lipid parameters are summarized below:

- Mean LDL cholesterol increased by 8 mg/dL in patients treated with OLUMIANT 2 mg and by 14 mg/dL in patients treated with baricitinib 4 mg.
- Mean HDL cholesterol increased by 7 mg/dL in patients treated with OLUMIANT 2 mg and by 9 mg/dL in patients treated with baricitinib 4 mg.
- The mean LDL/HDL ratio remained stable.
- Mean triglycerides increased by 7 mg/dL in patients treated with OLUMIANT 2 mg and by 15 mg/dL in patients treated with baricitinib 4 mg.

[See Warnings and Precautions (5.5)].

Creatine Phosphokinase (CPK) – OLUMIANT treatment was associated with increases in CPK within one week of starting OLUMIANT and plateauing after 8 to 12 weeks. At 16 weeks, the mean change in CPK for OLUMIANT 2 mg and baricitinib 4 mg was 37 IU/L and 52 IU/L, respectively.

Creatinine – In controlled clinical trials, dose-related increases in serum creatinine were observed with OLUMIANT treatment. At 52 weeks, the mean increase in serum creatinine was less than 0.1 mg/dL with baricitinib 4 mg. The clinical significance of the observed serum creatinine increases is unknown.

Other Adverse Reactions

Other adverse reactions are summarized in Table 4.

Table 4: Adverse Reactions occurring in greater than or equal to 1% of OLUMIANT 2 mg and Baricitinib 4 mg Treated Patients in Placebo-Controlled Trials

Events	Weeks 0-16		
	Placebo n=1070 (%)	OLUMIANT 2 mg n=479 (%)	Baricitinib 4 mg n=997 (%)
Upper respiratory tract infections[a]	11.7	16.3	14.7
Nausea	1.6	2.7	2.8
Herpes simplex[b]	0.7	0.8	1.8
Herpes zoster	0.4	1.0	1.4

[a] Includes acute sinusitis, acute tonsillitis, chronic tonsillitis, epiglottitis, laryngitis, nasopharyngitis, oropharyngeal pain, pharyngitis, pharyngotonsillitis, rhinitis, sinobronchitis, sinusitis, tonsillitis, tracheitis, and upper respiratory tract infection.

[b] Includes eczema herpeticum, genital herpes, herpes simplex, ophthalmic herpes simplex, and oral herpes.

Additional adverse drug reactions occurring in fewer than 1% of patients: acne.

7 DRUG INTERACTIONS

7.1 Strong OAT3 Inhibitors

Baricitinib exposure is increased when OLUMIANT is co-administered with strong OAT3 inhibitors (such as probenecid) *[see Dosage and Administration (2.5) and Clinical Pharmacology (12.3)]*.

7.2 Other JAK Inhibitors or Biologic DMARDs

OLUMIANT has not been studied in combination with other JAK inhibitors or with biologic DMARDs *[see Indications and Usage (1.1)]*.

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Risk Summary

The limited human data on use of OLUMIANT in pregnant women are not sufficient to inform a drug-associated risk for major birth defects or miscarriage. In animal embryo-fetal development studies, oral baricitinib administration to pregnant rats and rabbits at exposures equal to and greater than approximately 20 and 84 times the maximum recommended human dose (MRHD), respectively, resulted in reduced fetal body weights, increased embryolethality (rabbits only), and dose-related increases in skeletal malformations. No developmental toxicity was observed in pregnant rats and rabbits treated with oral baricitinib during organogenesis at approximately 5 and 13 times the exposure at the MRHD, respectively. In a pre- and post-natal development study in pregnant female rats, oral baricitinib administration at exposures approximately 43 times the MRHD resulted in reduction in pup viability (increased incidence of stillborn pups and early neonatal deaths), decreased fetal birth weight, reduced fetal body weight gain, decreased cytotoxic T cells on post-natal day (PND) 35 with evidence of recovery by PND 65, and developmental delays that might be attributable to decreased body weight gain. No developmental toxicity was observed at an exposure approximately 9 times the exposure at the MRHD [*see* Animal Data].

The estimated background risk of major birth defects and miscarriage for the indicated population(s) are unknown. All pregnancies have a background risk of birth defect, loss, or other adverse outcomes. In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2-4% and 15-20%, respectively.

Data

Animal Data

In an embryofetal development study in pregnant rats, dosed orally during the period of organogenesis from gestation days 6 to 17, baricitinib was teratogenic (skeletal malformations that consisted of bent limb bones and rib anomalies) at exposures equal to or greater than approximately 20 times the MRHD (on an AUC basis at maternal oral doses of 10 mg/kg/day and higher). No developmental toxicity was observed in rats at an exposure approximately 5 times the MRHD (on an AUC basis at a maternal oral dose of 2 mg/kg/day).

In an embryofetal development study in pregnant rabbits, dosed orally during the period of organogenesis from gestation days 7 to 20, embryolethality, decreased fetal body weights, and skeletal malformations (rib anomalies) were observed in the presence of maternal toxicity at an exposure approximately 84 times the MRHD (on an AUC basis at a maternal oral dose of 30 mg/kg/day). Embryolethality consisted of increased post-implantation loss that was due to elevated incidences of both early and late resorptions. No developmental toxicity was observed in rabbits at an exposure approximately 12 times the MRHD (on an AUC basis at a maternal oral dose of 10 mg/kg/day).

In a pre- and post-natal development study in pregnant female rats dosed orally from gestation day 6 through lactation day 20, adverse findings observed in pups included decreased survival from birth to post-natal day 4 (due to increased stillbirths and early neonatal deaths), decreased birth weight, decreased body weight gain during the pre-weaning phase, increased incidence of malrotated forelimbs during the pre-weaning phase, and decreased cytotoxic T cells on PND 35 with recovery by PND 65 at exposures approximately 43 times the MRHD (on an AUC basis at a maternal oral dose of 25 mg/kg/day). Developmental delays (that may be secondary to decreased body weight gain) were observed in males and females at exposures approximately 43 times the MRHD (on an AUC basis at a maternal oral dose of 25 mg/kg/day). These findings included decreased forelimb and hindlimb grip strengths, and delayed mean age of sexual maturity. No developmental toxicity was observed in rats at an exposure approximately 9 times the MRHD (on an AUC basis at a maternal oral dose of 5 mg/kg/day).

8.2 Lactation

Risk Summary

No information is available on the presence of OLUMIANT in human milk, the effects of the drug on the breastfed infant, or the effects of the drug on milk production. Baricitinib is present in the milk of lactating rats. Due to species-specific differences in lactation physiology, the clinical relevance of these data are not clear. Because of the potential for serious adverse reactions in nursing infants, advise an OLUMIANT-treated woman not to breastfeed.

Data

A single oral dose of 25 mg/kg radiolabeled baricitinib was administered to lactating female Sprague-Dawley rats on post-partum day 13. Drug exposure was approximately 45-fold greater in milk than in plasma based on AUC_{0-t} values.

8.4 Pediatric Use

The safety and effectiveness of OLUMIANT in pediatric patients have not been established.

8.5 Geriatric Use

Of the 3100 patients treated in the four phase 3 studies, a total of 537 rheumatoid arthritis patients were 65 years of age and older, including 71 patients 75 years and older. No overall differences in safety or effectiveness were observed between these subjects and younger subjects, and other reported clinical experience has not identified differences in responses between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out *[see Clinical Pharmacology (12.3)]*.

OLUMIANT is known to be substantially excreted by the kidney, and the risk of adverse reactions to this drug may be greater in patients with impaired renal function. Because elderly patients are more likely to have decreased renal function, care should be taken in dose selection, and it may be useful to monitor renal function. *[See Dosing and Administration (2.4)]*.

8.6 Hepatic Impairment

No dose adjustment is necessary in patients with mild or moderate hepatic impairment. The use of OLUMIANT has not been studied in patients with severe hepatic impairment and is therefore not recommended *[see Dosage and Administration (2.4) and Clinical Pharmacology (12.3)]*.

8.7 Renal Impairment

Renal function was found to significantly affect baricitinib exposure. OLUMIANT is not recommended for use in patients with estimated GFR of less than 60 mL/min/1.73 m^2 *[see Dosage and Administration (2.4) and Clinical Pharmacology (12.3)]*.

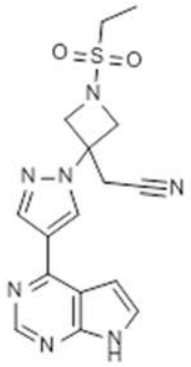
10 OVERDOSAGE

Single doses up to 40 mg and multiple doses of up to 20 mg daily for 10 days have been administered in clinical trials without dose-limiting toxicity. Pharmacokinetic data of a single dose of 40 mg in healthy volunteers indicate that more than 90% of the administered dose is expected to be eliminated within 24 hours.

In case of an overdose, it is recommended that the patient should be monitored for signs and symptoms of adverse reactions. Patients who develop adverse reactions should receive appropriate treatment.

11 DESCRIPTION

OLUMIANT (baricitinib) is a Janus kinase (JAK) inhibitor with the chemical name {1-(ethylsulfonyl)-3-[4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl]azetidin-3-yl}acetonitrile. Baricitinib has an empirical formula of $C_{16}H_{17}N_7O_2S$ and a molecular weight of 371.42. Baricitinib has the following structural formula:



OLUMIANT tablets contain a recessed area on each face of the tablet surface and are available for oral administration as debossed, film-coated, immediate-release tablets. The 2 mg tablet is light pink, oblong, debossed with "Lilly" on one side and "2" on the other.

Each tablet contains 2 mg of baricitinib and the following inactive ingredients: croscarmellose sodium, magnesium stearate, mannitol, microcrystalline cellulose, ferric oxide, lecithin (soya), polyethylene glycol, polyvinyl alcohol, talc and titanium dioxide.

12 CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

Baricitinib is a Janus kinase (JAK) inhibitor. JAKs are intracellular enzymes which transmit signals arising from cytokine or growth factor-receptor interactions on the cellular membrane to influence cellular processes of hematopoiesis and immune cell function. Within the signaling pathway, JAKs phosphorylate and activate Signal Transducers and Activators of Transcription (STATs) which modulate intracellular activity including gene expression. Baricitinib modulates the signaling pathway at the point of JAKs, preventing the phosphorylation and activation of STATs.

JAK enzymes transmit cytokine signaling through their pairing (e.g., JAK1/JAK2, JAK1/JAK3, JAK1/TYK2, JAK2/JAK2, JAK2/TYK2). In cell-free isolated enzyme assays, baricitinib had greater inhibitory potency at JAK1, JAK2 and TYK2 relative to JAK3. In human leukocytes, baricitinib inhibited cytokine induced STAT phosphorylation mediated by JAK1/JAK2, JAK1/JAK3, JAK1/TYK2, or JAK2/TYK2 with comparable potencies. However, the relevance of inhibition of specific JAK enzymes to therapeutic effectiveness is not currently known.

12.2 Pharmacodynamics

Baricitinib inhibition of IL-6 induced STAT3 phosphorylation – Baricitinib administration resulted in a dose dependent inhibition of IL-6 induced STAT3 phosphorylation in whole blood from healthy subjects with maximal inhibition observed approximately 1 hour after dosing, which returned to near baseline by 24 hours. Similar levels of inhibition were observed using either IL-6 or TPO as the stimulus.

Immunoglobulins – Mean serum IgG, IgM, and IgA values decreased by 12 weeks after starting treatment with OLUMIANT, and remained stable through at least 52 weeks. For most patients, changes in immunoglobulins occurred within the normal reference range.

C-reactive protein – In patients with rheumatoid arthritis, decreases in serum C-reactive protein (CRP) were observed as early as one week after starting treatment with OLUMIANT and were maintained throughout dosing.

Cardiac Electrophysiology – At a dose 10 times the maximum recommended dose, baricitinib does not prolong the QT interval to any clinically relevant extent.

12.3 Pharmacokinetics

Following oral administration of OLUMIANT, peak plasma concentrations are reached approximately at 1 hour. A dose-proportional increase in systemic exposure was observed in the therapeutic dose range. The pharmacokinetics of baricitinib do not change over time. Steady-state concentrations are achieved in 2 to 3 days with minimal accumulation after once-daily administration.

Absorption – The absolute bioavailability of baricitinib is approximately 80%. An assessment of food effects in healthy subjects showed that a high-fat meal decreased the mean AUC and C_{max} of baricitinib by approximately 11% and 18%, respectively, and delayed the t_{max} by 0.5 hours. Administration with meals is not associated with a clinically relevant effect on exposure. In clinical studies, OLUMIANT was administered without regard to meals.

Distribution – After intravenous administration, the volume of distribution is 76 L, indicating distribution of baricitinib into tissues. Baricitinib is approximately 50% bound to plasma proteins and 45% bound to serum proteins. Baricitinib is a substrate of the Pgp, BCRP, OAT3 and MATE2-K transporters, which play roles in drug distribution.

Elimination – The total body clearance of baricitinib is 8.9 L/h in patients with RA. Elimination half-life in patients with rheumatoid arthritis is approximately 12 hours.

Metabolism – Approximately 6% of the orally administered baricitinib dose is identified as metabolites (three from urine and one from feces), with CYP3A4 identified as the main metabolizing enzyme. No metabolites of baricitinib were quantifiable in plasma.

Excretion – Renal elimination is the principal clearance mechanism for baricitinib through filtration and active secretion as baricitinib is identified as a substrate of OAT3, Pgp, BCRP and MATE2-K from *in vitro* studies. In a clinical pharmacology study, approximately 75% of the administered dose was eliminated in the urine, while about 20% of the dose was eliminated in the feces. Baricitinib was excreted predominately as unchanged drug in urine (69%) and feces (15%).

Specific Populations

Effects of Body Weight, Gender, Race, and Age

Body weight, gender, race, ethnicity, and age did not have a clinically relevant effect on the PK (AUC and C_{max}) of baricitinib (Figure 1). The mean effects of intrinsic factors on PK parameters (AUC and C_{max}) were generally within the inter-subject PK variability of baricitinib. The inter-subject variabilities (% coefficients of variation) in AUC and C_{max} of baricitinib are approximately 41% and 22%, respectively. *[See Use in Specific Populations (8.5)]*.

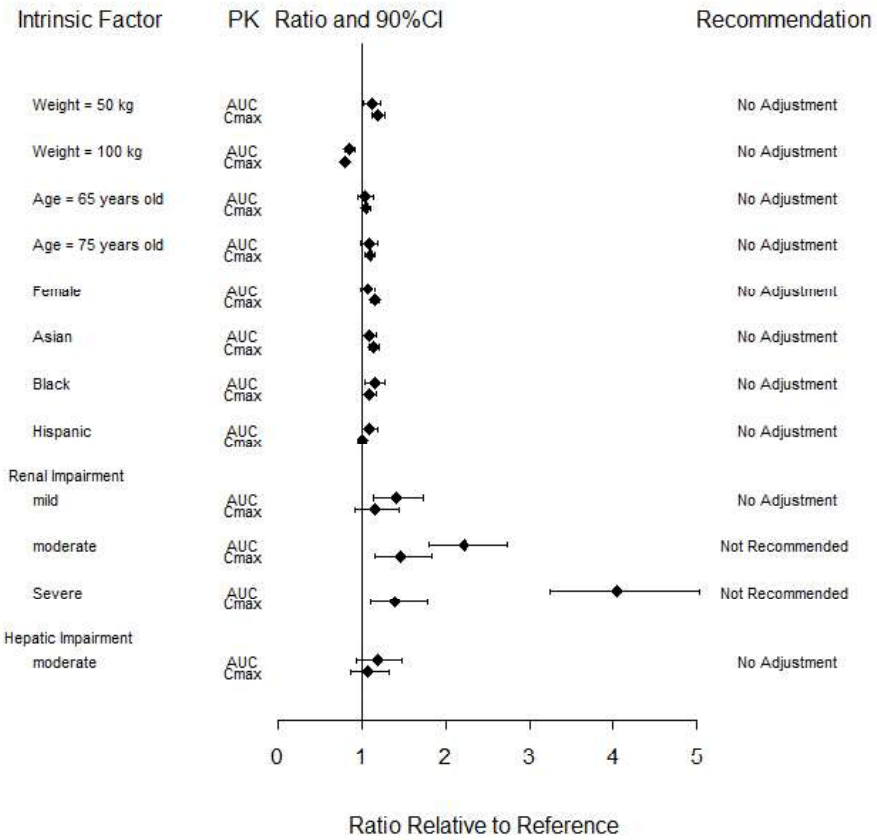
Renal Impairment

Baricitinib systemic exposure in AUC was increased by 1.41-, 2.22-, 4.05- and 2.41-fold for mild, moderate, severe, and ESRD (with hemodialysis) renal impairment sub-groups, respectively, compared to subjects with normal renal function. The corresponding values for increase in C_{max} were 1.16-, 1.46-, 1.40- and 0.88-fold, respectively (Figure 1) *[see Use in Specific Populations (8.7)]*.

Hepatic Impairment

Baricitinib systemic exposure and C_{max} increased by 1.19- and 1.08-fold for the moderate hepatic impairment group, respectively, compared to subjects with normal hepatic function (Figure 1) *[see Use in Specific Populations (8.6)]*.

Figure 1: Impact of Intrinsic Factors on Baricitinib Pharmacokinetics[a,b]



[a] Reference values for weight, age, gender, and race comparisons are 70 kg, 54 years, male, and white, respectively; reference groups for renal and hepatic impairment are subjects with normal renal and hepatic function, respectively.

[b] Effects of renal and hepatic impairment on baricitinib exposure were summarized from dedicated renal and hepatic impairment studies, respectively. Effects of other intrinsic factors on baricitinib exposure were summarized from population PK analysis.

Drug Interactions

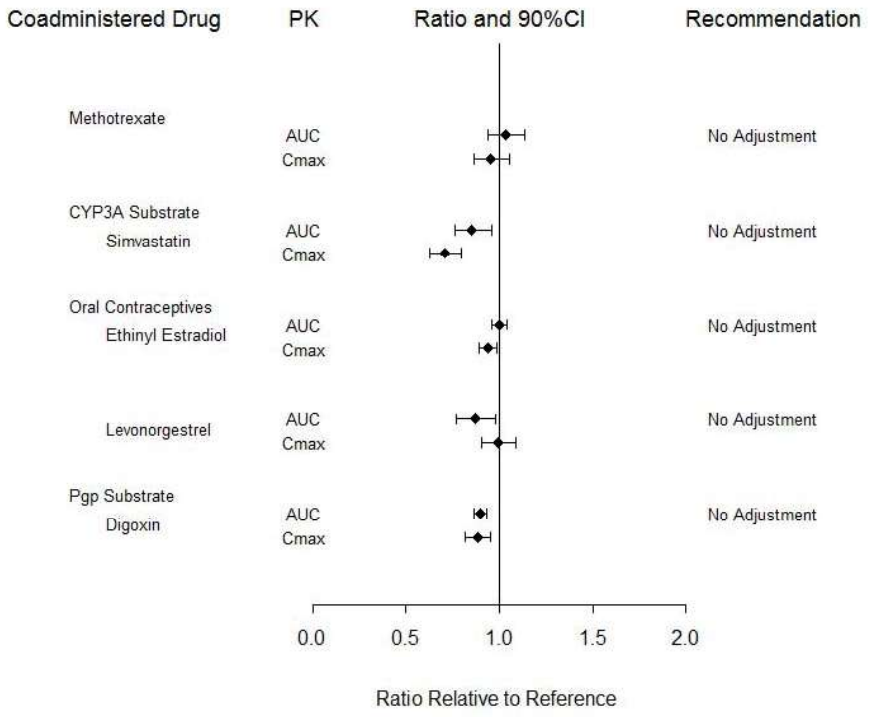
Potential for Baricitinib to Influence the PK of Other Drugs

In vitro, baricitinib did not significantly inhibit or induce the activity of cytochrome P450 enzymes (CYPs 3A, 1A2, 2B6, 2C8, 2C9, 2C19, and 2D6). In clinical pharmacology studies, there were no clinically meaningful changes in the pharmacokinetics (PK) of simvastatin, ethinyl estradiol, or levonorgestrel (CYP3A substrates) when co-administered with baricitinib.

In vitro studies suggest that baricitinib is not an inhibitor of the transporters, P-glycoprotein (Pgp) or Organic Anion Transporting Polypeptide (OATP) 1B1. *In vitro* data indicate baricitinib does inhibit organic anionic transporter (OAT) 1, OAT2, OAT3, organic cationic transporter (OCT) 1, OCT2, OATP1B3, Breast Cancer Resistance Protein (BCRP) and Multidrug and Toxic Extrusion Protein (MATE) 1 and MATE2-K, but clinically meaningful changes in the pharmacokinetics of drugs that are substrates for these transporters are unlikely. In clinical pharmacology studies there were no clinically meaningful effects on the PK of digoxin (Pgp substrate) or methotrexate (substrate of several transporters) when co-administered with baricitinib.

Exposure changes of drugs following co-administration with baricitinib are shown in Figure 2.

Figure 2: Impact of Baricitinib on the Pharmacokinetics of Other Drugs[a]



[a] Reference group is administration of concomitant drug alone.

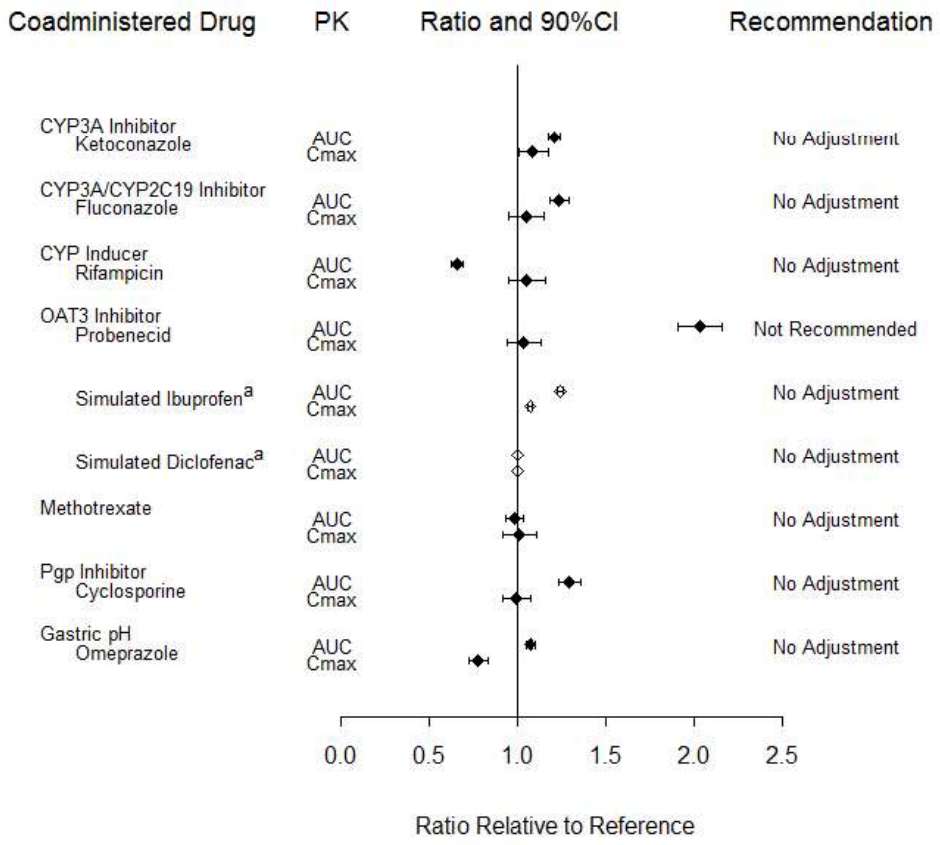
Potential for Other Drugs to Influence the PK of Baricitinib

In vitro studies suggest that baricitinib is a CYP3A4 substrate. In clinical pharmacology studies there was no effect on the PK of baricitinib when co-administered with ketoconazole (CYP3A inhibitor). There were no clinically meaningful changes in the PK of baricitinib when co-administered with fluconazole (CYP3A/CYP2C19/CYP2C9 inhibitor) or rifampicin (CYP3A inducer).

In vitro studies suggest that baricitinib is a substrate for OAT3, Pgp, BCRP and MATE2-K. In a clinical study, probenecid administration (strong OAT3 inhibitor) resulted in an approximately 2-fold increase in baricitinib $AUC_{0-\infty}$ with no effect on C_{max} and t_{max} *[see Dosage and Administration (2.5) and Drug Interactions (7.1)]*. However, simulations with diclofenac and ibuprofen (OAT3 inhibitors with less inhibition potential) predicted minimal effect on the PK of baricitinib. In clinical pharmacology studies there was no clinically meaningful effect on the PK of baricitinib when co-administered with cyclosporine (Pgp and BCRP inhibitor). Co-administration with methotrexate (substrate of several transporters) did not have a clinically meaningful effect on the PK of baricitinib.

Exposure changes of baricitinib following co-administration with CYP inhibitors or inducers, transporter inhibitors, as well as methotrexate and the proton pump inhibitor, omeprazole, are shown in Figure 3.

Figure 3: Impact of Other Drugs on the Pharmacokinetics of Baricitinib[b]



[a] Values are based on simulated studies.
[b] Reference group is administration of baricitinib alone.

13 NONCLINICAL TOXICOLOGY

13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

The carcinogenic potential of baricitinib was evaluated in Sprague-Dawley rats and Tg.rasH2 mice. No evidence of tumorigenicity was observed in male or female rats that received baricitinib for 91 to 94 weeks at oral doses up to 8 or 25 mg/kg/day, respectively (approximately 12 and 55 times the MRHD on an AUC basis). No evidence of tumorigenicity was observed in Tg.rasH2 mice that received baricitinib for 26 weeks at oral doses up to 300 and 150 mg/kg/day in male and female mice, respectively.

Baricitinib tested negative in the following genotoxicity assays: the *in vitro* bacterial mutagenicity assay (Ames assay), *in vitro* chromosome aberration assay in human peripheral blood lymphocytes, and *in vivo* rat bone marrow micronucleus assay.

Fertility (achievement of pregnancy) was reduced in male and female rats that received baricitinib at oral doses of 50 and 100 mg/kg/day respectively (approximately 113 and 169 times the MRHD in males and females, respectively, on an AUC basis) based upon findings that 7 of 19 (36.8%) drug-treated females with evidence of mating were not gravid compared to 1 of 19 (5.3%) control females. It could not be determined from the study design if these findings were attributable to toxicities in one sex or both. Fertility was unaffected in male and female rats at oral doses of 15 mg/kg and 25 mg/kg, respectively (approximately 25 and 48 times the MRHD on an AUC basis). However, maintenance of pregnancy was adversely affected at these doses based upon findings of increased post-implantation losses (early resorptions) and decreased numbers of mean viable embryos per litter. The number of viable embryos was unaffected in female rats that received baricitinib at an oral dose of 5 mg/kg/day and were mated to males that received the same dose (approximately 8 times the MRHD on an AUC basis). Reproductive performance was unaffected in male and female rats that received baricitinib at oral doses up to 50 and 100 mg/kg/day respectively (approximately 113 and 169 times the MRHD in males and females, respectively, on an AUC basis).

14 CLINICAL STUDIES

The OLUMIANT clinical development program included two dose-ranging trials and four confirmatory phase 3 trials. Although other doses have been studied, the recommended dose of OLUMIANT is 2 mg once daily.

Dose-Ranging Studies

The dose-ranging studies I (NCT01185353) and II (NCT01469013) included a 12-week randomized comparison of baricitinib 1, 2, 4, and 8 mg versus placebo in 301 and 145 patients, respectively.

The results from the dose-ranging studies are shown in Table 5. In dose-ranging Study I, the observed ACR response was similar for baricitinib 1 and 2 mg daily and for baricitinib 4 and 8 mg daily, with the highest response for baricitinib 8 mg daily. In dose-ranging Study II, there was not a clear trend of dose response, with similar response rates for 1 mg and 4 mg and 2 mg and 8 mg.

Table 5: Proportion of Patients with ACR20 Response at Week 12 in Dose-Ranging Studies

	% ACR20 Responders				
Dose-Ranging Study	**Placebo**	**Baricitinib 1 mg daily**	**Baricitinib 2 mg daily**	**Baricitinib 4 mg daily**	**Baricitinib 8 mg daily**
I (N=301)	41	57	54	75	78
II (N=145)	31	67	83	67	88

Confirmatory Studies

The efficacy and safety of OLUMIANT 2 mg once daily was assessed in two confirmatory phase 3 trials. These trials were randomized, double-blind, multicenter studies in patients with active rheumatoid arthritis diagnosed according to American College of Rheumatology (ACR)/European League Against Rheumatism 2010 criteria. Patients over 18 years of age were eligible if at least 6 tender and 6 swollen joints were present at baseline. The two studies (Studies III and IV) evaluated OLUMIANT 2 mg and baricitinib 4 mg.

Study III (NCT01721057) was a 24-week trial in 684 patients with moderately to severely active rheumatoid arthritis who had an inadequate response or intolerance to conventional DMARDs (cDMARDs). Patients received OLUMIANT 2 mg or 4 mg once daily or placebo added to existing background cDMARD treatment. From Week 16, non-responding patients could be rescued to receive baricitinib 4 mg once daily. The primary endpoint was the proportion of patients who achieved an ACR20 response at Week 12.

Study IV (NCT01721044) was a 24-week trial in 527 patients with moderately to severely active rheumatoid arthritis who had an inadequate response or intolerance to 1 or more TNF inhibitor therapies with or without other biologic DMARDs (TNFi-IR). Patients received OLUMIANT 2 mg or baricitinib 4 mg once daily or placebo added to background cDMARD treatment. From Week 16, non-responding patients could be rescued to receive baricitinib 4 mg once daily. The primary endpoint was the proportion of patients who achieved an ACR20 response at Week 12.

Clinical Response

The percentages of OLUMIANT-treated patients achieving ACR20, ACR50, and ACR70 responses, and Disease Activity Score (DAS28-CRP) <2.6 in Studies III and IV are shown in Table 6.

Patients treated with OLUMIANT had higher rates of ACR response and DAS28-CRP <2.6 versus placebo-treated patients at Week 12 (Studies III and IV) (Table 6).

In Study IV, higher ACR20 response rates (Figure 4) were observed as early as 1 week with OLUMIANT 2 mg versus placebo.

In Study IV, the proportions of patients achieving DAS28-CRP <2.6 who had at least 3 active joints at the end of Week 24 were 18.2% and 10.5%, in the placebo and OLUMIANT 2 mg arms, respectively.

Table 6: Clinical Response[a]

	Percent of Patients			
	cDMARD-IR		**TNFi-IR**	
	Study III		**Study IV**	
	Placebo + cDMARDs	**OLUMIANT 2 mg/day + cDMARDs** Δ **(95% CI)[b]**	**Placebo + cDMARDs**	**OLUMIANT 2 mg/day + cDMARDs** Δ **(95% CI)[b]**
N	**228**	**229**	**176**	**174**
ACR 20				
Week 12 %	39	66 27 (18, 35)	27	49 22 (12, 32)
Week 24 %	42	61 19 (10, 28)	27	45 18 (8, 27)
ACR 50				

Week 12 %	13	34 21 (13, 28)	8	20 12 (5, 19)
Week 24 %	21	41 20 (12, 28)	13	23 10 (2, 18)
ACR 70				
Week 12 %	3	18 15 (9, 20)	2	13 11 (5, 16)
Week 24 %	8	25 17 (11, 24)	3	13 10 (4, 16)
DAS28-CRP<2.6				
Week 12 %	9	26 (10, 24)	4	11 (2, 12)
Week 24 %	11	31 (13, 27)	6	11 (-1, 11)

[a] Patients who were rescued or discontinued treatment were considered as non-responders in the analyses.
[b] 95% confidence interval for the difference (Δ) in response rate between OLUMIANT treatment and placebo (Study III, Study IV).

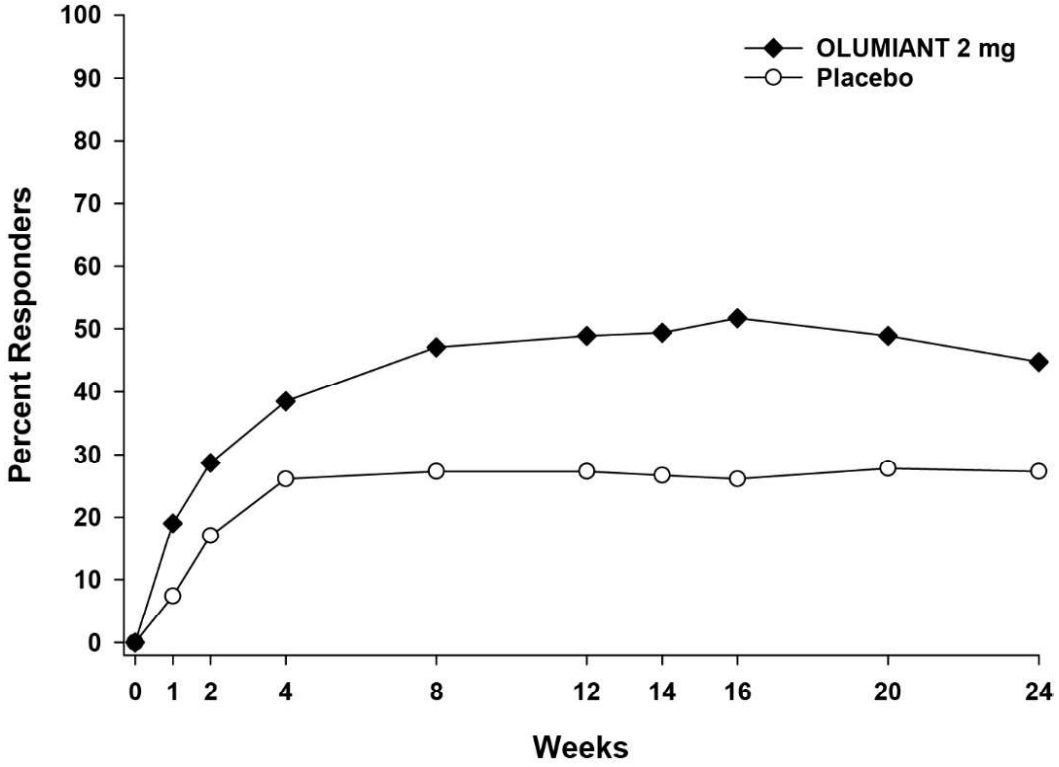
The effects of OLUMIANT treatment on the components of the ACR response criteria for Studies III and IV are shown in Table 7.

Table 7: Components of ACR Response at Week 12 in Studies III and IV[a]

	cDMARD-IR		**TNFi-IR**	
	Study III		**Study IV**	
	Placebo + cDMARDs	**OLUMIANT 2 mg/day + cDMARDs**	**Placebo + cDMARDs**	**OLUMIANT 2 mg/day + cDMARDs**
N	**228**	**229**	**176**	**174**
Number of Tender Joints (0-68)				
Baseline	24 (15)	24 (14)	28 (16)	31 (16)
Week 12	15 (14)	11 (13)	20 (16)	19 (18)
Number of Swollen Joints (0-66)				
Baseline	13 (7)	14 (9)	17 (11)	19 (12)
Week 12	8 (8)	5 (6)	12 (10)	10 (12)
Pain[b]				
Baseline	57 (23)	60 (21)	65 (19)	62 (22)
Week 12	43 (24)	34 (25)	55 (25)	46 (28)
Patient Global Assessment[b]				
Baseline	60 (21)	62 (20)	66 (19)	67 (19)
Week 12	44 (23)	36 (25)	56 (25)	46 (26)
Physician Global Assessment[b]				
Baseline	62 (17)	64 (17)	67 (19)	67 (17)
Week 12	41 (24)	33 (22)	50 (26)	36 (24)
Disability Index (HAQ-DI)[c]				
Baseline	1.50 (0.60)	1.51 (0.62)	1.78 (0.57)	1.71 (0.55)
Week 12	1.17 (0.62)	0.96 (0.69)	1.59 (0.68)	1.31 (0.72)
hsCRP (mg/L)				
Baseline	17.7 (20.4)	18.2 (21.5)	20.6 (25.3)	19.9 (22.5)
Week 12	17.2 (19.3)	8.6 (14.6)	19.9 (23.0)	13.5 (20.1)

[a] Data shown are mean (standard deviation).
[b] Visual analog scale: 0=best, 100=worst.
[c] Health Assessment Questionnaire–Disability Index: 0=best, 3=worst; 20 questions; 8 categories: dressing and grooming, arising, eating, walking, hygiene, reach, grip, and activities.

Figure 4: Percent of Patients Achieving ACR20



Physical Function Response

Improvement in physical function was measured by the Health Assessment Questionnaire-Disability Index (HAQ-DI). Patients receiving OLUMIANT 2 mg demonstrated greater improvement from baseline in physical functioning compared to placebo at Week 24. The mean difference (95% CI) from placebo in HAQ-DI change from baseline at Week 24 was -0.24 (-0.35, -0.14) in Study III and -0.23 (-0.35, -0.12) in Study IV.

Other Health Related Outcomes

General health status was assessed by the Short Form health survey (SF-36). In Studies III and IV, compared to placebo, patients treated with OLUMIANT 2 mg demonstrated greater improvement from baseline in the physical component summary (PCS) score and the physical function, role physical, bodily pain, vitality, and general health domains at Week 12, with no consistent improvements in the mental component summary (MCS) scores or the role emotional, mental health, and social functioning domains.

16 HOW SUPPLIED/STORAGE AND HANDLING

16.1 How Supplied

OLUMIANT for oral administration is available as debossed, film-coated, immediate-release tablets. Each tablet contains a recessed area on each face of the tablet surface.

OLUMIANT Tablets	2 mg
Color	Light Pink
Shape	Oblong
Identification	Lilly 2
NDC Code:	

Bottle of 30	0002-4182-30

16.2 Storage and Handling

Store at 20° to 25°C (68° to 77°F); excursions permitted to 15° to 30°C (59° to 86°F) [see USP Controlled Room Temperature].

Keep out of reach of children.

17 PATIENT COUNSELING INFORMATION

See FDA-approved patient labeling (Medication Guide).

Advise the patient to read the FDA-approved patient labeling (Medication Guide).

Patient Counseling

Advise patients of the potential benefits and risks of OLUMIANT.

Infections

Inform patients that they may be more likely to develop infections when taking OLUMIANT. Instruct patients to tell their healthcare provider if they develop any signs or symptoms of an infection *[see Warnings and Precautions (5.1)]*.

Advise patients that the risk of herpes zoster is increased in patients treated with OLUMIANT and some cases can be serious *[see Warnings and Precautions (5.1)]*.

Malignancies and Lymphoproliferative Disorders

Inform patients that OLUMIANT may increase their risk of certain cancers, and that lymphoma and other cancers have been observed in patients taking OLUMIANT. Instruct patients to inform their healthcare provider if they have ever had any type of cancer *[see Warnings and Precautions (5.2)]*.

Thrombosis

Advise patients that events of DVT and PE have been reported in clinical studies with OLUMIANT. Instruct patients to tell their healthcare provider if they develop any signs or symptoms of a DVT or PE *[see Warnings and Precautions (5.3)]*.

Laboratory Abnormalities

Inform patients that OLUMIANT may affect certain lab tests, and that blood tests are required before and during OLUMIANT treatment *[see Warnings and Precautions (5.5)]*.

Lactation

Advise a woman not to breastfeed during treatment with OLUMIANT *[see Use in Specific Populations (8.2)]*.

Literature issued Month dd, yyyy

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www.olumiant.com

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BAR-A10.0-NL0000-USPI-YYYYMMDD

MEDICATION GUIDE
OLUMIANT® (O-loo-me-ant)
(baricitinib)
tablets, for oral use

What is the most important information I should know about OLUMIANT?
OLUMIANT may cause serious side effects, including:

1. **Serious infections.**
   OLUMIANT is a medicine that affects your immune system. OLUMIANT can lower the ability of your immune system to fight infections. Some people have had serious infections while taking OLUMIANT, including tuberculosis (TB), and infections caused by bacteria, fungi, or viruses that can spread throughout the body. Some people have died from these infections.
   - Your healthcare provider should test you for TB before starting treatment with OLUMIANT.
   - Your healthcare provider should watch you closely for signs and symptoms of TB during treatment with OLUMIANT.

   You should not start taking OLUMIANT if you have any kind of infection unless your healthcare provider tells you it is okay. You may be at a higher risk of developing shingles.
   Before starting OLUMIANT, tell your healthcare provider if you:
   - are being treated for an infection.
   - have an infection that does not go away or that keeps coming back.
   - have diabetes, chronic lung disease, HIV, or a weak immune system. People with these conditions have a higher chance for infections.
   - have TB or have been in close contact with someone with TB.
   - have had hepatitis B or C.
   - live or have lived, or have traveled to certain parts of the country (such as the Ohio and Mississippi River valleys and the Southwest) where there is an increased chance for getting certain kinds of fungal infections. These infections may happen or become more severe if you use OLUMIANT. Ask your healthcare provider if you do not know if you have lived in an area where these infections are common.
   - think you have an infection or have symptoms of an infection such as:
     - fever, sweating, or chills
     - shortness of breath
     - warm, red, or painful skin or sores on your body
     - feeling tired
     - muscle aches
     - blood in your phlegm
     - diarrhea or stomach pain
     - cough
     - weight loss
     - burning when you urinate or urinating more often than normal

   After starting OLUMIANT, call your healthcare provider right away if you have any symptoms of an infection. OLUMIANT can make you more likely to get infections or make worse any infection that you have.
2. **Cancer and immune system problems.**
   OLUMIANT may increase your risk of certain cancers by changing the way your immune system works.
   - Lymphoma and other cancers including skin cancers can happen in people taking OLUMIANT. Tell your healthcare provider if you have ever had any type of cancer.
3. **Blood Clots.**
   Blood clots in the veins of your legs (deep vein thrombosis, DVT) or lungs (pulmonary embolism, PE) can happen in some people taking OLUMIANT. This may be life-threatening and cause death.
   - Tell your healthcare provider if you have had blood clots in the veins of your legs or lungs in the past.
   - Tell your healthcare provider right away if you have any signs and symptoms of blood clots during treatment with OLUMIANT, including: swelling, pain or tenderness in the leg, sudden unexplained chest pain, or shortness of breath.
4. **Tears (perforation) in the stomach or intestines.**
   - Tell your healthcare provider if you have had diverticulitis (inflammation in parts of the large intestine) or ulcers in your stomach or intestines. Some people taking OLUMIANT can get tears in their stomach or intestines. This happens most often in people who also take nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, or methotrexate.
   - Tell your healthcare provider right away if you have fever and stomach-area pain that does not go away, and a change in your bowel habits.
5. **Changes in certain laboratory test results.**
   Your healthcare provider should do blood tests before you start taking OLUMIANT and while you take OLUMIANT to check for the following:
   - **low lymphocyte counts.** Lymphocytes are white blood cells that help the body fight off infections.
   - **low neutrophil counts.** Neutrophils are white blood cells that help the body fight off infections.
   - **low red blood cell counts.** This may mean that you have anemia, which may make you feel weak and tired.

   Your healthcare provider should routinely check certain liver tests.
   You should not receive OLUMIANT if your lymphocyte count, neutrophil count, or red blood cell count is too low or your liver tests are too high.
   Your healthcare provider may stop your OLUMIANT treatment for a period of time if needed because of changes in these blood test results.

You may also have changes in other laboratory tests, such as your blood cholesterol levels. Your healthcare provider should do blood tests to check your cholesterol levels approximately 12 weeks after you start taking OLUMIANT, and as needed after that. Normal cholesterol levels are important to good heart health.

See "**What are the possible side effects of OLUMIANT?**" for more information about side effects.

What is OLUMIANT?

- OLUMIANT is a prescription medicine used to treat adult patients with moderately to severely active rheumatoid arthritis after treatment with at least one other medicine called a Tumor Necrosis Factor (TNF) antagonist has been used, and did not work well enough or could not be tolerated.
- It is not known if OLUMIANT is safe and effective in children.

Before taking OLUMIANT, tell your healthcare provider about all your medical conditions, including if you:

- See "**What is the most important information I should know about OLUMIANT?**"
- have an infection.
- have kidney problems.
- have liver problems.
- have low red or white blood cell counts.
- have recently received or are scheduled to receive a vaccine. People who take OLUMIANT should not receive live vaccines.
- have any stomach area (abdominal) pain or been diagnosed with diverticulitis or ulcers in your stomach or intestines.
- are pregnant or plan to become pregnant. It is not known if OLUMIANT will harm an unborn baby.
- are breastfeeding or plan to breastfeed. It is not known if OLUMIANT passes into your breast milk. You and your healthcare provider should decide if you will take OLUMIANT or breastfeed. You should not do both.

Tell your healthcare provider about all the medicines you take, including prescription and over-the-counter medicines, vitamins, and herbal supplements. OLUMIANT and other medicines may affect each other causing side effects.

Especially tell your healthcare provider if you take:

- a medicine called probenecid.
- any other medicines to treat your rheumatoid arthritis. For example, you should not take tocilizumab (Actemra®), etanercept (Enbrel®), adalimumab (Humira®), infliximab (Remicade®), rituximab (Rituxan®), abatacept (Orencia®), anakinra (Kineret®), certolizumab pegol (Cimzia®), golimumab (Simponi®), tofacitinib (Xeljanz®, Xeljanz® XR), sarilumab (Kevzara®), azathioprine or cyclosporine while you are taking OLUMIANT. Taking OLUMIANT with these medicines may increase your risk of infection.

Know the medicines you take. Keep a list of them to show your healthcare provider and pharmacist when you get a new medicine.

How should I take OLUMIANT?

- Take OLUMIANT exactly as your healthcare provider tells you to take it.
- Take OLUMIANT 1 time a day with or without food.

What are the possible side effects of OLUMIANT?

OLUMIANT can cause serious side effects including:

- See "**What is the most important information I should know about OLUMIANT?**"

Common side effects of OLUMIANT include (these are not all of the possible side effects of OLUMIANT):

- upper respiratory tract infections (common cold, sinus infections)
- nausea
- cold sores
- shingles

Call your doctor for medical advice about side effects. You may report side effects to FDA at 1-800-FDA-1088.

How should I store OLUMIANT?

Store OLUMIANT at room temperature between 68°F to 77°F (20°C to 25°C).

Keep OLUMIANT and all medicines out of the reach of children.

General Information about the safe and effective use of OLUMIANT.

Medicines are sometimes prescribed for purposes other than those listed in a Medication Guide. Do not use OLUMIANT for a condition for which it was not prescribed. Do not give OLUMIANT to other people, even if they have the same symptoms that you have. It may harm them.

You can ask your healthcare provider or pharmacist for information about OLUMIANT that is written for health professionals.

What are the ingredients in OLUMIANT?

Active ingredient: baricitinib

Inactive ingredients: croscarmellose sodium, magnesium stearate, mannitol, microcrystalline cellulose, ferric oxide, lecithin (soya), polyethylene glycol, polyvinyl alcohol, talc, titanium dioxide.

OLUMIANT is a registered trademark of Eli Lilly and Company.

Marketed by: Lilly USA, LLC Indianapolis, IN 46285, USA

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For more information, call 1-800-545-5979 or go to the following website: www.olumiant.com.

This Medication Guide has been approved by the U.S. Food and Drug Administration Issued: 05/2018

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ANNEXURE - 6 Colly

Baricitinib as potential treatment for 2019-nCoV acute respiratory disease

Given the scale and rapid spread of the 2019 novel coronavirus (2019-nCoV) acute respiratory disease, there is an immediate need for medicines that can help before a vaccine can be produced. Results of rapid sequencing of 2019-nCoV, coupled with molecular modelling based on the genomes of related virus proteins,[1] have suggested a few compounds that are likely to be effective, including the anti-HIV lopinavir plus ritonavir combination.

BenevolentAI's knowledge graph is a large repository of structured medical information, including numerous connections extracted from scientific literature by machine learning.[2] Together with customisations bespoke to 2019-nCoV, we used BenevolentAI to search for approved drugs that could help, focusing on those that might block the viral infection process. We identified baricitinib, which is predicted to reduce the ability of the virus to infect lung cells.

Most viruses enter cells through receptor-mediated endocytosis. The receptor that 2019-nCoV uses to infect lung cells might be ACE2, a cell-surface protein on cells in the kidney, blood vessels, heart, and, importantly, lung AT2 alveolar epithelial cells (figure). These AT2 cells are particularly prone to viral infection.[3] One of the known regulators of endocytosis is the AP2-associated protein kinase 1 (AAK1). Disruption of AAK1 might, in turn, interrupt the passage of the virus into cells and also the intracellular assembly of virus particles.[4]

Of 378 AAK1 inhibitors in the knowledge graph, 47 have been approved for medical use and six inhibited AAK1 with high affinity. These included a number of oncology drugs such as sunitinib and erlotinib, both of which have been shown to inhibit viral infection of cells through the inhibition of AAK1.[5] However, these compounds bring serious side-effects, and our data infer high doses to inhibit AAK1 effectively. We do not consider these drugs would be a safe therapy for a population of sick and infected people.

By contrast, one of the six high-affinity AAK1-binding drugs was the janus kinase inhibitor baricitinib, which also binds the cyclin G-associated kinase, another regulator of endocytosis.[6] Because the plasma concentration of baricitinib on therapeutic dosing (either as 2 mg or 4 mg once daily) is sufficient to inhibit AAK1, we suggest it could be trialled, using an appropriate patient population with 2019-nCoV acute respiratory disease, to reduce both the viral entry and the inflammation in patients, using endpoints such as the MuLBSTA score, an early warning model for predicting mortality in viral pneumonia.[7]

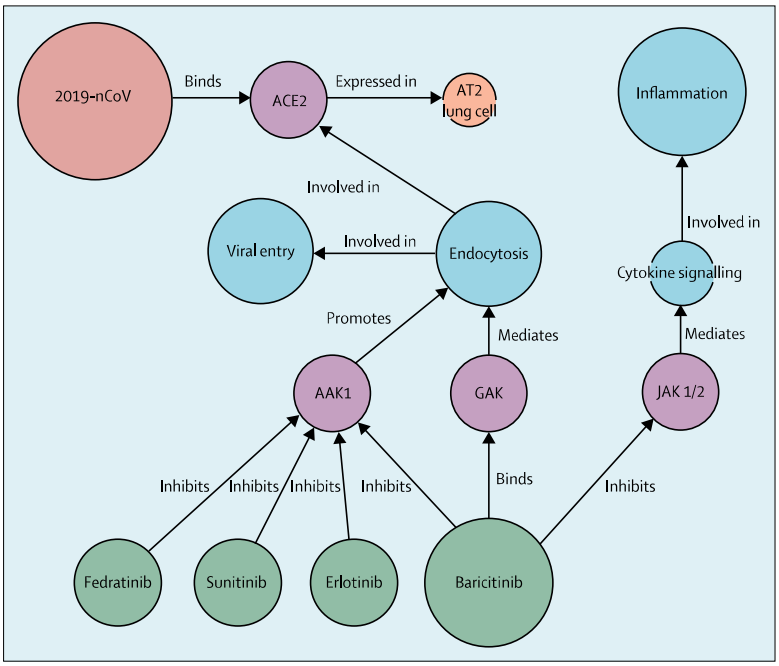


Figure: **The BenevolentAI knowledge graph**
The BenevolentAI knowledge graph integrates biomedical data from structured and unstructured sources. It is queried by a fleet of algorithms to identify new relationships to suggest new ways of tackling disease. 2019-nCoV=2019 novel coronavirus. AAK1=AP2-associated protein kinase 1. GAK=cyclin G-associated kinase. JAK1/2=janus kinase 1/2.

JS is editor-in-chief of *Oncogene*. JS has previously sat on a number of scientific advisory boards, including BenevolentAI, and has consulted with Lansdowne partners, Vitruvian, and Social Impact Capital; he now sits on the Board of Directors for BB Biotech Healthcare Trust and chairs Xerion Healthcare. All other authors are employees of BenevolentAI. Events in relation to the 2019-nCoV outbreak are evolving rapidly, and we make our initial thoughts available in this Correspondence in good faith and to assist in the global response. Our early investigations and suggestions require further detailed work and analysis and should not be relied on as constituting any kind of medical or other advice or recommendation.

*Peter Richardson, Ivan Griffin, Catherine Tucker, Dan Smith, Olly Oechsle, Anne Phelan, Michael Rawling, Edward Savory, *Justin Stebbing*
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COVID-19: combining antiviral and anti-inflammatory treatments

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Both coronavirus disease 2019 (COVID-19) and severe acute respiratory syndrome (SARS) are characterised by an overexuberant inflammatory response and, for SARS, viral load is not correlated with the worsening of symptoms.[1,2] In our previous Correspondence to *The Lancet*,[3] we described how BenevolentAI's proprietary artificial intelligence (AI)-derived knowledge graph,[4] queried by a suite of algorithms, enabled identification of a target and a potential therapeutic against SARS coronavirus 2 (SARS-CoV-2; the causative organism in COVID-19). We identified a group of approved drugs that could inhibit clathrin-mediated endocytosis and thereby inhibit viral infection of cells (appendix). The drug targets are members of the numb-associated kinase (NAK) family—including AAK1 and GAK—the inhibition of which has been shown to reduce viral infection in vitro.[5,6] Baricitinib was identified as a NAK inhibitor, with a particularly high affinity for AAK1, a pivotal regulator of clathrin-mediated endocytosis. We suggested that this drug could be of use in countering SARS-CoV-2 infections, subject to appropriate clinical testing.

See Online for appendix

To take this work further in a short timescale, a necessity when dealing with a new human pathogen, we re-examined the affinity and selectivity of all the approved drugs in our knowledge graph to identify those with both antiviral and anti-inflammatory properties. Such drugs are predicted to be of particular importance in the treatment of severe cases of COVID-19, when the host inflammatory response becomes a major cause of lung damage and subsequent mortality. Comparison of the properties of the three best candidates are shown in the table. Baricitinib, fedratinib, and ruxolitinib are potent and selective JAK inhibitors approved for indications such as rheumatoid arthritis and myelofibrosis. All three are powerful anti-inflammatories that, as JAK–STAT signalling inhibitors, are likely to be effective against the consequences of the elevated levels of cytokines (including interferon-γ) typically observed in people with COVID-19.[7] Although the three candidates have similar JAK inhibitor potencies, a high affinity for AAK1 suggests baricitinib is the best of the group, especially given its once-daily oral dosing and acceptable side-effect profile.[7] The most significant side-effect seen over 4214 patient-years in the clinical trial programmes used for European Medicines Agency registration was a small increase in upper respiratory tract infections (similar to that observed with methotrexate), but the incidence of serious infections (eg, herpes zoster) over 52 weeks' dosing was small (3·2 per 100 patient-years), and similar to placebo.[7] Use of this agent in patients with COVID-19 over 7–14 days, for example, suggests side-effects would be trivial.

Other AI-algorithm-predicted NAK inhibitors include a combination of the oncology drugs sunitinib and

	Baricitinib	Ruxolitinib	Fedratinib
Daily dose, mg	2–10	25	400
Affinity and efficacy: K_d or IC_{50}, nM*			
AAK1†			
Cell free	17	100	32
Cell	34	700	960
GAK†			
Cell free	136	120	1
Cell	272	840	30
BIKE†			
Cell free	40	210	32
Cell	80	1470	960
JAK1			
Cell free	6	3	20
Cell	12	20	600
JAK2			
Cell free	6	3	3
Cell	11	21	100
JAK3			
Cell free	>400	2	79
Cell	>800	14	2370
TYK2			
Cell free	53	1	20
Cell	106	7	600
Pharmacokinetics			
Plasma protein binding	50%	97%	95%
C_{max} (unbound), nM	103‡	117	170
Safety: tolerated dose	≤10 mg/day	≤20 mg twice daily	≤400 mg/day

See regulatory approval documents for further information on these drugs. K_d=dissociation constant. IC_{50}=half-maximal inhibitory concentration. C_{max}=maximum serum concentration. *All values are IC_{50} except the cell free values for AAK1, GAK, and BIKE; "cell free" values indicate inhibitory activity against purified protein in biochemical assay; "cell" values indicate enzyme-inhibitory activity inside a cell. †In the absence of direct measurements of drug inhibition in cells, the predicted cell affinity and efficacy values are derived from the ratio of each compound for their primary target; for example, for baricitinib, IC_{50} AAK1[cell] = (IC_{50}AK1[cell] / IC_{50}AK1[cell free]) × IC_{50}AAK1[cell free]. ‡At a 10 mg dose.

Table: **Properties of three antiviral and anti-inflammatory candidate drugs**

erlotinib, shown to reduce the infectivity of a wide range of viruses, including hepatitis C virus, dengue virus, Ebola virus, and respiratory syncytial virus.[5,6] However, sunitinib and erlotinib would be difficult for patients to tolerate at the doses required to inhibit AAK1 and GAK. By contrast, at therapeutic doses used for the treatment of patients with rheumatoid arthritis, the free plasma concentrations of baricitinib are predicted to be sufficient to inhibit AAK1, and potentially GAK, in cell-based assays.

The predicted inhibition of clathrin-mediated endocytosis by baricitinib is unlikely to be observed with other anti-arthritic drugs or JAK inhibitors. Our analysis of the closely related JAK inhibitors ruxolitinib and fedratinib (table) illustrates that the predicted unbound plasma exposure required to inhibit the enzymes needed for clathrin-mediated endocytosis greatly exceeds the currently tolerated exposures used therapeutically. These drugs are, therefore, unlikely to reduce viral infectivity at tolerated doses, although they might reduce the host inflammatory response through JAK inhibition. Intriguingly, another JAK inhibitor, tofacitinib, shows no detectable inhibition of AAK1. The high affinity of baricitinib for NAKs, its anti-inflammatory properties, and its ability to ameliorate associated chronic inflammation in interferonopathies,[8] together with its advantageous pharmacokinetic properties, appear to make it a special case among the approved drugs.

In addition, the potential for combination therapy with baracitinib is high because of its low plasma protein binding and minimal interaction with CYP enzymes and drug transporters. Furthermore, there is the potential for combining baricitinib with the direct-acting antivirals (lopinavir or ritonavir and remdesivir) currently being used in the COVID-19 outbreak, since it has a minimal interaction with the relevant CYP drug-metabolising enzymes. Combinations of baricitinib with these direct-acting antivirals could reduce viral infectivity, viral replication, and the aberrant host inflammatory response. This work demonstrates that the use of an AI-driven knowledge graph can facilitate rapid drug development.

JS is editor-in-chief of *Oncogene*. JS has previously sat on a number of scientific advisory boards, including BenevolentAI, and consults with Lansdowne partners and Vitruvian; he now sits on the Board of Directors for BB Biotech Healthcare Trust and chairs Xerion Healthcare. All other authors are employees of BenevolentAI. Events in relation to the COVID-19 outbreak are evolving rapidly, and we make our initial thoughts available in this Comment in good faith and to assist in the global response. Our early investigations and suggestions require further detailed work and analysis and should not be relied on as constituting any kind of medical or other advice or recommendation.

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Article

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ANNEXURE - 7

Mechanism of baricitinib supports artificial intelligence-predicted testing in COVID-19 patients

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Abstract

Baricitinib is an oral Janus kinase (JAK)1/JAK2 inhibitor approved for the treatment of rheumatoid arthritis (RA) that was independently predicted, using artificial intelligence (AI) algorithms, to be useful for COVID-19 infection via proposed anti-cytokine effects and as an inhibitor of host cell viral propagation. We evaluated the *in vitro* pharmacology of baricitinib across relevant leukocyte subpopulations coupled to its in vivo pharmacokinetics and showed it inhibited signaling of cytokines implicated in COVID-19 infection. We validated the AI-predicted biochemical inhibitory effects of baricitinib on human numb-associated kinase (hNAK) members measuring nanomolar affinities for AAK1, BIKE, and GAK. Inhibition of NAKs led to reduced viral infectivity with baricitinib using human primary liver spheroids. These effects occurred at exposure levels seen clinically. In a case series of patients with bilateral COVID-19 pneumonia, baricitinib treatment was associated with clinical and radiologic recovery, a rapid decline in SARS-CoV-2 viral load, inflammatory markers, and IL-6 levels. Collectively, these data support further evaluation of the anti-cytokine and anti-viral activity of baricitinib and support its assessment in randomized trials in hospitalized COVID-19 patients.

Keywords anti-cytokine; anti-viral; baricitinib; case series; COVID-19

Subject Categories Microbiology, Virology & Host Pathogen Interaction; Pharmacology & Drug Discovery

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See also: **MB Schultz *et al*** (August 2020)

Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is currently the biggest public health challenge to the biomedical community. Despite multiple public health measures, there remains an urgent need for pharmacologic therapies to treat infected patients, minimize mortality, and optimally decrease viral shedding and subsequent transmission. Artificial intelligence (AI) allows for rapid drug development (Schneider *et al*, 2020) including repurposing existing drugs. Algorithms were used to search for approved drugs capable of inhibiting both the inflammatory damage and infectivity associated with SARS-CoV-2 (Richardson *et al*, 2020a; Stebbing *et al*, 2020). Baricitinib, an oral inhibitor of Janus kinase (JAK)1 and JAK2 (Fridman *et al*, 2010) approved for the treatment of moderately-to-severely active rheumatoid arthritis (RA) in adults,

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§Sacco Baricitinib Study Group members are listed in the Appendix

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was independently hypothesized to be a therapeutic option for COVID-19. It was considered among all molecules studied to have a unique role by virtue of its potential to both inhibit relevant cytokine signaling and have activity against the numb-associated kinases (NAKs), AAK1 and GAK (Richardson *et al*, 2020a; Stebbing *et al*, 2020), which stimulate AP-2-mediated host viral propagation (Inoue *et al*, 2007; Bekerman *et al*, 2017; Owczarek *et al*, 2018).

Infection by pathogenic coronaviruses (e.g., SARS and SARS-CoV-2) often results in excessive cytokine and chemokine action with the development of acute respiratory distress syndrome (ARDS; Huang *et al*, 2005, 2020; Cameron *et al*, 2007; Ruan *et al*, 2020; Siddiqi & Mehra, 2020; Zhou *et al*, 2020). In patients with moderate-to-severe forms of these diseases, anti-viral cytokine signaling is maintained at inappropriate levels (perhaps due to incomplete viral clearance) causing acute lung injury (Nicholls *et al*, 2003), persistent interferon (IFN) activity, and impaired T-cell and antibody responses (Cui *et al*, 2003; Huang *et al*, 2005; Shi *et al*, 2020). In the COVID-19 setting, ARDS is the leading cause of death and is associated with high levels of interleukin-6 (IL-6), which appears to be a predictor of mortality (Ruan *et al*, 2020). Therefore, treating hospitalized patients requires both improved viral clearance and restriction of the inflammatory response, with the potential to improve outcomes such as mortality and reduce admissions to intensive care units. The anti-inflammatory benefit of baricitinib has been previously demonstrated through a reduction in a range of JAK-STAT-dependent cytokines (Fridman *et al*, 2010; Shi *et al*, 2014; McInnes *et al*, 2019). Phase 3 clinical trials providing safety and efficacy data have been conducted or are ongoing for baricitinib treatment in patients with autoimmune diseases including RA, atopic dermatitis, systemic lupus erythematosus, alopecia areata, juvenile idiopathic arthritis, and chronic atypical neutrophilic dermatosis with lipodystrophy and elevated temperature (CANDLE). Now, we provide biochemical and cellular evidence confirming predictions focused on anti-cytokine signaling and potential anti-viral effects for baricitinib, along with a case series, supporting its potential utility in hospitalized COVID-19 patients.

Results

Anti-cytokine activity for baricitinib

The anti-cytokine and anti-inflammatory activity of baricitinib was evaluated with a focus on cytokines relevant to COVID-19 infection. We evaluated the *in vitro* pharmacology of baricitinib across relevant leukocyte subpopulations coupled to its *in vivo* pharmacokinetics to determine its effect on distinct cytokine pathways. Concentration–response curves combined with exposure data from baricitinib-treated healthy volunteers demonstrated that baricitinib affects cytokine-dependent phosphorylated STAT (pSTAT) inhibition to varying degrees (Fig 1A). Baricitinib inhibited signaling of cytokines implicated in COVID-19 infection, including IL-2, IL-6, IL-10, IFN-γ, and G-CSF, with lower half-maximum inhibitory concentration (IC_{50}) values translating to a greater overall inhibition of cytokine-induced JAK/STAT signaling during the dosing interval (Fig 1A). Furthermore, baricitinib treatment resulted in a significant reduction ($P < 0.05$) from baseline in plasma IL-6 at week 12 in patients with active RA who had an inadequate response to methotrexate from a phase 2b (Tanaka *et al*, 2016), randomized, placebo-controlled, dose-ranging study (Fig 1B).

Anti-viral activity for baricitinib

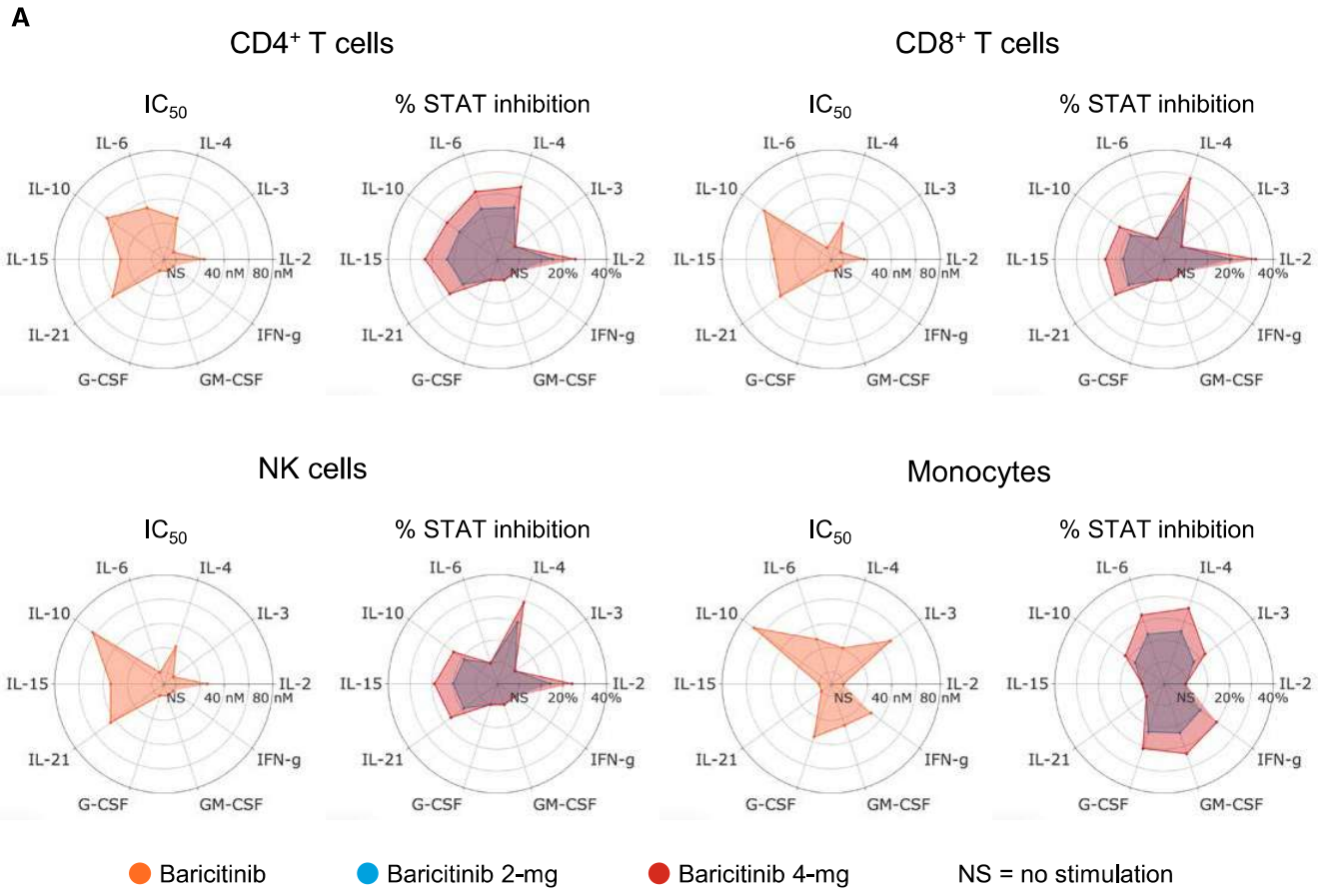
Next, we validated the proposed biochemical inhibitory activity of baricitinib on the NAK family members AAK1, BIKE, GAK, and STK16, some of which are hypothesized to facilitate viral propagation of coronavirus in epithelial cells (Bekerman *et al*, 2017; Owczarek *et al*, 2018; Richardson *et al*, 2020a). Baricitinib activity demonstrated affinity against AAK1 (8.2 nM), BIKE (20 nM), and GAK (120 nM; Fig 2A and B); these values are within the exposure range of the approved 2 mg (US, EU) and 4 mg (EU) once-daily doses of baricitinib for the treatment of RA (Shi *et al*, 2014). The pharmacokinetics of baricitinib show the unbound fraction of free bioavailable drug in RA patient sera as being 326 nM area under the curve (AUC) and 652 nM (AUC) for baricitinib 2 and 4 mg, respectively (data on file). We compared the relative binding affinities of different JAK inhibitors (JAKis) for these NAKs. Notably, among JAKis approved for the treatment of RA, baricitinib uniquely demonstrated high affinity for AAK1, BIKE, and GAK, whereas tofacitinib and upadacitinib did not demonstrate high affinity for these kinases (Fig 2B). The binding affinity of baricitinib for AAK1 and GAK is similar to the binding affinity of baricitinib for JAK1 (5.9 nM) and JAK2 (5.7 nM) (Fridman *et al*, 2010).

To extend these activities on NAKs, we evaluated the effect of baricitinib in reducing viral infectivity in 3D primary human liver spheroids (Bell *et al*, 2016) infected with purified SARS-CoV-2 and treated with baricitinib. Specifically, we used a 3D spheroid model of primary human liver cells in which hepatocytes retain their transcriptomic, proteomic, and metabolomic phenotype and functionality for multiple weeks (Bell *et al*, 2016, 2017; Vorrink *et al*, 2017), including expression of AAK1 and GAK (Fig 2C). The overlay of the viral antigen spike (as detected with 1A9 antibody) with the ACE-2 protein as detected by immunofluorescence, after 5 days of SARS-CoV-2 infection in these spheroids, provides a visual confirmation of virus infectivity in this system (Fig 2C). SARS-CoV-2 was able to infect human primary liver spheroids in this experimental paradigm, as demonstrated by a day post-infection (dpi) dependent increase in viral RNA (Fig 2D and E). Baricitinib did not result in liver cell injury up to concentrations approximately eightfold higher than the clinically observed AUC values at 4 mg (AUC = 652 nM; Fig 2F). Importantly, pretreatment of spheroids with physiologically relevant concentrations of baricitinib (400 and 800 nM) significantly ($P < 0.05$) reduced viral load by 30–40%, corroborating the proposed inhibitory effects of baricitinib on AAK1 and GAK-mediated viral propagation (Fig 2G and H). These results suggest that host cells that express these NAKs may serve as a target for baricitinib-mediated reduction in viral propagation.

Clinical case series using baricitinib

Following the recent publications by Richardson *et al* (2020a) and Stebbing *et al* (2020), COVID-19 patients were treated with baricitinib in a pilot study in Milan, Italy. Four patients with bilateral COVID-19 pneumonia, who presented with varying degrees of disease severity (Table 1), were included in this pilot study; three individuals (Patients B, C, and D) were clinically unstable with

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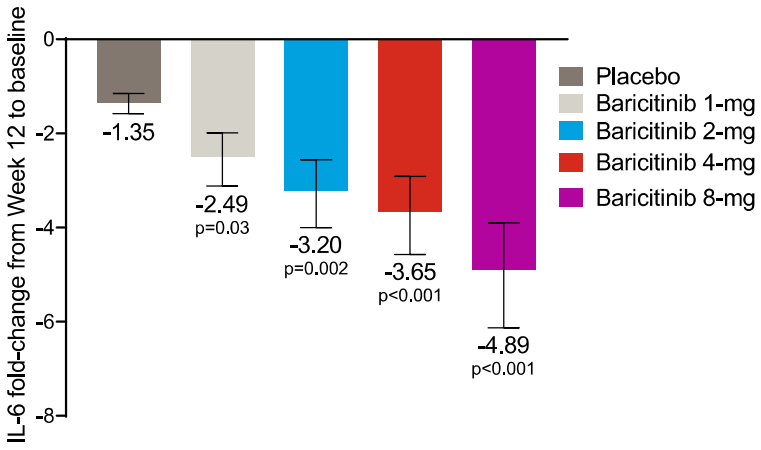


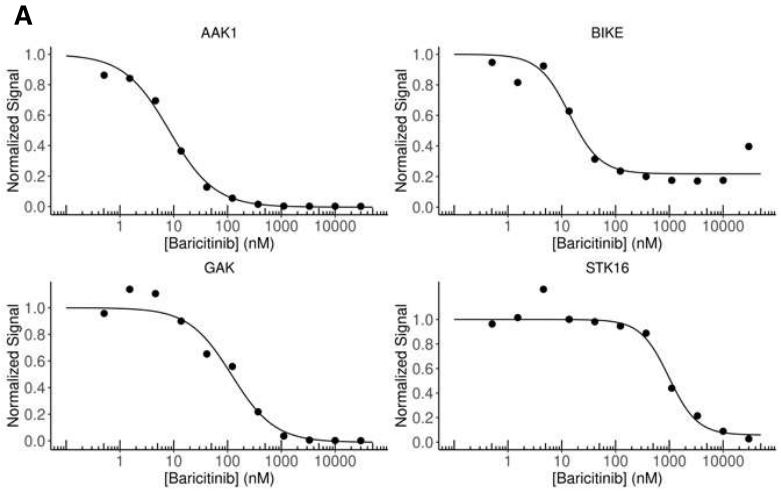
Figure 1. Anti-cytokine activity of baricitinib.

A IC_{50} values for baricitinib (orange) in cytokine-stimulated human $CD4^+$ T cells, $CD8^+$ T cells, NK cells, and monocytes are shown for IL-2/pSTAT5, IL-4/pSTAT6, IL-3/pSTAT5, IL-6/pSTAT3, IL-10/pSTAT3, IL-15/pSTAT5, IL-21/pSTAT3, G-CSF/pSTAT3, GM-CSF/pSTAT5, and IFN-γ/pSTAT1. Average daily percent STAT inhibition was calculated using *in vitro* concentration–response curves and published human exposure data. Cytokine treatments that did not result in sufficient pSTAT stimulation are denoted as "NS" in the radar plots.

B Fold change ± standard error in baseline IL-6 plasma levels at week 12 from RA patients treated with placebo (n = 47), and baricitinib 1 mg (n = 23), 2 mg (n = 24), 4 mg (n = 23), and 8 mg (n = 23) in the phase 2b randomized, placebo-controlled study NCT01469013. P values are for comparisons of baricitinib 1, 2, 4, and 8 mg change from baseline compared with the placebo change from baseline. Treatment effects were estimated using a mixed-effects repeated-measures model (SAS Proc Mixed) using log_{10}-transformed IL-6 levels with an unstructured covariance matrix.

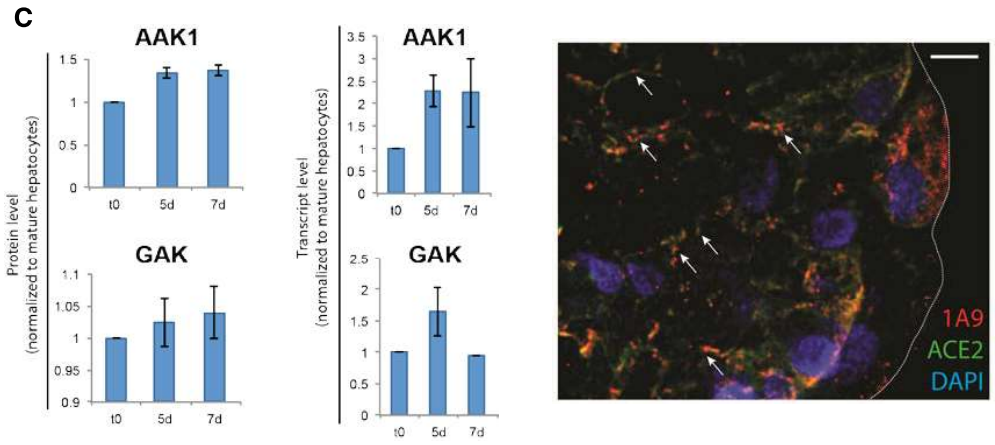
Data information: IC_{50}, half-maximum inhibitory concentration; NK, natural killer; pSTAT, phosphorylated signal transducer and activator of transcription.

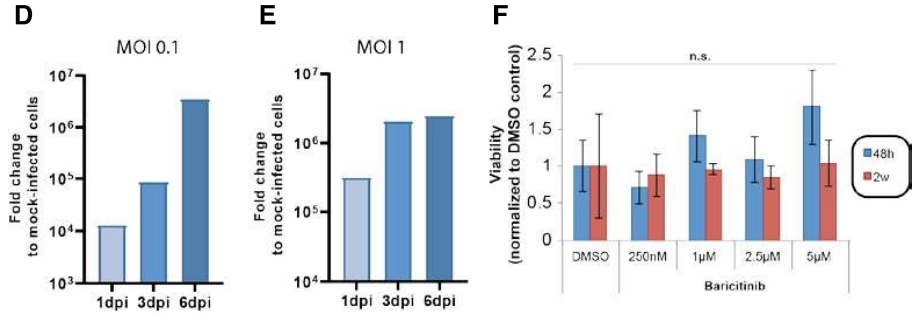
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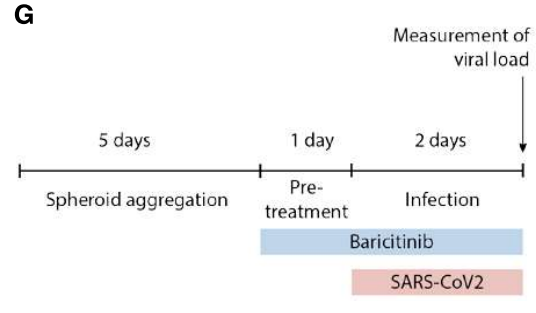


B

Compound	AAK1 Kd (nM)	BIKE Kd (nM)	GAK Kd (nM)	STK16 Kd (nM)
Baricitinib	8.2	20	120	1100
Tofacitinib	7500	4900	18000	5000
Upadacitinib	9900	11000	2200	9300
AZD7762	2.9	13	1.4	1900
Sunitinib	35	6.5	35	300
Erlotinib	2000	280	21	>30000







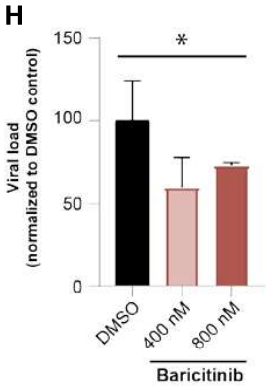


Figure 2.

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Figure 2. NAK-binding affinities of baricitinib and other comparators.

A, B Binding affinities in equilibrium affinity constant (Kd) are shown for baricitinib (A and B), tofacitinib, upadacitinib, AZD7762 (positive control), and broad-spectrum tyrosine kinase inhibitors sunitinib and erlotinib (B). Kd values were estimated from an 11-point concentration–response curve with fixed top parameters and a four-parameter logistic model ($n = 3$).

C Protein and mRNA expression of relevant numb-associated kinases in primary human liver organoids ($n = 3$) ($P < 0.05$). The immunofluorescence shows the juxtaposition of 1A9 (detecting spike protein from the SARS-CoV-2) in red and ACE2 in green along with the spheroid nuclei in blue as a DAPI stain ($n = 1$). Colocalization of spike and ACE2 is depicted with an arrow.

D, E Time course of days (one, three, and six days) post-infection (dpi) using liver spheroids and SARS-CoV-2 at 0.1 and 1.0 multiplicity of infection (MOI) ($n = 1$).

F Viability of spheroids was quantified by measuring intracellular ATP concentrations. Note that no significant (n.s.; Student's *t*-test) decrease in cell viability was observed for any concentration tested ($n = 10$).

G Schematic showing the timeline for the experiment shown in panel H.

H Viral load in infected (MOI 0.1) spheroids as measured by qPCR after treatment with 400 and 800 nM of baricitinib 48 h after infection (*$P < 0.05$; Student's *t*-test). Data are mean ± standard error of mean ($n = 3$).

Table 1. Clinical characteristics of patients in baricitinib COVID-19 case study.

	Patient A	Patient B	Patient C	Patient D
Age (years)	29	76	57	51
Gender	Female	Male	Male	Male
Coexisting conditions	None	AH, COPD, CAD	AH, COPD	Obesity
BMI	22	28	29	35
Medications	Combined oral contraception	Losartan, propranolol, omeprazole, aspirin, LMW heparin	Losartan, hydrochlorothiazide, inhaled beclomethasone	None
Smoking	No	Former	No	No
Data at presentation				
Symptoms	Fever, dry cough, and myalgias	Fever, dry cough	Fever, dry cough, dyspnea	Fever, dry cough, headache
Blood oxygen levels PaO2 (mmHg)	111	81	62	80
Alveolar oxygen gradient (KPa)	0	4.7	12.9	4.9
SpO2 (%)	98	97	94	91
RR/min	26	32	28	28
Baricitinib dose/days on treatment	4 mg for 10 days	2 mg for 10 days	4 mg for 12 days	4 mg for 10 days
Antibiotic therapy	None	Ceftriaxone, tazocin, fosfomycin	Ceftriaxone, azithromycin	None

Study note: According to the eligibility criteria, Patient A tested negative for pregnancy and all four patients tested negative for HIV-1/2, and tuberculosis using QuantiFERON-TB Gold Plus. AH, arterial hypertension; BMI, body mass index; CAD, coronary artery disease; COPD, chronic obstructive pulmonary disease; RR, respiratory rate.

moderate-to-severe disease. All four patients were admitted to the ward from the emergency department in March 2020. As shown in Table 1, Patient A was a female nurse, aged 29. Patient B, a 76-year-old male, had significant co-morbidities (a former smoker, arterial hypertension (AH), chronic obstructive pulmonary disease [COPD], coronary artery disease (CAD), and had undergone an aortic aneurysm Endurant II graft repair on February 25, 2020). Patient C, a 57-year-old male, had co-morbidities including AH and COPD (non-smoker); he suddenly deteriorated a few hours following hospitalization, and was placed on continuous positive airway pressure at the time baricitinib was initiated. Patient D, a 51-year-old male, had a high body mass index (BMI) of 35. All four patients had detectable plasma IL-6 levels (Fig 3A) with markedly raised inflammatory markers (C-reactive protein [CRP]), as would be expected in patients with COVID-19 pneumonia.

As shown in Fig 3A, all four patients showed improvement with baricitinib treatment in signs and symptoms such as cough, fever, and reduction in plasma IL-6 levels, along with a reduction in the SARS-CoV-2 RNA viral load, as detected by the real-time reverse transcriptase–polymerase chain reaction (RT–PCR) signal from the nasopharyngeal carriage. Stringent criteria were used for RNA detection of SARS-CoV-2 in nasopharyngeal carriage and peripheral blood. Real-time RT–PCR was performed on three distinct viral gene targets (Corman *et al*, 2020; Appendix Table S1), using the most sensitive target (N gene) and a cutoff using Ct values > 40 for the analyses illustrated in Fig 3A, in contrast to others, for example in the hydroxychloroquine study (Ct values ≥ 35; Gautret *et al*, 2020). Only two of the patients (Patients A and C) had detectable viral RNA in their peripheral blood (Fig 3A and Appendix Table S1).

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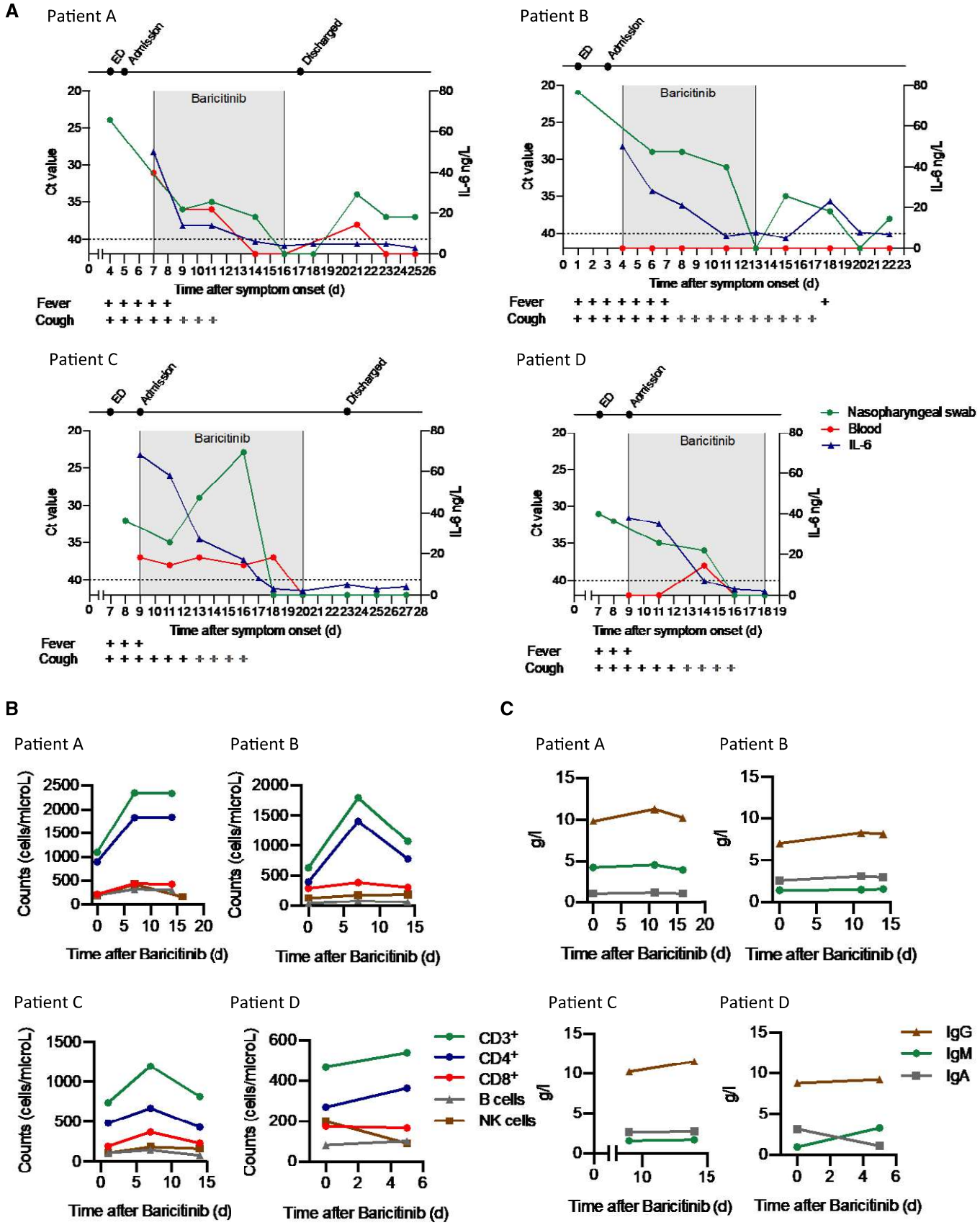


Figure 3.

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Figure 3. Viral detection and immunological features of four COVID-19 patients treated with baricitinib.

A Detection of SARS-CoV-2 in nasopharyngeal swabs and peripheral blood using the GeneFinder™ COVID-19 Plus RealAmp Kit assay (ELITechGroup S.p.A., Turin, Italy). Three viral target genes, RdRp, N, and E, together with the housekeeping gene GAPDH, were simultaneously amplified. Here, the most sensitive target gene, N, is shown. Samples with Ct values > 40 were defined as negative. A dashed horizontal line indicates the cutoff. IL-6 values are shown in the same graph. Time of baricitinib treatment is highlighted (Patients A, B, and D for 10 days, Patient C for 12 days) with total time of evaluation on the x-axis. Fever and cough symptoms are indicated. The bars in gray indicate that cough has improved but has not resolved.

B Levels of $CD3^+$, $CD4^+$, $CD8^+$, B cells ($CD19^+$), and NK cells ($CD3^-$, $CD16^+$, $CD56^+$) were determined using the AQUIOS CL Flow *Cytometry* System (Beckman Coulter).

C Total serum IgG, IgA, and IgM levels are shown for all patients.

Data information: Ct, cycle threshold; E, envelope membrane; ED, emergency department; N, nucleocapsid protein; NK, natural killer; RdRp, RNA-dependent RNA polymerase.

There were nominal changes in lymphocyte counts throughout the course of treatment with baricitinib in all four patients (Fig 3B). In addition, changes in IgG and IgM (Fig 3C) suggest adequate levels consistent with the confirmed sero-conversion for 3/4 of the patients after initiation of baricitinib (Fig 4). Most importantly, all four patients achieved sero-conversion as evidenced by the presence of neutralizing antibodies against the S1 and S2 spike proteins of SARS-CoV-2 after baricitinib exposure (Fig 4). Neutrophil and total white blood cell counts tracked with improvement in disease severity (Fig 5A). In addition, all four patients demonstrated improvement in their CRP, ferritin, and D-dimer levels (Fig 5A). Notably, Patient C, who had the lowest PaO_2 at baseline, showed radiographic improvement in lymphocytic infiltrates when comparing the computer tomography scan from day 1 to day 19 (Fig 5C). Overall, a total of 10 days of dosing for Patients A, B, and D and 12 days for Patient C, with baricitinib 4 mg once-daily orally in Patients A, C, and D, and 2 mg in Patient B (in accordance with the label guidelines for treatment of RA), was sufficient to document in all patients improved lung function, resolution of their illness, and reductions in viral load, plasma IL-6, ferritin, and CRP levels. Baricitinib treatment was associated with a rapid and consistent improvement in clinical, radiologic, virologic, inflammatory, and cytokine measures

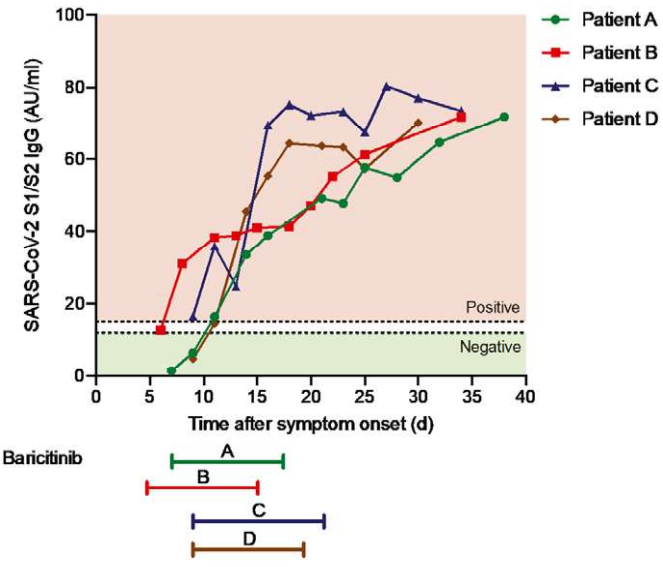


Figure 4. Sero-conversion of patients during baricitinib treatment.

Detection of IgG antibodies against the S1/S2 antigens of SARS-CoV-2. Time of baricitinib treatment is indicated for all patients (Patients A, B, and D for 10 days, Patient C for 12 days).

in this diverse group of patients, including 3 (Patients B, C, and D) who were deemed to be moderately-to-severely unwell and at high risk of deteriorating rapidly (i.e., those apart from the 29-year-old nurse). Transient increases in liver aminotransferases were observed in all four patients, with no changes in other liver enzymes or bilirubin (Fig 5B); however, these liver enzyme elevations improved within 72 h without interrupting baricitinib treatment, suggesting that these elevations may not be causally related to baricitinib treatment, but may be reflective of disease severity (Fig 5B). In general, these data demonstrate that treatment with baricitinib in these four patients with bilateral COVID-19 pneumonia was well-tolerated. Collectively, this limited case series provides preliminary evidence that baricitinib treatment may lower inflammatory burden and may result in a reduction in disease severity in COVID-19 patients.

Discussion

The pharmaceutical interventions for the treatment of COVID-19 patients proposed to date include testing anti-viral mechanisms, either in combination or alone, along with anti-malarials and immunomodulators (Siddiqi & Mehra, 2020). One such potential pharmacological approach is the use of immunomodulators in the subset of patients who develop a cytokine storm associated with pulmonary involvement including ARDS that leads to a rapid deterioration of the co-morbid conditions in such patients (Appendix Fig S1; Huang *et al*, 2020; Siddiqi & Mehra, 2020; Zhou *et al*, 2020). In this report, we demonstrate that baricitinib is an inhibitor of cytokines implicated in intensive care unit-bound COVID-19 patients, which have been collated from several reports, including IL-2, IL-6, IL-10, IFN-γ, and G-CSF (Huang *et al*, 2020; Ruan *et al*, 2020; Zhou *et al*, 2020). Elevated IL-6 and hyperferritinemia were predictors of death in COVID-19 patients in China (Ruan *et al*, 2020; Zhou *et al*, 2020). The relevance of IL-6 in COVID-19-associated ARDS was recently shown in an open-label study where blockade with tocilizumab, an IL-6R antibody, resulted in a rapid recovery of peripheral oxygen saturation and recovery from febrile signs and symptoms (Xu *et al*, 2020). Baricitinib has been previously shown to inhibit IL-6-induced MCP-1 production from human peripheral blood mononuclear cells (Fridman *et al*, 2010). In addition to a marked and rapid reduction in levels of human serum CRP in adult RA patients previously described (Tanaka *et al*, 2016), baricitinib treatment also reduced the mean change from baseline of plasma IL-6 in adult RA patients. The anti-inflammatory effects of baricitinib have also been demonstrated by the reduction in serum levels of IFN-γ, IP-10, GM-CSF, and MCP-1 in pediatric patients with steroid-dependent chronic inflammation,

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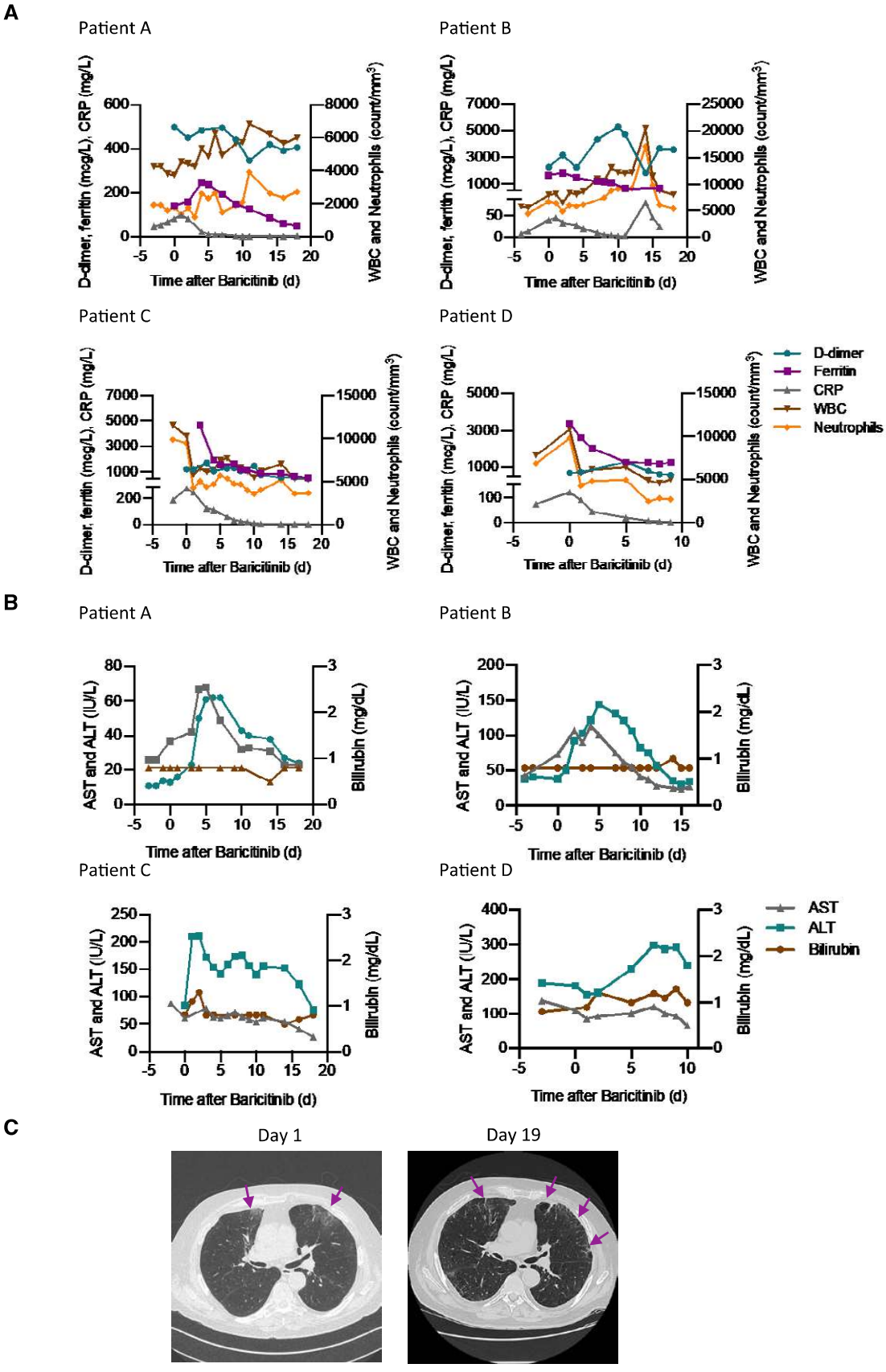


Figure 5.

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Figure 5. Standard laboratory and radiologic features of the four COVID-19 cases treated with baricitinib.

A Levels of D-dimer, CRP, ferritin, white blood cells, and neutrophils are shown for all patients.

B Levels of aspartate aminotransferase, alanine aminotransferase, and bilirubin are shown for all patients.

C Chest CT scan for Patient C on day 1 and day 19 from symptom onset showing clinical improvement over time. Day 1 CT scan shows ground-glass opacity (arrows) sub-pleurally in the lower lobes bilaterally (early stage one according to Pan *et al*, 2020). Day 19 CT scan shows that consolidation was gradually absorbed with evident residual fibrosis and emphysema bubbles (arrows) in the site of the early lesions (absorption stage 4 according to Pan *et al*, 2020).

Data information: ALT, alanine aminotransferase; AST, aspartate aminotransferase; CRP, C-reactive protein; CT, computed tomography; WBC, white blood cells.

resulting in control of disease activity and the ability to wean or taper steroids (Sanchez *et al*, 2018).

Another pharmacologic strategy could include targeting members of the NAK family (AAK1, GAK, BIKE, and STK16) that activate the AP-2 scaffolding protein vital to viral entry and propagation (Bekerman *et al*, 2017; Owczarek *et al*, 2018). Previous reports demonstrated inhibiting such kinases was effective in reducing cellular infectivity for viruses that rely on the activity of AP-2 such as HCV, dengue, HIV, SARS, and Ebola (Chaudhuri *et al*, 2007; Neveu *et al*, 2015; Bekerman *et al*, 2017; Owczarek *et al*, 2018). While baricitinib demonstrated potent inhibition of several NAKs that phosphorylate the AP-2 adaptor and reduced viral infectivity in primary human liver spheroids, it is still unknown whether this inhibition inhibits SARS-CoV-2 propagation in COVID-19-infected patients.

The aforementioned four COVID-19 patients offer support to the mechanism of action of baricitinib as an anti-cytokine and a potential anti-viral agent. Reductions in inflammatory markers of COVID-19 diseases, such as IL-6, CRP, and ferritin, are consistent with expected anti-inflammatory activity. While the consistent reduction in viral RNA observed in all four patients (measured from their nasopharyngeal carriage) is suggestive of reduction in viral load, this could be a consequence of the natural ability in these patients to clear the virus. At the time of manuscript submission, a few weeks have elapsed since cessation of baricitinib. Active clinical, biochemical, and virologic surveillance of each patient to monitor any sequelae, including the possible appearance of an immune reconstitution inflammatory syndrome or molecular evidence of *de novo* SARS-CoV-2 replication in the respiratory tract or peripheral blood, clearly shows that all four patients were devoid of viral load and signs and symptoms of COVID-19.

Given many unknowns concerning this novel SARS-CoV-2 virus, it is necessary to consider safety concerns alongside potential efficacy. As an effective immunomodulatory agent used for the treatment of RA, baricitinib was associated with an increased risk of infections such as upper respiratory tract infections and herpes zoster (Eli Lilly and Company, 2019). Baricitinib treatment in RA patients has been associated with increased incidence of deep vein thrombosis (DVT), and it is recommended that appropriate prophylactic measures be considered with use of baricitinib in hospitalized patients with higher risk of DVT (Eli Lilly and Company, 2019). This is especially relevant given recent findings of thrombotic complications in COVID-19 patients (Klok *et al*, 2020). As baricitinib is an inhibitor of IFN-responsive genes (Sanchez *et al*, 2018), its potential impact on the subsequent development of protective humoral and cell-mediated anti-viral immunity needs to be assessed in the context of COVID-19 infection. Of relevance, RA patients on long-term baricitinib treatment achieved satisfactory humoral responses to pneumococcal conjugate (PCV-13) vaccination suggesting that humoral responses remain partially intact (Winthrop *et al*, 2019). Changes seen in lymphocyte subsets in this limited clinical case series suggest that baricitinib treatment does not reduce T-cell subsets ($CD3^+$ and $CD4^+$) or NK cells. It is too early to ascribe observed reductions in SARS-CoV-2 RNA loads in the nasopharyngeal carriage to a putative anti-viral activity of baricitinib, since the underlying T-cell subset levels were maintained in these treated patients. This is consistent with previous reports wherein various T-cell and B-cell subsets remained within normal reference ranges after initiation of baricitinib treatment in RA patients (Tanaka *et al*, 2018). It is, however, reassuring to underscore that after treatment with an immunomodulatory agent such as baricitinib, we could measure IgG anti-S1- and anti-S2-neutralizing antibodies. Most importantly, three out of four patients, while under baricitinib exposure, achieved sero-conversion, as evidenced by the appearance of IgG antibodies with neutralizing activity against SARS-CoV-2. Moreover, in all four patients, a progressive rise in the titer of these neutralizing antibodies was observed during follow-up. However, the frequency and time course of this occurrence would require prospective validation in randomized controlled trials (Ottoviani & Stebbing, 2020). Translational research from these studies will also help delineate the relative contributions of the humoral, cellular, and innate immune responses to SARS-CoV-2.

Baricitinib has a well-established safety profile in patients with RA over long-term treatment; in 10,127 patients-year of exposure and up to 6.9 years of duration, the incidence rate of serious infection was 2.8/100 patient-years and stable over time (Genovese *et al*, 2019). Furthermore, in 89 individuals treated with baricitinib in four separate single-center studies across northern Italy, no over-arching adverse safety signals have been observed with transient use (< 14 days) of baricitinib in COVID-19 patients (Francesco Menichetti, Fabio Lena, Fabrizio Cantini, and Pinuccia Omodeo, *personal communications*). Vigilance for detecting serious adverse events and appropriate management of potential complications is essential given the inhibition on IFN-responsive genes by baricitinib (Sanchez *et al*, 2018). Therefore, the impact of baricitinib on the subsequent development of protective humoral and cell-mediated anti-viral immunity in COVID-19 patients must be evaluated in randomized clinical trials (Ottoviani & Stebbing, 2020). Importantly, baricitinib is administered orally once a day and has a low cytochrome P_{450} inhibitory activity with a low drug–drug interaction risk; its short half-life (approximately 12 h in RA patients) and renal elimination as the main clearance mechanism make it fast to wash-out if necessary (Eli Lilly and Company, 2019).

Collectively, these data provide preliminary evidence that baricitinib could be tested as an effective intervention strategy to stem the cytokine storm and viral propagation seen in hospitalized COVID-19 patients. The finding that baricitinib is a potent AAK1/BIKE/GAK inhibitor that may reduce host cell infectivity, along with reaffirmation of its anti-cytokine profile, provides reasons to study this intervention in randomized clinical trials. We cannot over-interpret the

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findings from the case series described in this manuscript. Therefore, results from such randomized trials, notably the adaptive National Institute of Allergy and Infectious disease (ADAPTIVE COVID-19 ACCT2), will be central to define efficacy and safety of baricitinib and to manage effective clinical care as this outbreak continues to expand across the globe.

Materials and Methods

Leukocyte preparation and experimental design

Leukocyte preparation and experimental design were largely performed as previously described (McInnes *et al*, 2019). Whole blood samples from healthy donors ($N = 6$) were apheresed, and leukocyte-enriched fractions were transferred to the company Primity Bio (Fremont, CA, USA). Immediately following apheresis, approximately 600,000 cells were plated in 100 µl into 96-well plates and incubated with baricitinib using an 8-point dose range from 0.1 nM to 10,000 nM for 1 h prior to stimulation with cytokines for 15 min at 37°C. Baricitinib (Eli Lilly and Company) was prepared as 10 mM stocks in dimethyl sulfoxide. Cytokines were used at the following concentrations: IL-2 (4 ng/ml), IL-3 (12 ng/ml), IL-4 (350 pg/ml), IL-6 (1.5 ng/ml), IL-10 (12 ng/ml), IL-15 (850 pg/ml), IL-21 (200 pg/ml), IFN-γ (100 pg/ml), G-CSF (5 ng/ml), and GM-CSF (5 pg/ml). The choice of cytokine concentrations and incubation conditions was optimized in order to ensure consistent signaling in alternate cell types and pSTAT readouts. After stimulation, cells were fixed, permeabilized, and fluorescence-barcoded, and multicolor flow cytometry was performed as previously described to quantify STAT phosphorylation in gated leukocyte subpopulations (McInnes *et al*, 2019). For a given case (stimulation, cell type, and pSTAT combination), the IC_{50} was determined if there was a consistent response to the stimulus as described in the statistical analysis section. The primary pSTAT observed for each stimulus is reported. Leukocyte populations were defined as $CD20^+$ (B cells), $CD3^+CD4^+$ ($CD4^+$ T cells), $CD3^+CD4^-$ ($CD8^+$ T cells), and $CD3^-CD56^+$ (natural killer cells), and by forward and side scatter (monocytes). Whole blood samples from healthy volunteers were obtained under a protocol approved by the Institutional Review Board of Stanford University (reference numbers eProtocol #13942 and IRB Registration #5136). The IRB provided a Waiver of Consent because leukocyte-enriched fractions are by-products of the blood donation.

IL-6 changes in baricitinib-treated RA patients

Patient samples were obtained from the double-blind, randomized, placebo-controlled, phase 2b study NCT01469013. Patients had moderate-to-severe active adult-onset RA, despite stable methotrexate treatment. Patients ($N = 145$) were randomized (2:1:1:1:1) to placebo or once-daily oral 1, 2, 4, or 8 mg baricitinib for 12 weeks (Tanaka *et al*, 2016). Plasma IL-6 levels were analyzed using an enzyme immunoassay. Treatment effects were estimated using a mixed-effects repeated-measures model (SAS Proc Mixed) using log10-transformed IL-6 levels with an unstructured covariance matrix. NCT01469013 was conducted in accordance with ethical principles of the Declaration of Helsinki and Good Clinical Practice guidelines. All investigation sites received approval from the appropriate authorized institutional review board or ethics committee. All patients provided written informed consent before the study-related procedures were undertaken.

Human NAK assays and viral infection

AAK1-, BIKE-, GAK-, and STK16-binding assays were performed with DNA-tagged recombinant human proteins derived from HEK-293 cells or *Escherichia coli*. AAK1 kinase-tagged T7 phage strains were prepared in an *E. coli* host derived from the BL21 strain. *E. coli* were grown to log phase and infected with T7 phage and incubated with shaking at 32°C until lysis. The lysates were centrifuged and filtered to remove cell debris. The remaining kinases (BIKE, GAK, and STK16) were produced in HEK-293 cells and subsequently tagged with DNA for qPCR detection. Streptavidin-coated magnetic beads were treated with biotinylated small molecule ligands for 30 min at room temperature to generate affinity resins for kinase assays. The liganded beads were blocked with excess biotin and washed with blocking buffer (SeaBlock; Thermo Scientific Pierce, 1% BSA, 0.05% Tween 20, 1 mM DTT) to remove unbound ligand and to reduce non-specific binding. Binding reactions were assembled by combining kinases, liganded affinity beads, and test compounds in 1× binding buffer (20% SeaBlock, 0.17× PBS, 0.05% Tween 20, 6 mM DTT). Test compounds were prepared as 111× stocks in 100% DMSO. Equilibrium affinity constants (Kds) were determined using an 11-point threefold compound dilution series with three DMSO control points.

All compounds for Kd measurements were distributed by acoustic transfer (non-contact dispensing) in 100% DMSO. The compounds were then diluted directly into the assays such that the final concentration of DMSO was 0.9%. All reactions were performed in polypropylene 384-well plates with a final volume of 0.02 ml. The assay plates were incubated at room temperature with shaking for 1 h, and the affinity beads were washed with wash buffer (1× PBS, 0.05% Tween 20). The beads were then re-suspended in elution buffer (1× PBS, 0.05% Tween 20, 0.5 µM non-biotinylated affinity ligand) and incubated at room temperature with shaking for 30 min. The kinase concentration in the eluates was measured by qPCR.

SARS-CoV-2 infection of human liver spheroids

Protein levels of AAK1 and GAK were pulled out from tandem mass tag (tmt)-based proteomic datasets (Oliva-Vilarnau *et al*, In press) generated from total protein of 192 spheroids at the Clinical Proteomics Mass Spectrometry facility (Science for Life Laboratory, Stockholm, Sweden). Both proteins had a protein spectrum match (PSM) level of > 1 in all analyzed samples. The corresponding RNA expression values were obtained by bulk RNA sequencing (poly-A) of a minimum of 100 ng total RNA at the National Genomics Infrastructure (NGI) facility (Science for Life Laboratory, Stockholm, Sweden).

SARS-CoV-2 (GenBank accession number MT093571) was isolated from a nasopharyngeal sample of a patient in Sweden on Vero E6 cells. Cryopreserved PHH (BioIVT, USA) was thawed and seeded into 96-well ultra-low attachment plates (Corning) with 1,500 cells per well as previously described (Bell *et al*, 2016). Spheroids were pre-exposed to baricitinib for 24 h starting five days after cell seeding. At day 6 of culture, cells were exposed to SARS-CoV-2 at a multiplicity of infection of 0.1 in triplicate for 48 h. After 48 h, spheroids were

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washed with PBS, pooled (32 wells/condition), and lysed using TRIzolTM (Thermo Fisher). RNA was extracted using Direct-zol Mini Kit (Zymo Research), and relative level of viral RNA was determined by qRT–PCR as previously described (Monteil *et al*, 2020).

Immunofluorescence microscopy

Primary human hepatocyte spheroid cryo-sections were washed twice with PBS for 10 min at room temperature. Afterward, samples were blocked with PBTA buffer (5% BSA, 0.25% Triton X-100, 0.01% NaN_3 in PBS) for 2 h at room temperature prior to an overnight incubation at 4°C with the monoclonal primary antibody anti-1A9 (diluted in PBTA to a final concentration 5 μg/ml). Samples were washed 3 × 15 min with PBS at room temperature before incubation with the secondary antibody (donkey anti-mouse diluted in PBTA 1:500) for 2 h at room temperature. Subsequently, samples were washed 3 × 15 min with PBS at room temperature and mounted with DAPI Gold Antifade.

Clinical case series

Study design and participants

On the basis of the two reports of AI-derived discovery of baricitinib in COVID-19 (Richardson *et al*, 2020a; Stebbing *et al*, 2020), the Sacco Baricitinib Study Group and Imperial College developed a protocol to assess baricitinib in a small case series of patients, acknowledging potential risks of pulmonary infections (Favalli *et al*, 2020; Richardson *et al*, 2020b) based on its mechanism of action while leveraging the hypothesis for a potential therapeutic benefit in COVID-19. Herein, we describe the cases from the independent research conducted. Ethics and local Institutional Review Board approval was authorized on March 16, 2020 (number 14581/2020), which provided permission to treat three patients with bilateral COVID-19 pneumonia with baricitinib. Three patients (Patients A, B, and C) were immediately recruited that day, having been admitted to the wards from the emergency department. A supplementary approval was sought on March 25, 2020, and obtained to treat a fourth patient (Patient D) for validation purposes.

Inclusion criteria for compassionate use of an investigational oral medicine (albeit one that was approved in another indication) for patients with signs of severe illness at diagnosis or secondary clinical aggravation (respiratory symptoms or general signs) were based on World Health Organization (WHO) criteria for severe pneumonia caused by SARS-CoV-2 (WHO, 2020a).

Written informed consent was obtained from each patient, and 4 mg oral baricitinib was administered once-daily according to the label for treatment of RA with a 2 mg lower dose as per the label, for 10–12 days.

Criteria for patient discharge with recovery were from the European Centre for Disease Prevention and Control guidelines (ECDC, 2020). The open-access Clinical Characterization Protocol for Severe Emerging Infections of the International Severe Acute Respiratory and Emerging Infection Consortium (supported by WHO) has been updated and used in response to COVID-19 (Dunning *et al*, 2014).

Procedures

Clinical samples for SARS-CoV-2 diagnostic testing were obtained according to WHO guidelines (WHO, 2020b). For each patient, a sampling strategy was implemented in which nasopharyngeal and blood samples were obtained regularly from hospital admission, and subsequently once every two or three days until patient discharge. At the time of manuscript submission, these four patients continue to be monitored for COVID-19 disease. Upper respiratory samples were nasopharyngeal swabs, and blood samples were EDTA tubes adapted for RT–PCR. All samples were analyzed in the same center as the patients where procedures for RNA extraction, real-time RT–PCR (rRT–PCR), were undertaken.

Throat swabs and plasma for each patient were processed using the automated ELITe InGenius® system and the GeneFinderTM COVID-19 Plus RealAmp Kit assay (ELITechGroup, France). The reaction mix was manually prepared (according to the manufacturer's instruction) and loaded onto the system with other reagents, while RNA was extracted from 200 μl of sample and eluted in 100 μl; the final reaction volume consisted of 5 μl of RNA plus 15 μl of reagent mix. The RT–PCR setup according to the manufacturer's instructions was 50°C for 20 min, 95°C for five minutes plus 45 cycles at 95°C for 15 s, and 58°C for 60 s. Three target genes, RNA-dependent RNA polymerase (RdRP), nucleocapsid protein (N), and envelope membrane protein (E) were simultaneously amplified and tested. A cycle threshold value (Ct value) < 40 was defined as a positive test result, and a Ct value greater than 40 was defined as a negative outcome according to our criteria. The quality of nasopharyngeal swabs was checked using the CELL Control r-gene Kit (bioMérieux).

IL-6 levels were determined on the fully automated immunochemistry platform COBAS e601 (Roche Diagnostics) by the proprietary electrochemiluminescent immunoassay (ref. 05109442190, lot 43676101) using 30 μl of serum. SARS-CoV-2 serum IgG and serum IgM were qualitatively assessed using the immunochromatographic COVID-19 IgG/IgM Rapid Test, following instructions (PRIMA Lab SA, Balerna, Switzerland). Briefly, 10 μl of EDTA-anticoagulated plasma was loaded into the well of each cassette. 80 μl of buffer was subsequently added to the well. The presence of SARS-CoV-2 IgG and IgM was visually determined after an incubation of 10 min.

Immunoglobulin levels (IgG, IgA, IgM) were measured on the automated platform AU 480 (Beckman Coulter) by their respective proprietary immunoturbidimetric assays; complete blood cell count was performed on XN-9000 Automated Hematology System (Sysmex); coagulation tests including D-dimer levels were carried out on the fully automated hemostasis testing analyzer ACL 750 TOP (Werfen) using proprietary reagents; alanine aminotransferase and aspartate aminotransferase activity, CRP, and serum ferritin concentrations were determined on the fully automated platform for Clinical Chemistry and Immunoassay Alinity ci (Abbott Diagnostics) with the proprietary reagents. For measuring AST and ALT, the assays with the addition of pyridoxal-5-phosphate (P-5′-P) traceable to the reference measurement system, for CRP the high-sensitive immunoturbidimetric assay, and for ferritin levels the chemiluminescent microparticle immunoassay, were respectively used.

On the wards, standard laboratory and clinical management according to two treating physicians' discretions (MC and GC) were used. The chest CT shown was performed using a single inspiratory phase in one commercial multidetector CT scanner (General Electric Healthcare Revolution64) with a breath-holding protocol (tube

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Primer and probe sequences used for SARS-CoV-2 rRT–PCR

Assay	Oligonucleotide	Sequence
N	Forward primer (HKU-NF)	TAATCAGACAAGGAACTGATTA
N	Reverse primer (HKU-NR)	CGAAGGTGTGACTTCCATG
N	Probe (HKU-NP)	FAM-GCAAATTGTGCAATTTGCGG-TAMRA
E	Primer E_Sarbeco_F1	ACAGGTACGTTAATAGTTAATAGC GT
E	Primer E_Sarbeco_R2	ATATTGCAGCAGTACGCACACA
E	Probe E_Sarbeco_P1	FAM-ACACTAGCCATCCTTACTGC GCTTCG-BBQ
RdRP	Primer RdRP_SARSr-F2	GTGARATGGTCATGTGTGGCGG
RdRP	Primer RdRP_SARSr-R1	CARATGTTAAASACACTATTAGCATA
RdRP	Probe RdRP_SARSr-P1	FAM-CCAGGTGGWACRTCATCMG GTGATGC-BBQ
RdRP	Probe RdRP_SARSr-P2	FAM-CAGGTGGAACCTCATCAGGA GATGC-BBQ

Primer and probe sequences for gene N are from the Hong Kong protocol (HKUMed, 2020). Primer and probe sequences for genes E and RdRp are from the Berlin protocol (Drosten *et al*, 2020). E, envelope membrane; N, nucleocapsid protein; RdRp, RNA-dependent RNA polymerase; rRT–PCR, real-time reverse transcriptase–polymerase chain reaction.

voltage 120 kVp, thickness 1.4 mm, increment of 1.4 mm, mean CTDIvol 19 mGy).

Sero-conversion assay

IgG antibodies against the S1/S2 antigens of SARS-CoV-2 using the LIAISON SARS-CoV-2 S1/S2 IgG Kit (DiaSorin S.p.A., Saluggia, Italy) were detected. The IgG antibody concentrations are expressed as arbitrary units (AU/ml) with values < 12 being interpreted as negative; between 12 and 15 as equivocal; and > 15 as positive. Dashed horizontal lines indicate the cutoff values.

Statistical analysis

NAK-binding assays

The concentration–response curve (CRC) fitting for NAK-binding assay as previously described was normalized by dividing by the mean of three replicates of the 0 nM treatment condition. Four-parameter logistic (4PL) curves were fit with the normalized assay signal as the response and $\log_{10}$ compound concentration as the independent variable using the R drc package (R version 3.6.0 and drc version 3.0). The curve top parameter was fixed to a value of one, while all other parameters were estimated in the curve fitting. Kd values were determined using the absolute half-maximum efficacy concentration (EC_{50}) values estimated from the logistic model.

IC_{50} values for cytokine signaling

IC_{50} values were determined by analyzing the mean fluorescence intensity (MFI) of cytokine-stimulated samples in the presence of the designated concentration of compound. For a given case (stimulation, cell type, and pSTAT combination), the MFI for unstimulated and stimulated cells was determined for each donor. To ensure that a biologically relevant signal was induced, CRCs were only analyzed when a consistent response to stimulus was observed as described below. Data for baricitinib were analyzed with a mixed-effects model having compound as a fixed effect and donor as a random effect.

Selection of cases for analysis, fitting, and selection of CRC curves for anti-cytokine activity of baricitinib

Two sets of criteria for reporting an IC_{50} value and computing a steady-state activity (SSACTIVITY) curve were used: one at the case level and another at the individual curve level. At the case level, the median across the six donors of the minimum stimulated to unstimulated ratio over two replicates is computed, and it is required that the median minimum ratio be above 1.5. Out of a total of 85 cases, 43 were selected according to these criteria. Once a case met this criterion, 4PL curves were fit to the curve response concentration data. If an individual curve had top outside of the 80–120% activity range or bottom outside of the (−20, 20%) range, the 4PL was refitted with these constraints. After a CRC was fit, the following quality criteria were evaluated: (i) R2 above 0.8; (ii) SE of $\ln(I\ IC_{50})$ below 10; and (iii) estimated IC_{50} is within a fivefold difference in the minimum and maximum experimented concentrations. A curve failing any of these criteria was discarded.

Estimation of daily percent inhibition

The individual 4PL CRCs were combined with population pharmacokinetic (PK) curves to calculate the average steady-state daily percent inhibition. The PK profiles of baricitinib were estimated from a two-compartment model with zero-order absorption that was developed using data from healthy volunteers from three phase 1 clinical trials with once-daily 2–20 mg or twice-daily 5 mg. Protein-binding effects were accounted for by replacing the *in vitro* IC_{50} with an adjusted IC_{50} value computed by dividing the IC_{50} value for each donor by the proportion of compound unbound. Protein-bound adjusted CRCs were constructed by replacing the *in vitro* IC_{50} value with the adjusted value. The average daily percent inhibition for a subject was obtained by entering the steady-state PK concentrations into the adjusted CRCs, computing the area under this curve, and dividing it by 24 h. Using the individual donor values for average daily percent inhibition, a mixed-effects model having compound as a fixed effect and donor as a random effect was fit. The reported estimates for population average SSACTIVITY are taken as the least-squares means from this model. No transformations were undertaken to keep the estimates of SSACTIVITY within the 0–100% range.

Data availability

Eli Lilly and Company data are available upon request at vivli.org. Access to data is provided after a proposal has been approved by an independent review committee identified for this purpose and after receipt of a signed data-sharing agreement. Access to data and documents will be provided in a secure data-sharing environment. For details on submitting a request, see the instructions provided at www.vivli.org. In your request, include the following accession/reference numbers (GenBank accession number MT093571) so that

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The paper explained

Problem
There are few drugs that are useful to treat COVID-19, the largest medical crisis of this century. To try to solve this problem, using AI, we found that an oral, once-daily medicine, baricitinib, normally used to treat adult rheumatoid arthritis (RA), may be useful in both reducing viral propagation in cells, and to mitigate the cytokine signaling seen in the hyper-inflammatory stage of the disease. We wished to understand this further in various models and in a case series of patients.

Results
We found that baricitinib inhibited the signaling of cytokines we typically see as being present in hospitalized patients with COVID-19. Using samples from a previous randomized trial in RA, we showed statistically significant declines in IL-6 levels with baricitinib treatment. In liver spheroids designed to investigate SARS-CoV-2 infectivity and separately in kinase assays, we showed that baricitinib could reduce cellular infection by blockade of numb-associated kinase members used in viral propagation. In a small case series of patients in northern Italy with bilateral COVID-19 pneumonia, baricitinib therapy was associated with improvement in clinical, radiologic, and viral parameters along with a rapid decline in CRP and plasma IL-6 levels.

Impact
Finding new drugs in our armamentarium to treat COVID-19 would be enormously valuable. Here, we stitched together the anti-cytokine and anti-viral activity of baricitinib and studied it in a small number of hospitalized patients. This study represents rapid repurposing from AI to the laboratory to a potential bedside therapeutic and supports the testing of baricitinib in randomized controlled trials in COVID-19 patients.

we can identify the related publication and specific dataset that you are trying to access.

Expanded View for this article is available online.

Acknowledgements
Eli Lilly and Company supported the non-clinical studies (anti-cytokine activity of baricitinib and NAK-binding assays) and IL-6 assay from NCT01469013. The Sacco Baricitinib Study Group supported the clinical case series. The authors would like to thank the patients who participated in the study. We also thank the contributions of the members of the Sacco Baricitinib Study Group, who are listed in the Appendix. JS wishes to dedicate the paper to his uncle Mark who died from COVID-19 pneumonia on April 1, 2020. VM acknowledges ERC HEPASPHER project [grant agreement number 742020]. JS and SO are supported by the Imperial ECMC and BRC, the NIHR, BSAC and AAC. The non-clinical studies (anti-cytokine activity of baricitinib and NAK-binding assays) and IL-6 assay from NCT01469013 were designed and analyzed by representatives of Eli Lilly and Company. The clinical case series was not funded or approved by Eli Lilly and Company, and discussions between Eli Lilly and Company and the Sacco Baricitinib Study Group did not occur until patients had been dosed and preliminary results obtained. Similarly, Eli Lilly and Company performed the non-clinical *in vitro* analyses (anti-cytokine activity of baricitinib and NAK-binding assays) and IL-6 assay from NCT01469013 independently. The Sacco Baricitinib Study Group funded the clinical case series, and representatives (including those from Imperial College, London) had a role in study design, data collection, and data analysis. All authors participated in data analysis and interpretation, draft, and final manuscript review, and provided critical comment, including the decision to submit the manuscript for publication with medical writing support from Eli Lilly and Company; all authors reviewed and approved the final submitted version. Venkatesh Krishnan had full access to all data and had final responsibility for the decision to submit for publication.

Author contributions
VK wrote the first draft of the manuscript. VK, VML, and REH designed the laboratory experiments, and analyzed and interpreted the data. JS, SO, GC, PJR, and MC wrote the clinical case series protocol, obtained ethical approval, collated case studies, and interpreted the data. JS, VK, SdB, SO, GC, VM, VML, AM, PJR, JART, BJN, REH, GR, NLB, DES, AC, AN, SY, Y-JT, AS, FB, and MC participated in the analyses and interpretation of data, wrote or critically reviewed the manuscript, and reviewed and approved the final version.

Conflict of interest
JS is editor-in-chief of Oncogene. JS has sat on a number of scientific advisory boards, including BenevolentAI, and consults with Lansdowne partners and Vitruvian, and since these findings in patients, consults with Eli Lilly and Company; he sits on the Board of Directors for BB Biotech Healthcare Trust. VML is the founder, CEO, and shareholder of HepaPredict AB. In addition, VML discloses consultancy work for EnginZyme AB. VM, AM, SO, MC, and GC report no conflicts of interest. PJR is an employee of BenevolentAI. VK, SdB, JART, BJN, REH, GR, NLB, DES, AN, and AC are employees and shareholders of Eli Lilly and Company.

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ANNEXURE - 8

ORIGINAL ARTICLE

Baricitinib plus Remdesivir for Hospitalized Adults with Covid-19

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ABSTRACT

BACKGROUND

Severe coronavirus disease 2019 (Covid-19) is associated with dysregulated inflammation. The effects of combination treatment with baricitinib, a Janus kinase inhibitor, plus remdesivir are not known.

METHODS

We conducted a double-blind, randomized, placebo-controlled trial evaluating baricitinib plus remdesivir in hospitalized adults with Covid-19. All the patients received remdesivir (≤10 days) and either baricitinib (≤14 days) or placebo (control). The primary outcome was the time to recovery. The key secondary outcome was clinical status at day 15.

RESULTS

A total of 1033 patients underwent randomization (with 515 assigned to combination treatment and 518 to control). Patients receiving baricitinib had a median time to recovery of 7 days (95% confidence interval [CI], 6 to 8), as compared with 8 days (95% CI, 7 to 9) with control (rate ratio for recovery, 1.16; 95% CI, 1.01 to 1.32; P=0.03), and a 30% higher odds of improvement in clinical status at day 15 (odds ratio, 1.3; 95% CI, 1.0 to 1.6). Patients receiving high-flow oxygen or noninvasive ventilation at enrollment had a time to recovery of 10 days with combination treatment and 18 days with control (rate ratio for recovery, 1.51; 95% CI, 1.10 to 2.08). The 28-day mortality was 5.1% in the combination group and 7.8% in the control group (hazard ratio for death, 0.65; 95% CI, 0.39 to 1.09). Serious adverse events were less frequent in the combination group than in the control group (16.0% vs. 21.0%; difference, –5.0 percentage points; 95% CI, –9.8 to –0.3; P=0.03), as were new infections (5.9% vs. 11.2%; difference, –5.3 percentage points; 95% CI, –8.7 to –1.9; P=0.003).

CONCLUSIONS

Baricitinib plus remdesivir was superior to remdesivir alone in reducing recovery time and accelerating improvement in clinical status among patients with Covid-19, notably among those receiving high-flow oxygen or noninvasive ventilation. The combination was associated with fewer serious adverse events. (Funded by the National Institute of Allergy and Infectious Diseases; ClinicalTrials.gov number, NCT04401579.)

The authors' full names, academic degrees, and affiliations are listed in the Appendix. Address reprint requests to Dr. Kalil at the University of Nebraska Medical Center, 985400 Nebraska Medicine, Omaha, NE 68198-5400, or at akalil@unmc.edu.

A complete list of members of the ACTT-2 Study Group is provided in the Supplementary Appendix, available at NEJM.org.

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In May 2020, the first stage of the Adaptive Covid-19 Treatment Trial (ACTT-1), a randomized, double-blind, placebo-controlled trial, showed that remdesivir is an effective treatment for hospitalized adult patients with coronavirus disease 2019 (Covid-19) pneumonia.[1] Despite the benefits of remdesivir, substantial morbidity and mortality due to Covid-19 remain. Emerging data suggest that disease severity may be due in part to a dysregulated inflammatory response.[2] It is postulated that mitigating the immune response and preventing a hyperinflammatory state may further improve clinical outcomes. Baricitinib, an orally administered, selective inhibitor of Janus kinase (JAK) 1 and 2, was predicted with the use of artificial intelligence algorithms to be a potential therapeutic against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[3,4] Baricitinib inhibits the intracellular signaling pathway of cytokines known to be elevated in severe Covid-19, including interleukin-2, interleukin-6, interleukin-10, interferon-γ, and granulocyte–macrophage colony-stimulating factor; acts against SARS-CoV-2 through the impairment of AP2-associated protein kinase 1 and the prevention of SARS-CoV-2 cellular entry and infectivity; and improves lymphocyte counts in patients with Covid-19.[3,5-8] In three case series of patients with Covid-19, baricitinib treatment was associated with both an improvement in oxygenation and a reduction in select inflammatory markers.[9-11] Randomized, controlled trials are needed to further understand the role of immunomodulation in patients with Covid-19.[12] After the successful completion of ACTT-1, we designed the next iteration of ACTT (ACTT-2) to evaluate whether the combination of baricitinib plus remdesivir was superior to remdesivir alone.

METHODS

DESIGN

The ACTT-2 protocol was designed and written by a working group of the ACTT investigators and the sponsor (the National Institute of Allergy and Infectious Diseases), with input from the manufacturer of baricitinib, Eli Lilly. Investigators and staff at participating sites gathered the data, which were then analyzed by statisticians at the statistical and data center (Emmes) and the sponsor. The authors wrote the manuscript, and, on behalf of the ACTT-2 Study Group, vouch for the accuracy and completeness of the data and for the fidelity of the trial to the protocol.

Enrollment into this double-blind, placebo-controlled trial began on May 8, 2020, and ended on July 1, 2020. There were 67 trial sites in 8 countries: the United States (55 sites), Singapore (4), South Korea (2), Mexico (2), Japan (1), Spain (1), the United Kingdom (1), and Denmark (1). Eligible patients were randomly assigned in a 1:1 ratio to receive either remdesivir and baricitinib or remdesivir and placebo. Randomization was stratified according to trial site and disease severity at enrollment (see the Supplementary Appendix, available with the full text of this article at NEJM.org). Patients received remdesivir intravenously as a 200-mg loading dose on day 1, followed by a 100-mg maintenance dose administered daily on days 2 through 10 or until hospital discharge or death. Baricitinib was administered as a 4-mg daily dose (either orally [two 2-mg tablets] or through a nasogastric tube) for 14 days or until hospital discharge. Patients with an estimated glomerular filtration rate of less than 60 ml per minute received baricitinib at a dose of 2 mg once daily. A matching oral placebo was administered according to the same schedule as the active drug. All the patients received standard supportive care at the trial site hospital. Venous thromboembolism prophylaxis was recommended for all the patients without a major contraindication. If a hospital had a written policy for Covid-19 treatments, patients could receive those treatments. In the absence of a written policy, other experimental treatment and off-label use of marketed medications intended as specific treatment for Covid-19 were prohibited. This included glucocorticoids, which were permitted only for standard indications such as adrenal insufficiency, asthma exacerbation, laryngeal edema, septic shock, and acute respiratory distress syndrome.

The trial protocol was approved by the institutional review board at each site (or a centralized institutional review board as applicable) and was overseen by an independent data and safety monitoring board. Written informed consent was obtained from each patient or from the patient's legally authorized representative if the patient was unable to provide consent. Full details of the trial design, conduct, oversight, and analyses are provided in the protocol and statistical analysis plan (available at NEJM.org).

PROCEDURES

All patients were evaluated daily during their hospitalization, from day 1 through day 29. (See the full description of procedures in the Supplementary Appendix.) The trial team was unaware of the trial-group assignments until after all data queries were resolved and the database was locked. The first draft of the manuscript was written by the first author, and then all the authors contributed to the subsequent versions. No one who is not an author contributed to the writing of the manuscript.

OUTCOMES AND STATISTICAL ANALYSIS

The primary outcome measure was the time to recovery, with the day of recovery defined as the first day, during the 28 days after enrollment, on which a patient attained category 1, 2, or 3 on the eight-category ordinal scale. The competing event of death was handled in a manner similar to the Fine–Gray competing-risk approach.[13] The categories are the same as those used in ACTT-1[1] and are listed in Table S1 in the Supplementary Appendix. The primary analysis was a stratified log-rank test of the time to recovery with remdesivir plus baricitinib as compared with remdesivir plus placebo, stratified according to baseline disease severity (i.e., score on the ordinal scale of 4 or 5 vs. 6 or 7 at enrollment).

The key secondary outcome measure was clinical status at day 15, based on the eight-category ordinal scale. Other secondary outcome measures included the time to improvement by one or two categories from the ordinal score at baseline; clinical status, as assessed on the ordinal scale at days 3, 5, 8, 11, 15, 22, and 29; mean change in the ordinal score from day 1 to days 3, 5, 8, 11, 15, 22, and 29; time to discharge or to a National Early Warning Score of 2 or less (on a scale from 0 to 20, with higher scores indicating greater clinical risk) that was maintained for 24 hours, whichever occurred first; change in the National Early Warning Score from day 1 to days 3, 5, 8, 11, 15, 22, and 29; number of days of receipt of supplemental oxygen, noninvasive ventilation or high-flow oxygen, and invasive ventilation or extracorporeal membrane oxygenation (ECMO) up to day 29 (if these were being used at baseline); the incidence and duration of new use of oxygen, new use of noninvasive ventilation or high-flow oxygen, and new use of invasive ventilation or ECMO; duration of hospitalization up to day 29 (patients who remained hospitalized at day 29 had a value of 28 days); and mortality at 14 and 28 days after enrollment. Secondary safety outcomes included grade 3 and 4 adverse events and serious adverse events that occurred through day 29, discontinuation or temporary suspension of trial-product administration for any reason, and changes in assessed laboratory values over time. There was a single primary hypothesis test. For secondary outcomes, no adjustments for multiplicity were made.

Prespecified subgroups were defined according to sex, disease severity (as defined for stratification and by an ordinal score of 4, 5, 6, and 7 at enrollment), age (18 to 39 years, 40 to 64 years, or ≥65 years), race, ethnic group, duration of symptoms before randomization (measured as ≤10 days or >10 days, in quartiles, and as the median), site location, and presence of coexisting conditions.

RESULTS

PATIENTS

Of 1067 patients assessed for eligibility, 1033 underwent randomization; 515 were assigned to the combination group, and 518 to the control group (Fig. 1). The intention-to-treat population included 706 patients with moderate disease (ordinal score of 4 or 5 [not receiving ventilation]) and 327 with severe disease (ordinal score of 6 or 7 [receiving noninvasive or invasive ventilation]). Of those assigned to the combination group, 507 (98.4%) received treatment as assigned. Of those assigned to the control group, 509 (98.3%) received treatment as assigned. A total of 498 patients in the combination group and 495 in the control group completed the trial through day 29, recovered, or died. The mean age of the patients was 55.4 years, and 63.1% were male (Table 1). Overall, 48.0% of the patients were White, 15.1% were Black, 9.8% were Asian, and 1.0% were American Indian or Alaska Native; 51.4% were Hispanic or Latino (Table 1). The characteristics of the U.S. patients are shown in Table S4.

PRIMARY OUTCOME

Patients who received combination treatment with baricitinib plus remdesivir recovered a median of 1 day faster than patients who received remdesivir and placebo (median, 7 days vs. 8 days; rate ratio for recovery, 1.16; 95% confidence interval [CI], 1.01 to 1.32; P=0.03 by log-rank test

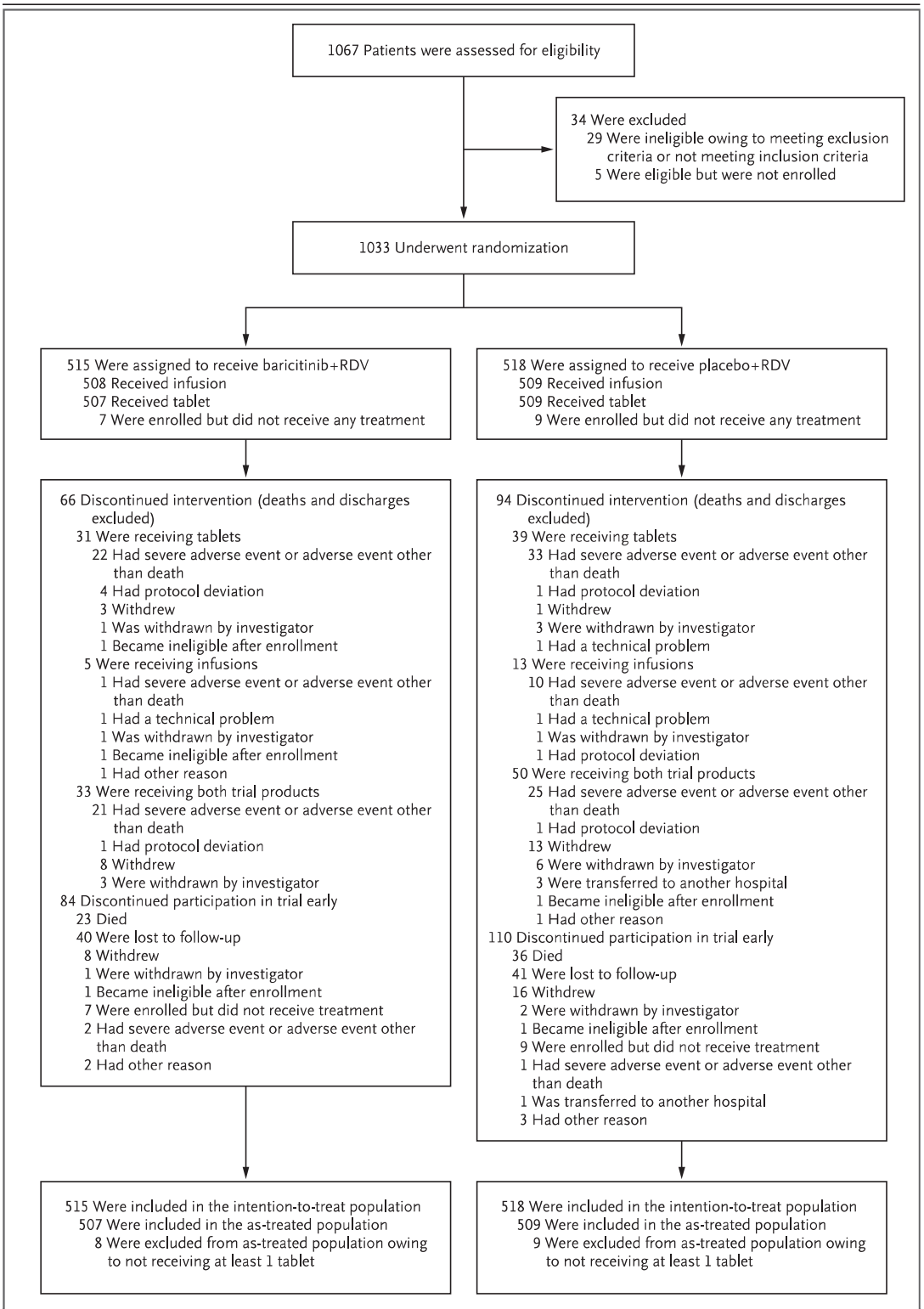


Figure 1. Enrollment and Randomization.

RDV denotes remdesivir.

Table 1. Demographic and Clinical Characteristics of the Patients at Baseline.*

Characteristic	All Patients (N=1033)	Baricitinib+RDV (N=515)	Placebo+RDV (N=518)
Age			
Mean — yr	55.4±15.7	55.0±15.4	55.8±16.0
Distribution — no. (%)			
<40 yr	173 (16.7)	87 (16.9)	86 (16.6)
40–64 yr	555 (53.7)	281 (54.6)	274 (52.9)
≥65 yr	305 (29.5)	147 (28.5)	158 (30.5)
Sex — no. (%)			
Female	381 (36.9)	196 (38.1)	185 (35.7)
Male	652 (63.1)	319 (61.9)	333 (64.3)
Race — no. (%)†			
Asian	101 (9.8)	49 (9.5)	52 (10.0)
Black	156 (15.1)	77 (15.0)	79 (15.3)
White	496 (48.0)	251 (48.7)	245 (47.3)
Other or unknown	280 (27.1)	138 (26.8)	142 (27.4)
Ethnic group — no. (%)†			
Hispanic or Latino	531 (51.4)	263 (51.1)	268 (51.7)
Not Hispanic or Latino	486 (47.0)	246 (47.8)	240 (46.3)
Not reported or unknown	16 (1.5)	6 (1.2)	10 (1.9)
Body-mass index‡	32.2±8.3	32.2±8.2	32.3±8.4
Median time (IQR) from symptom onset to randomization — days	8 (5–10)	8 (5–10)	8 (5–11)
Disease severity — no. (%)			
Moderate	706 (68.3)	358 (69.5)	348 (67.2)
Severe	327 (31.7)	157 (30.5)	170 (32.8)
Coexisting conditions — no./total no. (%)			
None	155/994 (15.6)	64/496 (12.9)	91/498 (18.3)
One	270/994 (27.2)	148/496 (29.8)	122/498 (24.5)
Two or more	569/994 (57.2)	284/496 (57.3)	285/498 (57.2)
Score on ordinal scale — no. (%)			
4. Hospitalized, not requiring supplemental oxygen, requiring ongoing medical care (Covid-19–related or otherwise)	142 (13.7)	70 (13.6)	72 (13.9)
5. Hospitalized, requiring supplemental oxygen	564 (54.6)	288 (55.9)	276 (53.3)
6. Hospitalized, receiving noninvasive ventilation or high-flow oxygen devices	216 (20.9)	103 (20.0)	113 (21.8)
7. Hospitalized, receiving invasive mechanical ventilation or ECMO	111 (10.7)	54 (10.5)	57 (11.0)
Geographic region — no. (%)			
Asia	67 (6.5)	33 (6.4)	34 (6.6)
Europe	13 (1.3)	6 (1.2)	7 (1.4)
North America	953 (92.3)	476 (92.4)	477 (92.1)

* Plus–minus values are means ±SD. Percentages may not total 100 because of rounding. Covid-19 denotes coronavirus disease 2019, ECMO extracorporeal membrane oxygenation, IQR interquartile range, and RDV remdesivir.
† Race and ethnic group were reported by the patients. With respect to "other" race, the categories that were used when data on race were reported included American Indian or Alaska Native and Native Hawaiian or other Pacific Islander.
‡ The body-mass index is the weight in kilograms divided by the square of the height in meters.

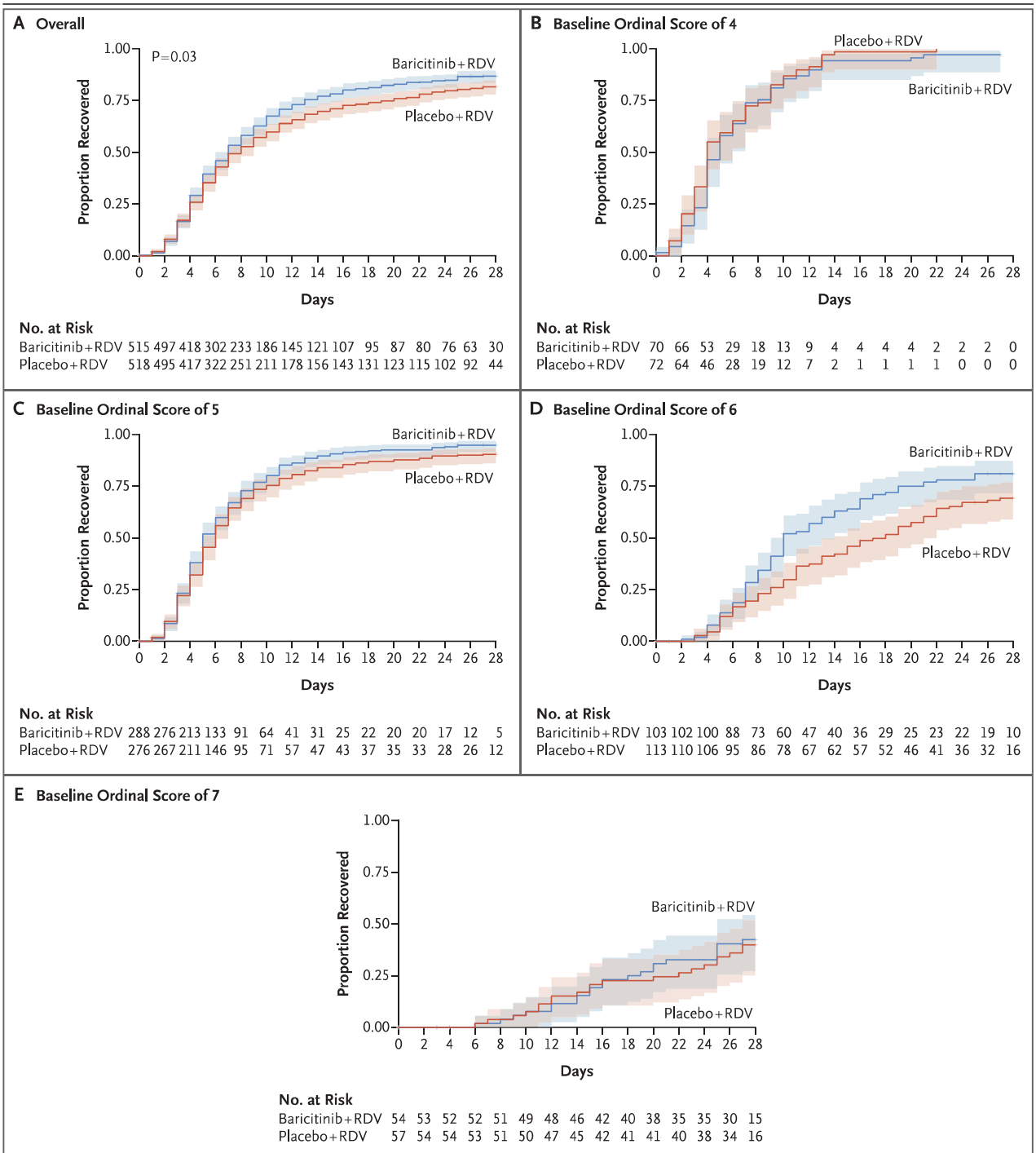


Figure 2. Kaplan–Meier Estimates of Cumulative Recoveries.

Cumulative recovery estimates are shown in the overall population (Panel A), in patients with a baseline score of 4 on the ordinal scale (not requiring oxygen; Panel B), in those with a baseline score of 5 (requiring oxygen; Panel C), in those with a baseline score of 6 (receiving high-flow oxygen or noninvasive mechanical ventilation; Panel D), and in those with a baseline score of 7 (receiving mechanical ventilation or extracorporeal membrane oxygenation [ECMO]; Panel E). Shaded areas indicate 95% confidence intervals.

stratified according to actual baseline severity) (Fig. 2 and Table 2). When analyzed according to the severity entered at the time of randomization (moderate vs. severe), the hazard ratio was 1.15 (95% CI, 1.00 to 1.31; P=0.047) (Table S6). The median time to recovery among patients receiving noninvasive ventilation or high-flow oxygen (baseline ordinal score of 6) was 10 days in the combination group and 18 days in the control group (rate ratio for recovery, 1.51; 95% CI, 1.10 to 2.08). Among patients with a baseline score of 4 (no oxygen) and 5 (supplemental oxygen), the rate ratio for recovery was 0.88 (95% CI, 0.63 to 1.23) and 1.17 (95% CI, 0.98 to 1.39), respectively. For those receiving mechanical ventilation or ECMO at enrollment (baseline ordinal score of 7), the rate ratio for recovery was 1.08 (95% CI, 0.59 to 1.97) (Table 2 and Fig. 3). The rate ratio for recovery among the 223 patients who received glucocorticoids for clinical indications during the trial was 1.06 (95% CI, 0.75 to 1.48). A sensitivity analysis with a random effect for hospital site yielded similar results (conditional random-effects estimate of rate ratio for recovery, 1.16; 95% CI, 1.01 to 1.33; restricted maximum likelihood–based random-effects estimate of variance, 0.0305) (Table S13).

KEY SECONDARY OUTCOME

The odds of improvement in clinical status at day 15 as assessed with the ordinal scale were greater in the combination group than in the control group (odds ratio for improvement, 1.3; 95% CI, 1.0 to 1.6). Patients with a baseline ordinal score of 6 who received combination treatment were most likely to have clinical improvement at day 15 (odds ratio, 2.2; 95% CI, 1.4 to 3.6) (Table 2 and Fig. S1).

MORTALITY

The Kaplan–Meier estimates of mortality at day 28 after randomization were 5.1% (95% CI, 3.5 to 7.6) in the combination group and 7.8% (95% CI, 5.7 to 10.6) in the control group (hazard ratio for death, 0.65; 95% CI, 0.39 to 1.09). The greatest numerical differences in mortality between patients in the combination group and those in the control group were observed among those with a baseline ordinal score of 5 (1.9% vs. 4.7%; hazard ratio, 0.40; 95% CI, 0.14 to 1.14) or 6 (7.5% vs. 12.9%; hazard ratio, 0.55; 95% CI, 0.22 to 1.38). The Kaplan–Meier estimates of mortality at 14 days after randomization were 1.6% in the combination group and 3.0% in the control group (hazard ratio, 0.54; 95% CI, 0.23 to 1.28) (Table 2 and Fig. S2).

ADDITIONAL SECONDARY OUTCOMES

The median time to an improvement by one category on the ordinal scale was 6 days in the combination group and 8 days in the control group (rate ratio, 1.21; 95% CI, 1.06 to 1.39), and the median time to discharge or a National Early Warning Score of 2 or less for 24 hours was 6 days and 7 days in the respective groups (rate ratio, 1.24; 95% CI, 1.07 to 1.44) (Table 3). The incidence of new use of oxygen was lower in the combination group than in the control group (22.9% vs. 40.3%; difference, –17.4 percentage points; 95% CI, –31.6 to –2.1), as was the incidence of new use of mechanical ventilation or ECMO (10.0% vs. 15.2%; difference, –5.2 percentage points; 95% CI, –9.5 to –0.9). The median number of days of receipt of mechanical ventilation or ECMO among the 128 patients in whom these interventions were started after enrollment or who died with no observed new use was 16 days in the combination group and 27 days in the control group (difference, –11.0; 95% CI, –18.3 to –3.7). The incidence of progression to death or noninvasive or invasive ventilation was lower in the combination group than in the control group (22.5% vs. 28.4%; rate ratio, 0.77; 95% CI, 0.60 to 0.98), as was the incidence of progression to death or invasive ventilation (12.2% vs. 17.2%; rate ratio, 0.69; 95% CI, 0.50 to 0.95).

SAFETY OUTCOMES

Grade 3 or 4 adverse events occurred in 207 patients (40.7%) in the combination group and 238 (46.8%) in the control group (Table S11). A total of 25 grade 3 or 4 adverse events were judged by the principal investigators to be related to combination treatment and 28 to control (Table S10). The most common grade 3 or 4 adverse events occurring in at least 5% of all patients were hyperglycemia, anemia, decreased lymphocyte count, and acute kidney injury (Table S10). The incidence of these adverse events was similar in the two treatment groups. The percentage of patients who were reported to have a serious or nonseri-

Table 2. Outcomes Overall and According to Score on the Ordinal Scale in the Intention-to-Treat Population.*

Outcome	Overall		Ordinal Score at Baseline							
			4		5		6		7	
	Baricitinib (N=515)	Placebo (N=518)	Baricitinib (N=70)	Placebo (N=72)	Baricitinib (N=288)	Placebo (N=276)	Baricitinib (N=103)	Placebo (N=113)	Baricitinib (N=54)	Placebo (N=57)
Recovery										
No. of recoveries	433	406	67	69	262	243	82	73	22	21
Median time to recovery (95% CI) — days	7 (6–8)	8 (7–9)	5 (4–6)	4 (4–6)	5 (5–6)	6 (5–6)	10 (9–13)	18 (13–21)	NE (25–NE)	NE (26–NE)
Rate ratio (95% CI)†	1.16 (1.01–1.32 [P=0.03])		0.88 (0.63–1.23)		1.17 (0.98–1.39)		1.51 (1.10–2.08)		1.08 (0.59–1.97)	
Mortality over first 14 days‡										
Hazard ratio (95% CI) for data through day 14	0.54 (0.23–1.28)		NE		0.73 (0.16–3.26)		0.21 (0.02–1.80)		0.69 (0.19–2.44)	
No. of deaths by day 14	8	15	0	0	3	4	1	5	4	6
Kaplan–Meier estimate of mortality by day 14 — % (95% CI)	1.6 (0.8–3.2)	3.0 (1.8–5.0)	0 (NE–NE)	0 (NE–NE)	1.1 (0.4–3.4)	1.5 (0.6–3.9)	1.0 (0.1–6.7)	4.6 (2.0–10.8)	7.6 (2.9–19.1)	11.3 (5.3–23.5)
Mortality over entire trial period‡										
Hazard ratio (95% CI)	0.65 (0.39–1.09)		NE		0.40 (0.14–1.14)		0.55 (0.22–1.38)		1.00 (0.45–2.22)	
No. of deaths by day 28	24	37	0	0	5	12	7	13	12	12
Kaplan–Meier estimate of mortality by day 28 — % (95% CI)	5.1 (3.5–7.6)	7.8 (5.7–10.6)	0 (NE–NE)	0 (NE–NE)	1.9 (0.8–4.4)	4.7 (2.7–8.1)	7.5 (3.6–15.2)	12.9 (7.7–21.3)	23.1 (13.8–37.1)	22.6 (13.5–36.4)
Ordinal score at day 15 (±2 days) — no. (%)§										
1	177 (34.4)	165 (31.9)	33 (47.1)	44 (61.1)	114 (39.6)	101 (36.6)	27 (26.2)	17 (15.0)	3 (5.6)	3 (5.3)
2	177 (34.4)	163 (31.5)	25 (35.7)	20 (27.8)	120 (41.7)	115 (41.7)	30 (29.1)	24 (21.2)	2 (3.7)	4 (7.0)
3	8 (1.6)	3 (0.6)	5 (7.1)	2 (2.8)	2 (0.7)	1 (0.4)	0	0	1 (1.9)	0
4	31 (6.0)	18 (3.5)	7 (10.0)	6 (8.3)	14 (4.9)	7 (2.5)	7 (6.8)	3 (2.7)	3 (5.6)	2 (3.5)
5	43 (8.3)	50 (9.7)	0	0	18 (6.2)	27 (9.8)	15 (14.6)	20 (17.7)	10 (18.5)	3 (5.3)
6	20 (3.9)	19 (3.7)	0	0	9 (3.1)	1 (0.4)	7 (6.8)	16 (14.2)	4 (7.4)	2 (3.5)
7	48 (9.3)	83 (16.0)	0	0	8 (2.8)	19 (6.9)	15 (14.6)	28 (24.8)	25 (46.3)	36 (63.2)
8	11 (2.1)	17 (3.3)	0	0	3 (1.0)	5 (1.8)	2 (1.9)	5 (4.4)	6 (11.1)	7 (12.3)
Odds ratio (95% CI)	1.3 (1.0–1.6)		0.6 (0.3–1.1)		1.2 (0.9–1.6)		2.2 (1.4–3.6)		1.7 (0.8–3.4)	

* Patients in both groups received RDV in addition to either baricitinib or placebo. Neither the P value nor any confidence intervals have not been adjusted for multiple comparisons. Percentages may not total 100 because of rounding. NE denotes not possible to estimate.

† Rate ratios for recovery and hazard ratios were calculated from the stratified Cox model. The P value for the primary outcome was calculated with the stratified log-rank test (overall model stratified according to actual disease severity). Rate ratios for recovery greater than 1 indicate a benefit with baricitinib plus RDV; hazard ratios less than 1 indicate a benefit with baricitinib plus RDV.

‡ Mortality over the first 14 days includes data from all patients who were still alive through 14 days after enrollment, with data censored on day 14, as if 14 days was the maximum follow-up time. Mortality over the entire trial period uses the totality of the trial data and censors data from patients who completed follow-up alive at 28 days after enrollment.

§ The ordinal score at day 15 (±2-day visit window) is the patient's worst score on the ordinal scale during the previous day. Scores on the ordinal scale are as follows: 1, not hospitalized, no limitations of activities; 2, not hospitalized, limitation of activities, home oxygen requirement, or both; 3, hospitalized, not requiring supplemental oxygen and no longer requiring ongoing medical care (used if hospitalization was extended for infection-control reasons); 4, hospitalized, not requiring supplemental oxygen but requiring ongoing medical care (Covid-19–related or other medical conditions); 5, hospitalized, requiring any supplemental oxygen; 6, hospitalized, receiving noninvasive ventilation or use of high-flow oxygen devices; 7, hospitalized, receiving invasive mechanical ventilation or ECMO; and 8, death. Five deaths (three in patients receiving baricitinib plus RDV and two in patients receiving placebo plus RDV) occurred within the day 15 visit window but after 14 days — these deaths are included in the outcome of the ordinal score at day 15 but not in the outcome of mortality over the first 14 days. Odds ratios were calculated with the use of a proportional odds model (overall model adjusted for actual disease severity). Odds ratios greater than 1 indicate a benefit with baricitinib plus RDV.

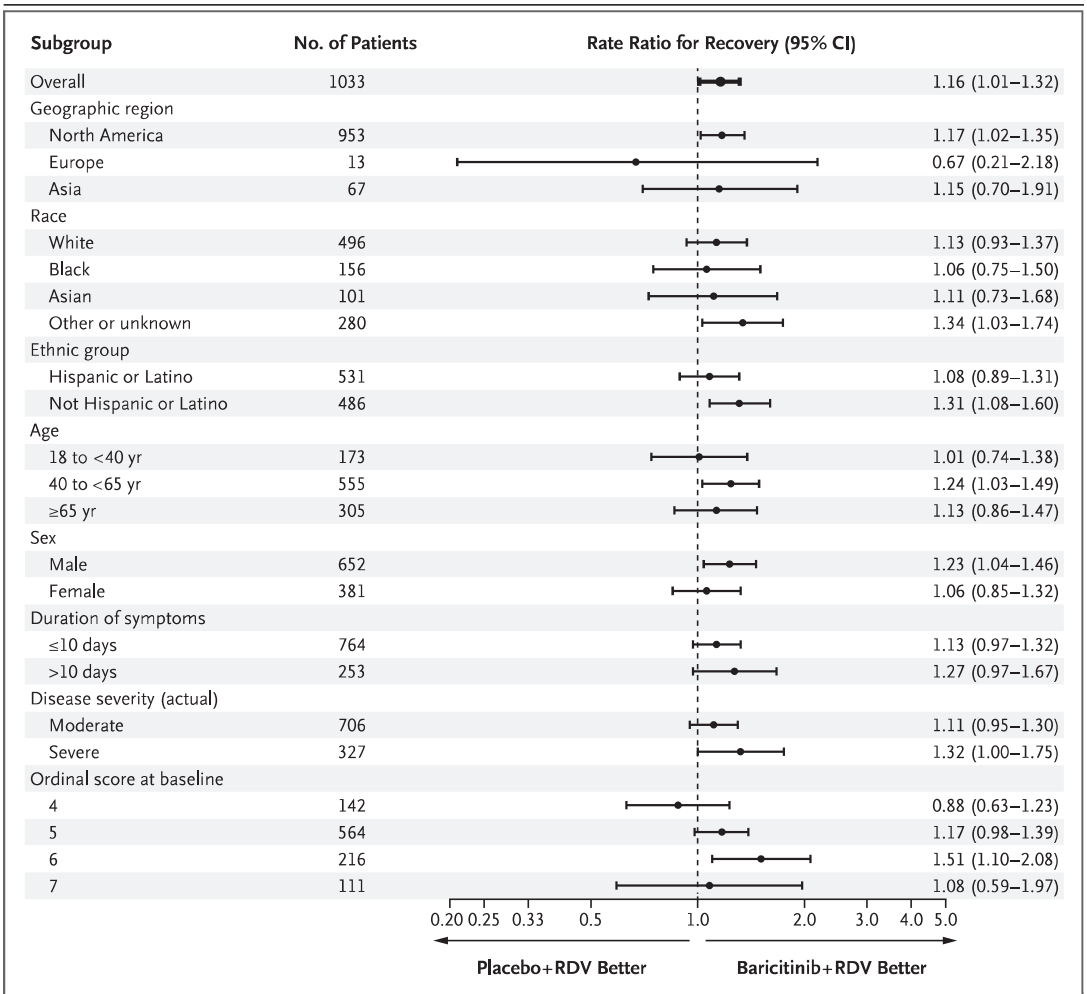


Figure 3. Time to Recovery According to Subgroup.

The widths of the confidence intervals have not been adjusted for multiplicity and therefore cannot be used to infer treatment effects. Race and ethnic group were reported by the patients. With respect to "other" race, the categories that were used when data on race were reported included American Indian or Alaska Native and Native Hawaiian or other Pacific Islander.

ous adverse event of venous thromboembolism was similar in the combination group and the control group (21 patients [4.1%] and 16 patients [3.1%], respectively; difference, 1.0 percentage points; 95% CI, –1.3 to 3.3).

Serious adverse events occurred in 81 patients (16.0%) in the combination group, and six of these events were thought to be related to the trial product (Table S7). Serious adverse events occurred in 107 patients (21.0%) in the control group, and five of these events were thought to be related to the trial product. The between-group difference was –5.0 percentage points (95% CI, –9.8 to –0.3; P=0.03). The incidences of all serious adverse events, all adverse events, serious adverse events with fatal outcome, and adverse events leading to discontinuation of the trial product were each lower in the combination group than in the control group. Overall, the incidence of serious or nonserious adverse events of new infection was lower in the combination group (30 patients [5.9%]) than in the control group (57 patients [11.2%]) (difference, –5.3 percentage points; 95% CI, –8.7 to –1.9; P=0.003). Patients who received glucocorticoids after randomization had a higher incidence of serious or nonserious new infection than those who did not (56 of 223 patients [25.1%] vs. 44 of 793 patients [5.5%]).

Table 3. Additional Secondary Outcomes.

Outcome	Baricitinib+RDV	Placebo+RDV	Rate Ratio (95% CI)
Median time to event (95% CI) — days			
Improvement by one category on ordinal scale	6.0 (5.0 to 7.0)	8.0 (7.0 to 9.0)	1.21 (1.06 to 1.39)
Improvement by two categories on ordinal scale	12.0 (12.0 to 13.0)	13.0 (NE)	1.20 (1.05 to 1.38)
Discharge or National Early Warning Score ≤2 for 24 hr*	6.0 (6.0 to 7.0)	7.0 (6.0 to 9.0)	1.24 (1.07 to 1.44)
Death or progression to noninvasive or invasive mechanical ventilation	NE	NE	0.77 (0.60 to 0.98)
Death or progression to invasive mechanical ventilation	NE	NE	0.69 (0.50 to 0.95)
New use of oxygen	NE	NE (3.0 to NE)	0.53 (0.29 to 0.98)
New use of invasive mechanical ventilation or ECMO	NE	NE	0.64 (0.44 to 0.93)
Use of noninvasive ventilation or high-flow oxygen	NE	NE	0.82 (0.60 to 1.13)
			Difference (95% CI)
Hospitalization			
Median duration of initial hospitalization (IQR) — days			
With imputation of data for those who died†	8 (5 to 15)	8 (5 to 20)	0.0 (–1.1 to 1.1)
Among those who did not die	8 (5 to 13)	8 (5 to 15)	0.0 (–1.0 to 1.0)
Patients rehospitalized — % (95% CI)	3 (2 to 5)	2 (1 to 4)	1.0 (–1.1 to 3.1)‡
Oxygen			
Median days receiving oxygen if receiving oxygen at baseline (IQR)			
With imputation of data for those who died†	10 (4 to 27)	12 (4 to 28)	–2.0 (–5.2 to 1.2)
Among those who did not die	9 (4 to 23)	10 (4 to 28)	–1.0 (–3.5 to 1.5)
New use of oxygen during trial			
No. of patients/total no.	16/70	29/72	
Percent of patients (95% CI)	23 (15 to 34)	40 (30 to 52)	–17.4 (–31.6 to –2.1)‡
Median days receiving oxygen (IQR)	3 (2 to 4)	3 (2 to 6)	0.0 (–2.2 to 2.2)
Noninvasive ventilation or high-flow oxygen			
Median days of noninvasive ventilation or high-flow oxygen use during trial if receiving these interventions at baseline (IQR)			
With imputation of data for those who died†	4 (3 to 9)	5 (2 to 12)	–1.0 (–2.9 to 0.9)
Among those who did not die	4 (3 to 6)	4 (2 to 9)	0.0 (–1.7 to 1.7)
New use of noninvasive ventilation or high-flow oxygen during trial			
No. of patients/total no.	70/358	82/348	
Percent of patients (95% CI)	20 (16 to 24)	24 (19 to 28)	–4.0 (–10.1 to 2.1)‡
Median days of use during trial (IQR)	6 (3 to 13)	4 (2 to 11)	2.0 (–0.4 to 4.4)
Mechanical ventilation or ECMO			
Median days of mechanical ventilation or ECMO during trial if receiving these interventions at baseline (IQR)			
With imputation of data for those who died†	20 (9 to 28)	25 (11 to 28)	–5.0 (–12.9 to 2.9)
Among those who did not die	13 (7 to 24)	16 (6 to 28)	–2.0 (–11.4 to 7.4)
New use of mechanical ventilation or ECMO during trial			
No. of patients/total no.	46/461	70/461	
Percent of patients (95% CI)	10 (8 to 13)	15 (12 to 19)	–5.2 (–9.5 to –0.9)‡
Median days of use during trial§	16 (7 to 28)	27 (12 to 28)	–11.0 (–18.3 to –3.7)

* The National Early Warning Score includes six physiological measures; total scores range from 0 to 20, with higher scores indicating greater clinical risk. Only patients with a score of more than 2 at baseline were included in this analysis.
† The value for patients who died was imputed as 28 days.
‡ Differences between percentages are given in percentage points.
§ This analysis includes imputation of data for patients who died with no observed new use. A total of 12 patients died without progression to ECMO. All the patients who died had other oxygen use.

DISCUSSION

The results of this randomized, double-blind, placebo-controlled trial show that combination treatment with the antiinflammatory drug baricitinib and the antiviral drug remdesivir was safe and superior to remdesivir alone for the treatment of hospitalized patients with Covid-19 pneumonia. The beneficial effects of the combination treatment were seen both in the primary outcome, with a 1-day shorter time to recovery, and in the key secondary outcome, with a greater improvement in clinical status as assessed on the ordinal scale. Although ACTT-2 was not powered to detect a difference in mortality between the two groups, both the survival rate and the time-to-death analyses favored combination treatment. These clinical benefits were observed across different age groups, sexes, ethnic groups, and races and were independent of symptom duration or disease severity at enrollment. The large proportion of Hispanic or Latino patients who were enrolled in the trial reflects the disproportionate effect of the pandemic on racial and ethnic minorities with respect to high incidences of hospitalization.[14]

The observed benefit of combination treatment was most evident in patients with a baseline ordinal score of 5 (supplemental oxygen) or 6 (high-flow oxygen or noninvasive ventilation), among whom the median time to recovery was, respectively, 1 and 8 days sooner with combination treatment than with placebo. Patients with a baseline ordinal score of 6 who received combination treatment were twice as likely as those in the control group to have improved clinical status at day 15 (odds ratio, 2.2; 95% CI, 1.4 to 3.6). The faster recovery in patients who received baricitinib plus remdesivir suggests that the combination treatment may have an effect in lowering the hospital-associated risk of nosocomial infections, thrombosis, and errors in hospital drug administration. Moreover, faster recovery also decreases the burden on the health care system, potentially increasing capacity, which is of critical importance during a surge of cases.

In addition, the combination treatment showed clinical benefits directly relevant to patient care, such as a difference of –17.4 percentage points in new use of oxygen (22.9% vs. 40.3%) and a difference of –5.2 percentage points in new use of mechanical ventilation or ECMO (10.0% vs. 15.2%). In fact, the odds of progression to death or invasive ventilation were 31% lower in the combination group than in the control group (hazard ratio, 0.69; 95% CI, 0.50 to 0.95), and patients in the combination group had 11 fewer days receiving new mechanical ventilation than those in the control group.

Despite concerns about immunosuppression, secondary infections, and thrombosis with use of JAK inhibitors, the addition of baricitinib was not associated with a significantly higher incidence of adverse events or thromboembolic events. In fact, patients receiving baricitinib plus remdesivir had a significantly lower incidence of adverse events, adverse events leading to discontinuation of the trial drug, serious adverse events, serious adverse events with a fatal outcome, and infection-related adverse events than patients who received remdesivir alone. The consistently lower incidence of adverse events with baricitinib may be related to its action in reducing inflammatory-mediated lung injury and improving lymphocyte counts, its antiviral properties, or its associated shorter recovery time and faster clinical improvement, all of which could have reduced the risk of nosocomial infection. Another ongoing trial may provide more information regarding the effects of baricitinib (ClinicalTrials.gov number, NCT04421027). In summary, our results and the characteristics of baricitinib, including the fact that it is an oral drug with few drug–drug interactions and a good safety profile, lend itself to use in low-to-middle-income countries.

The Randomized Evaluation of Covid-19 Therapy (RECOVERY) trial evaluated dexamethasone in patients with Covid-19[15] and showed a significant benefit in survival, most pronounced in patients receiving mechanical ventilation, and a 1-day shorter hospital stay. Baricitinib and dexamethasone have important biologic differences, and ACTT-2 and the RECOVERY trial have design differences. Dexamethasone has a long half-life, acts on glucocorticoid receptors, and reduces inflammation through a broad-pathway approach that has been associated with immunosuppression, hospital-acquired infections, gastrointestinal bleeding, hyperglycemia, and neuromuscular weakness, even with short courses.[16] Baricitinib has a short half-life, acts on targeted critical pathways to reduce inflammation while

minimizing biologic redundancy with less immunosuppression, and may have antiviral activity.[3] The two trials had different designs and cannot be compared directly. The high mortality in the control group of the RECOVERY trial and the low mortality in the control group of ACTT-2 suggest that these trials might not be generalizable to the same patient population. Only a randomized, double-blind, placebo-controlled, head-to-head comparison of baricitinib plus remdesivir with dexamethasone plus remdesivir will allow the efficacy and safety differences between these two approaches to be fully understood.

Baricitinib plus remdesivir was superior to remdesivir alone in reducing recovery time and accelerating improvement in clinical status, notably among patients receiving high-flow oxygen or noninvasive mechanical ventilation. The combination was associated with fewer serious adverse events.

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Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

A data sharing statement provided by the authors is available with the full text of this article at NEJM.org.

We thank the members of the ACTT-2 Study Team (see the Supplementary Appendix) for their many contributions in conducting the trial, the members of the data and safety monitoring board (Michael G. Ison, M.D. [chair], Northwestern University Feinberg School of Medicine; Nina Singh, M.D., University of Pittsburgh; Bernd Salzberger, M.D., Ph.D., University of Regensburg; Wendy Leisenring, Sc.D., Fred Hutchinson Cancer Research Center; Peter Sasieni, Ph.D., King's College London; and Kelvin Kai-Wang To, M.B., B.S., M.D., University of Hong Kong) for their oversight, and the patients for their altruism in participating in this trial.

APPENDIX

The authors' full names and academic degrees are as follows: Andre C. Kalil, M.D., M.P.H., Thomas F. Patterson, M.D., Aneesh K. Mehta, M.D., Kay M. Tomashek, M.D., M.P.H., Cameron R. Wolfe, M.B., B.S., M.P.H., Varduhi Ghazaryan, M.D., Vincent C. Marconi, M.D., Guillermo M. Ruiz-Palacios, M.D., Lanny Hsieh, M.D., Susan Kline, M.D., Victor Tapson, M.D., Nicole M. Iovine, M.D., Ph.D., Mamta K. Jain, M.D., M.P.H., Daniel A. Sweeney, M.D., Hana M. El Sahly, M.D., Angela R. Branche, M.D., Justino Regalado Pineda, M.D., David C. Lye, M.B., B.S., Uriel Sandkovsky, M.D., Anne F. Luetkemeyer, M.D., Stuart H. Cohen, M.D., Robert W. Finberg, M.D., Patrick E.H. Jackson, M.D., Babafemi Taiwo, M.B., B.S., Catherine I. Paules, M.D., Henry Arguinchona, M.D., Paul Goepfert, M.D., Neera Ahuja, M.D., Maria Frank, M.D., Myoung-don Oh, M.D., Eu S. Kim, M.D., Seow Y. Tan, M.B., B.S., Richard A. Mularski, M.D., M.S.H.S., Henrik Nielsen, M.D., Philip O. Ponce, M.D., Barbara S. Taylor, M.D., LuAnn Larson, R.N., B.S.N., Nadine G. Rouphael, M.D., Youssef Saklawi, M.D., Valeria D. Cantos, M.D., Emily R. Ko, M.D., John J. Engemann, M.D., Alpesh N. Amin, M.D., Miki Watanabe, M.D., Joanne Billings, M.D., M.P.H., Marie-Carmelle Elie, M.D., Richard T. Davey, M.D., Timothy H. Burgess, M.D., M.P.H., Jennifer Ferreira, Sc.M., Michelle Green, M.P.H., Mat Makowski, Ph.D., Anabela Cardoso, M.D., Stephanie de Bono, M.D., Ph.D., Tyler Bonnett, M.S., Michael Proschan, Ph.D., Gregory A. Deye, M.D., Walla Dempsey, Ph.D., Seema U. Nayak, M.D., Lori E. Dodd, Ph.D., and John H. Beigel, M.D.

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of Massachusetts Medical School, Worcester (R.W.F.); University of Virginia, Charlottesville (P.E.H.J.); Northwestern University, Chicago (B.T.); Penn State Health Milton S. Hershey Medical Center, Hershey, PA (C.I.P.); Providence Sacred Heart Medical Center, Spokane, WA (H.A.); University of Alabama at Birmingham, Birmingham (P.G.); Denver Health and Hospital Authority, Denver (M.F.); Seoul National University Hospital, Seoul (M.O.), and Seoul National University Bundang Hospital, Seongnam (E.S.K.) — both in South Korea; Kaiser Permanente Northwest, Portland, OR (R.A.M.); Aalborg University Hospital, Aalborg, Denmark (H.N.); and Eli Lilly, Indianapolis (A.C., S.B.).

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U.S. FOOD & DRUG ADMINISTRATION

ANNEXURE - 9

November 19, 2020

Eli Lilly and Company
Attention: Jillian Venci Fuhs, JD, PharmD
Advisor, Global Regulatory Affairs – North America
Lilly Corporate Center
Drop Code 2543
Indianapolis, IN 46285

Dear Dr. Fuhs:

This letter is in response to Eli Lilly and Company's ("Lilly") request that the Food and Drug Administration (FDA) issue an Emergency Use Authorization (EUA) for emergency use of baricitinib (Olumiant), in combination with remdesivir (Veklury), for the treatment of suspected or laboratory confirmed coronavirus disease 2019 (COVID-19) in certain hospitalized patients requiring supplemental oxygen, invasive mechanical ventilation, or extracorporeal membrane oxygenation (ECMO), as described in the Scope of Authorization (Section II) of this letter, pursuant to Section 564 of the Federal Food, Drug, and Cosmetic Act (the Act) (21 U.S.C. §360bbb-3).

On February 4, 2020, pursuant to Section 564(b)(1)(C) of the Act, the Secretary of the Department of Health and Human Services (HHS) determined that there is a public health emergency that has a significant potential to affect national security or the health and security of United States citizens living abroad, and that involves the virus that causes COVID-19.[1] On the basis of such determination, the Secretary of HHS on March 27, 2020, declared that circumstances exist justifying the authorization of emergency use of drugs and biological products during the COVID-19 pandemic, pursuant to Section 564 of the Federal Food, Drug, and Cosmetic Act (the Act) (21 U.S.C. 360bbb-3), subject to terms of any authorization issued under that section.[2]

Baricitinib is a Janus kinase (JAK) inhibitor. JAKs are intracellular enzymes which transmit signals arising from cytokine or growth factor-receptor interactions on the cellular membrane to influence cellular processes of hematopoiesis and immune cell function. Baricitinib (Olumiant) is approved by FDA for the treatment of adult patients with moderately to severely active rheumatoid arthritis who have had an inadequate response to one or more tumor necrosis factor antagonist therapies. Baricitinib has not been approved by FDA for the treatment of COVID-19.

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[1] U.S. Department of Health and Human Services, *Determination of a Public Health Emergency and Declaration that Circumstances Exist Justifying Authorizations Pursuant to Section 564(b) of the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 360bbb-3*. February 4, 2020.
[2] U.S. Department of Health and Human Services, *Declaration that Circumstances Exist Justifying Authorizations Pursuant to Section 564(b) of the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 360bbb-3*, 85 FR 18250 (April 1, 2020).

Based on review of the data from the randomized, double-blind, placebo-controlled trial conducted by the National Institute of Allergy and Infectious Diseases (NIAID) comparing baricitinib in combination with remdesivir to remdesivir alone, also called ACTT-2 (NCT04401579), data for baricitinib that FDA reviewed for the FDA-approved indication of rheumatoid arthritis (NDA 207924), and data from populations studied for other indications, including pediatric patients, it is reasonable to believe that baricitinib may be effective, in combination with remdesivir, for the treatment of suspected or laboratory confirmed COVID-19 in hospitalized adults and pediatric patients 2 years of age or older requiring supplemental oxygen, invasive mechanical ventilation, or ECMO, and that, when used under the conditions described in this authorization, the known and potential benefits of baricitinib when used to treat COVID-19 in such patients outweigh the known and potential risks of such product.

Having concluded that the criteria for issuance of this authorization under Section 564(c) of the Act are met, I am authorizing the emergency use of baricitinib for treatment of COVID-19, as described in the Scope of Authorization section of this letter (Section II) and subject to the terms of this authorization.

I. Criteria for Issuance of Authorization

I have concluded that the emergency use of baricitinib for the treatment of COVID-19 when administered as described in the Scope of Authorization (Section II) meets the criteria for issuance of an authorization under Section 564(c) of the Act, because:

1. SARS-CoV-2 can cause a serious or life-threatening disease or condition, including severe respiratory illness, to humans infected by this virus;

2. Based on the totality of scientific evidence available to FDA, it is reasonable to believe that baricitinib, in combination with remdesivir, may be effective in treating suspected or laboratory confirmed COVID-19 in hospitalized adults and pediatric patients 2 years of age or older requiring supplemental oxygen, invasive mechanical ventilation, or ECMO, and that, when used under the conditions described in this authorization, the known and potential benefits of baricitinib when used in combination with remdesivir to treat COVID-19 in such patients outweigh the known and potential risks of such product; and

3. There is no adequate, approved, and available alternative to the emergency use of baricitinib, in combination with remdesivir, for treatment of suspected or laboratory confirmed COVID-19 in hospitalized adults and pediatric patients 2 years of age or older requiring supplemental oxygen, invasive mechanical ventilation, or ECMO.[3, 4]

[3] No other criteria of issuance have been prescribed by regulation under Section 564(c)(4) of the Act.
[4] On October 22, 2020, remdesivir was approved to treat COVID-19 in adults and pediatric patients (12 years of age and older and weighing at least 40 kg) requiring hospitalization. Remdesivir is a nucleoside ribonucleic acid polymerase inhibitor that has demonstrated antiviral activity against SARS-COV-2. Baricitinib is a Janus kinase (JAK) inhibitor, a class of drugs that block extracellular signals from multiple cytokines that are involved in inflammatory diseases and thought to contribute to inflammation and worsening of COVID-19. The Adaptive COVID-19 Treatment Trial 2 (ACTT-2) trial provided scientific evidence that the combination of baricitinib plus

II. Scope of Authorization

I have concluded, pursuant to Section 564(d)(1) of the Act, that the scope of this authorization is limited as follows:

- The baricitinib covered by this authorization will be used only by healthcare providers, in combination with remdesivir, to treat suspected or laboratory confirmed COVID-19 in hospitalized[5] adults and pediatric patients 2 years of age or older requiring supplemental oxygen, invasive mechanical ventilation, or ECMO; and

- The use of baricitinib covered by this authorization must be in accordance with the dosing regimens as detailed in the authorized Fact Sheets.

Product Description

Baricitinib is a Janus kinase (JAK) inhibitor. Baricitinib is available as debossed, film-coated, immediate-release tablets. Each tablet contains a recessed area on each face of the tablet surface. Baricitinib tablets are to be taken orally or can be crushed, dispersed in water, and given via a gastrostomy tube. The authorized baricitinib includes commercially available[6] Olumiant (baricitinib) supplied in 30 count bottles as follows:

- OLUMIANT (baricitinib) 1 mg (NDC 0002-4732-30)
- OLUMIANT (baricitinib) 2 mg (NDC 0002-4182-30)

Baricitinib should be stored at 20° to 25°C (68° to 77°F) with excursions permitted to 15° to 30°C (59° to 86°F).

Baricitinib is authorized for emergency use with the FDA-approved package insert and the following product-specific information required to be made available to healthcare providers and patients/caregivers, respectively, through Lilly's website at www.baricitinibemergencyuse.com:

- Fact Sheet for Health Care Providers: Emergency Use Authorization (EUA) of Baricitinib

- Fact Sheet for Patients, Parents and Caregivers: Emergency Use Authorization (EUA) of Baricitinib

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remdesivir provided a potential clinically meaningful benefit as compared to remdesivir alone in time to recovery, NIAID Ordinal Scale outcome at Day 15, and progression to ventilation or death at Day 29. Veklury's FDA-approved indication is for a narrower population than the use authorized for baricitinib under this EUA.

[5] Individuals determined as being appropriate for acute inpatient hospitalization and who are admitted or transferred to an alternate care site (ACS) that is capable of providing acute care that is comparable to general inpatient hospital care are within the terms and conditions of this Letter of Authorization. An ACS is intended to provide additional hospital surge capacity and capability for communities overwhelmed by patients with COVID-19.

[6] For the purposes of this Letter of Authorization, commercially available Olumiant (baricitinib) tablets refers to product in United States distribution under the approved New Drug Application 207924.

I have concluded, pursuant to Section 564(d)(2) of the Act, that it is reasonable to believe that the known and potential benefits of baricitinib, when used for the treatment of COVID-19 and used in accordance with this Scope of Authorization (Section II), outweigh its known and potential risks.

I have concluded, pursuant to Section 564(d)(3) of the Act, based on the totality of scientific evidence available to FDA, that it is reasonable to believe that baricitinib may be effective for the treatment of COVID-19 when used in accordance with this Scope of Authorization (Section II), pursuant to Section 564(c)(2)(A) of the Act.

Having reviewed the scientific information available to FDA, including the information supporting the conclusions described in Section I above, I have concluded that baricitinib (as described in this Scope of Authorization (Section II)) meets the criteria set forth in Section 564(c) of the Act concerning safety and potential effectiveness.

The emergency use of your product under an EUA must be consistent with, and may not exceed, the terms of the Authorization, including the Scope of Authorization (Section II) and the Conditions of Authorization (Section III). Subject to the terms of this EUA and under the circumstances set forth in the Secretary of HHS's determination under Section 564(b)(1)(C) described above and the Secretary of HHS's corresponding declaration under Section 564(b)(1), baricitinib is authorized, in combination with remdesivir, to treat suspected or laboratory confirmed COVID-19 in hospitalized adults and pediatric patients 2 years of age or older requiring supplemental oxygen, invasive mechanical ventilation, or ECMO as described in the Scope of Authorization (Section II) under this EUA, despite the fact that it does not meet certain requirements otherwise required by applicable federal law.

III. Conditions of Authorization

Pursuant to Section 564 of the Act, I am establishing the following conditions on this authorization:

Eli Lilly and Company (Lilly) and Authorized Distributors[7]

A. Lilly and authorized distributor(s) will ensure that the authorized baricitinib is distributed and the FDA-approved package insert and authorized labeling (i.e., Fact Sheets) will be made available to healthcare facilities and/or healthcare providers consistent with the terms of this letter.

B. Lilly and authorized distributor(s) will ensure that appropriate storage is maintained until the authorized product is delivered to healthcare facilities and/or healthcare providers.

C. Lilly and authorized distributor(s) will ensure that the terms of this EUA are made available to all relevant stakeholders (e.g., U.S. government agencies, state and local government authorities, authorized distributors, healthcare facilities, healthcare providers) involved in distributing or receiving authorized baricitinib. Lilly will provide to all relevant

[7] "Authorized Distributor(s)" are identified by Lilly as an entity or entities allowed to distribute authorized baricitinib.

stakeholders a copy of this letter of authorization and communicate any subsequent amendments that might be made to this letter of authorization and its authorized accompanying materials (i.e., Fact Sheets).

D. Lilly may request changes to this authorization, including to the authorized Fact Sheets for baricitinib, that do not alter the analysis of benefits and risks that underlies this authorization and FDA may determine that such changes may be permitted without amendment of this EUA. That determination must be made by joint decision of the Office of Infectious Diseases/Office of New Drugs/Center for Drug Evaluation and Research (CDER), the Counter-Terrorism and Emergency Coordination Staff/Office of the Center Director/CDER, and Office of Counterterrorism and Emerging Threats/Office of the Chief Scientist/Office of the Commissioner.

E. Lilly will report to FDA serious adverse events and all medication errors associated with the use of the authorized baricitinib that are reported to Lilly using either of the following options.

Option 1: Submit reports through the Safety Reporting Portal (SRP) as described on the FDA SRP web page.

Option 2: Submit reports directly through the Electronic Submissions Gateway (ESG) as described on the FAERS electronic submissions web page.

Submitted reports under both options should state: "Baricitinib treatment under Emergency Use Authorization (EUA)." For reports submitted under Option 1, include this language at the beginning of the question "Describe Event" for further analysis. For reports submitted under Option 2, include this language at the beginning of the "Case Narrative" field.

F. All manufacturing facilities will comply with Current Good Manufacturing Practice requirements.

G. Lilly will submit information to the Agency within three working days of receipt of any information concerning any batch of authorized baricitinib (whether the batch is distributed or not), as follows: (1) information concerning any incident that causes the drug product or its labeling to be mistaken for, or applied to, another article; and (2) information concerning any bacteriological or microscopic contamination, or any significant chemical, physical, or other change in deterioration in the drug product, or any failure of one or more batches of the drug product to meet the established specifications. Lilly will include in its notification to the Agency whether the batch, or batches, in question will be recalled.

H. Lilly will not implement any changes to the description of the authorized product, manufacturing process, facilities and equipment, and elements of the associated control strategy that assure process performance and quality of the authorized product without notification to and concurrence by the Agency.

I. Lilly will manufacture and test authorized baricitinib per the process and methods, including in-process sampling and testing and finishing product testing (release and stability) to meet all specifications as detailed in Lilly's EUA request.

J. Through a process of inventory control, Lilly and authorized distributor(s) will maintain records regarding distribution of the authorized baricitinib (i.e., lot numbers, quantity, receiving site, receipt date).

K. Lilly and authorized distributor(s) will make available to FDA upon request any records maintained in connection with this EUA.

Healthcare Facilities to Whom the Authorized Baricitinib Is Distributed and Healthcare Providers Administering the Authorized Baricitinib

L. Healthcare facilities and healthcare providers will ensure that they are aware of the letter of authorization, and the terms herein, and that the authorized Fact Sheets are made available to healthcare providers and to patients and caregivers, respectively, through appropriate means, prior to administration of baricitinib for the authorized use.

M. Healthcare facilities and healthcare providers will track serious adverse events that are considered to be potentially attributable to the authorized baricitinib use and must report these to FDA in accordance with the Fact Sheet for Healthcare Providers. Complete and submit a MedWatch form (www.fda.gov/medwatch/report.htm), or Complete and submit FDA Form 3500 (health professional) by fax (1-800-FDA-0178) (these forms can be found via link above). Call 1-800-FDA-1088 for questions. Submitted reports should state, "Baricitinib treatment under Emergency Use Authorization (EUA)" at the beginning of the question "Describe Event" for further analysis.

N. Healthcare facilities and healthcare providers will ensure that appropriate storage is maintained until the authorized product is administered consistent with the terms of this letter.

O. Through a process of inventory control, healthcare facilities will maintain records regarding the dispensed authorized baricitinib (i.e., lot numbers, quantity, receiving site, receipt date), product storage, and maintain patient information (e.g., patient name, age, disease manifestation, number of doses administered per patient, other drugs administered).

P. Healthcare facilities will ensure that any records associated with this EUA are maintained until notified by Lilly and/or FDA. Such records will be made available to Lilly, HHS, and FDA for inspection upon request.

Conditions Related to Printed Matter, Advertising and Promotion

Q. All descriptive printed matter, advertising, and promotional material, relating to the use of the baricitinib under this authorization shall be consistent with the authorized labeling, as

well as the terms set forth in this EUA and the applicable requirements set forth in the Act and FDA regulations.

R. No descriptive printed matter, advertising, or promotional material, relating to the use of baricitinib under this authorization may represent or suggest that such products are safe or effective when used, in combination with remdesivir, for the treatment of suspected or laboratory confirmed COVID-19 in hospitalized adults and pediatric patients 2 years of age or older requiring supplemental oxygen, invasive mechanical ventilation, or ECMO.

S. All descriptive printed matter, advertising, and promotional material, relating to the use of the baricitinib under this authorization clearly and conspicuously shall state that:

- the baricitinib has not been approved, but has been authorized for emergency use by FDA, in combination with remdesivir, for the treatment of suspected or laboratory confirmed COVID-19 in hospitalized adults and pediatric patients 2 years of age or older requiring supplemental oxygen, invasive mechanical ventilation, or ECMO.

- the baricitinib is authorized, in combination with remdesivir, for the treatment of suspected or laboratory confirmed COVID-19 in hospitalized adults and pediatric patients 2 years of age or older requiring supplemental oxygen, invasive mechanical ventilation, or ECMO only for the duration of the declaration that circumstances exist justifying the authorization of the emergency use of the baricitinib under Section 564(b)(1) of the Act, 21 U.S.C. § 360bbb-3(b)(1), unless the authorization is terminated or revoked sooner.

IV. Duration of Authorization

This EUA will be effective until the declaration that circumstances exist justifying the authorization of the emergency use of drugs and biological products during the COVID-19 pandemic is terminated under Section 564(b)(2) of the Act or the EUA is revoked under Section 564(g) of the Act.

Sincerely,

--/S/--

RADM Denise M. Hinton
Chief Scientist
Food and Drug Administration

ANNEXURE - 10

Office of the Controller General of Patents, Designs & Trade Marks
Department of Industrial Policy & Promotion,
Ministry of Commerce & Industry,
Government of India

(http://ipindia.nic.in/index.htm)

INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS | GEOGRAPHICAL INDICATIONS

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Legal Status : Inforce

Due date of next renewal : 10/03/2022

Patent Number	:	270765	Date of Patent	:	10/03/2009
Application Number	:	1863/MUMNP/2010	Date of Grant	:	18/01/2016
Type of Application	:	PCT NATIONAL PHASE APPLICATION	Date of Recordal	:	18/01/2016
Parent Application Number	:	---	Appropriate Office	:	MUMBAI
PCT International Application Number	:	PCT/US2009/036635	PCT International Filing Date	:	10/03/2009
Grant Title	:	"AZETIDINE AND CYCLOBUTANE DERIVATIVES AS JAK INHIBITORS"			

Sl No	Name of Grantee	Grantee Address
1	INCYTE CORPORATION	Experimental Station Building 336 Route 141 & Henry Clay Road City of Wilmington State of Delaware United States of America.

Sl No	Name of Patentee	Address of Patentee
1	INCYTE HOLDINGS CORPORATION	1801 Augustine Cut-Off, Wilmington, Delaware 19803, United States of America

Address of Service	:	K & S PARTNERS INTELLECTUAL PROPERTY ATTORNEYS B1-601, 6TH FLOOR, MARATHON NEXTGEN INNOVA, OPPOSITE PENINSULA CORPORATE PARK, OFF G.K. MARG, LOWER PAREL, MUMBAI-400013, INDIA
Additional Address of Service	:	--
Priority Date	:	11/03/2008

Year	Due dates for Renewal	CBR No	CBR Date	Renewal Amount	Renewal Certificate No	Date of Renewal	Renewal Period:

	Normal Due Date	Due Date with Extension						From	To
3rd year	18/04/2016	18/10/2016	4122	08/03/2016	4000	2362	08/03/2016	10/03/2011	10/03/2012
4th year	18/04/2016	18/10/2016	4122	08/03/2016	4000	2363	08/03/2016	10/03/2012	10/03/2013
5th year	18/04/2016	18/10/2016	4122	08/03/2016	4000	2364	08/03/2016	10/03/2013	10/03/2014
6th year	18/04/2016	18/10/2016	4122	08/03/2016	4000	2365	08/03/2016	10/03/2014	10/03/2015
7th year	18/04/2016	18/10/2016	4122	08/03/2016	12000	2366	08/03/2016	10/03/2015	10/03/2016
8th year	18/04/2016	18/10/2016	4122	08/03/2016	12000	2367	08/03/2016	10/03/2016	10/03/2017
9th year	10/03/2017	10/09/2017	3050	09/02/2017	12000	1386	09/02/2017	10/03/2017	10/03/2018
10th year	10/03/2018	10/09/2018	1639	30/01/2018	12000	1255	30/01/2018	10/03/2018	10/03/2019
11th year	10/03/2019	10/09/2019	2482	04/02/2019	24000	1937	04/02/2019	10/03/2019	10/03/2020
12th year	10/03/2020	10/09/2020	594	09/01/2020	24000	708	09/01/2020	10/03/2020	10/03/2021
13th year	10/03/2021	10/09/2021	5077	03/03/2021	24000	5811	03/03/2021	10/03/2021	10/03/2022
14th year	--	--	--	--	--	--	--	--	--
15th year	--	--	--	--	--	--	--	--	--
16th year	--	--	--	--	--	--	--	--	--
17th year	--	--	--	--	--	--	--	--	--
18th year	--	--	--	--	--	--	--	--	--
19th year	--	--	--	--	--	--	--	--	--
20th year	--	--	--	--	--	--	--	--	--

Sl No	Date of Entry	Particulars/Remarks
1	05/07/2019	In pursuance of Form 16 filed (dated 18/06/2019) for the record of Licence agreement (dated 18/12/2009)between INCYTE CORPORATION (Patentee/Grantee/ Licencor)on the on e part and on the other part Eli Lilly & Company (License); On the request of Licensee the copy of agreement to keep the terms of the license secure as provided under provisions of Section 69(4) is allowed;

2	07/08/2017	"In pursuance of an application received on the 04/07/2016 made by " INCYTE HOLDINGS CORPORATION" registered as Proprietor by virtue of a deed of assignment dated 01-01-2015 and made between INCYTE CORPORATION of the one part and INCYTE HOLDINGS CORPORATION of the other part."

Information u/s 146 (Working of Patents)

Sl No	Patent Number	Year	
1	270765	2016-2017	No Document
2	270765	2016-2017	View Document
3	270765	2017-2018	View Document
4	270765	2018-2019	View Document
5	270765	2018-2019	View Document
6	270765	2018-2019	View Document
7	270765	2019-2020	View Document
8	270765	2019-2020	View Document
9	270765	2019-2020	View Document

View Documents

ANNEXURE - 11

FORM 2

GRANTED

THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003

COMPLETE SPECIFICATION
(See section 10, rule 13)

270765
18/01/2016

"AZETIDINE AND CYCLOBUTANE DERIVATIVES AS JAK INHIBITORS"

INCYTE CORPORATION, a corporation of the State of Delaware, United States of America, having a principal place of business at Experimental Station Building 336, Route 141 & Henry Clay Road, City of Wilmington, State of Delaware, United States of America.

The following specification particularly describes the invention and the manner in which it is to be performed.

1863/MUMNP/2010
1-9-2010

AZETIDINE AND CYCLOBUTANE DERIVATIVES AS JAK INHIBITORS

FIELD OF THE INVENTION

The present invention relates to azetidine and cyclobutane derivatives, as well as their compositions and methods of use and preparation, which are JAK inhibitors useful in the treatment of JAK-associated diseases including, for example, inflammatory and autoimmune disorders, as well as cancer.

BACKGROUND OF THE INVENTION

Protein kinases (PKs) are a group of enzymes that regulate diverse, important biological processes including cell growth, survival and differentiation, organ formation and morphogenesis, neovascularization, tissue repair and regeneration, among others. Protein kinases exert their physiological functions through catalyzing the phosphorylation of proteins (or substrates) and thereby modulating the cellular activities of the substrates in various biological contexts. In addition to the functions in normal tissues/organs, many protein kinases also play more specialized roles in a host of human diseases including cancer. A subset of protein kinases (also referred to as oncogenic protein kinases), when dysregulated, can cause tumor formation and growth, and further contribute to tumor maintenance and progression. Thus far, oncogenic protein kinases represent one of the largest and most attractive groups of protein targets for cancer intervention and drug development.

The Janus Kinase (JAK) family plays a role in the cytokine-dependent regulation of proliferation and function of cells involved in immune response. Currently, there are four known mammalian JAK family members: JAK1 (also known as Janus kinase-1), JAK2 (also known as Janus kinase-2), JAK3 (also known as Janus kinase, leukocyte; JAKL; L-JAK and Janus kinase-3) and TYK2 (also known as protein-tyrosine kinase 2). The JAK proteins range in size from 120 to 140 kDa and comprise seven conserved JAK homology (JH) domains; one of these is a functional catalytic kinase domain, and another is a pseudokinase domain potentially serving a regulatory function and/or serving as a docking site for STATs.

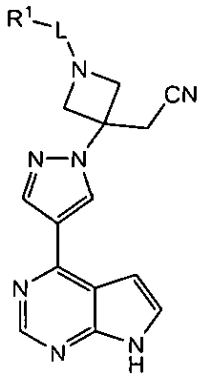
Blocking signal transduction at the level of the JAK kinases holds promise for developing treatments for inflammatory diseases, autoimmune diseases, myeloproliferative

diseases, and human cancers, to name a few. Inhibition of the JAK kinases is also envisioned to have therapeutic benefits in patients suffering from skin immune disorders such as psoriasis, and skin sensitization. Accordingly, inhibitors of Janus kinases or related kinases are widely sought and several publications report effective classes of compounds. For example, certain JAK inhibitors, including pyrrolopyridine and pyrrolopyrimidines, are reported in U.S. Ser. No. 11/637,545, filed December 12, 2006.

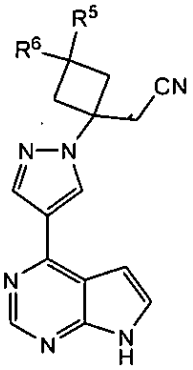
Thus, new or improved agents which inhibit kinases such as Janus kinases are continually needed for developing new and more effective pharmaceuticals to treat cancer and other diseases. The compounds and processes described herein are directed toward these needs and other ends.

SUMMARY OF THE INVENTION

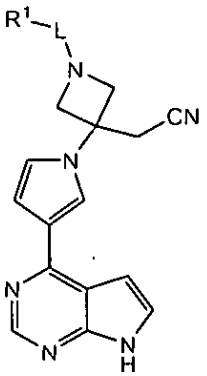
The present invention provides, *inter alia*, JAK inhibitors of Formulas I, II, III, and IV:



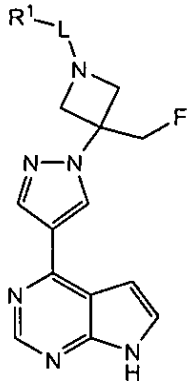
I



II



III



IV

or pharmaceutically acceptable salts thereof, wherein constituent members are defined below.

The present invention further provides pharmaceutical compositions comprising a compound of Formula I, II, III, or IV, or a pharmaceutically acceptable salt thereof, and at least one pharmaceutically acceptable carrier.

The present invention further provides methods of treating any of the various JAK-associated diseases and disorders named herein by administering to a patient a therapeutically effective amount of a compound of Formula I, II, III, or IV, or a pharmaceutically acceptable salt of the same.

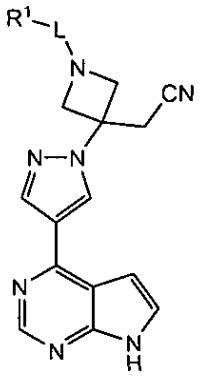
The present invention further provides compounds of Formulas I, II, III, and IV, or pharmaceutically acceptable salts thereof, for use in therapy.

The present invention further provides use of the compounds of Formulas I, II, III, and IV, or pharmaceutically acceptable salts thereof, for the production of a medicament for use in therapy.

The present invention further provides methods for the preparation of the compounds of Formulas I, II, III, and IV.

DETAILED DESCRIPTION

The present invention provides, *inter alia*, JAK inhibitors of Formula I:



I

or pharmaceutically acceptable salts thereof, wherein:

L is SO_2 or CO;

R^1 is C_{1-5} alkyl, C_{3-7} cycloalkyl, phenyl, 5- or 6-membered heteroaryl, indolyl, NR^2R^3, or OR^4, wherein said alkyl, cycloalkyl, phenyl, or heteroaryl is optionally substituted with 1, 2, or 3 substituents independently selected from F, CN, and C_{1-4} alkyl;

R^2 and R^3 are independently selected from H, C_{1-4} alkyl, and phenyl; and

R^4 is C_{1-5} alkyl, phenyl, or benzyl.

In some embodiments, when L is SO_2, then R^1 is other than OR^4.

In some embodiments, when L is SO_2, then R^1 is C_{1-6} alkyl, C_{3-7} cycloalkyl, phenyl, 5- or 6-membered heteroaryl, or NR^2R^3, wherein said alkyl, cycloalkyl, phenyl, or heteroaryl is optionally substituted with 1, 2, or 3 substituents independently selected from F and C_{1-4} alkyl.

In some embodiments, when L is CO, then R^1 is C_{3-7} cycloalkyl, phenyl, 5- or 6-membered heteroaryl, indolyl, NR^2R^3, or OR^4, wherein said cycloalkyl, phenyl, or heteroaryl is optionally substituted with 1, 2, or 3 substituents independently selected from CN and C_{1-4} alkyl.

In some embodiments, L is SO_2.

In some embodiments, L is CO.

In some embodiments, R^1 is methyl, ethyl, n-propyl, isopropyl, n-butyl, t-butyl, 2-methylprop-1-yl, 1-methylprop-1-yl, each optionally substituted with 1, 2, or 3 F.

In some embodiments, R^1 is C_{1-4} alkyl.

In some embodiments, R^1 is ethyl.

In some embodiments, R^1 is C_{3-7} cycloalkyl optionally substituted by C_{1-4} alkyl.

In some embodiments, R^1 is phenyl optionally substituted with F, methyl, or CN.

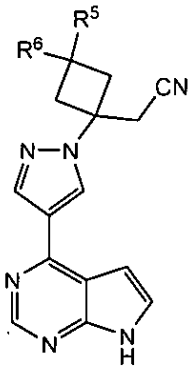
In some embodiments, R^1 is 5-membered heteroaryl selected from thienyl, pyrazolyl, pyrrolyl, 1,2,4-oxadiazolyl, and isoxazolyl, each optionally substituted with C_{1-4} alkyl.

In some embodiments, R^1 is pyridinyl.

In some embodiments, R^1 is NR^2R^3 or OR^4.

In some embodiments, L is SO_2 and R^1 is C_{1-6} alkyl.

The present invention further provides compounds of Formula II:



II

or pharmaceutically acceptable salts thereof, wherein:

R^5 and R^6 are independently selected from H, F, CN, OH, C_{1-4} alkyl, benzyloxy, C_{2-8} dialkylaminosulfonyl, and 5-membered heteroaryl, wherein said alkyl is optionally substituted by 1, 2, or 3 substituents selected from F, OH, CN, and C_{1-4} alkoxy, and wherein said 5-membered heteroaryl is optionally substituted with C_{1-4} alkyl.

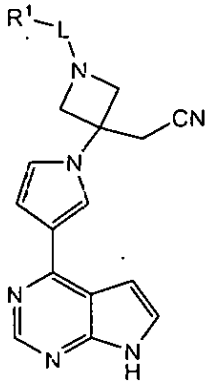
In some embodiments, when one of R^5 and R^6 is OH, then the other of R^5 and R^6 is other than CN or F.

In some embodiments, one of R^5 and R^6 is H and the other is selected from H, F, CN, OH, C_{1-4} alkyl, benzyloxy, C_{2-8} dialkylaminosulfonyl, and 5-membered heteroaryl, wherein said alkyl is optionally substituted by 1, 2, or 3 substituents selected from F, OH, CN, and C_{1-4} alkoxy, and wherein said 5-membered heteroaryl is optionally substituted with C_{1-4} alkyl.

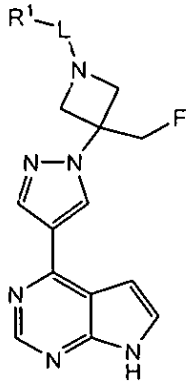
In some embodiments, R^5 and R^6 are independently selected from H, F, CN, OH, and methyl.

In some embodiments, R^5 and R^6 are independently selected from H and CN.

The present invention further provides a compound of Formula III or IV:



III



IV

or a pharmaceutically acceptable salt thereof, wherein:

L is SO_2 or CO;

R^1 is C_{1-5} alkyl, C_{3-7} cycloalkyl, phenyl, 5- or 6-membered heteroaryl, indolyl, NR^2R^3, or OR^4, wherein said alkyl, cycloalkyl, phenyl, or heteroaryl is optionally substituted with 1, 2, or 3 substituents independently selected from F, CN, and C_{1-4} alkyl;

R^2 and R^3 are independently selected from H, C_{1-4} alkyl, and phenyl; and

R^4 is C_{1-5} alkyl, phenyl, or benzyl;

wherein when L is SO_2, R^1 is other than OR^4.

In some embodiments, L is SO_2.

In some embodiments, L is CO.

In some embodiments, R^1 is methyl, ethyl, n-propyl, isopropyl, n-butyl, t-butyl, 2-methylprop-1-yl, 1-methylprop-1-yl, each optionally substituted with 1, 2, or 3 F.

In some embodiments, R^1 is C_{1-4} alkyl.

In some embodiments, R^1 is ethyl.

In some embodiments, R^1 is C_{3-7} cycloalkyl optionally substituted by C_{1-4} alkyl.

In some embodiments, R^1 is phenyl optionally substituted with F, methyl, or CN.

In some embodiments, R^1 is 5-membered heteroaryl selected from thienyl, pyrazolyl, pyrrolyl, 1,2,4-oxadiazolyl, and isoxazolyl, each optionally substituted with C_{1-4} alkyl.

In some embodiments, R^1 is pyridinyl.

In some embodiments, R^1 is NR^2R^3 or OR^4.

In some embodiments, L is SO_2 and R^1 is C_{1-6} alkyl.

At various places in the present specification, substituents of compounds of the invention are disclosed in groups or in ranges. It is specifically intended that the invention include each and every individual subcombination of the members of such groups and ranges. For example, the term "C_{1-6} alkyl" is specifically intended to individually disclose methyl, ethyl, C_3 alkyl, C_4 alkyl, C_5 alkyl, and C_6 alkyl.

It is further appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, can also be provided in combination in a single embodiment. Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment, can also be provided separately or in any suitable subcombination.

As used herein, the term "alkyl" is meant to refer to a saturated hydrocarbon group *which is straight-chained or branched. Example alkyl groups include methyl (Me), ethyl (Et),* propyl (*e.g.*, n-propyl and isopropyl), butyl (*e.g.*, n-butyl, isobutyl, sec-butyl, t-butyl), pentyl (*e.g.*, n-pentyl, isopentyl, sec-pentyl, neopentyl), and the like. An alkyl group can contain from 1 to about 20, from 2 to about 20, from 1 to about 10, from 1 to about 8, from 1 to about 6, from 1 to about 4, or from 1 to about 3 carbon atoms. A linking alkyl group is referred to herein as "alkylene."

As used herein, "cycloalkyl" refers to non-aromatic cyclic hydrocarbons including cyclized alkyl, alkenyl, and alkynyl groups. Cycloalkyl groups can include mono- or polycyclic (*e.g.*, having 2, 3 or 4 fused rings) groups and spirocycles. Ring-forming carbon atoms of a cycloalkyl group can be optionally substituted by oxo or sulfido. Cycloalkyl

groups also include cycloalkylidenes. Example cycloalkyl groups include cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl, cyclopentenyl, cyclohexenyl, cyclohexadienyl, cycloheptatrienyl, norbornyl, norpinyl, norcarnyl, adamantyl, and the like. In some embodiments, the cycloalkyl group is cyclopropyl. Also included in the definition of cycloalkyl are moieties that have one or more aromatic rings fused (i.e., having a bond in common with) to the cycloalkyl ring, for example, benzo or thienyl derivatives of cyclopentane, cyclopentene, cyclohexane, and the like. A cycloalkyl group containing a fused aromatic ring can be attached through any ring-forming atom including a ring-forming atom of the fused aromatic ring.

As used herein, "heteroaryl" refers to an aromatic heterocycle having at least one heteroatom ring member such as sulfur, oxygen, or nitrogen. Heteroaryl groups include monocyclic and polycyclic (*e.g.*, having 2, 3 or 4 fused rings) systems. Examples of heteroaryl groups include without limitation, pyridyl, pyrimidinyl, pyrazinyl, pyridazinyl, triazinyl, furyl, quinolyl, isoquinolyl, thienyl, imidazolyl, thiazolyl, indolyl, pyrryl, oxazolyl, benzofuryl, benzothienyl, benzthiazolyl, isoxazolyl, pyrazolyl, triazolyl, tetrazolyl, indazolyl, 1,2,4-thiadiazolyl, isothiazolyl, benzothienyl, purinyl, carbazolyl, benzimidazolyl, indolinyl, and the like. In some embodiments, the heteroaryl is pyridinyl. In some embodiments, the heteroaryl is thienyl, pyrazolyl, pyrrolyl, 1,2,4-oxadiazolyl, or isoxazolyl. In some embodiments, the heteroaryl is indolyl. In some embodiments, any ring-forming N in a heteroaryl moiety can be substituted by oxo. In some embodiments, the heteroaryl group has from 1 to about 20 carbon atoms, and in further embodiments from about 3 to about 20 carbon atoms. In some embodiments, the heteroaryl group contains 3 to about 14, 4 to about 14, 3 to about 7, or 5 to 6 ring-forming atoms. In some embodiments, the heteroaryl group has 1 to about 4, 1 to about 3, or 1 to 2 heteroatoms.

As used herein, "*benzyloxy*" refers to –O-benzyl.

As used herein, "dialkylaminosulfonyl" refers to $-SO_2-N(alkyl)_2$.

The compounds described herein can be asymmetric (*e.g.*, having one or more stereocenters). All stereoisomers, such as enantiomers and diastereomers, are intended unless otherwise indicated. Compounds of the present invention that contain asymmetrically substituted carbon atoms can be isolated in optically active or racemic forms. Methods on how to prepare optically active forms from optically active starting materials are known in the art, such as by resolution of racemic mixtures or by stereoselective synthesis. Many geometric isomers of olefins, C=N double bonds, and the like can also be present in the compounds described herein, and all such stable isomers are contemplated in the present

invention. Cis and trans geometric isomers of the compounds of the present invention are described and may be isolated as a mixture of isomers or as separated isomeric forms. Where a compound capable of stereoisomerism or geometric isomerism is designated in its structure or name without reference to specific R/S or cis/trans configurations, it is intended that all such isomers are contemplated.

Resolution of racemic mixtures of compounds can be carried out by any of numerous methods known in the art. An example method includes fractional recrystallizaion using a chiral resolving acid which is an optically active, salt-forming organic acid. Suitable resolving agents for fractional recrystallization methods are, for example, optically active acids, such as the D and L forms of tartaric acid, diacetyltartaric acid, dibenzoyltartaric acid, mandelic acid, malic acid, lactic acid or the various optically active camphorsulfonic acids such as β-camphorsulfonic acid. Other resolving agents suitable for fractional crystallization methods include stereoisomerically pure forms of α-methylbenzylamine (*e.g.*, *S* and *R* forms, or diastereomerically pure forms), 2-phenylglycinol, norephedrine, ephedrine, N-methylephedrine, cyclohexylethylamine, 1,2-diaminocyclohexane, and the like.

Resolution of racemic mixtures can also be carried out by elution on a column packed with an optically active resolving agent (*e.g.*, dinitrobenzoylphenylglycine). Suitable elution solvent composition can be determined by one skilled in the art.

Compounds of the invention also include tautomeric forms. Tautomeric forms result from the swapping of a single bond with an adjacent double bond together with the concomitant migration of a proton. Tautomeric forms include prototropic tautomers which are isomeric protonation states having the same empirical formula and total charge. Example prototropic tautomers include ketone – enol pairs, amide - imidic acid pairs, lactam – lactim pairs, amide - imidic acid pairs, enamine – imine pairs, and annular forms where a proton can occupy two or more positions of a heterocyclic system, for example, 1H- and 3H-imidazole, 1H-, 2H- and 4H- 1,2,4-triazole, 1H- and 2H- isoindole, and 1H- and 2H-pyrazole. Tautomeric forms can be in equilibrium or sterically locked into one form by appropriate substitution.

Compounds of the invention further include hydrates and solvates, as well as anhydrous and non-solvated forms.

The term, "compound," as used herein is meant to include all stereoisomers, geometric iosomers, tautomers, and isotopes of the structures depicted.

All compounds, and pharmaceuticaly acceptable salts thereof, can be found together with other substances such as water and solvents (e.g. hydrates and solvates) or can be isolated.

Compounds of the invention can also include all isotopes of atoms occurring in the intermediates or final compounds. Isotopes include those atoms having the same atomic number but different mass numbers. For example, isotopes of hydrogen include tritium and deuterium.

In some embodiments, the compounds of the invention, and salts thereof, are substantially isolated. By "substantially isolated" is meant that the compound is at least partially or substantially separated from the environment in which it was formed or detected. Partial separation can include, for example, a composition enriched in the compound of the invention. Substantial separation can include compositions containing at least about 50%, at least about 60%, at least about 70%, at least about 80%, at least about 90%, at least about 95%, at least about 97%, or at least about 99% by weight of the compound of the invention, or salt thereof. Methods for isolating compounds and their salts are routine in the art.

The phrase "pharmaceutically acceptable" is employed herein to refer to those compounds, materials, compositions, and/or dosage forms which are, within the scope of sound medical judgment, suitable for use in contact with the tissues of human beings and animals without excessive toxicity, irritation, allergic response, or other problem or complication, commensurate with a reasonable benefit/risk ratio.

The expressions, "ambient temperature" and "room temperature," as used herein, are understood in the art, and refer generally to a temperature, *e.g.* a reaction temperature, that is about the temperature of the room in which the reaction is carried out, for example, a temperature from about 20 °C to about 30 °C.

The present invention also includes pharmaceutically acceptable salts of the compounds described herein. As used herein, "pharmaceutically acceptable salts" refers to derivatives of the disclosed compounds wherein the parent compound is modified by converting an existing acid or base moiety to its salt form. Examples of pharmaceutically acceptable salts include, but are not limited to, mineral or organic acid salts of basic residues such as amines; alkali or organic salts of acidic residues such as carboxylic acids; and the like. The pharmaceutically acceptable salts of the present invention include the conventional non-toxic salts of the parent compound formed, for example, from non-toxic inorganic or organic acids. The pharmaceutically acceptable salts of the present invention can be synthesized from the parent compound which contains a basic or acidic moiety by

conventional chemical methods. Generally, such salts can be prepared by reacting the free acid or base forms of these compounds with a stoichiometric amount of the appropriate base or acid in water or in an organic solvent, or in a mixture of the two; generally, nonaqueous media like ether, ethyl acetate, ethanol, isopropanol, or acetonitrile (ACN) are preferred. Lists of suitable salts are found in *Remington's Pharmaceutical Sciences*, 17th ed., Mack Publishing Company, Easton, Pa., 1985, p. 1418 and *Journal of Pharmaceutical Science*, 66, 2 (1977), each of which is incorporated herein by reference in its entirety.

Synthesis

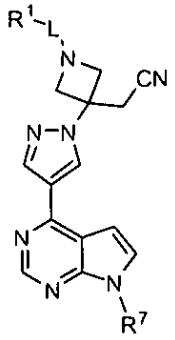
Compounds of the invention, including salts thereof, can be prepared using known organic synthesis techniques and can be synthesized according to any of numerous possible synthetic routes.

The reactions for preparing compounds of the invention can be carried out in suitable solvents which can be readily selected by one of skill in the art of organic synthesis. Suitable solvents can be substantially non-reactive with the starting materials (reactants), the intermediates, or products at the temperatures at which the reactions are carried out, *e.g.*, temperatures which can range from the solvent's freezing temperature to the solvent's boiling temperature. A given reaction can be carried out in one solvent or a mixture of more than one solvent. Depending on the particular reaction step, suitable solvents for a particular reaction step can be selected by the skilled artisan.

Preparation of compounds of the invention can involve the protection and deprotection of various chemical groups. The need for protection and deprotection, and the selection of appropriate protecting groups, can be readily determined by one skilled in the art. The chemistry of protecting groups can be found, for example, in T. W. Greene and P. G. M. Wuts, *Protective Groups in Organic Synthesis*, 3rd Ed., Wiley & Sons, Inc., New York (1999), which is incorporated herein by reference in its entirety.

Reactions can be monitored according to any suitable method known in the art. For example, product formation can be monitored by spectroscopic means, such as nuclear magnetic resonance spectroscopy (e.g., ^{1}H or ^{13}C), infrared spectroscopy, spectrophotometry (*e.g.*, UV-visible), mass spectrometry, or by chromatographic methods such as high performance liquid chromatography (HPLC) or thin layer chromatography (TLC).

The present invention provides a method of forming a compound of Formula I as shown below in Schemes 1, 2, and 3. Accordingly, in step (i) of Scheme 1, the compound of Formula I is prepared by a method comprising treating a compound of Formula Ia:



Ia

to remove the R^7 moiety; wherein:

L is SO_2 or CO;

R^1 is C_{1-6} alkyl, C_{3-7} cycloalkyl, phenyl, 5- or 6-membered heteroaryl, indolyl, NR^2R^3, or OR^4, wherein the alkyl, cycloalkyl, phenyl, or heteroaryl is optionally substituted with 1, 2, or 3 substituents independently selected from F, CN, and C_{1-4} alkyl;

R^2 and R^3 are independently selected from H, C_{1-4} alkyl, and phenyl;

R^4 is C_{1-6} alkyl, phenyl, or benzyl; and

R^7 is a protecting group;

wherein when L is SO_2, R^1 is other than OR^4.

Appropriate R^7 protecting groups include, but are not limited to the protecting groups for amines delineated in Wuts and Greene, Protective Groups in Organic Synthesis, 4th ed., John Wiley & Sons: New Jersey, pages 696-887 (and, in particular, pages 872-887) (2007), which is incorporated herein by reference in its entirety. In some embodiments, the protecting group for the R^7 group is one which is stable to conditions for removing the R^{10} protecting group in step (vi) of Scheme 2. In some embodiments, the protecting group for the R^7 group is one which is stable to conditions for removing the R^9 protecting group in step (iv) of Scheme 1. In some embodiments, R^7 is a group which is resistant to room temperature acidic conditions. In some embodiments, the R^7 is a group which is not removed in 1 to 5 N hydrochloric acid at room temperature, at a temperature from about 10 °C to about 40 °C, at a temperature from about 15 °C to about 40 °C, or at a temperature from about 15 °C to about 30 °C. In some embodiments, R^7 is benzyloxycarbonyl (Cbz), 2,2,2-trichloroethoxycarbonyl (Troc), 2-(trimethylsilyl)ethoxycarbonyl (Teoc), 2-(4-trifluoromethylphenylsulfonyl)ethoxycarbonyl (Tsc), t-butoxycarbonyl (BOC), 1-adamantyloxycarbonyl (Adoc), 2-adamantylcarbonyl (2-Adoc), 2,4-dimethylpent-3-yloxycarbonyl (Doc), cyclohexyloxycarbonyl (Hoc), 1,1-dimethyl-2,2,2-

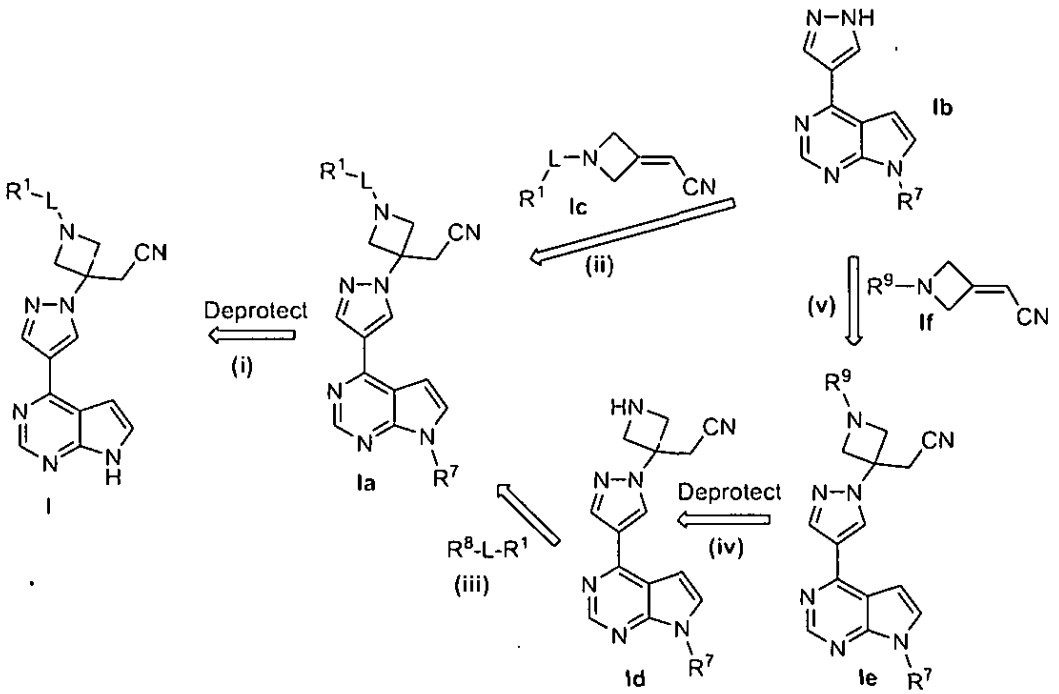
trichloroethoxycarbonyl (TcBOC), vinyl, 2-chloroethyl, 2-phenylsulfonylethyl, allyl, benzyl, 2-nitrobenzyl, 4-nitrobenzyl, diphenyl-4-pyridylmethyl, N',N'-dimethylhydrazinyl, methoxymethyl, t-butoxymethyl (Bum), benzyloxymethyl (BOM), or 2-tetrahydropyranyl (THP). In some embodiments, R^7 is 2-(trimethylsilyl)ethoxymethyl (SEM). In some embodiments, R^7 is N-pivaloyloxymethyl (POM).

Treatment of the compound of Formula Ia to remove the R^7 group can be accomplished by methods known in the art for the removal of particular protecting groups for amines, such as those in Wuts and Greene, Protective Groups in Organic Synthesis, 4th ed., John Wiley & Sons: New Jersey, pages 696-887 (and, in particular, pages 872-887) (2007), which is incorporated herein by reference in its entirety. For example, in some embodiments, the R^7 group is removed by treating with fluoride ion (e.g., treating with tetrabutylammonium fluoride), hydrochloric acid, pyridinium p-toluenesulfonic acid (PPTS), or a Lewis acid (e.g., lithium tetrafluoroborate)). In some embodiments, the treating comprises treating with lithium tetrafluoroborate, followed by treating with ammonium hydroxide (e.g., when R^7 is 2-(trimethylsilyl)ethoxymethyl). In some embodiments, the treating comprises treating with base (e.g., R^7 is N-pivaloyloxymethyl). In some embodiments, the base is an alkali metal hydroxide. In some embodiments, the base is sodium hydroxide. In some embodiments, the treating comprises treating with sodium hydroxide or ammonia in a solvent such as methanol or water.

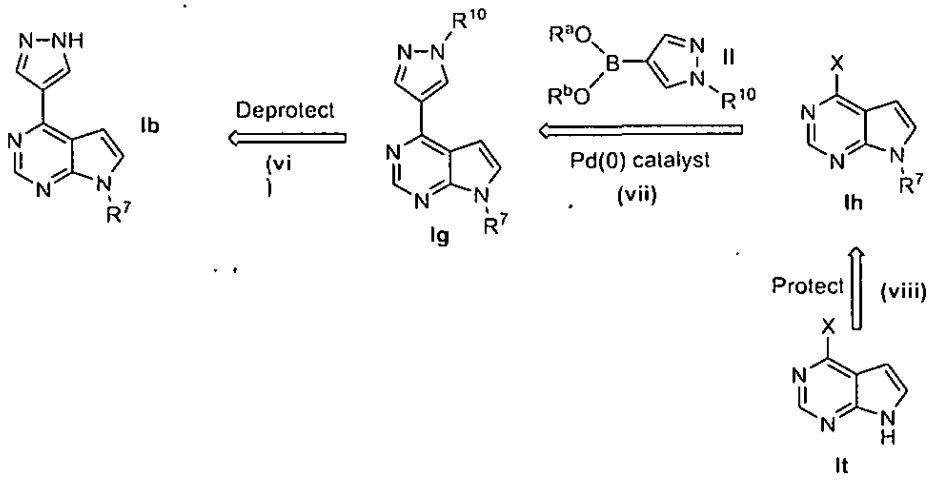
In some embodiments, to deprotect the SEM-protection group, a mild, two stage protocol is employed. The SEM-protected substrate of Formula Ia is treated with lithium tetrafluoroborate ($LiBF_4$) or trifluoroborate etherate in aqueous acetonitrile at ambient or elevated temperature (in some embodiments, at about 80 °C) for ten to twenty hours. The resulting corresponding hydroxymethyl intermediate is then subsequently treated with aqueous ammonium hydroxide (NH_4OH) at room temperature to provide the compound of Formula I.

In some embodiments, for the POM-deprotection, an aqueous sodium hydroxide (NaOH) or lithium hydroxide (LiOH) solution is used. Thus, a suspension of the POM-protected compound of Formula Ia, is treated with a 1 N aqueous sodium hydroxide solution at room temperature for two to three hours. The desired product of Formula I can be obtained after the typical acid-base work-up.

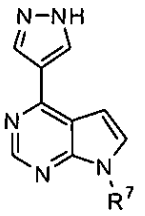
Scheme 1



Scheme 2

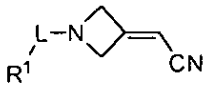


In step (:i), the compound of Formula Ia is formed by a method comprising reacting a compound of Formula Ib:



Ib

with a compound of Formula Ic:



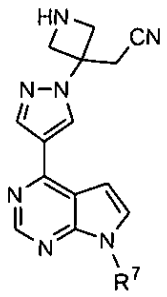
Ic

to form the compound of Formula Ia.

Step (ii) of Scheme 1 is a Michael addition reaction between the compound of Formula Ib and the compound of Formula Ic. The Michael addition may be promoted by a Michael addition catalyst, such as base. In some embodiments, the Michael addition catalyst is a tetraalkylammonium halide, tetraalkylammonium hydroxide, guanidine, amidine, hydroxide, alkoxide, silicate, alkali metal phosphate, oxide, tertiary amine, alkali metal carbonate, alkali metal bicarbonate, alkali metal hydrogen phosphate, phosphine, or alkali metal salt of a carboxylic acid. In some embodiments, the Michael addition catalyst is tetramethyl guanidine, 1,8-diazabicyclo(5.4.0)undec-7-ene, 1,5-diazabicyclo(4.3.0)non-5-ene, 1,4-diazabicyclo(2.2.2)octane, tert-butyl ammonium hydroxide, sodium hydroxide, potassium hydroxide, sodium methoxide, sodium ethoxide, tripotassium phosphate, sodium silicate, calcium oxide, triethylamine, sodium carbonate, potassium carbonate, sodium bicarbonate, potassium bicarbonate, potassium hydrogen phosphate, triphenyl phosphine, triethyl phosphine; potassium acetate, or potassium acrylate. In some embodiments, the Michael addition catalyst is 1,8-diazabicyclo(5.4.0)undec-7-ene (DBU). In some embodiments, a stoichiometric or a catalytical amount of base is used to facilitate the Michael addition reaction.

In some embodiments, the reaction is conducted in an organic solvent, such as acetonitrile or dimethylacetamide, at room temperature for two to six hours. Under the optimized reaction conditions, the desired Michael adduct, the compound of Formula Ia, may be obtained in high yield and purity.

Alternatively, the compound of Formula Ia can be formed by the process shown in step (iii) of Scheme 1. Accordingly, the compound of Formula Ia is formed by a method comprising reacting a compound of Formula Id:



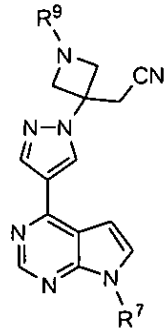
Id

with a compound of formula R^8-L-R^1 to form the compound of Formula Ia; wherein R^8 is a leaving group.

In some embodiments, R^8 is any good leaving group known in the art. In some embodiments, R^8 is halogen or C_{1-4} alkoxy. In some embodiments, R^8 is chloro.

In some embodiments, the reacting of the compound of Formula Id with the compound of formula R^8-L-R^1 is performed in the presence of a base. In some embodiments, the base is a tertiary amine, such as triethylamine, diisopropylethylamine, N-methylmorpholine, and the like. In some embodiments, the base is diisopropylethylamine.

In step (iv) of Scheme 1, the compound of Formula Id is formed by a method comprising treating a compound of Formula Ic:



Ic

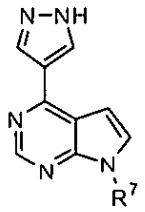
to remove the R^9 group thereby forming the compound of Formula Id; wherein R^9 is a protecting group.

Appropriate R^9 protecting groups include, but are not limited to the protecting groups for amines delineated in Wuts and Greene, Protective Groups in Organic Synthesis, 4th ed., John Wiley & Sons: New Jersey, pages 696-887 (and, in particular, pages 872-887) (2007), which is incorporated herein by reference in its entirety. R^9 is a protecting group which can be selectively removed under conditions which do not displace the R^7 protecting group. In some embodiments, the R^9 is a protecting group which can be removed under acidic

conditions at room temperature, at a temperature from about 15 °C to about 40 °C, or at a temperature from about 15 °C to about 30 °C. In some embodiments, R^9 is C_{1-6} alkoxycarbonyl. In some embodiments, R^9 is tert-butoxycarbonyl. As used herein, "alkoxycarbonyl" refers to a group of formula -C(=O)O-alkyl.

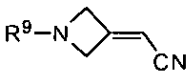
Treatment of the compound of Formula Ie to remove the R^9 group can be accomplished by methods known in the art for the removal of particular protecting groups for amines, such as those in Wuts and Greene, Protective Groups in Organic Synthesis, 4th ed., John Wiley & Sons: New Jersey, pages 696-887 (and, in particular, pages 872-887) (2007), which is incorporated herein by reference in its entirety. Appropriate treatment conditions do not displace the R^7 protecting group. In some embodiments, the treating comprises subjecting the compound of Formula Ie to acidic conditions at room temperature, at a temperature from about 15 °C to about 40 °C, or at a temperature from about 15 °C to about 30 °C. In some embodiments, the treating of the compound of Formula Ie comprises treating with hydrochloric acid in 1,4-dioxane.

In step (v) of Scheme 1, the compound of Formula Ia ie is formed by a method comprising reacting a compound of Formula Ib:



Ib

with a compound of Formula If:



If

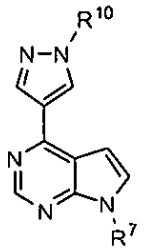
to form the compound of Formula Ie.

Step (v) of Scheme 1 is a Michael addition reaction between the compound of Formula Ib and the compound of Formula If. The Michael addition may be promoted by a Michael addition catalyst, such as base. In some embodiments, the Michael addition catalyst is a tetraalkylammonium halide, tetraalkylammonium hydroxide, guanidine, amidine, hydroxide, alkoxide, silicate, alkali metal phosphate, oxide, tertiary amine, alkali metal carbonate, alkali metal bicarbonate, alkali metal hydrogen phosphate, phosphine, or alkali metal salt of a carboxylic acid. In some embodiments, the Michael addition catalyst is

tetramethyl guanidine, 1,8-diazabicyclo(5.4.0)undec-7-ene, 1,5-diazabicyclo(4.3.0)non-5-ene, 1,4-diazabicyclo(2.2.2)octane, tert-butyl ammonium hydroxide, sodium hydroxide, potassium hydroxide, sodium methoxide, sodium ethoxide, tripotassium phosphate, sodium silicate, calcium oxide, triethylamine, sodium carbonate, potassium carbonate, sodium bicarbonate, potassium bicarbonate, potassium hydrogen phosphate, triphenyl phosphine, triethyl phosphine, potassium acetate, or potassium acrylate. In some embodiments, the Michael addition catalyst is 1,8-diazabicyclo(5.4.0)undec-7-ene (DBU). In some embodiments, a stoichiometric or a catalytical amount of base is used to facilitate the Michael addition reaction.

In some embodiments, the reaction is conducted in an organic solvent, such as acetonitrile or dimethylacetamide, at room temperature for two to six hours. Under the optimized reaction conditions, the desired Michael adduct, the compound of Formula Ia, may be obtained in high yield and purity.

In step (vi) of Scheme 2, the compound of Formula Ig is formed by a method comprising treating a compound of Formula Ig:



Ig

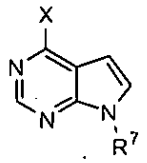
to remove the R^{10} group thereby forming the compound of Formula Ib; wherein R^{10} is a protecting group.

Appropriate R^{10} protecting groups include, but are not limited to the protecting groups for amines delineated in Wuts and Greene, Protective Groups in Organic Synthesis, 4th ed., John Wiley & Sons: New Jersey, pages 696-887 (and, in particular, pages 872-887) (2007), which is incorporated herein by reference in its entirety. R^{10} is a protecting group which can be selectively removed under conditions which do not displace the R^7 protecting group. In some embodiments, the R^{10} is a protecting group which can be removed under acidic conditions at room temperature, at a temperature from about 15 °C to about 40 °C, or at a temperature from about 15 °C to about 30 °C. In some embodiments, R^{10} is a group which is deprotected under room temperature acidic conditions. In some embodiments, R^{10} is 1-(ethoxy)ethyl, tri(C_{1-6} alkyl)silyl (e.g., t-butyldimethylsilyl or triisopropylsilyl), p-

methoxybenzyl (PMB), triphenylmethyl (Tr), diphenylmethyl, hydroxymethyl, methoxymethyl (MOM), diethoxymethyl, or t-butyldimethylsilylmethyl. In some embodiments, R^{10} is 1-(ethoxy)ethyl.

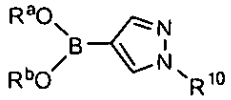
Treatment of the compound of Formula Ig to remove the R^{10} group can be accomplished by methods known in the art for the removal of particular protecting groups for amines, such as those in Wuts and Greene, Protective Groups in Organic Synthesis, 4th ed., John Wiley & Sons: New Jersey, pages 696-887 (and, in particular, pages 872-887) (2007), which is incorporated herein by reference in its entirety. In some embodiments, the treating comprises treating the compound of Formula Ig under acidic conditions (e.g., hydrochloric acid or trifluoroacetic acid) at room temperature, at a temperature from about 15 °C to about 40 °C, or at a temperature from about 15 °C to about 30 °C. In some embodiments, the treating comprises treating the compound of Formula Ig with an aqueous solution of from about 1 N to about 5 N hydrochloric acid at a temperature of from about 10 °C to about 30 °C.

In step (vii) of Scheme 2, the compound of Formula Ig is formed by a method comprising reacting a compound of Formula Ih:



Ih

with a compound of Formula II:



II

in the presence of a palladium catalyst and a base to form the compound of Formula Ig; wherein:

X is a tosylate group, a triflate group, iodo, chloro, or bromo; and

R^a and R^b are each independently H or C_{1-6} alkyl; or

R^a and R^b, together with the oxygen atoms to which they are attached and the boron atom, form a 5- to 6-membered heterocyclic ring, which is optionally substituted with 1, 2, 3, or 4 C_{1-4} alkyl groups.

Step (vii) is a Suzuki coupling reaction, which can be initiated using a number of palladium(0) and palladium(II) catalysts and performed under conditions known in the art

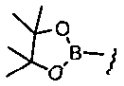
(see, e.g., Miyaura and Suzuki, *Chem. Rev.* 1995, 95, 2457-2483, which is hereby incorporated in its entirety). In some embodiments, the palladium catalyst is $Pd(PPh_3)_4$ and $Pd(dppf)_2Cl_2$. In some embodiments, the palladium catalyst is tetrakis(triphenylphosphine)palladium(0) or tetrakis(tri(*o*-tolyl)phosphine)palladium(0). In some embodiments, the palladium catalyst is tetrakis(triphenylphosphine)palladium(0).

In some embodiments, the palladium catalyst loading is from about 1×10^{-4} to about 0.1 equivalents. In some embodiments, the palladium catalyst loading is from about 0.0010 to about 0.0015 equivalents. In some embodiments, the stoichiometric ratio of the compound of Formula Ih to the compound of Formula II is from about 1 to about 1.05, or from about to 1 to about 1.35. In some embodiments, the solvent for step (vii) comprises water and an organic solvent. In some embodiments, the organic solvent is 1,4-dioxane, 1-butanol, 1,2-dimethoxyethane (DME), 2-propanol, toluene or ethanol, or a combination thereof. In some embodiments, the organic solvent comprises a combination of 1-butanol and DME.

In some embodiments, the base is an inorganic base. In some embodiments, the base is an organic base. In some embodiments, the base is an alkali metal carbonate or an alkali metal hydrogen carbonate. In some embodiments, the base is potassium carbonate (K_2CO_3). In some embodiments, two to five equivalents of base (e.g., K_2CO_3) are used. In some embodiments, two to five equivalents of base (e.g., $NaHCO_3$) are used.

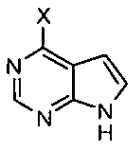
In some embodiments, the Suzuki coupling reaction is conducted at a temperature of about 80 to about 100 °C. In some embodiments, the reaction is carried out for two to twelve hours.

In some embodiments, R^a and R^b, together with the oxygen atoms to which they are attached and the boron atom, form the moiety:



In some embodiments, X is chloro, bromo, or iodo. In some embodiments, X is chloro.

In step (*viii*) of Scheme 2, the compound of Formula Ih is formed by protecting a compound of Formula It:



It

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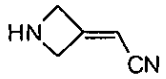
with a R^7 group.

The R^7 group is chosen as described above. In some embodiments, R^7 is 2-(trimethylsilyl)ethoxymethyl. In some embodiments, R^7 is N-pivaloyloxymethyl.

Addition of the R^7 protecting groups can be added by methods known in the art for attachment of protecing groups for amines (see e.g., Wuts and Green referred to above). For example, the indole nitrogen can be deprotonated with a base (e.g., with sodium hydride (NaH)) in an organic solvent (e.g., THF, 1,4-dioxane, 1,2-dimethoxyethane (DME), or *N*,*N*-dimethylacetamide (DMAC)) at low temperature (e.g., from about 0 to about 5 °C) before being treated with an electrophile, such as trimethylsilylethoxymethyl chloride (SEM-Cl) or pivaloyloxymethyl chloride (POM-Cl). The SEM- or POM-protected 4-chloro-7*H*-pyrrolo[2,3-*d*]pyrimidine can then isolated or *in-situ* generated as the starting materials for subsequent Suzuki reaction with or without further purification.

The compound of Formula Ic can be formed by the methods shown in Scheme 3 below.

Accordingly, in step (ix) of Scheme 3, the compound of Formula Ic is formed by a method comprising reacting the compound of Formula Ik:



Ik

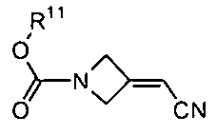
or salt thereof, with a compound of formula R^8-L-R^1 in the presence of a base to form the compound of Formula Ic; wherein R^8 is a leaving group.

The R^8 group can be any appropriate leaving group known in the art for adding a sulfonyl or carbonyl containing moiety. In some embodiments, R^8 is halogen or C_{1-4} alkoxy. In some embodiments, R^8 is chloro, bromo, or iodo. In some embodiments, R^8 is chloro.

In some embodiments, the base is a tertiary amine, such as triethylamine, diisopropylethylamine, N-methylmorpholine, and the like. In some embodiments, the base is diisopropylethylamine. In some embodiments, the salt of the compound of Formula Ik is the hydrochloride salt.

A compound of Formula If can be formed by protecting the amino group of a compound of Formula Ik with an appropriate R^9 group by methods known in the art (see e.g., Wuts and Green above). Alternatively, a compound of Formula Im may be used in place of the compound of Formula If.

In step (x) of Scheme 3, the compound of Formula Ik is formed by a method comprising treating a compound of Formula Im:

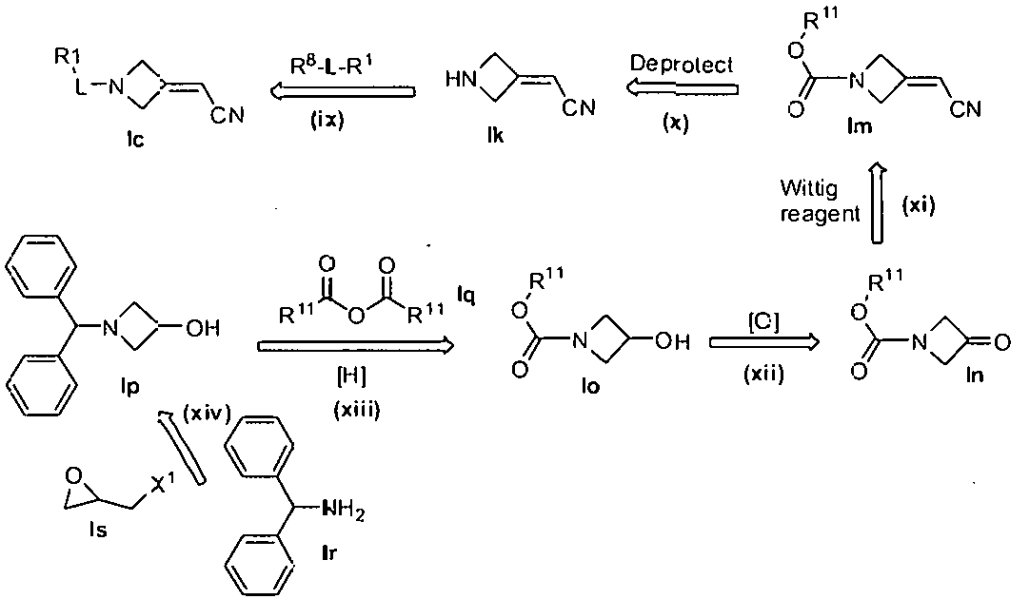


Im

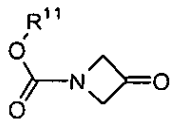
to remove the -C(=O)OR^{11} moiety thereby forming the compound of Formula Ik; wherein R^{11} is is C_{1-6} alkoxycarbonyl.

In some embodiments, R^{11} is tert-butoxycarbonyl (BOC). In some embodiments, the treating of the compound of Formula Im comprises any method known in the art for removing an alkoxycarbonyl group from an amine (e.g., a BOC group) (see e.g., Wuts and Greene, Protective Groups in Organic Synthesis, 4th ed., John Wiley & Sons: New Jersey, pages 696-887 (and, in particular, pages 872-887) (2007), which is incorporated herein by reference in its entirety). In some embodiments, the treating of the compound of Formula Im comprises treating with aqueous hydrochloric acid.

Scheme 3



In step (xi) of Scheme 3, the compound of Formula Im is formed by a method comprising reacting a compound of Formula In:



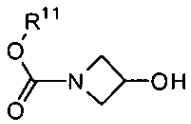
In

with a Wittig-type reagent containing a cyanomethyl or cyanomethyl ylide group to form the compound of Formula Im.

As used herein, the term "Wittig-type reagent" refers to reagents used in the Wittig reaction, the Wadsworth-Emmons reaction, and the Horner-Wittig reaction as described in the art (see e.g., Carey and Sundberg, Advanced Organic Chemistry, Part B: Reactions and Synthesis, 4th ed , Kluwer Academic/Plenum Publishers:New York, pages 111-119 (2001); and March, Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 3rd ed., John Wiley & Sons:New York, pages 845-855 (1985), each of which is incorporated herein by references in its entirety). Exemplative Wittig-type reagents containing a cyanomethyl or cyanomethyl ylice group include, but are not limited to, compounds of general formula $(R'O)_2P(=O)$-L-R^1, $R"_3P(+)$-L(-)-R^1, $R"_2P(=O)$-L-R^1, and $(R'N)_2P(=O)$-L-R^1, wherein R' is C_{1-6} alkoxy or optionally substituted phenyl; R" is optionally substituted phenyl; L is -CH_2- or -CH-; and R^1 is cyano. In some embodiments, the Wittig-type reagent is diethyl cyanomethyl phosphate. In some embodiments, the reacting of the compound of Formula In with the Wittig-type reagent in the presence of a base. In some embodiments, the base is a strong base. In some embodiments, the base is potassium t-butoxide, sodium t-butoxide, sodium hydride, sodium ethoxide, sodium hydroxide, potassium carbonate, or sodium carbonate. In some embodiments, the base is an alkali metal alkoxide. In some embodiments, the base is an alkali metal t-butoxide. In some embodiments, the base is potassium t-butoxide. In some embodiments, the olefination of the azetidine ketone of Formula In with a Wittig reagent is conducted in an organic solvent, such as THF, under the influence a base, such as potassium *tert*-butoxide, at a temperature from about 0 to about 5 °C.

The azetidinones of Formula In can be prepared by a modified procedure reported by Gaertner (*J. Org. Chem.*, **1967**, *32*, 2972) (see e.g., steps (xii) to (xiv)). In one embodiment, the "one-part" formation of the corresponding carbamate protected azetidinols of Formula Io from the compounds of Formula Ip under the catalytic hydrogenolysis conditions in the presence an electrophile, such as di-*tert*-butyl dicarbonate, simplifies the process to prepare the protected azetidinols compared to other modified procedures (Zhengming, Chen et al, WO 00/63168). TEMPO-catalyzed oxidation of the protected azetidinols of Formula Io to the corresponding ketones of Formula In provides almost quantitative yield under the mild reaction conditions. As the di-funtionalized compounds, *N*-protected azetidinones of Formula Io are very useful synthetic intermediates for the preparation of complex organic molecules.

Accordingly, in step (xii) of Scheme 3, the compound of Formula In is formed by a method comprising treating a compound of Formula Io:

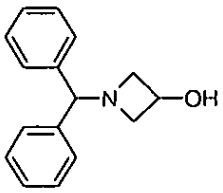


Io

with an oxidizing agent component to form the compound of Formula In.

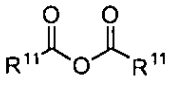
As used herein, the term "oxidizing agent component" refers to one or more oxidizing agents known in the art for oxidizing a secondary alcohol to a ketone (see, e.g., Carey and Sundberg, Advanced Organic Chemistry, Part B: Reactions and Synthesis, 4th ed., Kluwer Academic/Plenum Publishers:New York, pages 747-757), which is incorporated herein by references in its entirety). In some embodiments, the oxidizing agent component comprises a transition-metal oxidant, including, but not limited to, a chromium (VI) reagent (e.g., a Collins reagent, pyridinium dichromate (PDC), or pyridinium chlorochromate (PCC)), potassium permanganate, manganese(IV) dioxide, a ruthenium (II) reagent (e.g., $RuCl_2$(p-cymene)$_2$), ruthenium tetraoxide, or a combination of a manganese(IV) dioxide, a ruthenium (II) reagent and benzoquinone; DMSO and an electrophilic reagent such as a carbodiimide reagent (e.g., dicyclohexylcarbodiimide), acetic anhydride, trifluoroacetic anhydride, oxalyl chloride, or sulfur trioxide; dimethyl sulfide and N-chlorosuccinimide; DMSO and chlorine; or a Dess-Martin reagent. In some embodiments, the oxidizing agent component comprises 2,2,6,6-tetramethylpiperidine-1-oxyl (TEMPO) and a stoichiometric oxidant (e.g., sodium hypochlorite or N-chlorosuccinimide (NCS)). In some embodiments, the oxidizing agent component comprises TEMPO and sodium hypochlorite.

In step (xiii) of Scheme 3, the compound of Formula Io is formed by a method comprising reacting a compound of Formula Ip:



Ip

with a compound of Formula Iq:



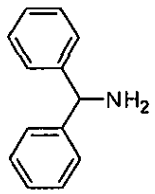
Iq

under catalytic hydrogenation conditions to form the compound of Formula Io.

In some embodiments, the catalytic hydrogenation conditions comprises hydrogen gas and a palladium on carbon catalyst.

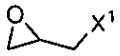
In step (xiv) of Scheme 3, the compound of Formula Ip is prepared by a method comprising the steps of:

(a) reacting a compound of Formula Ir:



Ir

with a compound of Formula Is:



Is

to form the halide salt of the compound of Formula Ip; and

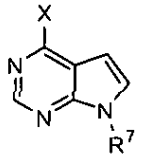
(b) treating the salt of the compound of Formula Ip with a base to form the compound of Formula Ip;

wherein X^1 is halogen.

In some embodiments, X^1 is chloro.

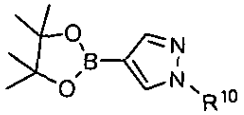
The present invention further provides a method of forming a compound of Formula I comprising:

(a) reacting a compound of Formula Ih:

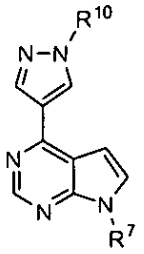


Ih

with a compound of formula:

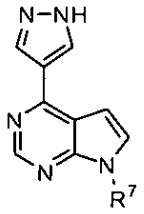


in the presence of tetrakis(triphenylphosphine)palladium(0) and an alkali metal carbonate or alkali metal hydrogen carbonate base to form a compound of Formula Ig:



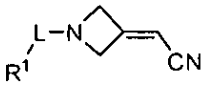
Ig ;

(b) treating the compound of Formula Ig to remove the R^{10} group to form a compound of Formula Ib:



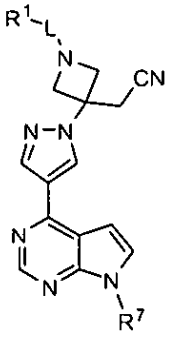
Ib ;

(c) reacting the compound of Formula Ib with a compound of Formula Ic:



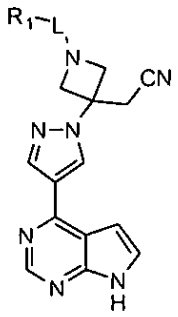
Ic

in the presence of a catalytic or stoichiometric amount of 1,8-diazabicyclo(5.4.0)undec-7-ene to form the compound of Formula Ia:



Ia;

(d) treating the compound of Formula Ia to remove the R^7 moiety to form a compound of Formula I:



I

wherein:

L is SO_2;

R^1 is C_{1-6} alkyl;

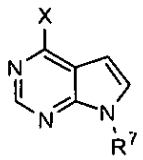
R^7 is 2-(trimethylsilyl)ethoxyethyl or 2-pivaloyloxymethyl;

R^{10} is 1-(ethoxy)ethyl; and

X is chloro.

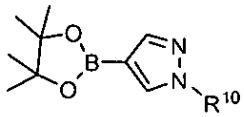
The present invention further provides a method of forming a compound of Formula I comprising:

(a) reacting a compound of Formula Ih:

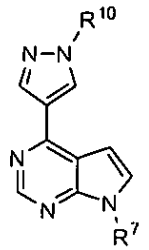


Ih

with a compound of formula:

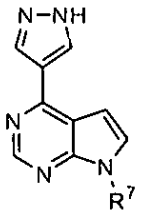


in the presence of tetrakis(triphenylphosphine)palladium(0) and an alkali metal carbonate base to form a compound of Formula Ig:



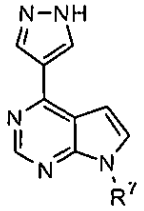
Ig ;

(b) treating the compound of Formula Ig to remove the R^{10} group to form a compound of Formula Ib:



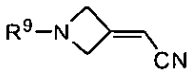
Ib ;

(c) reacting a compound of Formula Ib:



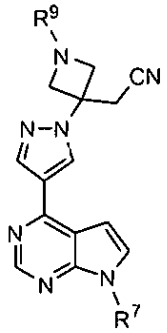
Ib

with a compound of Formula If:



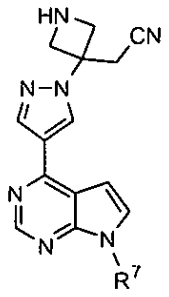
If

in the presence of a catalytic or stoichiometric amount of 1,8-diazabicyclo(5.4.0)undec-7-ene to form a compound of Formula Ic:



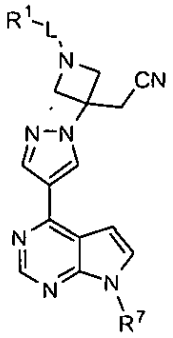
Ic ;

(d) treating the compound of Formula Ic to remove the R^9 group thereby forming a compound of Formula Id:



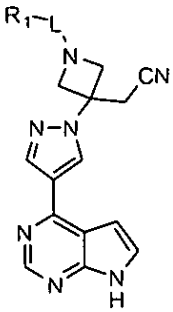
Id

(e) reacting the compound of Formula Id with a compound of formula R^8-L-R^1 to form a compound of Formula Ia:



Ia ;

(f) treating the compound of Formula Ia to remove the R^7 moiety to form a compound of Formula I:



I

wherein:

L is SO_2;

R^1 is C_{1-6} alkyl;

R^7 is 2-(trimethylsilyl)ethoxyethyl or 2-pivaloyloxymethyl;

R^8 is chloro;

R^9 is tert-butoxycarbonyl;

R^{10} is 1-(ethoxy)ethyl; and

X is chloro.

The methods may be used to produce any of the compounds described in the embodiments herein, or combinations thereof, or any of the compounds of the examples. The present invention provides any combination of the individual methods for forming compounds of Formula I, compounds of Formula Ia, etc. The present invention further provides any of the intermediates above, or salts thereof.

In some embodiments, the compound of Formula I produced by the methods, or combination thereof, is {1-(Ethylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile. The present invention further provides each of the corresponding intermediates of Formula Ia, Ib, Ic, etc., for producing {1-(Ethylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile.

In some embodiments, the methods further comprise reacting the compound of Formula I with phosphoric acid to form the phosphate salt. The phosphoric acid salt of the compound of Formula I may be produced by treating a solution of the corresponding free base in an organic solvent, such as ethanol (EtOH), with a solution of phosphoric acid in an organic solvent, such as ethanol, at room temperature or at an elevated temperature (e.g., from about 60 to about 70 °C). The produced crude phosphate salt may then be further purified by recrystallization or re-slurry in an organic solvent or a mixed organic solvent system.

In some embodiments, the compound produced by the method is {1-(ethylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile phosphoric acid salt.

In some embodiments, the compounds of Formulas I, II, III, and IV can be prepared according to the synthetic procedures described below in the Example section.

Methods

Compounds of the invention can modulate activity of one or more Janus kinases (JAKs). The term "modulate" is meant to refer to an ability to increase or decrease the activity of one or more members of the JAK family of kinases. Accordingly, compounds of the invention can be used in methods of modulating a JAK by contacting the JAK with any one or more of the compounds or compositions described herein. In some embodiments, compounds of the present invention can act as inhibitors of one or more JAKs. In further

embodiments, the compounds of the invention can be used to modulate activity of a JAK in an individual in need of modulation of the receptor by administering a modulating amount of a compound of Formula I, II, III, or IV.

JAKs to which the present compounds bind and/or modulate include any member of the JAK family. In some embodiments, the JAK is JAK1, JAK2, JAK3 or TYK2. In some embodiments, the JAK is JAK1 or JAK2. In some embodiments, the JAK is JAK2. In some embodiments, the JAK is JAK3.

Another aspect of the present invention pertains to methods of treating a JAK-associated disease or disorder in an individual (*e.g.*, patient) by administering to the individual in need of such treatment a therapeutically effective amount or dose of a compound of the present invention or a pharmaceutical composition thereof. A JAK-associated disease can include any disease, disorder or condition that is directly or indirectly linked to expression or activity of the JAK, including overexpression and/or abnormal activity levels. A JAK-associated disease can also include any disease, disorder or condition that can be prevented, ameliorated, or cured by modulating JAK activity.

Examples of JAK-associated diseases include diseases involving the immune system including, for example, organ transplant rejection (*e.g.*, allograft rejection and graft versus host disease).

Further examples of JAK-associated diseases include autoimmune diseases such as multiple sclerosis, rheumatoid arthritis, juvenile arthritis, psoriatic arthritis, type I diabetes, lupus, psoriasis, inflammatory bowel disease, ulcerative colitis, Crohn's disease, myasthenia gravis, immunoglobulin nephropathies, autoimmune thyroid disorders, and the like. In some embodiments, the autoimmune disease is an autoimmune bullous skin disorder such as pemphigus vulgaris (PV) or bullous pemphigoid (BP).

Further examples of JAK-associated diseases include allergic conditions such as asthma, food allergies, atopic dermatitis and rhinitis. Further examples of JAK-associated diseases include viral diseases such as Epstein Barr Virus (EBV), Hepatitis B, Hepatitis C, HIV, HTLV 1, Varicella-Zoster Virus (VZV) and Human Papilloma Virus (HPV).

Further examples of JAK-associated diseases or conditions include skin disorders such as psoriasis (for example, psoriasis vulgaris), atopic dermatitis, skin rash, skin irritation, skin sensitization (*e.g.*, contact dermatitis or allergic contact dermatitis). For example, certain substances including some pharmaceuticals when topically applied can cause skin sensitization. In some embodiments, co-administration or sequential administration of at least one JAK inhibitor of the invention together with the agent causing unwanted

sensitization can be helpful in treating such unwanted sensitization or dermatitis. In some embodiments, the skin disorder is treated by topical administration of at least one JAK inhibitor of the invention.

In further embodiments, the JAK-associated disease is cancer including those characterized by solid tumors (*e.g.*, prostate cancer, renal cancer, hepatic cancer, pancreatic cancer, gastric cancer, breast cancer, lung cancer, cancers of the head and neck, thyroid cancer, glioblastoma, Kaposi's sarcoma, Castleman's disease, melanoma etc.), hematological cancers (*e.g.*, lymphoma, leukemia such as acute lymphoblastic leukemia, acute myelogenous leukemia (AML) or multiple myeloma), and skin cancer such as cutaneous T-cell lymphoma (CTCL) and cutaneous B-cell lymphoma. Example cutaneous T-cell lymphomas include Sezary syndrome and mycosis fungoides.

JAK-associated diseases can further include those characterized by expression of a mutant JAK2 such as those having at least one mutation in the pseudo-kinase domain (*e.g.*, JAK2V617F).

JAK-associated diseases can further include myeloproliferative disorders (MPDs) such as polycythemia vera (PV), essential thrombocythemia (ET), myelofibrosis with myeloid metaplasia (MMM), chronic myelogenous leukemia (CML), chronic myelomonocytic leukemia (CMML), hypereosinophilic syndrome (HES), systemic mast cell disease (SMCD), and the like. In some embodiments, the myeloproliferative disorder is primary myelofibrosis (PMF) or post polycythemia vera/essential thrombocythemia myelofibrosis (Post-PV/ET MF).

Further JAK-associated diseases include inflammation and inflammatory diseases. Example inflammatory diseases include inflammatory diseases of the eye (*e.g.*, iritis, uveitis, scleritis, conjunctivitis, or related disease), inflammatory diseases of the respiratory tract (*e.g.*, the upper respiratory tract including the nose and sinuses such as rhinitis or sinusitis or the lower respiratory tract including bronchitis, chronic obstructive pulmonary disease, and the like), inflammatory myopathy such as myocarditis, and other inflammatory diseases.

The JAK inhibitors described herein can further be used to treat ischemia reperfusion injuries or a disease or condition related to an inflammatory ischemic event such as stroke or cardiac arrest. The JAK inhibitors described herein can further be used to treat anorexia, cachexia, or fatigue such as that resulting from or associated with cancer. The JAK inhibitors described herein can further be used to treat restenosis, scleroderma, or fibrosis. The JAK inhibitors described herein can further be used to treat conditions associated with hypoxia or astrogliosis such as, for example, diabetic retinopathy, cancer, or neurodegeneration. See,

e.g., Dudley, A.C. *et al. Biochem. J.* 2005, 390(Pt 2):427-36 and Sriram, K. *et al. J. Biol. Chem.* 2004, 279(19):19936-47. Epub 2004 Mar 2. The JAK inhibitors described herein can be used to treat Alzheimer's disease.

The JAK inhibitors described herein can further be used to treat other inflammatory diseases such as systemic inflammatory response syndrome (SIRS) and septic shock.

The JAK inhibitors described herein can further be used to treat gout and increased prostate size due to, e.g., benign prostatic hypertophy or benign prostatic hyperplasia.

The JAK inhibitors described herein, as well as other JAK inhibitors capable of influencing IL-6/STAT3 signalling, can further be used to treat inflammation-associated proliferative diseases. Inflammation has been shown to be linked to the development of certain types of cancers. For example, patients suffering from inflammatory bowel disease such as ulcerative colitis have been shown to have a much higher risk of developing colorectal cancer. These types of inflammation-linked cancers have been termed colitis-associated cancer (CAC). Several studies have shown that the IL-6/STAT3 signaling is involved in promoting CAC. For example, mice deficient in STAT3 intestinal epithelial cells had decreased tumor size and incidence in an animal model of CAC. Bromberg, et al., "Inflammation and cancer: IL-6 and STAT3 complete the link", *Cancer Cell*, 15:79-80 (2009). Similar results were obtained with IL-6 deficient mice, which developed fewer and smaller adenomas than wild-type mice. Grivennikov, et al., "IL-6 and STAT3 are required for survival of intestinal epithelial cells and the development of colitis-associated cancer", *Cancer Cell*, 15:103-111 (2009). See also, Bollrath, et al., "gp130-Mediated STAT3 activation in enterocytes regulates cell survival and cell-cycle progression during colitis-associated tumorigenesis", *Cancer Cell*, 15:91-102 (2009); and Kortylewski, et al., "Regulation of the IL-23 and IL-12 balance by Stat3 signaling in the tumor microenvironment", *Cancer Cell*, 15:114-123 (2009).

Accordingly, in some embodiments, JAK inhibitors of the invention and those which influence IL-6/STAT3 signaling, can be used to treat inflammation-associated cancers. In some embodiments, the cancer is associated with inflammatory bowel disease. In some embodiments, the inflammatory bowel disease is ulcerative colitis. In some embodiments, the inflammatory bowel disease is Crohn's disease. In some embodiments, the inflammation-associated cancer is colitis-associated cancer. In some embodiments, the inflammation-associated cancer is colon cancer or colorectal cancer. In some embodiments, the cancer is gastric cancer, gastrointestinal carcinoid tumor, gastrointestinal stromal tumor (GIST), adenocarcinoma, small intestine cancer, or rectal cancer. In addition to the compounds

provided herein, example JAK inhibitors that can be used in the treatment of inflammation-associated cancers include those described in US 2006/0106020; US 2006/0183906; US 2007/0149506; US 2007/0135461; US 2008/0188500; US 2008/0312258; US 2008/0312259; and U.S. Ser. No. 12/270,135.

JAK inhibitors can be tested in animal models for potential efficacy in treating inflammation-associated cancers. For example, CAC can be induced in treated (e.g., with JAK inhibitors) or untreated mice by the method summarized in Grivennikov, et al., "IL-6 and STAT3 are required for survival of intestinal epithelial cells and the development of colitis-associated cancer", *Cancer Cell*, 15:103-111 (2009). Progression of the disease can be followed by measuring body weight and monitoring for signs of rectal bleeding and diarrhea. After sacrifice of the animals, portions of the distal colon are removed for analysis.

In some embodiments, the JAK inhibitors described herein can further be used to treat a dry eye disorder. As used herein, "dry eye disorder" is intended to encompass the disease states summarized in a recent official report of the Dry Eye Workshop (DEWS), which defined dry eye as "a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface." Lemp, "The Definition and Classification of Dry Eye Disease: Report of the Definition and Classification Subcommittee of the International Dry Eye WorkShop", The Ocular Surface, 5(2), 75-92 April 2007, which is incorporated herein by reference in its entirety. Dry eye is also sometimes referred to as keratoconjunctivitis sicca. In some embodiments, the treatment of the dry eye disorder involves ameliorating a particular symptom of dry eye disorder, such as eye discomfort, visual disturbance, tear film instability, tear hyperosmolarity, and inflammation of the ocular surface.

As summarized in the DEWS report, dry eye can be classified into two different classes: aqueous tear-deficient dry eye and evaporative dry eye, which in turn encompass various subclasses. Accordingly, in some embodiments, the dry eye disorder is aqueous tear-deficient dry eye (ADDE). In further embodiments, the dry eye disorder is evaporative dry eye. In further embodiments, the dry eye disorder is selected from any of the subclasses of ADDE or evaporative dry eye disorder, or appropriate combinations thereof. As noted by the author of the DEWS report, however, the various classes and subclasses are not mutually exclusive. Hence, dry eye can occur via different mechanism in different subclasses or a dry eye disease state originating in one subclass can lead to events that cause dry eye by a mechanism in another subclass.

The first class of dry eye, aqueous tear-deficient dry eye (ADDE), is also known as tear deficient dry eye and lacrimal tear deficiency. In ADDE, dry eye is believed to be due to a failure of lacrimal tear secretion. While not wishing to be bound by any theory, it is believed that dryness results from reduced lacrimal tear secretion and volume, causing tear hyperosmolarity. Tear film hyperosmolarity can cause hyperosmolarity of the ocular surface epithelial cells, stimulating inflammatory events involving various kinases and signaling pathways.

Two subclasses of ADDE are Sjogren syndrome dry eye (SSDE), where the lacrimal glands are targeted by an autoimmune process, and non-Sjogren syndrome dry eye (NSSDE). Accordingly, in some embodiments, the eye disorder is SSDE. In other embodiments, dry eye disorder is non-Sjogren syndrome dry eye. In SSDE, it is believed that activated T-cells can infiltrate the lacrimal glands, causing cell death of acinar and ductular cells and hyposecretion of tears. The effects of locally released cytokines or circulating antibodies can amplify the effects of hyposecretion. The two major forms of SSDE are primary and secondary forms Primary SS can occur in combination with dry mouth (xerostomia). Secondary SSDE occurs with the symptoms of primary SSDE together with an autoimmune connective disease such as rheumatoid arthritis (RA), systemic lupus erythematosis, polyarteritis nodosa, Wegener's granulomatosis, systemic sclerosis, primary bilary sclerosis, or mixed connective tissue disease. Diagnostic criteria for each of these connective diseases is known in the art. Further, primary SSDE may be associated with systemic manifestations of disease which may involve the lungs, kdneys, liver, blood vessels and joints.

In NSSDE, the systemic autoimmune characteristics of Sjogren syndrome dry eye are excluded. Forms of NSSDE include primary lacrimal gland deficiencies (including age-related dry eye, congenital alacrima, and familial dysautonomia), secondary lacrimal deficiencies (including inflammatory infiltration of the lacrimal gland by sarcoid granulomata, lymphomatous cells, and AIDS related T-cells; that associated with graft vs. host disease; and that resulting from lacrimal gland ablation or lacrimal gland denervation), obstruction of the lacrimal gland ducts (including that caused by cicatrizing conjunctivitis including trachoma, cicatricial pemphigoid and mucous membrane pemphigoid, erythema multiforme, and chemical or thermal burns), and reflex hyposecretion (including reflex sensory block, such as that associated with contact lens wear, diabetes mellitus, and neurotrophic keratitis, and reflex motor block, including that associated with VII cranial nerve damage, multiple neuromatosis, and exposure to systemic drugs such as antihistamines,

beta blockers, antispasmodics, diuretics, tricyclic antidepressants, selective serotonin reuptake inhibitors, and other psychotropic drugs).

The second major class of dry eye disorder is evaporative dry eye, which is caused by excessive water loss from the exposed ocular surface in the presence of normal lacrimal secretory function. Intrinsic causes of evaporative dry eye include Meibomian gland dysfunction (MGD) (including that caused by a reduced number of glands due to congenital deficiency acquired-MGD; MGD associated with dystichiasis, dystichiasis lymphedema syndrome, and metaplasia; hypersecretory MGD associated with Meibomian seborrhea, hypersecretory MGD associated with retinoid therapy, primary and secondary obstructive MGD, focal or diffuse obstructive MGD, simple or cicatricial obstructive MGD, atrophic or inflammatory obstructive MGD; Simple MGD primary or secondary to anterior blepharitis, acne rosacea; seborrhoeic dermatitis, ectrodactyly syndrome, Turner syndrome, systemic toxicity from 13-cis retinoic acid, polychlorinated biphenyls, and epinephrine; and cicatricial MGD primary or secondary to chemical burns, pemphigoid, acne rosacea, erythema multiforms, VKC and AKC), disorders of the lid aperture and lid/globe congruity or dynamic (such as that occurring with craniostenosis, endocrine and other forms of proptosis, myopia, and after plastic surgery on the lids), and low blink rate (including that caused by an extrapyramidal disorder such as Parkinson's disease). Extrinsic causes of evaporative dry eye include ocular surface disorders (including xerophthalmia caused by vitamin A deficiency; and that associated with topical drugs and preservatives such as topical anesthesia and benzalkonium chloride), contact lens wear, ocular surface disease (including allergic eye disease), allergic conjunctivitis (including aseasonal allergic conjunctivitis, vernal keratoconjunctivitis, and atopic keratoconjunctivitis), and the use of anti-histamines.

Patients in need of treatment of a dry eye disorder can be identified by a variety of diagnostic methods known in the art, including the diagnostic methods summarized in Bron, et al., "Methodologies to Diagnose and Monitor Dry Eye Disease: Report of the Diagnostic Methodology Subcommittee of the International Dry Eye Workshop (2007)", The Ocular Surface, 5(2), 108-152 (April 2007), which is hereby incorporated herein by reference in its entirety. These include, but are not limited to: (1) symptom questionnaires (e.g., Begley, et al., "Use of the dry eye questionnaire to measure symptoms of ocular irritation in patients with aqueous tear deficient dry eye", Cornea, 2002:21:664-70); (2) staining of the ocular surface to check for surface damage (e.g., Rose Bengal or fluorescein staining or other staining method such as those techniques summarized in Barr et al., "Corneal scarring in the Collaborative Longitudinal Evaluation of Keratoconus (CLEK) Study: baseline prevalence

and repeatability of detection", Cornea 1999;18(1):34-46; Lemp, "Report of the National Eye Institute/Industry Workshop on clinical trials in dry eyes", CLAO J 1995;21(4):221-31; Nichols, et al., "The repeatability of clinical measurements of dry eye", Cornea 2004;23:272-85; Bron, et al., "Grading of corneal and conjunctival staining in the context of other dry eye tests", Cornea 2003;22(7):640-50); (3) measurement of tear film break-up time to test for tear film stability (e.g., Abelson, et al., "Alternate reference values for tear film break-up time in normal and dry eye populations", Adv Exp Med Biol 2002;506,Part B:1121-1125; Bron AJ, et al., "Grading of corneal and conjunctival staining in the context of other dry eye tests", Cornea 2003;22:640-50; Cho et al, "Review of the tear break-up time and a closer look at the tear break-up time of Hong Kong Chinese", Optom Vis Sci 1993;70(1):30-8; Craig et al. "Tear lipid layer structure and stability following expression of the meibomian glands. Ophthalmic Physiol Opt 1995, 15(6):569-74; Eliason, et al., "Staining of the conjunctiva and conjunctival tear film", Br J Ophthalmol 1990;74:519-22; Farrell et al., "A classification for dry eyes following comparison of tear thinning time with Schirmer tear test", Acta Ophthalmol (Copenh) 1992; 70(3):357-60; Johnson et al., "The effect of instilled fluorescein solution volume on the values and repeatability of TBUT measurements", Cornea 2005;24:811-7; Lemp et al., "Corneal desiccation despite normal tear volume", Ann Ophthalmol 1970;284:258-261; Lemp "Report of National Eye Institute/Industry Workshop on clinical trials in dry eyes", CLAO J 1995;21:221-232; Madden et al. Comparative study of two non-invasive tear film stability techniques. Curr Eye Res 1994; 13(4):263-9; Marquardt et al., "Modification of tear film break-up time test for increased reliability" in Holly ed. The Preocular Tear Film inHealth, Disease and Contact Lens Wear. Lubbock, Texas: Dry Eye Institute, 1986:57-63; Mengher et al., "Non-invasive tear film break-up time: sensitivity and specificity", Acta Ophthalmol (Copenh) 1986; 64(4):441-4; Nichols et al., "The repeatability *of clinical measurements of dry eye" Cornea 2004;23:272-85; Pflugfelder et al. "Evaluation* of subjective assessments and objective diagnostic tests for diagnosing tear-film disorders known to cause ocular irritation. Cornea 1998; 17(1):38-56; Vitali et al. "The European Community Study Group on diagnostic criteria for Sjogren's syndrome. Sensitivity and specificity of tests for ocular and oral involvement in Sjogren's syndrome." 1992; Ann Rheum Dis 53(10):637-47; Welch et al., "An approach to a more standardized method of evaluating tear film break-up time" Invest Ophthalmol Vis Sci 2003; 2485/B324.); (4) the Schirmer test (an estimation of tear flow stimulated reflexly by insertion of a filter paper into the conjunctival sac) (e.g., van Bijsterveld, "Diagnostic tests in the sicca syndrome" Arch Ophthalmol 1969;82:10-14; Holly et al., "Lacrimation kinetics as determined by a novel

technique", in Holly FJ (ed). The preocular tear film. Lubbock TX, Lubbock Dry Eye Institute, 1986, pp 76-88); (5) measurement of tear osmolarity (e.g., Farris, "Tear osmolarity--a new gold standard?" Adv Exp Med Biol 350:495-503, 1994; Nelson et al., "Tear film osmolality determination: an evaluation of potential errors in measurement" Curr Eye Res Sep;5(9):677-81, 1986; Sullivan et al., "4th International Conference on the Lacrimal Gland, Tear Film & Ocular Surface and Dry Eye Syndromes, 11/20/04"; White et al., "Human basic tear fluid osmolality. I. Importance of sample collection strategy", Acta Ophthalmol (Copenh) Aug;71(4):524-9, 1993; (6) measurement of tear meniscus radius, height and cross sectional area to diagnose aqueous tear deficiency (e.g., Cermak et al, "Is complete androgen insensitivity syndrome associated with alterations in the meibomium gland and ocular surface", Cornea 2003;22:516-521; Farrell et al., "A clinical procedure to predict the value of temporary occlusion therapy in keratoconjunctivitis sicca" Ophthal Physiol Opt 2003;23:1-8; Glasson et al., "Differences in clinical parameters and tear film of tolerant and intolerant contact lens wearers", Invest Ophthalmol Vis Sci 2003;44:5116-5124; Mainstone et al., "Tear meniscus measurement in the diagnosis of dry eye", Curr Eye Res 1996; 15:653-661; Nichols et al., "The repeatability of clinical measurements of dry eye", Cornea 2004a; 23:272-285; Nichols et al., "The lack of association between signs and symptoms in patients with dry eye disease", Cornea 2004b; 23:762-770; Oguz et al., "The height and radius of the tear meniscus and methods for examining these parameters", Cornea 2000;19:497-500; Yokoi et al., "Non-invasive methods of assessing the tear film", Exp Eye Res 2004;78:399-407); (7) tear film lipid layer interferometry to diagnose aqueous tear deficient dry eye (ATD) or precorneal lipid tear deficiency (Danjo et al., "Observation of precorneal tear film in patients with Sjogren's syndrome", Acta Ophthalmol Scand 1995;73:501-5; Doane, "An instrument for in vivo tear film interferometry", Optom Vis Sci 1989; 66: 383-8; Goto et al., "Computer-synthesis of an interference color chart of human tear lipid layer by a colorimetric approach",Invest Ophthalmol Vis Sci 2003;44:4693-7; Goto et al., "Differentiation of lipid tear deficiency dry eye by kinetic analysis of tear interference images", Arch Ophthalmol 2003;121:173-80; Goto E, et al., "Kinetic analysis of tear interference images in aqueous tear deficiency dry eye before and after punctal occlusion. Invest Ophthalmol Vis Sci 2003;44:1897-905; Goto et al., "Color mapping of tear lipid layer thickness distribution from the image analysis in DR-1 tear lipid layer interference images (ARVO abstract). ARVO 2004; Guillon, "Tear film photography and contact lens wear", J Br Contact Lens Assoc 1982;5:84-7; King-Smith et al., "Three interferometric methods for measuring the thickness of layers of the tear film", Optom Vis Sci 1999;76:19-32; Korb, et al., "Increase in tear film

lipid layer thickness following treatment of meibomian gland dysfunction", Adv Exp Med Biol 1994;350:293-8; Korb et al., "The effect of two novel lubricant eye drops on tear film lipid layer thickness in subjects with dry eye symptoms", Optom Vis Sci 2005; 82: 594-601; Mathers et al., "Assessment of the tear film with tandem scanning confocal microscopy", Cornea 1997;16:162-8; Maruyama et al., "Effect of environmental conditions on tear dynamics in soft contact lens wearers", Invest Ophthalmol Vis Sci 2004;45(8):2563-8; Tiffany, "Refractive index of meibomian and other lipids", Curr Eye Res 1986;5:887-9; Tiffany et al., "Meniscometry using the Tearscope-plus (ARVO abstract). Invest Ophthalmol Vis Sci 2001;42. s37; Yokoi et al., "Correlation of tear lipid layer interference patterns with the diagnosis and severity of dry eye", Am J Ophthalmol 1996;122:818-24; Yokoi et al., "Assessment of meibomian gland function in dry eye using meibometry", Arch Ophthalmol 1999;117:723-9); (8) Tear Stability Analyses System (TSAS) to diagnose tear instability (e.g., Goto et al., "Tear Film Stability Analysis System: Introducing a new application for videokeratography", Cornea 2004a; Nov;23(8):S65-S70; Goto et al., "Evaluation of the tear film stability after laser in situ keratomileusis using the tear film stability analysis system", Am J Ophthalmol 2004b Jan;137(1):116-20; Kojima et al., "A new noninvasive tear stability analysis system for the assessment of dry eyes" Invest Ophthalmol Vis Sci 2004;May;45(5):1369-74); (9) meibometry to assess Meibomian gland dysfunction (e.g., Chew et al., "An instrument for quantifying meibomian lipid on the lid margin: the Meibometer", Curr Eye Res 1993a;12:247-254; Chew et al., "The casual level of meibomian lipids in humans", Current Eye Research 1993b;12:255-259; Komuro et al., "Assessment of meibomian gland function by a newly developed laser meibometer", Adv Exp Med Biol 2002;506:517-520; Yokoi et al., "Assessment of meibomian gland function in dry eye using meibometry" Arch Ophthalmol 1999;117:723-729); (10) meibography or meiboscopy to measure Meibomian gland dysfunction (e.g., Kaercher, "Ocular symptoms and signs in patients with ectodermal dysplasia symdromes", Grafes Arch Clin Exp Ophthalmol 2004;495-500; Jester et al., "In vivo biomcroscopy and photography of meibomian glands in a rabbit model of meibomian gland dysfunction", Invest Ophthalmol Vis Sci 1982;22:660-7; Mathers et al., "Video imaging of the meibomian gland", Arch Ophthalmol 1994;112:448-9; Pflugfelder, et al., "Evaluation of subjective assessments and objective diagnostic tests for diagnosing tear-film disorders known to cause ocular irritation", Cornea 1998;17(1):38-56; Robin et al., "In vivo transillumination biomicroscopy and photography of meibomian gland dysfunction. Ophthalmology 1985;92:1423-6; Shimazaki et al., "Meibomian gland dysfunction in patients with Sjogren syndrome", Ophthalmology 1998;105(8):1485-8; Yokoi

et al., "A newly developed video-meibography system featuring a newly designed probe", Jpn J Ophthalmol 2007; 51: 53-6); (11) Brush Cytology Technique (e.g., Fukagawa et al., "Histological evaluation of brush cytology of rabbit conjunctiva", Nippon Ganka Gakkai Zasshi 1993;97:1173-8; Fujihara et al., "Evaluation of human conjunctival epithelium by a combination of brush cytology and flow cytometry: an approach to the quantitative technique", Diagn Cytopathol 1997;17:456-60; Miyoshi et al., "Interleukin-8 concentrations in conjunctival epithelium brush cytology samples correlate with neutrophil, eosinophil infiltration, and corneal damage", Cornea 2001;20:743-7; Takano et al., "Inflammatory cells in brush cytology samples correlate with the severity of corneal lesions in atopic keratoconjunctivitis", Br J Ophthalmol 2004;88:1504-5; Tsubota et al., "Brush cytology for the evaluation of dry-eye", Nippon Ganka Gakkai Zasshi 1990a ;94:224-30; Tsubota et al., "Conjunctival brush cytology", Acta Cytol 1990 b;34:233-5; Tsubota et al., "Detection by brush cytology of mast cells and eosinophils in allergic and vernal conjunctivitis"; Cornea 1991;10:525-31); (12) Flow cytometry in impression cytology to detect conjuctivial inflammation (e.g., Baudouin et al., "Flow cytometry in impression cytology specimens. A new method for evaluation of conjunctival Inflammation", Invest Ophthalmol Vis Sci 1997a;38:1458-1464; Bourcier et al., "Expression of CD40 and CD40 ligand in the human conjunctival epithelium", Invest Ophthalmol Vis Sci 2000;41:120-126; Brignole et al., "Expression of Fas antigen (CD95) in the human conjunctival epithelium. Positive correlation with class II HLA DR expression in inflammatory conditions", Exp Eye Res 1998;67:687-697; Brignole et al., "Flow cytometric analysis of inflammatory markers in conjunctival epithelial cells of patients with dry eyes" Invest Ophthalmol Vis Sci 2000; 41:1356-1363; Brignole et al., "Flow cytometric analysis of inflammatory markers in KCS: 6-month treatment with topical cyclosporin A", Invest Ophthalmol Vis Sci 2001;42:90-95; Brignole et al., "Flow cytometry in conjunctival impression cytology: a new tool for exploring ocular surface pathologies", Exp Eye Res 2004;78:473-481; Fujihara et al., "Evaluation of human conjunctival epithelium by a combination of brush cytology and flow cytometry: an approach to the quantitative technique" Diagn Cytopathol 1997;17:456-460; Pisella et al., "Flow cytometric analysis of conjunctival epithelium in ocular rosacea and keratoconjunctivitis sicca. Ophthalmology 2000;107:1841-1849; Pisella, et al., "Conjunctival proinflammatory and proapoptotic effects of latanoprost, preserved timolol and unpreserved timolol: an ex vivo and in vitro study. Invest Ophthalmol Vis Sci 2004;45:1360-1368); (13) the Ferning test to diagnose the quality of tears (electrolyte concentration), KCS, and hyperosmolarity (e.g., Albach et al., "Diagnosis of keratoconjunctivitis sicca in rheumatoid arthritis. The value of

various tests", Ophthalmologe 1994 Apr;91(2):229-34; Golding et al., "X-ray and scanning electron microscopic analysis of the structural composition of tear ferns", Cornea 1994 Jan;13(1):58-66; Norn, "Quantitative tear ferning. Clinical investigations", Acta Ophthalmol (Copenh) 1994 Jun;72(3):369-72; Pearce et al., "Spatial location studies on the chemical composition of human tear ferns", Ophthalmic Physiol Opt 2000;Jul;20(4):306-13; Pensyl et al., "The repeatability of tear mucus ferning grading", Optom Vis Sci 1998 Aug;75(8):600-4; Rolando, "Tear mucus ferning test in normal and keratoconjunctivitis sicca eyes. Chibret Int J Ophthalmol 1984;2(4):32-41; Rolando et al., "Tear mucus ferning test in keratoconjunctivitis sicca",in: Holly FJ, Lamberts DW, MacKeen DL (eds.): The preocular tear film in health, disease, and contact lens wear,. 1st Intern Tear Film Symposium. Lubbok (Texas, USA), Dry Eye Institute, 1986, 203-210; Rolando et al., "The effect of hyperosmolarity on tear mucus ferning", Fortschr Ophthalmol 1986;83:644-646; Rolando et al., "Tear mucus crystallization in children with cystic fibrosis", Ophthalmologica 1988;197(4):202-6); (14) Ocular Protection Index (OPI) to assess ocular surface protection and risk of ocular surface damage (e.g., Ousler et al., "Factors that influence the inter-blink interval (IBI) as measured by the ocular protection index (OPI)", (Poster presentation) ARVO 2002; Nally et al., "Ocular discomfort and tear film break-up time in dry eye patients: A correlation", Invest Ophthalmol Vis Sci 2000;41:4:1436; Abelson et al., "Alternate reference values for tear film break-up time in normal and dry eye populations", Lacrimal Gland, Tear Film, and Dry Eye Syndromes 3 Part B", Adv Exp Med Biol 2002; 506:1121-1125; Abelson et al., "Dry eye syndrome: diagnosis, clinical trials, and pharmaceutical treatment—'improving clinical trials'. Lacrimal Gland, Tear Film, and Dry Eye Syndromes 3 Part B", Adv Exp Med Biol 2002; 506:1079-86); (15) fluorophotometry (fluorimetry) of tear flow to assess changes in tear flow in aqueous tear deficiency (ATD) (e.g., Gobbels et al., "Tear secretion in dry eyes as assessed by objective fluorophotometry. Ger J Ophthalmol 1992; 1:350-353; Kuppens et al., "Basal tear turnover and topical timolol in glaucoma patients and healthy controls by Fluorophotometry", Invest Ophthalmol Vis Sci 1992; 33:3442-3448; Mishima, "Some physiological aspects of the precorneal tear film", Arch Ophthalmol 1965;73:233-241; Mishima S, "Determination of tear volume and tear flow", Invest Ophthalmol 1966; 5:264-275; Mathers et al., "Tear film and evaporation in patients with and without dry eye", Ophthalmology 1996; 103:664-669; Mathers et al., "Tear film changes associated with normal aging", Cornea 1996; 15:229-334; Mathers, "Evaporation from the ocular surface", Exp Eye Res 2004; 78:389-394; Van Best et al., "Measurement of basal tear turnover using a standardized protocol", Graefe's Arch Clin Exp Ophthalmol 1995; 233:1-7; McNamara et al.,

"Fluorometry in contact lens research: The next step", Optom Vis Sci 1998; 75:316-322; Pearce, "An improved fluorophotometric method for tear turnover assessment", Optom Vis Sci 2001; 78:30-36), and combinations of these diagnostic tests, the disclosures of each reference are incorporated herein by reference in their entireties. These methods can also be used to assess the clinical efficacy of the compounds described herein in treating dry eye disorders.

In a further aspect, the present invention provides a method of treating conjunctivitis, uveitis (including chronic uveitis), chorioditis, retinitis, cyclitis, scleritis, episcleritis, or iritis; treating inflammation or pain related to corneal transplant, LASIK (laser assisted in situ keratomileusis), photorefractive keratectomy, or LASEK (laser assisted sub-epithelial keratomileusis); inhibiting loss of visual acuity related to corneal transplant, LASIK, photorefractive keratectomy, or LASEK; or inhibiting transplant rejection in a patient in need thereof, comprising administering to the patient a therapeutically effective amount of a compound of Formula I, or pharmaceutically acceptable salt or N-oxide thereof. In some embodiments, the compound, or pharmaceutically acceptable salt or N-oxide thereof, is administered preoperatively to a patient about to undergo a procedure selected from corneal transplant, LASIK, photorefractive keratectomy, and LASEK. In some embodiments, the compound, or pharmaceutically acceptable salt or N-oxide thereof, suppresses or lessens inflammation or pain during and after the procedure. In some embodiments, the compound, or pharmaceutically acceptable salt or N-oxide thereof, is administered about 1 day to about 2 days prior to the procedure. In some embodiments, the compound, or pharmaceutically acceptable salt or N-oxide thereof, is administered postoperatively to a patient who has undergone a procedure selected from corneal transplant, LASIK, photorefractive keratectomy, and LASEK. In some embodiments, inhibiting loss of visual acuity means lessening the loss of visual acuity. In some embodiments, the postoperative or preoperative treatment lessens the amount of scarring and fibrous deposits following the procedure. In some embodiments, inhibiting loss of visual acuity means that the patient retains visual acuity. In some embodiments, inhibiting transplant rejection means that the compound, or pharmaceutically acceptable salt or N-oxide thereof, is immunosuppressive, thereby preventing total rejection of the corneal transplant.

As used herein, the term "contacting" refers to the bringing together of indicated moieties in an *in vitro* system or an *in vivo* system. For example, "contacting" a JAK with a compound of the invention includes the administration of a compound of the present invention to an individual or patient, such as a human, having a JAK, as well as, for example,

introducing a compound of the invention into a sample containing a cellular or purified preparation containing the JAK.

As used herein, the term "individual" or "patient," used interchangeably, refers to any animal, including mammals, preferably mice, rats, other rodents, rabbits, dogs, cats, swine, cattle, sheep, horses, or primates, and most preferably humans.

As used herein, the phrase "therapeutically effective amount" refers to the amount of active compound or pharmaceutical agent that elicits the biological or medicinal response that is being sought in a tissue, system, animal, individual or human by a researcher, veterinarian, medical doctor or other clinician.

As used herein, the term "treating" or "treatment" refers to one or more of (1) preventing the disease; for example, preventing a disease, condition or disorder in an individual who may be predisposed to the disease, condition or disorder but does not yet experience or display the pathology or symptomatology of the disease; (2) inhibiting the disease; for example, inhibiting a disease, condition or disorder in an individual who is experiencing or displaying the pathology or symptomatology of the disease, condition or disorder; and (3) ameliorating the disease; for example, ameliorating a disease, condition or disorder in an individual who is experiencing or displaying the pathology or symptomatology of the disease, condition or disorder (i.e., reversing the pathology and/or symptomatology) such as decreasing the severity of disease.

Combination Therapies

One or more additional pharmaceutical agents such as, for example, chemotherapeutics, anti-inflammatory agents, steroids, immunosuppressants, as well as Bcr-Abl, Flt-3, RAF and FAK kinase inhibitors such as, for example, those described in WO 2006/056399, or other agents can be used in combination with the compounds of the present invention for treatment of JAK-associated diseases, disorders or conditions. The one or more additional pharmaceutical agents can be administered to a patient simultaneously or sequentially.

Example chemotherapeutic include proteosome inhibitors (*e.g.*, bortezomib), thalidomide, revlimid, and DNA-damaging agents such as melphalan, doxorubicin, cyclophosphamide, vincristine etoposide, carmustine, and the like.

Example steroids include coriticosteroids such as dexamethasone or prednisone.

Example Bcr-Abl inhibitors include the compounds, and pharmaceutically acceptable salts thereof, of the genera and species disclosed in U.S. Pat. No. 5,521,184, WO 04/005281, and U.S. Ser. No. 60/578,491.

Example suitable Flt-3 inhibitors include compounds, and their pharmaceutically acceptable salts, as disclosed in WO 03/037347, WO 03/099771, and WO 04/046120.

Example suitable RAF inhibitors include compounds, and their pharmaceutically acceptable salts, as disclosed in WO 00/09495 and WO 05/028444.

Example suitable FAK inhibitors include compounds, and their pharmaceutically acceptable salts, as disclosed in WO 04/080980, WO 04/056786, WO 03/024967, WO 01/064655, WO 00/053595, and WO 01/014402.

In some embodiments, one or more of the compounds of the invention can be used in combination with one or more other kinase inhibitors including imatinib, particularly for treating patients resistant to imatinib or other kinase inhibitors.

In some embodiments, one or more JAK inhibitors of the invention can be used in combination with a chemotherapeutic in the treatment of cancer, such as multiple myeloma, and may improve the treatment response as compared to the response to the chemotherapeutic agent alone, without exacerbation of its toxic effects. Examples of additional pharmaceutical agents used in the treatment of multiple myeloma, for example, can include, without limitation, melphalan, melphalan plus prednisone [MP], doxorubicin, dexamethasone, and Velcade (bortezomib). Further additional agents used in the treatment of multiple myeloma include Bcr-Abl, Flt-3, RAF and FAK kinase inhibitors. Additive or synergistic effects are desirable outcomes of combining a JAK inhibitor of the present invention with an additional agent. Furthermore, resistance of multiple myeloma cells to agents such as dexamethasone may be reversible upon treatment with a JAK inhibitor of the present invention. The agents can be combined with the present compounds in a single or continuous dosage form, or the agents can be administered simultaneously or sequentially as separate dosage forms.

In some embodiments, a corticosteroid such as dexamethasone is administered to a patient in combination with at least one JAK inhibitor where the dexamethasone is administered intermittently as opposed to continuously.

In some further embodiments, combinations of one or more JAK inhibitors of the invention with other therapeutic agents can be administered to a patient prior to, during, and/or after a bone marrow transplant or stem cell transplant.

In some embodiments, at least one additional therapeutic agent can be used in connection with treatment of dry eye disorders and other disorders of the eye. In some embodiments, the additional therapeutic agent is fluocinolone acetonide (Retisert®), or rimexolone (AL-2178, Vexol, Alcon). In some embodiments, the additional therapeutic agent is cyclosporine (Restasis®). In some embodiments, the additional therapeutic agent is a corticosteroid. In some embodiments, the corticosteroid is triaminolone, dexamethasone, fluocinolone, cortisone, prednisolone, or flumetholone.

In some embodiments, the additional therapeutic agent is selected from Dehydrex™ (Holles Labs), Civamide (Opko), sodium hyaluonate (Vismed, Lantibio/TRB Chemedia), cyclosporine (ST-603, Sirion Therapeutics), ARG101(T) (testosterone, Argentis), AGR1012(P) (Argentis), ecabet sodium (Senju-Ista), gefarnate (Santen), 15-(s)-hydroxyeicosatetraenoic acid (15(S)-HETE), cevilemine, doxycline (ALTY-0501, Alacrity), minocycline, iDestrin™ (NP50301, Nascent Pharmaceuticals), cyclosporine A (Nova22007, Novagali), oxytetracycline (Duramycin, MOLI1901, Lantibio), CF101 (2S,3S,4R,5R)-3,4-dihydroxy-5-[6-[(3-iodophenyl)methylamino]purin-9-yl]-N-m ethyl-oxolane-2-carbamyl, Can-Fite Biopharma), voclosporin (LX212 or LX214, Lux Biosciences), ARG103 (Agentis), RX-10045 (synthetic resolvin analog, Resolvyx), DYN15 (Dyanmis Therapeutics), rivoglitazone (DE011, Daiichi Sanko), TB4 (RegeneRx), OPH-01 (Ophtalmis Monaco), PCS101 (Pericor Science), REV1-31 (Evolutec), Lacritin (Senju), rebamipide (Otsuka-Novartis). OT-551 (Othera), PAI-2 (University of Pennsylvania and Temple University), pilocarpine, tacrolimus, pimecrolimus (AMS981, Novartis), loteprednol etabonate, rituximab, diquafosol tetrasodium (INS365, Inspire), KLS-0611 (Kissei Pharmaceuticals), dehydroepiandrosterone, anakinra, efalizumab, mycophenolate sodium, etanercept (Embrel®), hydroxychloroquine, NGX267 (TorreyPines Therapeutics), or thalidomide.

In some embodiments, the additional therapeutic agent is an anti-angiogenic agent, cholinergic agonist, TRP-1 receptor modulator, a calcium channel blocker, a mucin secretagogue, MUC1 stimulant, a calcineurin inhibitor, a corticosteroid, a P2Y2 receptor agonist, a muscarinic receptor agonist, another JAK inhibitor, Bcr-Abl kinase inhibitor, Flt-3 kinase inhibitor, RAF kinase inhibitor, and FAK kinase inhibitor such as, for example, those described in WO 2006/056399. In some embodiments, the additional therapeutic agent is a tetracycline derivative (e.g., minocycline or doxycline).

In some embodiments, the additional therapeutic agent(s) are demulcent eye drops (also known as "artificial tears"), which include, but are not limited to, compositions containing polyvinylalcohol, hydroxypropyl methylcellulose, glycerin, polyethylene glycol

(e.g. PEG400), or carboxymethyl cellulose. Artificial tears can help in the treatment dry eye by compensating for reduced moistening and lubricating capacity of the tear film. In some embodiments, the additional therapeutic agent is a mucolytic drug, such as N-acetyl-cysteine, which can interact with the mucoproteins and, therefore, to decrease the viscosity of the tear film.

In some embodiments, the additional therapeutic agent includes an antibiotic, antiviral, antifungal, anesthetic, anti-inflammatory agents including steroidal and non-steroidal anti-inflammatories, and anti-allergic agents. Examples of suitable medicaments include aminoglycosides such as amikacin, gentamycin, tobramycin, streptomycin, netilmycin, and kanamycin; fluoroquinolones such as ciprofloxacin, norfloxacin, ofloxacin, trovafloxacin, lomefloxacin, levofloxacin, and enoxacin; naphthyridine; sulfonamides; polymyxin; chloramphenicol; neomycin; paramomomycin; colistimethate; bacitracin; vancomycin; tetracyclines; rifampin and its derivatives ("rifampins"); cycloserine; beta-lactams; cephalosporins; amphotericins; fluconazole; flucytosine; natamycin; miconazole; ketoconazole; corticosteroids; diclofenac; flurbiprofen; ketorolac; suprofen; comolyn; lodoxamide; levocabastin; naphazoling; antazoline; pheniramimane; or azalide antibiotic.

Pharmaceutical Formulations and Dosage Forms

When employed as pharmaceuticals, the compounds of the invention can be administered in the form of pharmaceutical compositions. These compositions can be prepared in a manner well known in the pharmaceutical art, and can be administered by a variety of routes, depending upon whether local or systemic treatment is desired and upon the area to be treated. Administration may be topical (including transdermal, epidermal, ophthalmic and to mucous membranes including intranasal, vaginal and rectal delivery), pulmonary (*e.g.*, by inhalation or insufflation of powders or aerosols, including by nebulizer; intratracheal or intranasal), oral or parenteral. Parenteral administration includes intravenous, intraarterial, subcutaneous, intraperitoneal intramuscular or injection or infusion; or intracranial, *e.g.*, intrathecal or intraventricular, administration. Parenteral administration can be in the form of a single bolus dose, or may be, for example, by a continuous perfusion pump. Pharmaceutical compositions and formulations for topical administration may include transdermal patches, ointments, lotions, creams, gels, drops, suppositories, sprays, liquids and powders. Conventional pharmaceutical carriers, aqueous, powder or oily bases, thickeners and the like may be necessary or desirable. Coated condoms, gloves and the like may also be useful.

This invention also includes pharmaceutical compositions which contain, as the active ingredient, one or more of the compounds of the invention above in combination with one or more pharmaceutically acceptable carriers (excipients). In making the compositions of the invention, the active ingredient is typically mixed with an excipient, diluted by an excipient or enclosed within such a carrier in the form of, for example, a capsule, sachet, paper, or other container. When the excipient serves as a diluent, it can be a solid, semi-solid, or liquid material, which acts as a vehicle, carrier or medium for the active ingredient. Thus, the compositions can be in the form of tablets, pills, powders, lozenges, sachets, cachets, elixirs, suspensions, emulsions, solutions, syrups, aerosols (as a solid or in a liquid medium), ointments containing, for example, up to 10% by weight of the active compound, soft and hard gelatin capsules, suppositories, sterile injectable solutions, and sterile packaged powders.

In preparing a formulation, the active compound can be milled to provide the appropriate particle size prior to combining with the other ingredients. If the active compound is substantially insoluble, it can be milled to a particle size of less than 200 mesh. If the active compound is substantially water soluble, the particle size can be adjusted by milling to provide a substantially uniform distribution in the formulation, *e.g.* about 40 mesh.

The compounds of the invention may be milled using known milling procedures such as wet milling to obtain a particle size appropriate for tablet formation and for other formulation types. Finely divided (nanoparticulate) preparations of the compounds of the invention can be prepared by processes known in the art, for example see International Patent Application No. WO 2002/000196.

Some examples of suitable excipients include lactose, dextrose, sucrose, sorbitol, mannitol, starches, gum acacia, calcium phosphate, alginates, tragacanth, gelatin, calcium silicate, microcrystalline cellulose, polyvinylpyrrolidone, cellulose, water, syrup, and methyl cellulose. The formulations can additionally include: lubricating agents such as talc, magnesium stearate, and mineral oil; wetting agents; emulsifying and suspending agents; preserving agents such as methyl- and propylhydroxy-benzoates; sweetening agents; and flavoring agents. The compositions of the invention can be formulated so as to provide quick, sustained or delayed release of the active ingredient after administration to the patient by employing procedures known in the art.

The compositions can be formulated in a unit dosage form, each dosage containing from about 5 to about 1000 mg (1 g), more usually about 100 to about 500 mg, of the active ingredient. The term "unit dosage forms" refers to physically discrete units suitable as unitary

dosages for human subjects and other mammals, each unit containing a predetermined quantity of active material calculated to produce the desired therapeutic effect, in association with a suitable pharmaceutical excipient.

The active compound can be effective over a wide dosage range and is generally administered in a pharmaceutically effective amount. It will be understood, however, that the amount of the compound actually administered will usually be determined by a physician, according to the relevant circumstances, including the condition to be treated, the chosen route of administration, the actual compound administered, the age, weight, and response of the individual patient, the severity of the patient's symptoms, and the like.

For preparing solid compositions such as tablets, the principal active ingredient is mixed with a pharmaceutical excipient to form a solid preformulation composition containing a homogeneous mixture of a compound of the present invention. When referring to these preformulation compositions as homogeneous, the active ingredient is typically dispersed evenly throughout the composition so that the composition can be readily subdivided into equally effective unit dosage forms such as tablets, pills and capsules. This solid preformulation is then subdivided into unit dosage forms of the type described above containing from, for example, about 0.1 to about 1000 mg of the active ingredient of the present invention.

The tablets or pills of the present invention can be coated or otherwise compounded to provide a dosage form affording the advantage of prolonged action. For example, the tablet or pill can comprise an inner dosage and an outer dosage component, the latter being in the form of an envelope over the former. The two components can be separated by an enteric layer which serves to resist disintegration in the stomach and permit the inner component to pass intact into the duodenum or to be delayed in release. A variety of materials can be used for such enteric layers or coatings, such materials including a number of polymeric acids and mixtures of polymeric acids with such materials as shellac, cetyl alcohol, and cellulose acetate.

The liquid forms in which the compounds and compositions of the present invention can be incorporated for administration orally or by injection include aqueous solutions, suitably flavored syrups, aqueous or oil suspensions, and flavored emulsions with edible oils such as cottonseed oil, sesame oil, coconut oil, or peanut oil, as well as elixirs and similar pharmaceutical vehicles.

Compositions for inhalation or insufflation include solutions and suspensions in pharmaceutically acceptable, aqueous or organic solvents, or mixtures thereof, and powders.

The liquid or solid compositions may contain suitable pharmaceutically acceptable excipients as described *supra*. In some embodiments, the compositions are administered by the oral or nasal respiratory route for local or systemic effect. Compositions in can be nebulized by use of inert gases. Nebulized solutions may be breathed directly from the nebulizing device or the nebulizing device can be attached to a face masks tent, or intermittent positive pressure breathing machine. Solution, suspension, or powder compositions can be administered orally or nasally from devices which deliver the formulation in an appropriate manner.

The amount of compound or composition administered to a patient will vary depending upon what is being administered, the purpose of the administration, such as prophylaxis or therapy, the state of the patient, the manner of administration, and the like. In therapeutic applications, compositions can be administered to a patient already suffering from a disease in an amount sufficient to cure or at least partially arrest the symptoms of the disease and its complications. Effective doses will depend on the disease condition being treated as well as by the judgment of the attending clinician depending upon factors such as the severity of the disease, the age, weight and general condition of the patient, and the like.

The compositions administered to a patient can be in the form of pharmaceutical compositions described above. These compositions can be sterilized by conventional sterilization techniques, or may be sterile filtered. Aqueous solutions can be packaged for use as is, or lyophilized, the lyophilized preparation being combined with a sterile aqueous carrier prior to administration. The pH of the compound preparations typically will be between 3 and 11, more preferably from 5 to 9 and most preferably from 7 to 8. It will be understood that use of certain of the foregoing excipients, carriers, or stabilizers will result in the formation of pharmaceutical salts.

The therapeutic dosage of the compounds of the present invention can vary according to, for example, the particular use for which the treatment is made, the manner of administration of the compound, the health and condition of the patient, and the judgment of the prescribing physician. The proportion or concentration of a compound of the invention in a pharmaceutical composition can vary depending upon a number of factors including dosage, chemical characteristics (*e.g.*, hydrophobicity), and the route of administration. For example, the compounds of the invention can be provided in an aqueous physiological buffer solution containing about 0.1 to about 10% w/v of the compound for parenteral administration. Some typical dose ranges are from about 1 µg/kg to about 1 g/kg of body weight per day. In some embodiments, the dose range is from about 0.01 mg/kg to about 100

mg/kg of body weight per day. The dosage is likely to depend on such variables as the type and extent of progression of the disease or disorder, the overall health status of the particular patient, the relative biological efficacy of the compound selected, formulation of the excipient, and its route of administration. Effective doses can be extrapolated from dose-response curves derived from *in vitro* or animal model test systems.

In some embodiments, the compound of the invention, or pharmaceutically acceptable salt thereof, is administered as an ophthalmic composition. Accordingly, in some embodiments, the methods comprise administration of the compound, or pharmaceutically acceptable salt thereof, and an ophthalmically acceptable carrier. In some embodiments, the ophthalmic composition is a liquid composition, semi-solid composition, insert, film, microparticles or nanooparticles.

In some embodiments, the ophthalmic composition is a liquid composition. In some embodiments, the ophthalmic composition is a semi-solid composition. In some embodiments, the ophthalmic composition is an topical composition. The topical compositions include, but are not limited to liquid and semi-solid compositions. In some embodiments, the ophthalmic composition is a topical composition. In some embodiments, the topical composition comprises aqueous solution, an aqueous suspension, an ointment or a gel. In some embodiments, the ophthalmic composition is topically applied to the front of the eye, under the upper eyelid, on the lower eyelid and in the cul-de-sac. In some embodiments, the ophthalmic composition is sterilized. The sterilization can be accomplished by known techniques like sterilizing filtration of the solution or by heating of the solution in the ampoule ready for use. The ophthalmic compositions of the invention can further contain pharmaceutical excipients suitable for the preparation of ophthalmic formulations. Examples of such excipients are preserving agents, buffering agents, chelating agents, antioxidant agents and salts for regulating the osmotic pressure.

As used herein, the term "ophthalmically acceptable carrier" refers to any material that can contain and release the compound, or pharmaceutically acceptable salt or N-oxide thereof, and that is compatible with the eye. In some embodiments, the ophthalmically acceptable carrier is water or an aqueous solution or suspension, but also includes oils such as those used to make ointments and polymer matrices such as used in ocular inserts. In some embodiments, the composition may be an aqueous suspension comprising the compound, or pharmaceutically acceptable salt or N-oxide thereof. Liquid ophthalmic compositions, including both ointments and suspensions, may have a viscosity that is suited for the selected

route of administration. In some embodiments, the ophthalmic composition has a viscosity in the range of from about 1,000 to about 30,000 centipoise.

In some embodiments, the liquid composition further comprises a polymer. These polymers may be used to improve the bioavailability, raise viscosity, or reduce drainage from the eye for a liquid formulation. In some embodiments, the polymers include, but are not limited to, those described in Wagh, et al., "Polymers used in ocular dosage form and drug delivery systems", *Asian J. Pharm.*, pages 12-17 (Jan. 2008), which is incorporated herein by reference in its entirety. In some embodiments, the polymer is sodium hyaluronase, chitosan, a cyclodextrin (e.g., hydroxypropyl β-cyclodextrin), polygalactoronic acid, xyloglucan, xanthan gum, gellan gum, a thiomer, a poly(ortho ester) (e.g., as described in Einmahl, *Adv. Drug. Deliv. Rev.* 53:45-73 (2001), which is incorporated herein by reference in its entirety), or a tamarind seed polysaccharide (e.g., as described in Ghelardi, et al., Antimicrob. Agents Chemother. 48:3396-3401 (2004), which is incorporated herein by reference in its entirety).

In some embodiments, the ophthalmic compositions may further comprise one or more of surfactants, adjuvants, buffers, antioxidants, tonicity adjusters, preservatives (e.g., EDTA, BAK (benzalkonium chloride), sodium chlorite, sodium perborate, polyquaterium-1), thickeners or viscosity modifiers (e.g., carboxymethyl cellulose, hydroxymethyl cellulose, polyvinyl alcohol, polyethylene glycol, glycol 400, propylene glycol hydroxymethyl cellulose, hydroxpropyl-guar, hyaluronic acid, and hydroxypropyl cellulose) and the like. Additives in the formulation may include, but are not limited to, sodium chloride, sodium bicarbonate, sorbic acid, methyl paraben, propyl paraben, chlorhexidine, castor oil, and sodium perborate.

Aqueous ophthalmic compositions (solutions or suspensions) generally do not contain physiologically or ophthalmically harmful constituents. In some embodiments, purified or deionized water is used in the composition. The pH may be adjusted by adding any physiologically and ophthalmically acceptable pH adjusting acids, bases or buffers to within the range of about 5.0 to 8.5. Ophthalmically acceptable examples of acids include acetic, boric, citric, lactic, phosphoric, hydrochloric, and the like, and examples of bases include sodium hydroxide, sodium phosphate, sodium borate, sodium citrate, sodium acetate, sodium lactate, tromethamine, trishydroxymethylamino-methane, and the like. Salts and buffers include citrate/dextrose, sodium bicarbonate, ammonium chloride and mixtures of the aforementioned acids and bases.

In some embodiments, the osmotic pressure of the ophthalmic composition may be from about 10 milliosmolar (mOsM) to about 400 mOsM, or from 260 to about 340 mOsM. In some embodiments, the osmotic pressure can be adjusted by using appropriate amounts of physiologically and ophthalmically acceptable salts or excipients. In further embodiments, sodium chloride may be used to approximate physiologic fluid. In other embodiments, the composition comprises sodium chloride ranging from about 0.01% to about 1% by weight, or from about 0.05% to about 0.45% by weight, based on the total weight of the composition. Equivalent amounts of one or more salts made up of cations such as potassium, ammonium and the like and anions such as chloride, citrate, ascorbate, borate, phosphate, bicarbonate, sulfate, thiosulfate, bisulfate, sodium bisulfate, ammonium sulfate, and the like can also be used in addition to or instead of sodium chloride to achieve osmolalities within the above stated range. Similarly, a sugar such as mannitol, dextrose, sorbitol, glucose and the like can also be used to adjust osmolality.

In some embodiments, the methods involve forming or supplying a depot of the therapeutic agent in contact with the external surface of the eye. A depot refers to a source of therapeutic agent that is not rapidly removed by tears or other eye clearance mechanisms. This allows for continued, sustained high concentrations of therapeutic agent be present in the fluid on the external surface of the eye by a single application. Without wishing to be bound by any theory, it is believed that absorption and penetration may be dependent on both the dissolved drug concentration and the contact duration of the external tissue with the drug containing fluid. As the drug is removed by clearance of the ocular fluid and/or absorption into the eye tissue, more drug is provided, e.g. dissolved, into the replenished ocular fluid from the depot. Accordingly, the use of a depot may more easily facilitate loading of the ocular tissue for more insoluble therapeutic agents. In some embodiments, the depot can remain for up to eight hours or more. In some embodiments, the ophthalmic depot forms includes, but is not limited to, aqueous polymeric suspensions, ointments, and solid inserts.

In some embodiments, a semi-solid composition is a liquid formulation which increases in viscosity upon application to the eye, usually because of a polymer in the liquid formulation. This viscosity increase may be triggered by a change in temperature, pH, or electrolyte concentration. In some embodiments, the polymer include, but are not limited to, those described for semi-solid dosage forms in Wagh, et al., "Polymers used in ocular dosage form and drug delivery systems", *Asian J. Pharm.*, pages 12-17 (Jan. 2008), which is incorporated herein by reference in its entirety. In some embodiments, the polymer is celluloseacetophthalate, polyacrylic acid, gellan gum, hyaluronase, chitosan, salts of alginic

acid (e.g., sodium alginate), or a block copolymer of ethylene oxide and propylene oxide (e.g., Pluronic®, BASF; poloxamer). In some embodiment, the polyacrylic acid is crosslinked acrylic acid (e.g., Carbopol®). In some embodiments, the semi-solid composition comprises a mixture of carbopol and a block copolymer of ethylene oxide and propylene oxide; a mixture of methyl cellulose and hydroxyethyl cellulose; or a mixture of polyethylene glycol and a block copolymer of ethylene oxide and propylene oxide.

In some embodiments, the ophthalmic composition is an ointment or gel. In some embodiment, the ophthalmic composition is an oil-based delivery vehicle. In some embodiments, the composition comprises a petroleum or lanolin base to which is added the active ingredient, usually as 0.1 to 2%, and excipients. Common bases may include, but are not limited to, mineral oil, petrolatum and combinations thereof. In some embodiments, the ointment is applied as a ribbon onto the lower eyelid.

In some embodiment, the ophthalmic composition is an ophthalmic insert. In some embodiments, the ophthalmic insert is biologically inert, soft, bio-erodible, viscoelastic, stable to sterilization after exposure to therapeutic agents, resistant to infections from air borne bacteria, bio- erodible, biocompatible, and/or viscoelastic. In some embodiments, the insert comprises an ophthalmically acceptable matrix, e.g., a polymer matrix. The matrix is typically a polymer and the therapeutic agent is generally dispersed therein or bonded to the polymer matrix. In some embodiments, the therapeutic agent may slowly released from the matrix through dissolution or hydrolysis of the covalent bond. In some embodiments, the polymer is bioerodible (soluble) and the dissolution rate thereof can control the release rate of the therapeutic agent dispersed therein. In another form, the polymer matrix is a biodegradable polymer that breaks down such as by hydrolysis to thereby release the therapeutic agent bonded thereto or dispersed therein. In further embodiments, the matrix and therapeutic agent can be surrounded with an additional polymeric coating to further control release. In some embodiments, the insert comprises a biodegradable polymer such as polycaprolactone (PCL), an ethylene/vinyl acetate copolymer (EVA), polyalkyl cyanoacrylate, polyurethane, a nylon, or poly (dl-lactide-co-glycolide) (PLGA), or a copolymer of any of these. In some embodiments, the therapeutic agent is dispersed into the matrix material or dispersed amongst the monomer composition used to make the matrix material prior to polymerization. In some embodiments, the amount of therapeutic agent is from about 0.1 to about 50%, or from about 2 to about 20%. In further embodiments, the biodegradable or bioerodible polymer matrix is used so that the spent insert does not have to

be removed. As the biodegradable or bioerodible polymer is degraded or dissolved, the therapeutic agent is released.

In further embodiments, the ophthalmic insert comprises a polymer, including, but are not limited to, those described in Wagh, et al., "Polymers used in ocular dosage form and drug delivery systems", *Asian J. Pharm.*, pages 12-17 (Jan. 2008), which is incorporated herein by reference in its entirety. In some embodiments, the insert comprises a polymer selected from polyvinylpyrrolidone (PVP), an acrylate or methacrylate polymer or copolymer (e.g., Eudragit® family of polymers from Rohm or Degussa), hydroxymethyl cellulose, polyacrylic acid, poly(amidoamine) dendrimers, poly(dimethyl siloxane), polyethylene oxide, poly(lactide-co-glycolide), poly(2-hydroxyethylmethacrylate), poly(vinyl alcohol), or poly(propylene fumarate). In some embodiments, the insert comprises Gelfoam® R. In some embodiments, the insert is a polyacrylic acid of 450 kDa-cysteine conjugante.

In some embodiments, the ophthalmic composition is a ophthalmic film. Polymers suitable for such films include, but are not limited to, those described in Wagh, et al., "Polymers used in ocular dosage form and drug delivery systems", *Asian J. Pharm.*, pages 12-17 (Jan. 2008), In some embodiments, the film is a soft-contract lense, such as ones made from copolymers of N,N-diethylacrylamide and methacrylic acid crosslinked with ethyleneglycol dimethacrylate.

In some embodiments, the insert comprises a core comprising the therapeutic agent and an outer tube (see e.g., U.S. Patent Pub. No. 20040009222, which is incorporated herein by reference in its entirety). In some embodiments, the outer tube may be permeable, semi-permeable, or impermeable to the drug. In some embodiments, the drug core may include a polymer matrix which does not significantly affect the release rate of the drug. In some embodiments, the outer tube, the polymer matrix of the drug core, or both may be bioerodible. In some embodiments, the co-extruded product can be segmented into drug delivery devices. In some embodiments, the devices may be left uncoated so that their respective ends are open, or the devices may be coated with, for example, a layer that is permeable to the therapeutic agent, semi-permeable to the therapeutic agent, or bioerodible. In certain embodiments, the therapeutic agent and at least one polymer are admixed in powder form. In some embodiments, the insert is formed by forwarding a polymeric material to a first extrusion device, forwarding an therapeutic agent to a second extrusion device, co-extruding a mass including the polymeric material and the therapeutic agent, and forming the mass into at least one co-extruded drug delivery device which comprises a core including the therapeutic agent and an outer layer including the polymeric material. In certain

embodiments, the therapeutic agent forwarded to the second extrusion device is in admixture with at least one polymer. In certain embodiments, the therapeutic agent and at least one polymer are admixed in powder form. In certain embodiments, this act includes forwarding more than one drug to the second extrusion device. In certain embodiments, the polymeric material is one of impermeable, semi-permeable, or permeable to the therapeutic agent. The polymeric material may be bioerodible and/or radiation curable. In latter instances, the insert may be irradiated.

In certain embodiments, the insert is in a tubular form, and may be segmented into a plurality of shorter products. In certain embodiments, the insert further comprises a coating of the plurality of shorter products with one or more layers including at least one of a layer that is permeable to the therapeutic agent, a layer that is semi-permeable to the therapeutic agent, and a layer that is bioerodible. The polymeric material may include any biocompatible polymer, such as polycaprolactone (PCL), an ethylene/vinyl acetate copolymer (EVA), polyalkyl cyanoacrylate, polyurethane, a nylon, or poly (dl-lactide-co-glycolide) (PLGA), or a copolymer of any of these.

In some embodiments, the insert comprises a therapeutically effective amount of at least one therapeutic agent coated by or dispersed in a polymer matrix, wherein the therapeutic agent is in granular or particulate form. In some embodiments, the therapeutic agent is released from the formulation as drug from the granules dissolves into or within the matrix, diffuses through the matrix, and is released into the surrounding physiological fluid. In some embodiments, the rate of release is limited primarily by the rate of dissolution of the therapeutic agent from the granules/particles into the matrix; the steps of diffusion through the matrix and dispersion into the surrounding fluid are primarily not release-rate-limiting. In certain embodiments, the polymer matrix is non-bioerodible, while in other embodiments it is bioerodible. Exemplary non-bioerodible polymer matrices can be formed from polyurethane, polysilicone, poly(ethylene-co-vinyl acetate) (EVA), polyvinyl alcohol, and derivatives and copolymers thereof. Exemplary bioerodible polymer matrices can be formed from polyanhydride, polylactic acid, polyglycolic acid, polyorthoester, polyalkylcyanoacrylate, and derivatives and copolymers thereof.

In some embodiments, the insert comprises a collagenous material. In some embodiments, the insert may be a soluble ophthalmic drug insert (SODI, e.g., a polymeric oval film that can be introduced in the upper conjuctival sac for drug delivery; an elliptical insert such as OCUSERT® (Pilocarpine ocular therapeutic system, developed by Alza Corporation) which is made of ethylene vinyl acetate; OCUFIT® (developed by Escalon

Ophthalmics Inc., Skillman, NS), which is a rod shaped silicone elastomer; Lacrisert®, a rod shaped insert made of cellulose; New Ophthalmic Drug Delivery Systems (NODS), made of poly (vinyl alcohol); and the inserts described in Fabrizio, *Advanced Drug Delivery Reviews* 16: 95 -106, 1998, which is incorporated herein by reference in its entirety. In further embodiments, the insert can be placed, depending on the location and the mechanism used to hold the insert in position, by either the patient or the doctor. In further embodiments, the insert comprises collagen, gelatin, or a polymer, wherein the polymer is selected from polycaprolactone (PCL), an ethylene/vinyl acetate copolymer (EVA), polyalkyl cyanoacralate, polyurethane, a nylon, poly(dl-lactide-co-glycolide) (PLGA), or a copolymer of any of the aforementioned. In some embodiments, the insert is implanted under the upper eyelid. In some embodiments, the insert is implanted in the posterior segment of the eye, in the chroidal space, or in the sclera. In some embodiments, the insert is implanted intravitreally or sub-retinally. In some embodiments, the insert is injected sub-retinally. Methods of administration and techniques for their preparation are set forth in Remington's Pharmaceutical Sciences, which is incorporated herein by reference in it entirety.

In other embodiments, the insert provides a sustained release of the therapeutic agent to the vitreous of the eye. As used herein, "sustained release" means that the composition releases the therapeutic agent over an extended period of time in a controlled fashion. In some embodiments, the insert releases the therapeutic agent at a rate such that the aqueous therapeutic agent concentration remains less than the vitreous therapeutic agent concentration during the release. In some embodiments, the aqueous therapeutic agent concentration is from about 0.002 µg/mL to about 0.01 µg/mL, or from about 0.01 µg/mL to about 0.05 µg/ml., or less than about 0.05 µg/mL. In some embodiments, the therapeutic agent is released at a rate of about 1 µg/day to about 50 µg/day, or from about 1 µg/day to about 10 µg/day. In some embodiments, the insert further comprises an additional therapeutic agent, as detailed above, e.g., fluocinolone acetonide (such as that found in the ophthalmic insert Retisert®).

In some embodiments, the ophthalmic compositon comprises microspheres or nanoparticles. In some embodiment, the microspheres comprise gelatin. In some embodiments, the microspheres are injected to the posterior segment of the eye, in the chroidal space, in the sclera, intravitreally or sub-retinally. In some embodiments, the micospheres or nanoparticles comprises a polymer including, but not limited to, those described in Wagh, et al., "Polymers used in ocular dosage form and drug delivery systems",

Asian J. Pharm., pages 12-17 (Jan. 2008), which is incorporated herein by reference in its entirety. In some embodiments, the polymer is chitosan, a polycarboxylic acid such as polyacrylic acid, albumin particles, hyaluronic acid esters, polyitaconic acid, poly(butyl)cyanoacrylate, polycaprolactone, poly(isobutyl)caprolactone, poly(lactic acid-co-glycolic acid), or poly(lactic acid). In some embodiments, the microspheres or nanoparticles comprise solid lipid particles.

In some embodiments, the ophthalmic composition comprises an ion-exchange resin. In some embodiments, the ion-exchange resin is an inorganic zeolite or synthetic organic resin. In some embodiments, the ion-exchange resin includes, but is not limited to, those described in Wagh, et al., "Polymers used in ocular dosage form and drug delivery systems", *Asian J. Pharm.*, pages 12-17 (Jan. 2008), which is incorporated herein by reference in its entirety. In some embodiments, the ion-exhange resin is a partially neutralized polyacrylic acid.

In some embodiments, the ophthalmic composition is an aqueous polymeric suspension. In some embodiments, the therapeutic agent or a polymeric suspending agent is suspended in an aqueous medium (e.g., having the properties as described above). In some embodiment, the therapeutic agent is suspended. In some embodiments, the therapeutic agent is in solution. In further embodiments, the suspending agent serves to provide stability to the suspension, to increase the residence time of the dosage form on the eye, or to enhance the sustained release of the drug in terms of both longer release times and a more uniform release curve. Examples of polymeric suspending agents include, but are not limited to, dextrans, polyethylene glycols, polyvinylpyrolidone, polysaccharide gels, Gelrite®, cellulosic polymers like hydroxypropyl methylcellulose, and carboxy-containing polymers such as polymers or copolymers of acrylic acid, as well as other polymeric demulcents. In some embodiments, the polymeric suspending agent is a water swellable, water insoluble polymer, especially a crosslinked carboxy-containing polymer. In some embodiments, the polymeric suspending agent comprises from at least about 90% to about 99.9%, or from about 95% to about 99.9%, by weight based on the total weight of monomers present, of one or more carboxy-containing monoethylenically unsaturated monomers. In some embodiments, the carboxy-containing monoethylenically unsaturated monomer includes acrylic acid, methacrylic acid, ethacrylic acid, methylacrylic acid (crotonic acid), cis- α-methylcrotonic acid (angelic acid), trans-α-methylcrotonic acid (tiglic acid), α-butylcrotonic acid, α-phenylacrylic acid, α-benzylacrylic acid, α-cyclohexylacrylic acid, phenylacrylic acid

(cinnamic acid), coumaric acid (o-hydroxycinnamic acid), and umbellic acid (p-hydroxycoumaric acid). In some embodiments, the polymers may be crosslinked by a polyfunctional crosslinking agent (e.g., a difunctional crosslinking agent). In further embodiments, the amount of crosslinking should be sufficient to form insoluble polymer particles, but not so great as to unduly interfere with sustained release of the therapeutic agent. In some embodiment, the polymers are only lightly crosslinked. In some embodiments, the crosslinking agent is contained in an amount of from about 0.01% to about 5%, or from about 0.1% to about 5.0%, or from about 0.2% to about 1%, based on the total weight of monomers present. In some embodiments, the crosslinking agents are nonpolyalkenyl polyether difunctional crosslinking monomers such as divinyl glycol, 2,3-dihydroxyhexa-1,5-diene, 2,5-dimethyl-1,5-hexadiene, divinylbenzene, N,N-diallylacrylamide, N,N-diallymethacrylamide; polyalkenyl polyether crosslinking agents containing two or more alkenyl ether groupings per molecule, e.g., alkenyl ether groupings containing terminal $H_2C=C<$groups, prepared by etherifying a polyhydric alcohol containing at least four carbon atoms and at least three hydroxyl groups with an alkenyl halide such as allyl bromide or the like, e.g., polyallyl sucrose, polyallyl pentaerythritol, or the like; diolefinic non-hydrophilic macromeric crosslinking agents having molecular weights of from about 400 to about 8,000, such as insoluble diacrylates and polyacrylates and methacrylates of diols and polyols, diisocyanate hydroxyalkyl acrylate or methacrylate reaction products of isocyanate terminated prepolymers derived from polyester diols, polyether diols or polysiloxane diols with hydroxyalkylmethacrylates, and the like.

In some embodiments, the crosslinked polymers may be made from a carboxy-containing monoethylenically unsaturated monomer or monomers as the sole monoethylenically unsaturated monomer present, together with a crosslinking agent or agents. In some embodiments, the polymers are ones in which up to about 40%, and preferably from about 0% to about 20% by weight, of the carboxy-containing monoethylenically unsaturated monomer or monomers has been replaced by one or more non-carboxyl-containing monoethylenically unsaturated monomer or monomers containing only physiologically and ophthalmically innocuous substituents, including acrylic and methacrylic acid esters such as methyl methacrylate, ethyl acrylate, butyl acrylate, 2-ethylhexylacrylate, octyl methacrylate, 2-hydroxyethylmethacrylate, 3-hydroxypropylacrylate, and the like, vinyl acetate, N-vinylpyrrolidone, and the like (see Mueller et al. U.S. Pat. No. 4,548,990, the entire contents of which are incorporated herein by reference, for a more extensive listing of such additional monoethylenically unsaturated

monomers). In some embodiments, the polymers include polycarbophil (Noveon AA-1), Carbopol®, and DuraSite®. In some embodiments, the crosslinked polymers are prepared by suspension or emulsion polymerizing the monomers, using conventional free radical polymerization catalysts, to a dry particle size of not more than about 50 μm in equivalent spherical diameter. In some embodiments, the average dry particle size is from about 1 to about 30 μm, or from about 3 to about 20 μm in equivalent spherical diameter. In some embodiments, the polymer particles are obtained by mechanically milling larger polymer particles. In further embodiments, such polymers will have a molecular weight from about 250,000 to about 4,000,000, and from 3,000,000,000 to 4,000,000,000. In other embodiments, the particles of crosslinked polymer are monodisperse, meaning that they have a particle size distribution such that at least about 80%, about 90% or about 95%, of the particles fall within a μm band of major particle size distribution. In further embodiments, the monodisperse particle size means that there is no more than about 20%, about 10%, or about 5% particles of a size below 1 μm. In some embodiments, the aqueous polymeric suspension comprises from about 0.05 to about 1%, from about 0.1 to about 0.5%, or from about 0.1 to about 0.5%, of the therapeutic agent and from about 0.1 to about 10%, from about 0.5 to about 6.5%, from about 0.5 to about 2.0%, from about 0.5% to about 1.2%, from about 0.6 to about 0.9%, or from about 0.6 to about 0.8% of a polymeric suspending agent. Although referred to in the singular, it should be understood that one or more species of polymeric suspending agent can be used with the total amount falling within the stated ranges. In one embodiment, the amount of insoluble lightly crosslinked polymer particles, the pH, and the osmotic pressure can be correlated with each other and with the degree of crosslinking to give a composition having a viscosity in the range of from about 500 to about 100,000 centipoise, and preferably from about 1,000 to about 30,000 or about 1,000 to about 10,000 centipoise, as measured at room temperature (about 25° C.) using a Brookfield Digital LVT Viscometer equipped with a number 25 spindle and a 13R small sample adapter at 12 rpm. In some embodiments, the viscosity is from about 10 to about 400 centipoise, from about 10 to about 200 centipoises or from about 10 to about 25 centipoise.

In some embodiments, the aqueous polymeric suspensions may be formulated so that they retain the same or substantially the same viscosity in the eye that they had prior to administration to the eye. In some embodiments, they may be formulated so that there is increased gelation upon contact with tear fluid. For instance, when a formulation containing DuraSite® or other similar polyacrylic acid-type polymer is administered to the eye at a pH

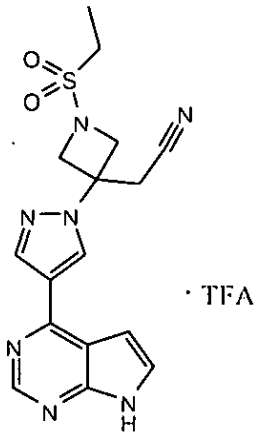
of less than about 6.7, the polymer may swell upon contact with tear fluid since it has a higher pH (around 7). This gelation or increase in gelation may lead to entrapment of the suspended particles, thereby extending the residence time of the composition in the eye. In some embodiments, the therapeutic agent is released slowly as the suspended particles dissolve over time. In some embodiments, this delivery route increases patient comfort and increased therapeutic agent contact time with the eye tissues, thereby increasing the extent of drug absorption and duration of action of the formulation in the eye. The therapeutic agents contained in these drug delivery systems may be released from the gels at rates that depend on such factors as the drug itself and its physical form, the extent of drug loading and the pH of the system, as well as on any drug delivery adjuvants, such as ion exchange resins compatible with the ocular surface, which may also be present.

The compositions of the invention can further include one or more additional pharmaceutical agents such as a chemotherapeutic, steroid, anti-inflammatory compound, or immunosuppressant, examples of which are listed hereinabove.

The invention will be described in greater detail by way of specific examples. The following examples are offered for illustrative purposes, and are not intended to limit the invention in any manner. Those of skill in the art will readily recognize a variety of noncritical parameters which can be changed or modified to yield essentially the same results.

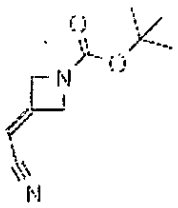
EXAMPLES

Example 1. {1-(ethylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt



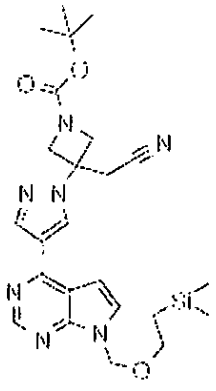
· TFA

Step 1. tert-butyl 3-(cyanomethylene)azetidine-1-carboxylate



To a suspension of sodium hydride (60% dispersion in mineral oil, 0.257 g, 6.42 mmol) in tetrahydrofuran (32 mL) at 0 °C under a nitrogen atmosphere was added diethyl cyanomethylphosphonate (1.19 g, 6.72 mmol) (purchased from Aldrich). The reaction was then stirred for 45 minutes at room temperature. A solution of tert-butyl 3-oxoazetidine-1-carboxylate (1.00 g, 5.84 mmol) (purchased from Alfa Aesar) in tetrahydrofuran (8.8 mL) was introduced dropwise and the mixture was stirred for 16 hours. Brine and ethyl acetate were added and the layers separated. The aqueous layer was extracted with three portions of ethyl acetate. The combined extracts were dried over sodium sulfate, filtered and concentrated to afford product, used without further purification in Step 2 (1.12 g, 99%). ^{1}H NMR (300 MHz, $CDCl_3$): δ 5.38 (p, 1H), 4.73-4.68 (m, 2H), 4.64-4.59 (m, 2H), 1.46 (s, 9H).

Step 2. tert-butyl 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidine-1-carboxylate

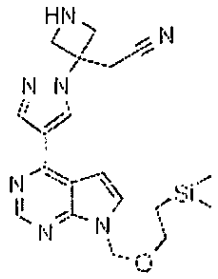


To a solution of 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (4.61 g, 14.6 mmol) (prepared according to the method of WO

2007/070514 in Example 65, Step 2) and tert-butyl 3-(cyanomethylene)azetidine-1-carboxylate (2.84 g, 14.6 mmol) in acetonitrile (100 mL) was added 1,8-diazabicyclo[5.4.0]undec-7-ene (2.19 mL, 14.6 mmol). The reaction was stirred at room temperature for 16 hours. The acetonitrile was removed *in vacuo* and the residue was dissolved in ethyl acetate. This solution was sequentially washed with 1N HCl and brine, dried over sodium sulfate, filtered and concentrated. The residue was purified by flash column chromatography, eluting with 80% ethyl acetate/hexanes to afford desired product (5.36 g, 72%).

^{1}H NMR (300 MHz, $CDCl_3$): δ 8.86 (s, 1H), 8.44 (s, 1H), 8.34 (s, 1H), 7.42 (d, 1H), 6.80 (d, 1H), 5.68 (s, 2H), 4.54 (d, 2H), 4.29 (d, 2H), 3.59-3.51 (m, 2H), 3.33 (s, 2H), 1.47 (s, 9H), 0.96-0.89 (m, 2H), -0.06 (s, 9H); LCMS $(M+H)^+$: 510.2.

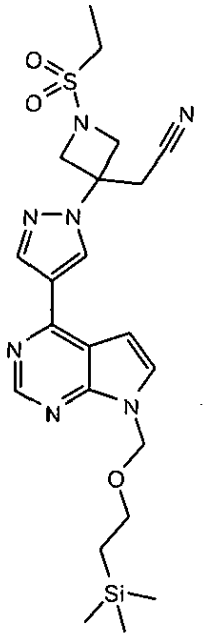
Step 3. 3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile



To a solution of tert-butyl 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidine-1-carboxylate (5.36 g, 10.5 mmol) in 1,4-dioxane (100 mL) was added 4.00 M of hydrogen chloride in 1,4-dioxane (40 mL, 160 mmol) and the mixture was stirred at room temperature for 16 hours. The reaction was poured into saturated sodium bicarbonate solution sufficient to neutralize. The product was extracted with three portions of ethyl acetate. The combined extracts were washed with brine, dried over sodium sulfate, filtered and concentrated to afford product which was used without further purification (3.0 g, 69%).

^{1}H NMR (400 MHz, $CDCl_3$): δ 8.85 (s, 1H), 8.42 (s, 1H), 8.32 (s, 1H), 7.41 (d, 1H), 6.80 (d, 1H), 5.68 (s, 2H), 4.30 (d, 2H), 3.88 (d, 2H), 3.58-3.51 (m, 2H), 3.42 (s, 2H), 0.96-0.89 (m, 2H), -0.06 (s, 9H); LCMS $(M+H)^+$: 410.2.

Step 4. 1-(ethylsulfonyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile



To a solution of 3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile (0.100 g, 0.244 mmol) in tetrahydrofuran (2 mL) containing N,N-diisopropylethylamine (0.085 mL, 0.49 mmol) was added ethanesulfonyl chloride (0.023 mL, 0.24 mmol). After stirring for 1.5 hours, the reaction mixture was poured into dilute HCl and extracted with three portions of ethyl acetate. The combined extracts were washed with brine, dried over sodium sulfate, decanted and concentrated to afford product, used without further purification in Step 5 (111 mg, 91%).

^{1}H NMR (300 MHz, $CDCl_3$): δ 8.86 (s, 1H), 8.63 (s, 1H), 8.35 (s, 1H), 7.45 (d, 1H), 6.83 (d, 1H), 5.68 (s, 2H), 4.63 (d, 2H), 4.26 (d, 2H), 3.54 (t, 2H), 3.42 (s, 2H), 3.09 (q, 2H), 1.41 (t, 3H), 0.92 (t, 2H), -0.06 (s, 9H); LCMS $(M+H)^+$: 502.1.

Step 5. 1-(ethylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile trifluoroacetate salt

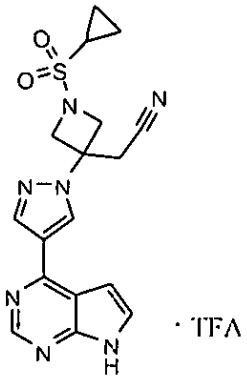
To a solution of 1-(ethylsulfonyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile (0.111 g, 0.22 mmol) in methylene chloride (3 mL) was added trifluoroacetic acid (2 mL) and the solution was stirred for 1.5 hours. The solvents were removed *in vacuo* and the residue was dissolved in

methanol (3 mL) and ethylenediamine (0.1 mL) was added. After stirring for 3 hours, the volume was reduced *in vacuo* and the product was purified by preparative-HPLC/MS, (SunFire C18 column, eluting with a gradient of MeCN/H_2O containing 0.1% TFA) to afford the product as the trifluoroacetic acid salt (50 mg, 47%).

^{1}H NMR (400 MHz, d_6-dmso): δ 12.55 (br d, 1H), 9.03 (s, 1H), 8.83 (s, 1H), 8.56 (s, 1H), 7.79-7.75 (m, 1H), 7.24-7.19 (m, 1H), 4.59 (d, 2H), 4.26 (d, 2H), 3.71 (s, 2H), 3.25 (q, 2H), 1.24 (t, 3H); LCMS $(M+H)^+$: 372.1.

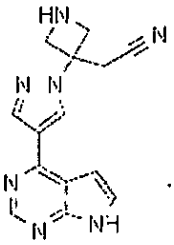
Alternatively, the deprotection and sulfonylation steps could be performed in the reverse order, as in Example 2.

Example 2. 1-(cyclopropylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile trifluoroacetic acid salt



· TFA

Step 1. 3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile trifluoroacetic acid salt



· 2TFA

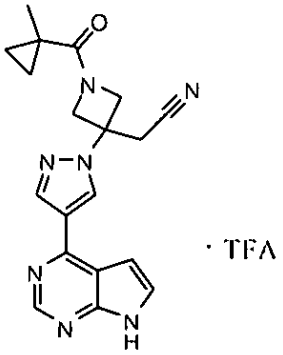
A solution of tert-butyl 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidine-1-carboxylate, as prepared in Example 1, Step 2 (0.60 g, 1.2 mmol) in trifluoroacetic acid (10 mL) and methylene chloride

(40 mL) was stirred for 5 hours. The solvents were removed *in vacuo* and the residue stirred in a solution of methanol (40 mL) and 14.50 M of ammonium hydroxide in water (10 mL) overnight. The solvent was evaporated, the residue reconstituted in methanol and purified by preparative-HPLC/MS (SunFire C18 column, eluting with a gradient of MeCN/H_2O containing 0.1% TFA) to afford the product as the trifluoroacetic acid salt (526 mg, 88%).
^{1}H NMR (400 MHz, d_6-dmso): δ 12.36 (br s, 1H), 9.37 (br s, 1H), 9.15 (br s, 1H), 9.05 (s, 1H), 8.77 (s, 1H), 8.56 (s, 1H), 7.71 (dd, 1H), 7.14 (dd, 1H), 4.75-4.65 (m, 2H), 4.48-4.39 (m, 2H), 3.74 (s, 2H); LCMS $(M+H)^+$: 280.1.

Step 2. 1-(cyclopropylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile trifluoroacetate salt

To 3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile bis(trifluoroacetate) (0.400 g, 0.788 mmol) in tetrahydrofuran (38 mL) and triethylamine (0.55 mL, 3.9 mmol) was added cyclopropanesulfonyl chloride (0.084 mL, 0.83 mmol). The reaction was stirred at room temperature for a few hours with periodic addition of cyclopropanesulfonyl chloride until the starting amine was consumed as evidenced by LCMS. To dissolve insolubles, methanol (0.16 mL) was added. The THF was removed *in vacuo* and MeOH was used to reconstitute the sample for purification by preparative-HPLC/MS (SunFire C18 column, eluting with a gradient of MeCN/H_2O containing 0.1% TFA) to afford the product as the trifluoroacetate salt (193 mg, 49%).
^{1}H NMR (300 MHz, d_6-dmso): δ 12.53 (br s, 1H), 9.05 (s, 1H), 8.82 (s, 1H), 8.55 (s, 1H), 7.76 (dd, 1H), 7.21 (dd, 1H), 4.65 (d, 2H), 4.31 (d, 2H), 3.70 (s, 2H), 2.90-2.80 (m, 1H), 1.07-0.97 (m, 4H); LCMS $(M+H)^+$: 384.1.

Example 3. 1-[(1-methylcyclopropyl)carbonyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile trifluoroacetic acid salt



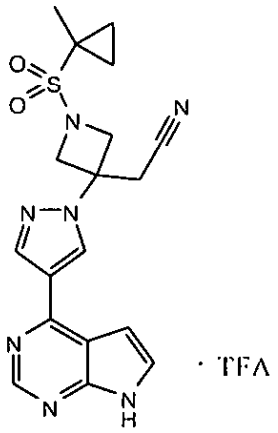
· TFA

To a solution of 1-methylcyclopropanecarboxylic acid (4.3 mg, 0.043 mmol) and N,N-diisopropylethylamine (0.018 g, 0.14 mmol) in N,N-dimethylformamide (1.5 mL) was added N,N,N',N'-tetramethyl-O-(7-azabenzotriazol-1-yl)uronium hexafluorophosphate (0.016 g, 0.043 mmol) (purchased from Aldrich). The reaction was stirred for 15 minutes followed by the addition of 3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile bis(trifluoroacetate) salt from Example 2, Step 1 (0.014 g, 0.029 mmol). The reaction was stirred for 16 hours. The product was purified by preparative-HPLC/MS, (SunFire C18 column, eluting with a gradient of MeCN/H_2O containing 0.1% TFA) to afford the product as the trifluoroacetate salt (6 mg, 45%).

^{1}H NMR (300 MHz, d_6-dmso): δ 12.82 (br s, 1H), 9.10 (s, 1H), 8.91 (s, 1H), 8.59 (s, 1H), 7.86 (s, 1H), 7.31 (s, 1H), 5.07-4.07 (br, 4H), 3.72 (s, 2H), 1.28 (s, 3H), 0.98 (s, 2H), 0.54 (s, 2H); LCMS(M+H)$^+$: 362.2.

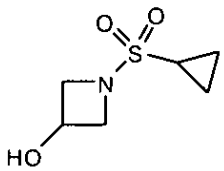
In some cases, a modification to Example 3 was used where THF was substituted for DMF as the solvent. In Table 1, this is indicated by modification A.

Example 4. 1-[(1-methylcyclopropyl)sulfonyl]-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile trifluoroacetic acid salt



· TFA

Step 1. 1-(cyclopropylsulfonyl)azetidin-3-ol

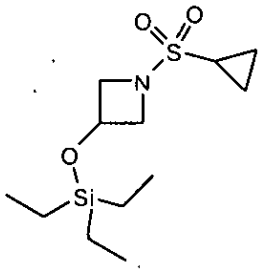


To a solution of azetidin-3-ol hydrochloride (1.00 g, 9.13 mmol) (purchased from

Matrix) and N,N-diisopropylethylamine (4.77 mL, 27.4 mmol) in tetrahydrofuran (100 mL) at 0 °C was added cyclopropanesulfonyl chloride (0.930 mL, 9.13 mmol) and the reaction was stirred for 16 hours. Water was added and the product was extracted with ethyl acetate. The combined extracts were washed with 1N HCl, saturated sodium bicarbonate, and brine, dried over sodium sulfate, decanted and concentrated to afford a yellow oil used without further purification (1.04 g, 64%).

^{1}H NMR (300 MHz, $CDCl_3$): δ 4.61 (p, 1H), 4.14-4.07 (m, 2H), 3.93-3.86 (m, 2H), 2.69 (br s, 1H), 2.42-2.32 (m, 1H), 1.20-1.11 (m, 2H), 1.06-0.98 (m, 2H).

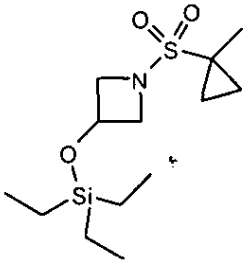
Step 2. 1-(cyclopropylsulfonyl)-3-[(triethylsilyl)oxy]azetidine



To a solution of 1-(cyclopropylsulfonyl)azetidin-3-ol (1.04 g, 5.87 mmol) and triethylamine (3.11 mL, 22.3 mmol) in tetrahydrofuran (20 mL) was added 4-dimethylaminopyridine (0.090 g, 0.73 mmol) followed by chlorotriethylsilane (1.00 M in THF, 8.0 mL, 8.0 mmol). The reaction was stirred at room temperature for 16 hours. To the reaction was added saturated sodium bicarbonate solution and the product was extracted with a 1:1 mix of ethyl acetate : hexanes three times. The combined organic extracts were washed with dilute HCl and brine, then dried over sodium sulfate, decanted and concentrated. Flash column chromatography, eluting with a gradient of 0-50% ethyl acetate in hexanes afforded desired product (1.0 g, 58%).

^{1}H NMR (300 MHz, $CDCl_3$): δ 4.56 (p, 1H), 4.05-3.98 (m, 2H), 3.90-3.83 (m, 2H), 2.41-2.32 (m, 1H), 1.20-1.12 (m, 2H), 1.05-0.96 (m, 2H), 0.93 (t, 9H), 0.57 (q, 6H).

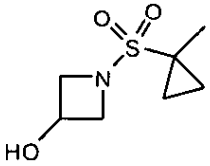
Step 3. 1-[(1-methylcyclopropyl)sulfonyl]-3-[(triethylsilyl)oxy]azetidine



To a solution of 1-(cyclopropylsulfonyl)-3-[(triethylsilyl)oxy]azetidine (1.0 g, 3.4 mmol) in tetrahydrofuran (20 mL) at -78 °C was added 2.50 M of n-butyllithium in hexane (1.37 mL, 3.43 mmol) dropwise. After stirring at this temperature for 1 hour, methyl iodide (0.224 mL, 3.60 mmol) was added. After 30 minutes, the reaction temperature was raised to 0 °C and stirred for 50 minutes. The reaction was quenched by the addition of saturated sodium bicarbonate, followed by brine and the product was extracted with ethyl acetate. The extracts were dried over sodium sulfate, decanted and concentrated. Flash column chromatography eluting with a gradient of 0-30% ethyl acetate in hexanes afforded product (890 mg, 85%).

^{1}H NMR (300 MHz, $CDCl_3$): δ 4.57 (p, 1H), 4.00-3.94 (m, 2H), 3.92-3.86 (m, 2H), 1.49 (s, 3H), 1.35-1.29 (m, 2H), 0.93 (t, 9H), 0.73 (dt, 2H), 0.57 (q, 6H).

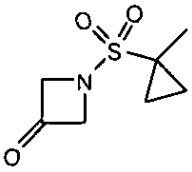
Step 4. 1-[(1-methylcyclopropyl)sulfonyl]azetidin-3-ol



A solution of 1-[(1-methylcyclopropyl)sulfonyl]-3-[(triethylsilyl)oxy]azetidine (0.125 g, 0.41 mmol) in tetrahydrofuran (3 mL), water (1 mL) and acetic acid (1 mL) was stirred at room temperature for four hours. The mixture was neutralized by pouring into a solution of sodium bicarbonate. The product was extracted with ethyl acetate, the extracts were washed with brine, dried over sodium sulfate, decanted and concentrated to afford product, used without further purification (64 mg, 82%).

^{1}H NMR (300 MHz, CD_3OD): δ 4.56-4.47 (m, 1H), 4.02-3.95 (m, 2H), 3.83-3.75 (m, 2H), 1.47 (s, 3H), 1.26-1.19 (m, 2H), 0.84-0.77 (m, 2H).

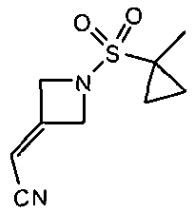
Step 5. 1-[(1-methylcyclopropyl)sulfonyl]azetidin-3-one



To a solution of oxalyl chloride (59 µL, 0.69 mmol) in methylene chloride (1.5 mL) at -78 °C was added dimethyl sulfoxide (0.10 mL, 1.5 mmol) slowly dropwise. The reaction was stirred for 15 minutes following complete addition. A solution of 1-[(1-methylcyclopropyl)-sulfonyl]azetidin-3-ol (64 mg, 0.33 mmol) in methylene chloride (1.0 mL) was added dropwise and the reaction mixture was stirred for 45 min at -60 °C. Triethylamine (0.28 mL, 2.0 mmol) was added dropwise and the reaction was stirred for 15 minutes and the bath was removed and the solution allowed to warm to ambient temperature. The solvent was removed *in vacuo* and ethyl acetate was added. The solution was washed sequentially with saturated sodium bicarbonate solution, water and brine, dried over sodium sulfate, decanted and concentrated. The crude product was used without further purification in Step 6.

^{1}H NMR (300 MHz, $CDCl_3$): δ 4.07 (d, 2H), 3.93 (d, 2H), 1.58 (s, 3H), 1.44-1.38 (m, 2H), 0.87 (dt, 2H).

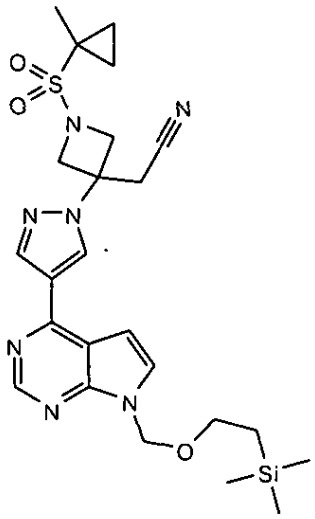
Step 6. 1-[(1-methylcyclopropyl)sulfonyl]azetidin-3-ylideneacetonitrile



To a mixture of sodium hydride (60% dispersion in mineral oil, 17 mg, 0.42 mmol) in tetrahydrofuran (2 mL) at 0 °C was added diethyl cyanomethylphosphonate (70 µL, 0.43 mmol) dropwise. The mixture was then allowed to reach room temperature and stir for a further 45 minutes. A solution of 1-[(1-methylcyclopropyl)sulfonyl]azetidin-3-one (prepared in Step 5) in tetrahydrofuran (1.0 mL) was added and the mixture was allowed to stir at ambient temperature for 16 hours. Into the reaction was added water and solid NaCl, and the product was extracted with three portions of ethyl acetate. The combined extracts were dried over sodium sulfate, decanted and concentrated to afford product (71 mg, 100%), used without further purification in Step 7.

^{1}H NMR (300 MHz, $CDCl_3$): δ 5.44-5.39 (m, 1H), 4.76-4.71 (m, 2H), 4.69-4.64 (m, 2H), 1.49 (s, 3H), 1.36-1.30 (m, 2H), 0.80 (dt, 2H).

Step 7. 1-[(1-methylcyclopropyl)sulfonyl]-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile



To a solution of 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (0.108 g, 0.344 mmol) and 1-[(1-methylcyclopropyl)sulfonyl]azetidin-3-ylideneacetonitrile (71 mg, 0.33 mmol) in acetonitrile (3 mL) was added 1,8-diazabicyclo[5.4.0]undec-7-ene (51 µL, 0.34 mmol). After a reaction time of 1.5 hours, the acetonitrile was removed *in vacuo* and the residue was partitioned between ethyl acetate and 1N HCl. The layers were separated and the organic layer was washed with brine, dried over sodium sulfate, filtered and concentrated. Flash column chromatography, eluting with a gradient of 0-80% ethyl acetate in hexanes afforded product (135 mg, 77%).

^{1}H NMR (300 MHz, $CDCl_3$): δ 8.86 (s, 1H), 8.46 (s, 1H), 8.35 (s, 1H), 7.42 (d, 1H), 6.80 (d, 1H), 5.68 (s, 2H), 4.62 (d, 2H), 4.22 (d, 2H), 3.59-3.50 (m, 2H), 3.42 (s, 2H), 1.55 (s, 3H), 1.42-1.36 (m, 2H), 0.96-0.89 (m, 2H), 0.85 (dt, 2H), -0.06 (s, 9H); LCMS $(M+H)^+$: 528.1.

Step 8. 1-[(1-methylcyclopropyl)sulfonyl]-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile trifluoroacetic acid salt

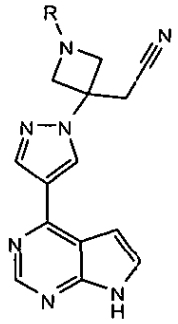
A solution of 1-[(1-methylcyclopropyl)sulfonyl]-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile (44 mg, 0.083 mmol) in methylene chloride (10 mL) and trifluoroacetic acid (5

mL) was stirred for 2 hours. The solvents were removed *in vacuo*. The residue was stirred with 14.50 M of ammonium hydroxide solution (3 mL) in methanol (10 mL) for 16 hours. Solvents were removed *in vacuo* and the residue was purified by preparative HPLC-MS (SunFire C18 column, eluting with a gradient of H_2O and MeCN containing 0.1% TFA) to afford product as the trifluoroacetate salt (0.02 g, 50%).

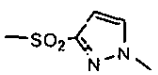
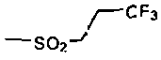
^{1}H NMR (300 MHz, d_6-dmso): δ 12.56 (br s, 1H), 9.03 (s, 1H), 8.83 (s, 1H), 8.55 (s, 1H), 7.77 (dd, 1H), 7.21 (dd, 1H), 4.58 (d, 2H), 4.23 (d, 2H), 3.71 (s, 2H), 1.46 (s, 3H), 1.22-1.16 (m, 2H), 0.93-0.87 (m, 2H); LCMS $(M+H)^+$: 398.1.

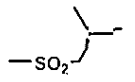
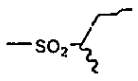
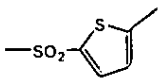
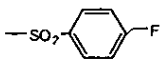
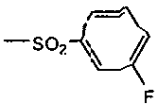
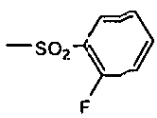
Acid chlorides, isocyanates or chloroformates were used in place of sulfonyl chlorides in either the method of Example 1 or Example 2 to afford amides (Ex. Nos. 22, 24, 26-30 & 33 of Table 1), ureas (Ex. No. 38 of Table 1) or carbamates (Ex. Nos. 35-37 of Table 1), respectively, as products. Additionally, triethylamine and diisopropylethylamine were used interchangeably. Some amides in Table 1 were prepared by an alternative method illustrated in Example 3, by coupling the amine of Example 2, Step 1 with carboxylic acids.

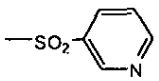
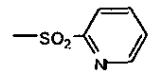
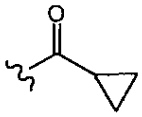
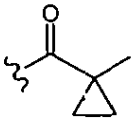
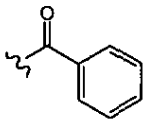
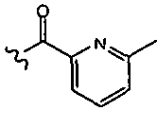
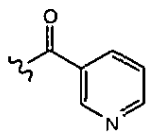
Table 1

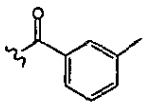
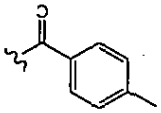
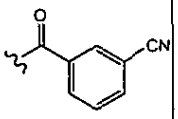
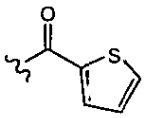
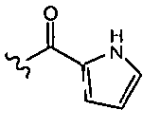


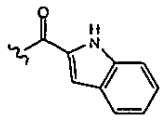
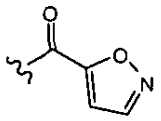
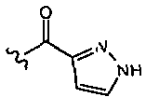
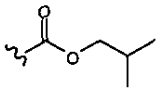
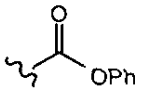
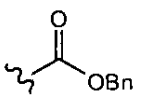
Ex. No.	-R	Name	MS $(M+H)^+$	^{1}H NMR (δ)	Method of Preparation
5	$-SO_2Me$	{1-(methylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	358.1	(400 MHz, d_6-dmso): 12.35 (br s, 1H), 8.99 (s, 1H), 8.77 (s, 1H), 8.52 (s, 1H), 7.70 (t, 1H), 7.16 (dd, 1H), 4.62 (d, 2H), 4.28 (d, 2H), 3.70 (s, 2H), 3.02 (br s, 3H).	Ex. # 1
6	$-SO_2Ph$	{1-(phenylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	420.1	(400 MHz, d_6-dmso): 12.55 (br s, 1H), 8.80 (s, 1H), 8.78 (s, 1H), 8.34 (s, 1H), 7.88-7.83 (m, 2H), 7.79-7.74 (m, 1H), 7.66-7.56 (m, 3H), 7.15-7.11 (m, 1H), 4.40 (d, 2H),	Ex. # 2

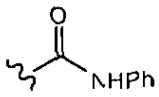
				4.23 (d, 2H), 3.55 (s, 3H).	
7	$-SO_2{}^iPr$	{1-(isopropylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile	386.1	(300 MHz, d_6-dmso): 12.16 (br s, 1H), 8.93 (s, 1H), 8.71 (s, 1H), 8.48 (s, 1H), 7.63 (t, 1H), 7.09 (d, 1H), 4.59 (d, 2H), 4.21 (d, 2H), 3.71 (s, 2H), 3.41-3.29 (m, 1H), 1.26 (d, 6H).	Ex. # 2
8	$-SO_2{}^nPr$	{1-(propylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile	386.1	(300 MHz, d_6-dmso): 12.17 (br s, 1H), 8.94 (s, 1H), 8.71 (s, 1H), 8.48 (s, 1H), 7.63 (dd, 1H), 7.09 (dd, 1H), 4.60 (d, 2H), 4.24 (d, 2H), 3.69 (s, 2H), 3.26-3.18 (m, 2H), 1.79-1.65 (m, 2H), 0.99 (t, 3H).	Ex. # 2
9	$-SO_2{}^nBu$	{1-(butylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile	400.1	(300 MHz, d_6-dmso): 12.17 (br s, 1H), 8.94 (s, 1H), 8.71 (s, 1H), 8.48 (s, 1H), 7.63 (dd, 1H), 7.09 (dd, 1H), 4.60 (d, 2H), 4.24 (d, 2H), 3.69 (s, 2H), 3.28-3.20 (m, 2H), 1.73-1.61 (m, 2H), 1.47-1.33 (m, 2H), 0.89 (t, 3H).	Ex. # 2
10	$-SO_2{}^tBu$	{1-(tert-butylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	400.1	(400 MHz, d_6-dmso): 12.48 (br s, 1H), 8.99 (s, 1H), 8.80 (s, 1H), 8.54 (s, 1H), 7.74 (s, 1H), 7.21-7.16 (m, 1H), 4.61 (d, 2H), 4.20 (d, 2H), 3.73 (s, 2H), 1.32 (s, 9H).	Ex. # 4
11	$-SO_2NMe_2$	3-(cyanomethyl)-N,N-dimethyl-3-[4-(7H-pyrrolo[2,3 -d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidine-1-sulfonamide trifluoroacetic acid salt	387.1	(400 MHz, d_6-dmso): 12.59 (br s, 1H), 9.03 (s, 1H), 8.84 (s, 1H), 8.56 (s, 1H), 7.80-7.76 (m, 1H), 7.24-7.20 (m, 1H), 4.53 (d, 2H), 4.20 (d, 2H), 3.70 (s, 2H), 2.79 (s, 6H).	Ex. # 2
12		{1-[(1-methyl-1H-pyrazol-3-yl)sulfonyl]-3-[4-(7H- pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]az etidin-3-yl}acetonitrile trifluoroacetic acid salt	424.1	(400 MHz, d_5-dmso): 12.56 (br s, 1H), 8.83 (s, 1H), 8.82 (s, 1H), 8.44 (s, 1H), 7.88 (d, 1H), 7.77 (t, 1H), 7.19-7.15 (m, 1H), 6.79 (d, 1H), 4.53 (d, 2H), 4.28 (d, 2H), 3.77 (s, 3H), 3.52 (s, 2H).	Ex. # 2
13		{3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]-1-[(3,3,3-trifluoropropyl)sulfonyl]azetidin-3-yl}acetonitrile	440.1	(300 MHz, d_6-dmso): 12.17 (br s, 1H), 8.94 (s, 1H), 8.71 (s, 1H), 8.49 (s, 1H), 7.63 (dd, 1H), 7.09 (dd, 1H), 4.68 (d, 2H), 4.31 (d, 2H), 3.72 (s,	Ex. # 2

				2H), 3.63-3.55 (m, 2H), 2.85-2.67 (m, 2H).	
14		{1-(isobutylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile	400.1	(300 MHz, d_6-dmso): 12.17 (br s, 1H), 8.94 (s, 1H), 8.71 (s, 1H), 8.48 (s, 1H), 7.63 (dd, 1H), 7.09 (dd, 1H), 4.60 (d, 2H), 4.24 (d, 2H), 3.68 (s, 2H), 3.16 (d, 2H), 2.22-2.06 (m, 1H), 1.05 (d, 6H).	Ex. # 2
15		{1-(sec-butylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile	400.1	(300 MHz, d_6-dmso): 12.16 (br s, 1H), 8.93 (s, 1H), 8.71 (s, 1H), 8.48 (s, 1H), 7.63 (dd, 1H), 7.08 (dd, 1H), 4.58 (d, 2H), 4.20 (d, 2H), 3.70 (s, 2H), 3.21-3.08 (m, 1H), 1.98-1.82 (m, 1H), 1.55-1.37 (m, 1H), 1.26 (d, 3H), 0.95 (t, 3H).	Ex. # 2
16		{1-[(5-methyl-2-thienyl)sulfonyl]-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	440.1	(400 MHz, d_6-dmso): 12.59 (br s, 1H), 8.82 (s, 2H), 8.41 (s, 1H), 7.78 (t, 1H), 7.59 (d, 1H), 7.17 (dd, 1H), 6.89 (dd, 1H), 4.45 (d, 2H), 4.30 (d, 2H), 3.56 (s, 2H), 2.30 (s, 3H).	Ex. # 2
17		{1-[(4-fluorophenyl)sulfonyl]-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	438.1	(400 MHz, d_6-dmso): 12.60 (br s, 1H), 8.83 (s, 1H), 8.78 (s, 1H), 8.38 (s, 1H), 7.97-7.91 (m, 2H), 7.80-7.77 (m, 1H), 7.44-7.38 (m, 2H), 7.18-7.14 (m, 1H), 4.42 (d, 2H), 4.25 (d, 2H), 3.57 (s, 2H).	Ex. # 2
18		{1-[(3-fluorophenyl)sulfonyl]-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	438.1	(400 MHz, d_6-dmso): 12.50 (br s, 1H), 8.79 (s, 1H), 8.78 (s, 1H), 8.34 (s, 1H), 7.78-7.68 (m, 3H), 7.64 (dt, 1H), 7.53-7.46 (m, 1H), 7.14-7.11 (m, 1H), 4.48 (d, 2H), 4.28 (d, 2H), 3.58 (s, 2H).	Ex. # 2
19		{1-[(2-fluorophenyl)sulfonyl]-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	438.1	(400 MHz, d_6-dmso): 12.65 (br s, 1H), 8.94 (s, 1H), 8.84 (s, 1H), 8.41 (s, 1H), 7.86 (dt, 1H), 7.80 (dd, 1H), 7.75-7.68 (m, 1H), 7.46 (dd, 1H), 7.43 (dd, 1H), 7.20-7.17 (m, 1H), 4.56 (d, 2H), 4.35 (d, 2H), 3.64 (s, 2H).	Ex. # 2

20		{1-(pyridin-3-ylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	421.1	(400 MHz, d_6-dmso):12.75 (br s, 1H), 9.01 (d, 1H), 8.86 (s, 2H), 8.80 (dd, 1H), 8.35 (s, 1H), 8.29 (dq, 1H), 7.83 (dd, 1H), 7.63 (ddd, 1H), 7.19 (dd, 1H), 4.49 (d, 2H), 4.32 (d, 2H), 3.62 (s, 2H).	Ex. # 2
21		{1-(pyridin-2-ylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	421.1	(400 MHz, d_6-dmso): 12.66 (br s, 1H), 9.02 (d, 1H), 8.85 (s, 1H), 8.84 (s, 1H), 8.81 (dd, 1H), 8.34 (s, 1H), 8.29 (dt, 1H), 7.82-7.78 (m, 1H), 7.63 (dd, 1H), 7.19-7.15 (m, 1H), 4.49 (d, 2H), 4.31 (d, 2H), 3.62 (s, 2H).	Ex. # 2
22		{1-(cyclopropylcarbonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	348.1	(400 MHz, d_6-dmso): 12.59 (br s, 1H), 9.05 (s, 1H), 8.83 (s, 1H), 8.56 (s, 1H), 7.79-7.75 (m, 1H), 7.25-7.22 (m, 1H), 4.92 (d, 1H), 4.65 (d, 1H), 4.50 (d, 1H), 4.25 (d, 1H), 3.75 (s, 2H), 1.67-1.60 (m, 1H), 0.83-0.71 (m, 4H).	Ex. # 2
23		1-[(1-methylcyclopropyl)carbonyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-ylacetonitrile trifluoroacetic acid salt	362.2	(300 MHz, d_6-dmso): 12.82 (br s, 1H), 9.10 (s, 1H), 8.91 (s, 1H), 8.59 (s, 1H), 7.86 (s, 1H), 7.31 (s, 1H), 5.07-4.07 (br, 4H), 3.72 (s, 2H), 1.28 (s, 3H), 0.98 (s, 2H), 0.54 (s, 2H).	Ex. # 3
24		{1-benzoyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	384.1	(400 MHz, d_6-dmso): 12.59 (br s, 1H), 9.07 (s, 1H), 8.84 (s, 1H), 8.55 (s, 1H), 7.78 (t, 1H), 7.74-7.69 (m, 2H), 7.60-7.47 (m, 3H), 7.26-7.22 (m, 1H), 5.05 (d, 1H), 4.68 (d, 2H), 4.46 (d, 1H), 3.74 (s, 2H).	Ex. # 2
25		{1-[(6-methylpyridin-2-yl)carbonyl]-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile	399.2	(300 MHz, d_6-dmso): 12.23 (br s, 1H), 9.00 (s, 1H), 8.73 (s, 1H), 8.49 (s, 1H), 7.91-7.79 (m, 2H), 7.65 (dd, 1H), 7.44 (dd, 1H), 7.13 (dd, 1H), 5.25 (d, 1H), 5.02 (d, 1H), 4.76 (d, 1H), 4.46 (d, 1H), 3.78 (s, 2H), 2.55 (s, 3H).	Ex. # 3
26		{1-(pyridin-3-ylcarbonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile	385.1	(300 MHz, d_5-dmso): 12.16 (br s, 1H), 8.98 (s, 1H), 8.90 (s, 1H), 8.74 (d, 1H), 8.70 (s, 1H), 8.48 (s, 1H), 8.11 (d, 1H), 7.65-7.60 (m, 1H),	Ex. # 2

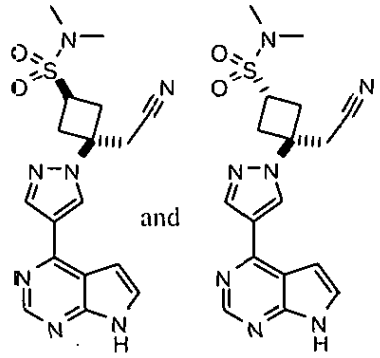
				7.57-7.50 (m, 1H), 7.12-7.07 (m, 1H), 5.13 (d, 1H), 4.76-4.72 (m, 2H), 4.46 (d, 1H), 3.73 (s, 2H).	
27		{1-(3-methylbenzoyl)-3-[4-(7H-pyrrolo[2,3-d]pyrim idin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	398.2	(400 MHz, d_6-dmso): 12.67 (br s, 1H), 9.09 (s, 1H), 8.86 (s, 1H), 8.57 (s, 1H), 7.80 (t, 1H), 7.54-7.48 (m, 2H), 7.39-7.35 (m, 2H), 7.26 (dd, 1H), 5.03 (d, 1H), 4.68 (d, 2H), 4.45 (d, 1H), 3.74 (s, 2H), 2.37 (s, 3H).	Ex. # 2
28		{1-(4-methylbenzoyl)-3-[4-(7H-pyrrolo[2,3-d]pyrim idin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	398.2	(400 MHz, d_6-dmso): 12.62 (br s, 1H), 9.08 (s, 1H), 8.85 (s, 1H), 8.56 (s, 1H), 7.79 (t, 1H), 7.62 (d, 2H), 7.30 (d, 2H), 7.24 (dd, 1H), 5.04 (d, 1H), 4.73-4.63 (m, 2H), 4.44 (d, 1H), 3.74 (s, 2H), 2.37 (s, 3H).	Ex. # 2
29		3-({3-(cyanomethyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimi din-4-yl)-1H-pyrazol-1-yl]azetidin-1-yl}carbonyl)benzonitrile trifluoroacetic acid salt	409.2	(400 MHz, d_6-dmso): 12.52 (br s, 1H), 9.06 (s, 1H), 8.82 (s, 1H), 8.54 (s, 1H), 8.16 (t, 1H), 8.06-8.01 (m, 2H), 7.77-7.74 (m, 1H), 7.72 (t, 1H), 7.24-7.19 (m, 1H), 5.11 (d, 1H), 4.72 (d, 1H), 4.71 (d, 1H), 4.47 (d, 1H), 3.74 (s, 2H).	Ex. # 2
30		[3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]-1-(2-thienylcarbonyl)azetidin-3-yl]acetonitrile trifluoroacetic acid salt	390.1	(400 MHz, d_6-dmso): 12.64 (br s, 1H), 9.11 (s, 1H), 8.85 (s, 1H), 8.58 (s, 1H), 7.89 (dd, minor rotamer 1H), 7.88 (dd, major rotamer, 1H), 7.81-7.77 (m, 1H), 7.73 (dd, minor rotamer, 1H), 7.62 (dd, major rotamer, 1H), 7.27-7.25 (m, 1H), 7.22 (dd, major rotamer, 1H), 7.18 (dd, minor rotamer, 1H), 5.23-5.14 (br d, 1H), 4.87 (br d, 1H), 4.69 (br d, 1H), 4.46 (br d, 1H), 3.79 (s, 2H).	Ex. # 2
31		[3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]-1-(1H-pyrrol-2-ylcarbonyl)azetidin-3-yl]acetonitrile trifluoroacetic acid salt	373.2	(400 MHz, d_6-dmso): 13.07 (br s, 1H), 11.69 (br s, 1H), 9.21 (s, 1H), 8.99 (s, 1H), 8.66 (s, 1H), 7.96 (s, 1H), 7.41 (s, 1H), 6.96 (s, 1H), 6.59 (s, 1H), 6.20-6.17 (m, 1H), 5.15-4.35 (br, 4H), 3.78 (s, 2H).	Ex. # 3 Modification A

32		{1-(1H-indol-2-ylcarbonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}a cetonitrile trifluoroacetic acid salt	423.1	(400 MHz, d_6-dmso): 12.91 (br s, 1H), 11.75 (d, 1H), 9.20 (s, 1H), 8.94 (s, 1H), 8.64 (s, 1H), 7.92-7.87 (m, 1H), 7.65 (d, 1H), 7.46 (d, 1H), 7.38-7.34 (m, 1H), 7.25-7.20 (m, 1H), 7.10-7.05 (m, 1H), 6.98 (d, 1H), 5.26 (d, 1H), 4.96 (d, 1H), 4.73 (d, 1H), 4.53 (d, 1H), 3.82 (s, 2H).	Ex. # 3
33		{1-(isoxazol-5-ylcarbonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile trifluoroacetic acid salt	375.0	(400 MHz, d_6-dmso): 12.50 (br s, 1H), 9.09 (s, 1H), 8.83 (d, major rotamer 1H), 8.80 (d, minor rotamer, 1H), 8.81 (s, 1H), 8.55 (s, 1H), 7.76-7.73 (m, 1H), 7.24-7.20 (m, 1H), 7.19 (d, minor rotamer, 1H), 7.15 (d, major rotamer, 1H), 5.22 (d, 1H), 4.91 (d, 1H), 4.73 (d, 1H), 4.48 (d, 1H), 3.79 (s, 2H).	Ex. # 2
34		{1-(1H-pyrazol-3-ylcarbonyl)-3-[4-(7H-pyrrolo[2,3 -d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl }acetonitrile trifluoroacetic acid salt	374.2	(400 MHz, d_6-dmso): 12.77 (br s, 1H), 9.14 (s, 1H), 8.89 (s, 1H), 8.59 (s, 1H), 7.87-7.82 (m, 2H), 7.33-7.29 (m, 1H), 6.71 (d, 1H), 5.11 (d, 1H), 4.91 (d, 1H), 4.68 (d, 1H), 4.44 (d, 1H), 3.78 (s, 2H)	Ex. # 3 Modification A
35		isobutyl 3-(cyanomethyl) -3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol- -yl]azetidine-1-carboxylate trifluoroacetic acid salt	380.1	(400 MHz, d_6-dmso): 12.53 (br s, 1H), 9.02 (s, 1H), 8.82 (s, 1H), 8.53 (s, 1H), 7.78-7.74 (m, 1H), 7.23-7.20 (m, 1H), 4.57 (br s, 2H), 4.30 (br s, 2H), 3.80 (d, 2H), 3.71 (s, 2H), 1.87 (sept, 1H), 0.89 (d, 6H).	Ex. # 2
36		phenyl 3-(cyanomethyl) -3-[4-(7H-pyrrolo[2,3-d]pyrim din-4-yl)-1H-pyrazol-1-yl]azetidine-1-carboxy ate trifluoroacetic acid salt	400.1	(400 MHz, d_6-dmso): 12.52 (br s, 1H), 9.08 (s, 1H), 8.83 (s, 1H), 8.57 (s, 1H), 7.79-7.75 (m, 1H), 7.44-7.37 (m, 2H), 7.28-7.22 (m, 2H), 7.20-7.12 (m, 2H), 4.85 (br m, 1H), 4.66 (br m, 1H), 4.56 (br m, 1H), 4.39 (br m, 1H), 3.79 (s, 2H).	Ex. # 2
37		benzyl 3-(cyanomethyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidine-1-carboxylate trifluoroacetic acid sal:	414.2	(400 MHz, d_6-dmso): 12.56 (br s, 1H), 9.03 (s, 1H), 8.83 (s, 1H), 8.54 (s, 1H), 7.79-7.75 (br m, 1H), 7.40-7.30 (m, 5H), 7.24-7.21 (br m, 1H), 5.10 (s, 2H), 4.60 (br,	Ex. # 2

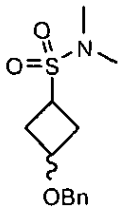
				2H), 4.34 (br, 2H), 3.72 (s, 2H).	
38		3-(cyanomethyl)-N-phenyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidine-1-carboxamide trifluoroacetic acid salt	399.2	(400 MHz, d_6-dmso): 12.61 (br s, 1H), 9.06 (s, 1H), 8.85 (s, 1H), 8.75 (s, 1H), 8.57 (s, 1H), 7.79 (br t, 1H), 7.53-7.48 (m, 2H), 7.29-7.22 (m, 3H), 6.95 (t, 1H), 4.61 (d, 2H), 4.36 (d, 2H), 3.75 (s, 2H).	Ex. # 2

Where products in Table 1 are referred to as the free base, they were purified using preparative-HPLC/MS (XBridge C18 column, eluting with a gradient of MeCN/H_2O containing 0.15% NH_4OH rather than containing 0.1% TFA).

Example 39. cis-3-(cyanomethyl)-N,N-dimethyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanesulfonamide
and trans-3-(cyanomethyl)-N,N-dimethyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanesulfonamide



Step 1. cis- and trans-3-(benzyloxy)-N,N-dimethylcyclobutanesulfonamide



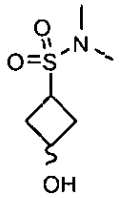
To a solution of methanesulfonamide, N,N-dimethyl- (7.45 g, 60.5 mmol) in tetrahydrofuran (190 mL) at -78 °C was added a solution of 2.50 M of n-butyllithium in

hexane (31 mL, 77.5 mmol) . The reaction was stirred at -78 °C for 45 minutes, was then warmed to 0 °C and stirred for 15 minutes, then was re-cooled to -78 °C. A solution of 2-(benzyloxy)-propane-1,3-diyl bis(4-methylbenzenesulfonate) (prepared as described in Chemical Communications v. 30, pp. 3190-3192 (2006); 29.1 g, 59.3 mmol) in tetrahydrofuran (120 mL) was added dropwise, rapidly. The reaction was stirred at -78 °C for 15 minutes following complete addition, then the bath was removed and the reaction allowed to warm to ambient temperature over 1.5 hours. The solution was re-cooled to -78 °C and 2.50 M of n-butyllithium in hexane (31 mL, 77.5 mmol) was added. After 15 min, the bath was removed and the reaction again allowed to reach ambient temperature and stir for 16 hours. As the reaction was judged incomplete by TLC, it was cooled again to -78 °C and a further portion of 2.50 M of n-butyllithium in hexane (10 mL, 25 mmol) was added. Upon warming to room temperature, the reaction was quenched by the addition of water and the mixture was extracted with three portions of ethyl acetate. The combined organic extracts were washed with saturated sodium bicarbonate solution followed by brine, dried over sodium sulfate, filtered and concentrated. Flash chromatography, eluting with a gradient of 20-50% ethyl acetate in hexanes afforded desired product. The isomers were characterized separately but were recombined for the subsequent transformation as a mixture of cis and trans isomers (7.06 g, 44%).

Isomer 1: ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.38-7.27 (m, 5H), 4.42 (s, 2H), 4.41-4.33 (m, 1H), 3.83-3.74 (m, 1H), 2.87 (s, 6H), 2.79-2.71 (m, 2H), 2.47-2.38 (m, 2H).

Isomer 2: ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.37-7.26 (m, 5H), 4.44 (s, 2H), 4.02-3.93 (m, 1H), 3.34-3.24 (m, 1H), 2.85 (s, 6H), 2.61-2.46 (m, 4H).

Step 2. cis- and trans-3-hydroxy-N,N-dimethylcyclobutanesulfonamide

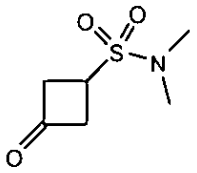


To a mixture of cis- and trans-3-(benzyloxy)-N,N-dimethylcyclobutanesulfonamide (7.06 g, 26.2 mmol) in ethanol (100 mL) was added palladium (2.8 g, 2.6 mmol) (10% on C, wet Degussa type). The mixture was degassed and shaken under 50 psi of hydrogen for 16 hours. The reaction mixture was filtered, and the palladium on carbon was rinsed with ethanol. The filtrate was concentrated to afford a white solid, used without further

purification (4.60 g, 98%).

^{1}H NMR (400 MHz, $CDCl_3$): δ 4.71-4.63 (m, 1H, minor isomer), 4.22 (p, 1H, major isomer), 3.83-3.74 (m, 1H, minor isomer), 3.37-3.27 (m, 1H, major isomer), 2.87 (s, 6H, minor isomer), 2.86 (s, 6H, major isomer), 2.85-2.77 (m, 2H, minor isomer), 2.76-2.68 (m, 2H, major isomer), 2.48-2.40 (m, 2H, major isomer), 2.40-2.32 (m, 2H, minor isomer).

Step 3. N,N-dimethyl-3-oxocyclobutanesulfonamide



To a solution of Dess-Martin periodinane (14.3 g, 33.7 mmol) in methylene chloride (200 mL) was added cis- and trans-3-hydroxy-N,N-dimethylcyclobutanesulfonamide (5.75 g, 32.1 mol) in methylene chloride (200 mL). The reaction was stirred at ambient temperature for 16 hours. The volume of DCM was reduced to 100 mL *in vacuo*. This solution was filtered through a plug of basic alumina, rinsing with further DCM. The filtrate was evaporated. The resulting yellow sticky solid was extracted by stirring vigorously with several portions of diethyl ether in succession. The extracts were filtered through a plug of solid sodium carbonate and again filtered through another plug of basic alumina, rinsing finally with an additional small portion of ethyl acetate to afford clean product (4 g, 70%).

^{1}H NMR (400 MHz, $CDCl_3$): δ 3.89-3.80 (m, 1H), 3.68-3.59 (m, 2H), 3.44-3.34 (m, 2H), 2.93 (s, 6H).

Step 4. cis-3-(cyanomethyl)-N,N-dimethyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanesulfonamide and trans-3-(cyanomethyl)-N,N-dimethyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanesulfonamide

A mixture of N,N-dimethyl-3-oxocyclobutanesulfonamide (4.0 g, 22 mmol) and (triphenylphosphoranylidene)acetonitrile (6.80 g, 22.6 mmol) in toluene (150 mL) was heated to reflux for 1 hour. The reaction solution was decanted away from insolubles and the solvent removed *in vacuo* to afford crude product, used without further purification in conjugate addition.

^{1}H NMR (300 MHz, $CDCl_3$): δ 5.31-5.25 (m, 1H), 3.91-3.78 (m, 1H), 3.50-3.10 (m, 4H), 2.89 (s, 6H).

To a solution of 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-

pyrrolo[2,3-d]pyrimidine (7.09 g, 22.5 mmol) and crude 3-(cyanomethylene)-N,N-dimethylcyclobutanesulfonamide (prepared above) in acetonitrile (200 mL) was added 1,8-diazabicyclo[5.4.0]undec-7-ene (3.36 mL, 22.5 mmol). The reaction was stirred for 16 hours. The crude product was purified by flash column chromatography, eluting with a gradient of 0-10% MeOH in DCM (dichloromethane). The product collected from this pre-purification was further purified using preparative-HPLC/MS (XBridge C18 column, eluting with a gradient of MeCN/H_2O containing 0.15% NH_4OH) to afford a mixture of isomers. The cis- and trans- isomers were separated using a portion of this mixture by the following method: Chiral Technologies Chiralcel OJ column, 30 x 250 mm, 5μ packing material, eluting with 60% ethanol in hexanes at a flow rate of 14.5 mL/min and column loading of 65 mg/injection. Peak 1 so obtained was deprotected by stirring with 20% TFA/DCM for 2 hours, followed by evaporation and dissolving the residue in 4 mL MeOH to which 0.25 mL of ethylenediamine was then added. After stirring for 1 hour, the solvents were removed *in vacuo*, the crude product reconstituted and purified by preparative-HPLC/MS (XBridge C18 column, eluting with a gradient of MeCN/H_2O containing 0.15% NH_4OH) to afford cis-3-(cyanomethyl)-N,N-dimethyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanesulfonamide.

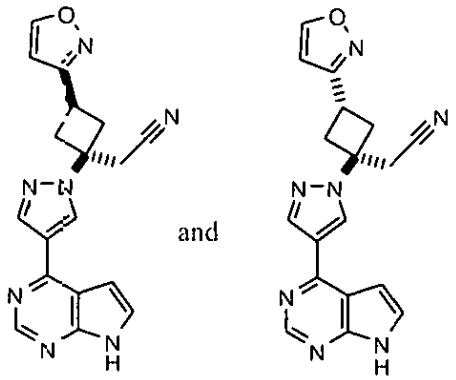
^{1}H NMR (500 MHz, d_6-dmso): δ 12.10 (br s, 1H), 8.78 (s, 1H), 8.69 (s, 1H), 8.42 (s, 1H), 7.60 (d, 1H), 7.06 (d, 1H), 4.25 (p, 1H), 3.59 (s, 2H), 3.14-3.07 (m, 2H), 2.85-2.79 (m, 2H), 3.80 (s, 6H); LCMS: 386.1.

Peak 2 obtained from the separation of isomers was deprotected and purified by the same method as for Peak 1 to afford trans-3-(cyanomethyl)-N,N-dimethyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanesulfonamide.

^{1}H NMR (500 MHz, d_6-dmso): δ 12.10 (br s, 1H), 8.90 (s, 1H), 8.70 (s, 1H), 8.45 (s, 1H), 7.60 (d, 1H), 7.09 (d, 1H), 4.18 (p, 1H), 3.46 (s, 2H), 3.35-3.28 (m, 2H), 2.89-2.82 (m, 2H), 2.79 (s, 6H); LCMS: 386.0.

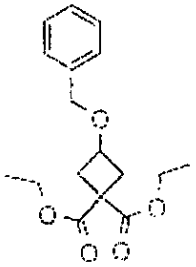
Example 40. cis-3-isoxazol-3-yl-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile

and trans -3-isoxazol-3-yl-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile



and

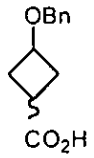
Step 1. diethyl 3-(benzyloxy)cyclobutane-1,1-dicarboxylate



To a suspension of sodium hydride (60% dispersion in mineral oil, 4.67 g, 0.117 mol) in 1,4-dioxane (69 mL) was added diethyl malonate (17.7 mL, 0.117 mol) dropwise. The mixture was stirred for 1.5 hours at ambient temperature after complete addition. To this mixture was added [2-bromo-1-(chloromethyl)ethoxy]methylbenzene (prepared according to the procedure found in Organic Letters (2004), 6(11), pp.1853-1856; 32.0 g, 0.121 mol) dropwise and the resulting mixture was stirred for 1 hour at ambient temperature, then heated at reflux for 16 hours. The mixture was cooled briefly in an ice bath and sodium hydride (60% dispersion in mineral oil, 4.67 g, 0.117 mol) was added portionwise. The mixture was heated to reflux for a further 24 hours. Upon cooling to room temperature, the mixture was poured into pH 7 buffer and brine, and the product was extracted with three portions of ethyl acetate. The combined extracts were washed with brine, dried over sodium sulfate, decanted and concentrated. Flash column chromatography, eluting with a gradient of 5-60% ethyl acetate in hexanes afforded product (26.9 g, 75%).

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.37-7.25 (m, 5H), 4.42 (s, 2H), 4.24-4.10 (m, 5H), 2.83-2.75 (m, 2H), 2.58-2.50 (m, 2H), 1.31-1.24 (m, 6H).

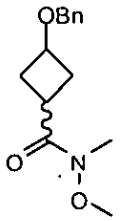
Step 2. cis- and trans-3-(benzyloxy)cyclobutanecarboxylic acid



A solution of diethyl 3-(benzyloxy)cyclobutane-1,1-dicarboxylate (20.0 g, 0.0653 mol) and potassium hydroxide (18 g, 0.32 mol) in ethanol (110 mL) and water (10 mL) was heated to reflux for 2 hours. The basic mixture was washed once with diethyl ether. The ether wash was back extracted with two portions of 1N NaOH. The combined aqueous layers were acidified by the addition of c.HCl and were then extracted with ethyl ether three times. The combined extracts were washed with brine, dried over sodium sulfate, decanted and concentrated to afford the intermediate diacid as a sticky yellow solid which was subsequently azeotroped with toluene. The diacid was heated neat under hyvac (<5 mm Hg) at 190 °C for 1.5 hours to effect decarboxyation to a mixture of cis- and trans- monoacids, used without further purification (13.5 g, 92%).

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.38-7.26 (m, 10H), 4.44 (s, 2H), 4.43 (s, 2H), 4.31 (p, 1H), 4.02-3.93 (m, 1H), 3.12-3.04 (m, 1H), 2.72-2.62 (m, 1H), 2.59-2.48 (m, 4H), 2.38-2.24 (m, 4H).

Step 3. cis- and trans-3-(benzyloxy)-N-methoxy-N-methylcyclobutanecarboxamide

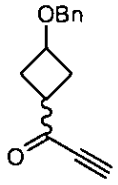


A mixture of 3-(benzyloxy)cyclobutanecarboxylic acid (2.50 g, 12.1 mmol), N,O-dimethylhydroxylamine hydrochloride (1.18 g, 12.1 mmol), benzotriazol-1-yloxytris(dimethylamino)phosphonium hexafluorophosphate (5.9 g, 13 mmol) (Advanced ChemTech) and triethylamine (3.7 mL, 27 mmol) in methylene chloride (80 mL) was stirred at room temperature for 16 hours. The solution was then washed with twice with water, once with brine, dried over sodium sulfate, decanted and concentrated. Flash column chromatography, eluting with a gradient of 20-50% ethyl acetate in hexanes afforded product as a mixture of cis- and trans- isomers (1.7 g, 56%).

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.35-7.24 (m, 10H), 4.43 (s, 2H), 4.42 (s, 2H), 4.31-4.24 (m,

1H), 4.03-3.95 (m, 1H), 3.64 (s, 3H), 3.63 (s, 3H), 3.47 (br s, 1H), 3.19 (s, 3H), 3.18 (s, 3H), 2.95 (br s, 1H), 2.57-2.48 (m, 2H), 2.47-2.38 (m, 2H), 2.34-2.23 (m, 4H).

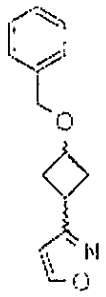
Step 4. cis- and trans-1-[3-(benzyloxy)cyclobutyl]prop-2-yn-1-one



To a solution of 3-(benzyloxy)-N-methoxy-N-methylcyclobutanecarboxamide (1.7 g, 6.8 mmol) in tetrahydrofuran (40 mL) at -78 °C was added 0.5 M of ethynylmagnesium bromide in tetrahydrofuran (14.3 mL, 7.15 mmol) and the reaction was allowed to warm to ambient temperature over a period of 1 hour. The reaction was quenched by the addition of satd. NH_4Cl solution and the product was extracted with ethyl acetate. The extracts were dried over sodium sulfate, decanted and concentrated to afford product used without further purification in Step 5.

^1H NMR (400 MHz, $CDCl_3$): δ 7.39-7.21 (m, 10H), 4.43 (s, 2H), 4.41 (s, 2H), 4.19-4.09 (m, 1H), 4.06-3.95 (m, 1H), 3.36-3.24 (m, 1H), 3.29 (s, 1H), 3.26 (s, 1H), 2.90-2.79 (m, 1H), 2.67-2.59 (m, 2H), 2.56-2.47 (m, 2H), 2.36-2.26 (m, 4H).

Step 5. cis-3-[3-(benzyloxy)cyclobutyl]isoxazole and trans-3-[3-(benzyloxy)cyclobutyl]isoxazole

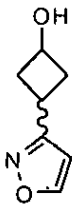


To a solution of 1-[3-(benzyloxy)cyclobutyl]prop-2-yn-1-one (prepared in Step 4) in ethanol (40 mL) was added hydroxylamine hydrochloride (0.54 g, 7.7 mmol) followed by sodium carbonate (1.48 g, 14.0 mmol). The reaction was stirred for 16 hours. The reaction

was then heated to reflux for 4 hours and cooled. Into the reaction mixture was added water and ethyl acetate. The layers were separated, and the aqueous layer was extracted with two further portions of ethyl acetate. The combined extracts were washed with brine, dried over sodium sulfate, decanted and concentrated. Flash column chromatography, eluting with a gradient of 15-50% ethyl acetate in hexanes afforded the product as a mixture of cis- and trans- isomers (520 mg, 33% over the two steps).

^{1}H NMR (400 MHz, $CDCl_3$): δ 8.32 (dd, 1H), 8.31 (dd, 1H), 7.36-7.26 (m, 10H), 6.30 (d, 1H), 6.21 (d, 1H), 4.47 (s, 2H), 4.45 (s, 2H), 4.38-4.30 (m, 1H), 4.12-4.04 (m, 1H), 3.62-3.53 (m, 1H), 3.23-3.13 (m, 1H), 2.75-2.14 (m, 8H).

Step 6. cis- and trans-3-isoxazol-3-ylcyclobutanol



A mixture of cis- and trans-3-[3-(benzyloxy)cyclobutyl]isoxazole (0.520 g, 2.27 mmol) and 20% palladium hydroxide on carbon (0.14 g, 0.20 mmol) in tetrahydrofuran (30 mL) and acetic acid (8 mL) was degassed and stirred under an atmosphere of hydrogen (provided by a balloon) for 3 hours. The mixture was filtered, neutralized by the addition of NaOH and extracted with three portions of ethyl acetate. The combined extracts were washed with brine, dried over sodium sulfate, decanted and concentrated to afford product as a mixture of cis- and trans- isomers (320 mg, 100%).

^{1}H NMR (400 MHz, CD_3OD): δ 8.55 (dd, 1H), 8.54 (dd, 1H), 6.44 (d, 1H), 6.42 (d, 1H), 4.50-4.41 (m, 1H), 4.26-4.17 (m, 1H), 3.55-3.46 (m, 1H), 3.14-3.03 (m, 1H), 2.73-2.64 (m, 2H), 2.54-2.46 (m, 2H), 2.44-2.35 (m, 2H), 2.13-2.03 (m, 2H).

Step 7. 3-isoxazol-3-ylcyclobutanone

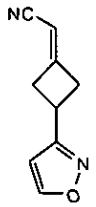


3-Isoxazol-3-ylcyclobutanol (0.316 g, 2.27 mmol), as a mixture of cis- and trans-

isomers, was dissolved in methylene chloride (10 mL) and Dess-Martin periodinane (0.96 g, 2.3 mmol) was added. After stirring for 2 hours, satd. $NaHCO_3$ solution and brine were added, and the mixture was extracted with three portions of ethyl acetate. The combined extracts were dried over sodium sulfate, decanted and concentrated. Flash column chromatography, eluting with a gradient of 20-50% ethyl acetate in hexanes, afforded product (258 mg, 83%).

^{1}H NMR (400 MHz, $CDCl_3$): δ 8.40 (dd, 1H), 6.31 (d, 1H), 3.81-3.72 (m, 1H), 3.59-3.48 (m, 2H), 3.46-3.37 (m, 2H).

Step 8. (3-isoxazol-3-ylcyclobutylidene)acetonitrile



Sodium hydride (60% dispersion in mineral oil, 75 mg, 1.88 mmol) was added at once to a solution of diethyl cyanomethylphosphonate (0.33 mL, 2.1 mmol) in tetrahydrofuran (8 mL). After stirring for 5 minutes, a solution of 3-isoxazol-3-ylcyclobutanone (258 mg, 1.88 mmol) in tetrahydrofuran (20 mL) was added. After 2 hours reaction time, the reaction mixture was partitioned between ethyl acetate and brine and the layers separated. The aqueous layer was extracted with two further portions of ethyl acetate and the combined extracts were dried over sodium sulfate, decanted and concentrated. The residue was then azeotroped with toluene and the product was used without further purification in Step 9.

^{1}H NMR (400 MHz, $CDCl_3$): δ 8.38 (dd, 1H), 6.28 (d, 1H), 5.27 (p, 1H), 3.81-3.72 (m, 1H), 3.50-3.15 (m, 4H).

Step 9. cis-3-isoxazol-3-yl-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile and trans-3-isoxazol-3-yl-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile

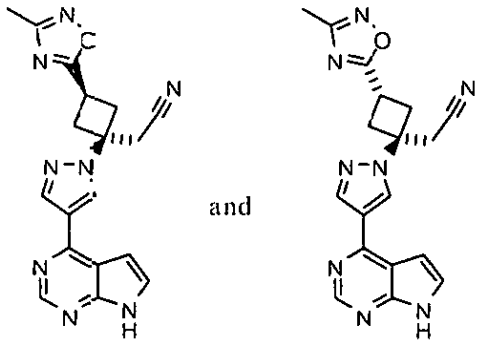
To a solution of (3-isoxazol-3-ylcyclobutylidene)acetonitrile (prepared in Step 8) in acetonitrile (8 mL) was added 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (0.59 g, 1.9 mmol) followed by 1,8-diazabicyclo[5.4.0]undec-7-ene (280 µL, 1.9 mmol). The reaction was stirred for 72 hours. The acetonitrile was removed *in*

vacuo. Flash column chromatography, eluting with a gradient of 50-100% ethyl acetate in hexanes, afforded a mixture of cis- and trans- isomers. The mixture was stirred with 20% TFA/DCM (8 mL/32 mL) for 3 hours, and the excess solvents were removed *in vacuo*. The residue was stirred with ethylenediamine (2 mL) in MeOH (40 mL) for 16 hours. Solvents were again removed *in vacuo*. The mixture was purified by preparative-HPLC/MS (XBridge C18 column, mobile phases 20.5-25.5 % of MeCN/H_2O containing 0.1% NH_4OH). Peak 1, cis-3-isoxazol-3-yl-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (185 mg, 28%), Peak 2, trans-3-isoxazol-3-yl-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (85 mg, 13%).

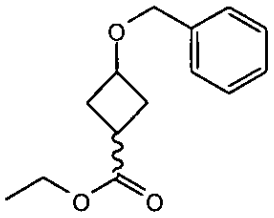
Peak 1, (cis-): ^{1}H NMR (400 MHz, d_6-dmso): δ 12.13 (br s, 1H), 8.85 (d, 1H), 8.76 (s, 1H), 8.69 (s, 1H), 8.42 (s, 1H), 7.60 (d, 1H), 7.07 (d, 1H), 6.67 (d, 1H), 3.85 (p, 1H), 3.67 (s, 2H), 3.04-2.95 (m, 2H), 2.89-2.81 (m, 2H); LCMS $(M+H)^+$: 346.1.

Peak 2, (trans-): ^{1}H NMR (400 MHz, d_6-dmso): δ 12.14 (br s, 1H), 8.94 (s, 1H), 8.89 (d, 1H), 8.71 (s, 1H), 8.47 (s, 1H), 7.62 (cd, 1H), 7.11 (dd, 1H), 6.73 (d, 1H), 3.71 (p, 1H), 3.46 (s, 2H), 3.34-3.27 (m, 2H), 2.80-2.71 (m, 2H); LCMS $(M+H)^+$: 346.1.

Example 41. {cis-3-(3-methyl-1,2,4-oxadiazol-5-yl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutyl}acetonitrile trifluoroacetate salt and {trans-3-(3-methyl-1,2,4-oxadiazol-5-yl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutyl}acetonitrile trifluoroacetic acid salt



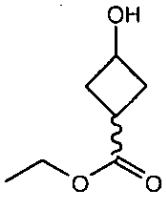
Step 1. cis- and trans-ethyl 3-(benzyloxy)cyclobutanecarboxylate



To a solution of 3-(benzyloxy)cyclobutanecarboxylic acid (5.00 g, 24.2 mmol) (prepared as in Example 6, Step 2) in ethanol (60 mL) was added 0.08 mL c.H_2SO_4. The mixture was heated at gentle reflux for 48 hours. After cooling to room temperature, the solvent was evaporated *in vacuo*. Flash column chromatography, eluting with a gradient of 0-20% ethyl acetate in hexanes afforded desired product as a mixture of cis- and trans- isomers (3.91 g, 69%).

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.37-7.26 (m, 10H), 4.43 (s, 2H), 4.41 (s, 2H), 4.29 (p, 1H), 4.14 (q, 2H), 4.13 (q, 2H), 3.99-3.91 (m, 1H), 3.07-2.98 (m, 1H), 2.66-2.55 (m, 1H), 2.54-2.44 (m, 4H), 2.34-2.20 (m, 4H), 1.26 (t, 3H), 1.25 (t, 3H).

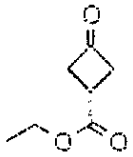
Step 2. cis- and trans-ethyl 3-hydroxycyclobutanecarboxylate



To a solution of cis- and trans-ethyl 3-(benzyloxy)cyclobutanecarboxylate (3.91 g, 16.7 mmol) in ethanol (40 mL) was added palladium (10% on carbon, wet Degussa type) (270 mg, 0.25 mmol). The mixture was degassed and shaken under 50 psi of hydrogen for 16 hours. The reaction mixture was filtered and the solvent removed *in vacuo* to afford product as a mixture of cis- and trans- isomers used without further purification (2.40 g, 99%).

^{1}H NMR (400 MHz, $CDCl_3$): δ 4.60-4.52 (m, 1H), 4.22-4.12 (m, 1H), 4.14 (q, 2H), 4.13 (q, 2H), 3.04-2.96 (m, 1H), 2.64-2.51 (m, 5H), 2.25-2.11 (m, 4H), 2.02 (br s, 2H), 1.25 (t, 3H) 1.25 (t, 3H).

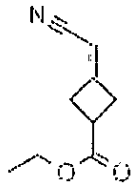
Step 3. ethyl 3-oxocyclobutanecarboxylate



To methylene chloride (100 mL) at -78 °C was added oxalyl chloride (1.79 mL, 21.2 mmol), followed by dimethyl sulfoxide (2.51 mL, 35.3 mmol). After 30 minutes, cis- and trans-ethyl 3-hydroxycyclobutanecarboxylate (2.68 g, 17.6 mol) in methylene chloride (46 mL) was added. The mixture was stirred for 30 minutes at -78 °C. Triethylamine (9.84 mL, 70.6 mmol) was added. The mixture was then allowed to warm to room temperature over 2 hours. Water was added to the reaction mixture, and the layers separated. The organic phase was washed sequentially with 1N HCl, water, saturated sodium bicarbonate solution, brine, dried over sodium sulfate, decanted and concentrated. The product (2.36 g, 94%) was used without further purification.

^{1}H NMR (400 MHz, $CDCl_3$): δ 4.21 (q, 2H), 3.45-3.37 (m, 2H), 3.33-3.17 (m, 3H), 1.29 (t, 3H).

Step 4. ethyl 3-(cyanomethylene)cyclobutanecarboxylate

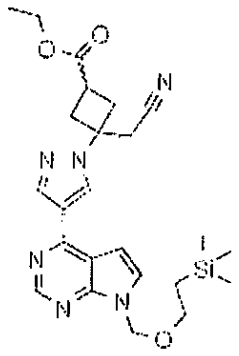


To a suspension of sodium hydride (60% dispersion in mineral oil, 0.730 g, 18.3 mmol) in tetrahydrofuran (100 mL) at 0 °C was added diethyl cyanomethylphosphonate (3.22 mL, 19.9 mmol), dropwise. The cooling bath was removed and the reaction was allowed to reach room temperature and was stirred at this temperature for 45 minutes. The solution was re-cooled to 0 °C and a solution of ethyl 3-oxocyclobutanecarboxylate (2.36 g, 16.6 mmol) in tetrahydrofuran (50 mL) was introduced dropwise. After stirring for 2 hours, water and ethyl ether were added into the reaction. The layers were separated and the aqueous portion extracted with two further portions of ether. The combined extracts were washed with brine, dried over sodium sulfate, decanted and concentrated. The residue was azeotroped once with toluene to afford product, used without further purification in Step 5.

^{1}H NMR (400 MHz, $CDCl_3$): δ 5.23-5.20 (m, 1H), 4.18 (q, 2H), 3.25-3.02 (m, 5H), 1.28 (t,

3H).

Step 5. ethyl 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarboxylate



To a solution of 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (5.23 g, 16.6 mmol) and ethyl 3-(cyanomethylene)cyclobutanecarboxylate (prepared in Step 4) in acetonitrile (40 mL) was added 1,8-diazabicyclo[5.4.0]undec-7-ene (2.48 mL, 16.6 mmol). The mixture was stirred for 136 hours at room temperature. The solvent was removed *in vacuo*. Flash column chromatography, eluting with a gradient of 50-90% ethyl acetate in hexanes afforded product as a mixture of cis- and trans- isomers (4.53 g, 52% over the two steps).

^{1}H NMR (400 MHz, $CDCl_3$): δ 8.85 (s, 1H), 8.84 (s, 1H), 8.45 (s, 1H), 8.41 (s, 1H), 8.33 (s, 1H), 8.31 (s, 1H), 7.41 (d, 1H), 7.40 (d, 1H), 6.81 (d, 1H), 6.80 (d, 1H), 5.68 (s, 4H), 4.17 (q, 2H), 4.12 (q, 2H), 3.54 (t, 4H), 3.27 (s, 2H), 3.28-2.80 (m, 10H), 3.19 (s, 2H), 1.26 (t, 3H), 1.25 (t, 3H), 0.92 (t, 4H), -0.06 (s, 18H); LCMS $(M+H)^+$: 481.1.

Step 6. {cis-3-(3-methyl-1,2,4-oxadiazol-5-yl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidn-4-yl)-1H-pyrazol-1-yl]cyclobutyl}acetonitrile trifluoroacetate salt and {trans-3-(3-methyl-1,2,4-oxadiazol-5-yl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidn-4-yl)-1H-pyrazol-1-yl]cyclobutyl}acetonitrile trifluoroacetate salt

To a solution of cis- and trans-ethyl 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarboxylate (2.25 g, 3.98 mmol) in tetrahydrofuran (55 mL) and water (18 mL) was added a solution of lithium hydroxide (0.48 g, 20 mmol) in a small amount of water.

The reaction was stirred at room temperature for 4 hours. The reaction mixture was cooled in an ice bath and c.HCl was added to achieve a pH of 5. The product was extracted with three portions of ethyl acetate. The extracts were dried over sodium sulfate, decanted and concentrated to afford the product as a mixture of cis- and trans- isomers, which was used without further purification. LCMS $(M+H)^+$: 453.1.

To a mixture of 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarboxylic acid prepared above (50.0 mg, 0.11 mmol), 1-Hydroxybenzotriazole (3.0 mg, 0.022 mmol), and N-hydroxyethanimidamide (prepared according to the procedure found in J. Org. Chem., 2003, 68(19), pp. 7316-7321) (8.2 mg, 0.11 mmol) in N,N-dimethylformamide (0.5 mL) and N,N-diisopropylethylamine (96 µL, 0.55 mmol) was added O-(Benzotriazol-1-yl)-N,N,N',N'-tetramethyluronium hexafluorophosphate (42 mg, 0.110 mmol) (Advanced ChemTech) and the mixture was stirred at room temperature for 16 hours. Additional sub-stoichiometric quantities of O-(benzotriazol-1-yl)-N,N,N',N'-tetramethyluronium hexafluorophosphate and N-hydroxyethanimidamide were added and the reaction was continued for a further 24 hours. The reaction was then heated to 110 °C for 1 hour to complete cyclization. Into the reaction was added saturated sodium bicarbonate solution and the product was extracted with four portions of ethyl acetate. The extracts were dried over sodium sulfate, decanted and concentrated. The crude product mixture was stirred in DCM containing 20% TFA for 2 hours, and the solvents were removed *in vacuo*. The residue was dissolved in 1.5 mL of methanol and 0.3 mL ethylenediamine and was stirred for 2 hours. The reaction mixture was purified by preparative-HPLC/MS (SunFire C18 column, eluting with a gradient of H_2O/MeCN containing 0.1% TFA), which resolved the cis- (6 mg, 10%) and trans- (5 mg, 8%) isomers and afforded each product as the trifluoroacetic acid salt.

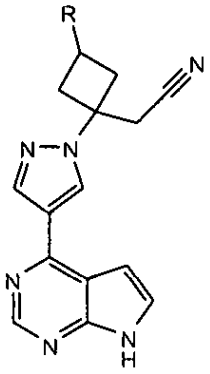
Cis- isomer: ^{1}H NMR (300 MHz, d_6-dmso): δ 12.39 (br s, 1H), 8.86 (s, 1H), 8.77 (s, 1H), 8.48 (s, 1H), 7.86 (br s, 1H), 7.73-7.68 (m, 1H), 7.19-7.14 (m, 1H), 4.12-3.96 (m, 1H), 3.70 (s, 2H), 3.22-3.08 (m, 2H), 2.99-2.85 (m, 2H), 2.31 (s, 3H); LCMS $(M+H)^+$: 361.1.

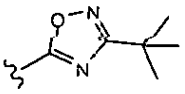
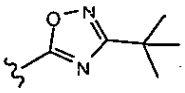
Trans- isomer: ^{1}H NMR (300 MHz, d_6-dmso): δ 12.36 (br s, 1H), 8.99 (s, 1H), 8.77 (s, 1H), 8.52 (s, 1H), 7.90 (br s, 1H), 7.72-7.67 (m, 1H), 7.21-7.17 (m, 1H), 4.03-3.88 (m, 1H), 3.52 (s, 2H), 3.47-3.31 (m, 2H), 2.93-2.84 (m, 2H), 2.36 (s, 3H); LCMS $(M+H)^+$: 361.0.

Additional oxadiazoles were prepared according to Example 41, using different amidoximes (prepared according to the procedure found in J. Org. Chem. 2003, 68(19), pp.

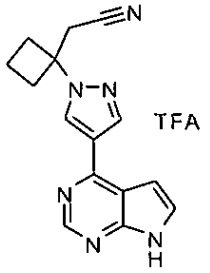
7316-7321) in Step 6, and are found in Table 2.

Table 2



Ex. No.	-R	Name	MS $(M+H)^+$	^{1}H NMR (δ)	Method of Preparation
42a	(cis-) 	{cis-3-(3-tert-butyl-1,2,4-oxadiazol-5-yl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutyl}acetonitrile trifluoroacetate salt	403.1	(300 MHz, d_6-dmso): 12.61 (br s, 1H), 8.92 (s, 1H), 8.83 (s, 1H), 8.53 (s, 1H), 7.80-7.74 (m, 1H), 7.25-7.20 (m, 1H), 4.06 (p, 1H), 3.68 (s, 2H), 3.19-3.09 (m, 2H), 3.01-2.90 (m, 2H), 1.27 (s, 9H).	Ex. # 41
42b	(trans-) 	{trans-3-(3-tert-butyl-1,2,4-oxadiazol-5-yl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutyl}acetonitrile trifluoroacetate salt	403.1	(300 MHz, d_6-dmso): 12.54 (br s, 1H), 9.03 (s, 1H), 8.83 (s, 1H), 8.55 (s, 1H), 7.79-7.73 (m, 1H), 7.27-7.22 (m, 1H), 3.96 (p, 1H), 3.51 (s, 2H), 3.45-3.33 (m, 2H), 2.98-2.87 (m, 2H), 1.33 (s, 9H).	Ex. # 41

Example 43. 1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile trifluoroacetic acid salt



Step 1. cyclobutylideneacetonitrile.

To a solution of 1.0000 M of potassium tert-butoxide in tetrahydrofuran (19.2 mL) at 0 °C was added dropwise a solution of diethyl cyanomethylphosphonate (3.26 mL, 0.0202

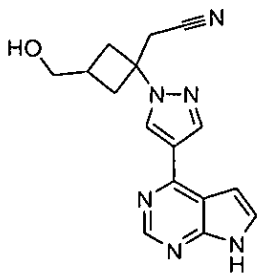
mol) in tetrahydrofuran (24.52 mL, 0.3023 mol). The reaction was warmed to rt and then cooled to 0 °C again. To the reaction mixture was added a solution of cyclobutanone (1.37 mL, 0.0183 mol) in tetrahydrofuran (4.90 mL, 0.0605 mol). The reaction was allowed to warm up to rt and stirred at rt overnight. After quenching with water, the mixture was extracted with EtOAc. The combined organic layers were washed with brine, dried and evaporated to dryness. The crude mixture was used directly in next step (1.30 g, 76.25%).

Step 2. 1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.

To a solution of 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (0.030 g, 0.000095 mol) in acetonitrile (0.60 mL, 0.011 mol) was added cyclobutylideneacetonitrile (0.0177 g, 0.000190 mol), followed by 1,8-diazabicyclo[5.4.0]undec-7-ene (0.0142 mL, 0.0000951 mol). The resulting mixture was stirred at rt overnight. After evaporation to dryness, the residue was purified on silica gel to give the desired Micheal addition product. LCMS (M+H) 409.1.

The crude residue made above was dissolved in 0.2 mL of dichloromethane and treated with 0.4 mL of TFA at rt for 30 min. After evaporation to dryness, the residue was treated with 50 µL of ethylenediamine in 1 mL of methanol at rt for 30 min. The resulting mixture was purified on RP-HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.1% TFA) to give the tilted product as TFA salt, LCMS calculated for $C_{15}H_{15}N_6(M+H)^+$: 279.1; Found: 279.0. ^1H NMR (400 MHz, DMSO-d_6): δ 12.68(1H, br s), 8.88 (1H, s), 8 84 (1H, s), 8.51 (1H, s), 7.78 (1H, m), 7.25 (1H, m), 3.49 (2H, s), 2.78 (2H, m), 2.39 (2H, m), 2.06 (1H, m), 1.93 (1H, m) ppm.

Example 44. cis- and trans-3-(hydroxymethyl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.



Step 1. diisopropyl 3,3-dimethoxycyclobutane-1,1-dicarboxylate.

Diisopropyl malonate (72 g, 0.38 mol) was added dropwise, under nitrogen, to a stirred suspension of sodium hydride (17 g, 0.42 mol) in dry N,N-dimethylformamide (140 mL, 1.8 mol) at a rate such that the temperature was maintained below 70 °C. On cessation of hydrogen evolution, 1,3-dibromo-2,2-dimethoxypropane (50 g, 0.2 mol) was added in one portion and the mixture heated at 140 °C for 48 h. The cooled mixture was poured into sat. solution of ammonium chloride (300 mL), extracted with hexane. The organic layer was washed with sat. sodium bicarbonate, brine, dried over sodium sulfate, and evaporated to dryness. The residue was distilled under vacuum (oil pump) to afford the desired cyclobutane compound (31 g, 56.32%). bp 92-94°C/0.01mm). ^{1}H NMR (400 MHz, $CDCl_3$): δ 5.02 (2H, sept., J = 6.4 Hz), 3.12 (6H, s), 2.66 (4H, s), 1.11 (12H, d, J = 6.4 Hz) ppm.

Step 2. 3-oxocyclobutanecarboxylic acid.

Diisopropyl 3,3-dimethoxycyclobutane-1,1-dicarboxylate (31 g, 0.11 mol) was heated with 78 mL of 20% HCl at reflux for 60 h. After cooling, the solution was continuously extracted with ether for 18 h. The ether was removed at a reduced pressure, leaving a yellow oil, which crystallized on standing to give the titled acid (10.4 g, 84.78%).

Step 3. methyl 3-oxocyclobutanecarboxylate.

A solution of N,N'-dicyclohexylcarbodiimide (7.17 g, 0.0347 mol) in methylene chloride (8 mL, 0.1 mol) was added dropwise to a stirred mixture of 3-oxocyclobutanecarboxylic acid (3.6 g, 0.032 mol), methanol (2.6 mL, 0.063 mol) and 4-dimethylaminopyridine (3.08 g, 0.0252 mol) in methylene chloride (20 mL, 0.2 mol). The mixture was stirred at rt for 24 h, then filtered through Celite. The filtrate was washed with 0.5 M HCl and sat. sodium bicarbonate, dried and concentrated to dry. The residue was purified on silica gel, eluting with 0 to 40% EtOAc in hexane, to give the desired ester (3.26 g, 80.64%). ^{1}H NMR ($CDCl_3$, 400 MHz): δ 3.78 (s, 3H), 3.43~3.20 (5H, m) ppm.

Step 4. methyl 3-(cyanomethylene)cyclobutanecarboxylate.

To a solution of 1.0000 M of potassium tert-butoxide in tetrahydrofuran (26.7 mL) at 0 °C was added dropwise a solution of diethyl cyanomethylphosphonate (4.53 mL, 0.0280 mol) in tetrahydrofuran (50 mL, 0.6 mol). The reaction was warmed to rt and then cooled at 0 °C again. To the reaction mixture was a solution of methyl 3-oxocyclobutanecarboxylate (3.26 g, 0.0254 mol) in tetrahydrofuran (20 mL, 0.3 mol). The reaction was allowed to warm

up to rt and stirred at rt overnight. After quenching with water, the mixture was extracted with ether. The combined organic layers were washed with water, brine, dried and evaporated to dryness. The crude mixture was purified on silica gel, eluting with 0 to 40% EtOAc in hexane, to give the desired product (3.12 g, 81.12%). LCMS calculated for $C_8H_{10}NO_2(M+H)^+$: 152.1; Found: 152.3.

Step 5. methyl 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarboxylate.

To a solution of 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (2.01 g, 0.00637 mol) in acetonitrile (4.0E1 mL, 0.77 mol) was added methyl 3-(cyanomethylene)cyclobutanecarboxylate (1.93 g, 0.0127 mol), followed by 1,8-diazabicyclo[5.4.0]undec-7-ene (0.953 mL, 0.00637 mol). The resulting mixture was stirred at 50 °C overnight. After evaporation to dryness, the residue was purified on silica gel, eluting with 0 to 100% EtOAc in hexane, to give the desired Micheal addition product as a mixture of cis- and trans- isomers (2.12 g, 71.3%). LCMS calculated for $C_{23}H_{31}N_6O_3Si(M+H)^+$: 467.2; Found: 467.4.

Step 6. 3-(hydroxymethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.

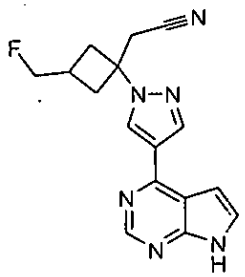
To a mixture of methyl 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarboxylate (7.0 g, 0.015 mol) in tetrahydrofuran (100 mL, 1 mol) was added lithium tetrahydroborate (0.327 g, 0.0150 mol) at 0 °C. The reaction was then heated at 50 °C for 3 h. To the reaction was added 60 mL of methanol. The resulting mixture was heated at 50 °C for another 15 min, then evaporated to dryness. The residue was treated with 1 N HCl, then neutralized with solid sodium bicarbonate, extracted with EtOAc. The combined organic layers were washed with brine, dried over sodium sulfate and evaporated to dryness. The residue was purified on silica gel, eluting with 0 to 100% EtOAc, to give the desired product as cis- and trans- mixture (5.85 g, 88.91%). LCMS calculated for $C_{22}H_{31}N_6O_2Si(M+H)^+$: 439.2; Found: 439.4.

Step 7. 3-(hydroxymethyl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.

To 3-(hydroxymethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.030 g, 0.000068 mol) was added

1.5 mL of TFA. The reaction was stirred at rt for 30 min, then evaporated to dryness. The crude mixture was dissolved in 1 mL of methanol and treated with 60 µL of ethylenediamine at rt for 5 h. The resulting mixture was purified on RP-HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give the desired products as free bases. First peak retention time 0.766 min, LCMS calculated for $C_{16}H_{17}N_6O(M+H)^+$: 309.1; Found: 309.3. ^1H NMR (400 MHz, DMSO-d_6): δ 12.11(1H, br s), 8.67 (1H, s), 8.65 (1H, s), 8.37 (1H, s), 7.58 (1H, d, J = 3.6), 7.02 (1H, d, J = 3.6 Hz), 4.69 (1H, br s), 3.47 (2H, s), 3.41 (2H, br s), 2.53 (2H, m), 2.37 (2H, m) ppm. Second peak retention time 0.805 min, LCMS calculated for $C_{16}H_{17}N_6O(M+H)^+$: 309.1; Found: 309.3. ^1H NMR (400 MHz, DMSO-d_6): δ 12.11(1H, br s), 8.80 (1H, s), 8.68 (1H, s), 8.40 (1H, s), 7.58 (1H, d, J = 3.6 Hz), 7.07 (1H, d, J = 3.6 Hz), 4.78 (1H, br t, J = 5.2 Hz), 3.47 (2H, br t, J = 5.2 Hz), 3.36 (2H, s), 2.85 (2H, m), 2.29 (2H, m) ppm.

Example 45. cis- and trans-3-(fluoromethyl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.

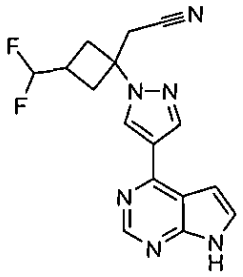


To a mixture of 3-(hydroxymethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.050 g, 0.00011 mol) in methylene chloride (3.10 mL, 0.0483 mol) in a plastic bottle was added 2-methoxy-N-(2-methoxyethyl)-N-(trifluoro-λ(4)-sulfanyl)ethanamine (63.0 µL, 0.000342 mol) followed by ethanol (1 µL, 0.00002 mol). The reaction was stirred at rt overnight, then evaporated to dryness to yield the fluorinated product. LCMS (M+H) 441.1.

To the residue from above was added 3 mL of TFA. The reaction was stirred at rt for 30 min, then evaporated to dryness. The crude mixture was dissolved in 1 mL of methanol and treated with 60 µL of ethylenediamine at rt for 5 h. The resulting mixture was purified on RP-HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing

0.15% NH_4OH) to give the desired products as free bases. First peak retention time 0.973 min on analytic LCMS [Waters SunFire HPLC column (C18, 2.1x50 mm, 5 μM), injection volumn 2 μL, flow rate 3 mL/min, gradient from 2 to 80% B in 3 minutes (A = water with 0.025% TFA; B = acetonitrile)], LCMS calculated for $C_{16}H_{16}FN_6(M+H)^+$: 311.1; Found: 311.3. Second peak retention time 1.006 min on analytic LCMS, LCMS calculated for $C_{16}H_{16}FN_6(M+H)^+$: 311.1; Found: 311.3. ^1H NMR (500 MHz, DMSO-d_6): δ 12.09(1H, br s), 8.84 (1H, s), 8.70 (1H, s), 8.43 (1H, s), 7.59 (1H, d, J = 4.0 Hz), 7.08 (1H, d, J = 4.0 Hz), 4.53 (2H, dd, J = 5.5 and 47.5 Hz), 3.38 (2H, s), 2.97 (2H, m), 2.68 (1H, m), 2.39 (2H, m) ppm. ^{19}F NMR (500 MHz, DMSO-d_6) δ -221.84 (td, J = 47.5 and 21.0 Hz) ppm.

Example 46. cis- and trans-3-(difluoromethyl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.



Step 1. 3-formyl-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.

Dimethyl sulfoxide (0.194 mL, 0.00274 mol) was added to a solution of oxalyl chloride (0.145 mL, 0.00171 mol) in methylene chloride (6.384 mL, 0.09959 mol) at -78 °C. After 10 min, 3-(hydroxymethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.500 g, 0.00114 mol) in methylene chloride (12.77 mL, 0.1992 mol) was added and the resultant mixture was stirred at -78 °C for 30 min. Triethylamine (0.794 mL, 0.00570 mol) was then added and the mixture was stirred for 5 h with the temperature allowed to gradually warm up to rt. After quenching with water, the mixture was extracted with methylene chloride. The organic layers were combined, washed with brine, dried and evaporated to dry. The residue was purified on silica gel, eluting with 0 to 100% EtOAc in hexane, to give the desired aldehyde (430 mg, 86%). LCMS calculated for $C_{22}H_{29}N_6O_2Si(M+H)^+$: 437.2; Found: 437.4.

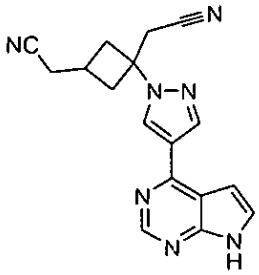
Step 2. 3-(difluoromethyl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-

yl]cyclobutylacetonitrile.

To a mixture of 3-formyl-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol- -yl]cyclobutylacetonitrile (0.285 g, 0.000653 mol) in methylene chloride (6 mL, 0.09 mol) in a plastic bottle was added 2-methoxy-N-(2-methoxyethyl)-N-(trifluoro-λ(4)-sulfanyl)ethanamine (0.481 mL, 0.00261 mol) followed by ethanol (8 µL, 0.0001 mol). The reaction was stirred at rt overnight, then evaporated to dryness. LCMS (M+H) 459.4.

To the residue made above was added 3 mL of TFA. The reaction was stirred at rt for 30 min, then evaporated to dryness. The crude mixture was dissolved in 3 mL of methanol and treated with ethylenediamine (0.22 mL, 0.0033 mol) at rt for 5 h. The resulting mixture was purified on RP-HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give the desired products as free bases. First peak retention time 0.935 min, LCMS calculated for $C_{16}H_{15}F_2N_6(M+H)^+$: 329.1; Found: 329.1. ^1H NMR (500 MHz, DMSO-d_6): δ 12.10(1H, br s), 8.74 (1H, s), 8.69 (1H, s), 8.40 (1H, s), 7.59 (1H, d, J = 3.5 Hz), 7.06 (1H, d, J = 3.5 Hz), 6.20 (1H, td, J = 57.0 and 4.0 Hz), 3.57 (2H, s), 2.98 (1H, m), 2.81 (2H, m), 2.52 (2H, m) ppm. Second peak retention time 0.974 min, LCMS calculated for $C_{16}H_{15}F_2N_6(M+H)^+$: 329.1; Found: 329.1. ^1H NMR (500 MHz, DMSO-d_6): δ 12.10(1H, br s), 8.78 (1H, s), 8.70 (1H, s), 8.44 (1H, s), 7.60 (1H, d, J = 3.5 Hz), 7.09 (1H, d, J = 3.5 Hz), 6.25 (1H, td, J = 57.0 and 4.5 Hz), 3.41 (2H, s), 3.01 (2H, m), 2.90 (1H, m), 2.56 (2H, m) ppm.

Example 47. cis- and trans-2,2'-[1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutane-1,3-diyl]diacetonitrile.



Step 1. 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylmethyl methanesulfonate.

To a mixture of 3-(hydroxymethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.122 g, 0.000278 mol) in methylene chloride (2 mL, 0.04 mol) was added triethylamine (0.0775 mL, 0.000556

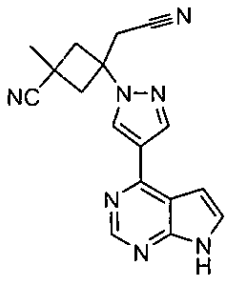
mol) followed by methanesulfonyl chloride (0.0478 g, 0.000417 mol) at 0 °C. The reaction was stirred at rt overnight, quenched with water, extracted with dichloromethane. The organic layers were washed with brine, dried over magnesium sulfate, then evaporated to dryness. The crude mixture was used directly in next step (138 mg, 96.02%). LCMS calculated for $C_{23}H_{33}N_6O_4SSi(M+H)^+$: 517.2; Found: 517.4.

Step 2. 2,2'-[1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutane-1,3-diyl]diacetonitrile.

A mixture of 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylmethyl methanesulfonate (0.138 g, 0.000267 mol) and potassium cyanide (0.0870 g, 0.00134 mol) in N,N-dimethylformamide (1.0 mL, 0.013 mol) was heated at 65 °C overnight. After cooled to rt, the mixture was extracted with EtOAc. The combined organic layers were washed with water, brine, dried over magnesium sulfate, then evaporated to dryness. LCMS (M+H) 448.4.

The crude product made above was treated with 1 mL of TFA at rt for 30 min, then evaporated to dryness. The resulting residue was treated with 0.1 mL of ethylenediamine in 1 mL of MeOH at rt overnight. The mixture was applied on RP-HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give two isomers at a ratio of 3:2. First peak retention time 0.869 min, LCMS calculated for $C_{17}H_{16}N_7(M+H)^+$: 318.1; Found 318.3. ^1H NMR (500 MHz, DMSO-d_6): δ 12.09(1H, br s), 8.72 (1H, s), 8.69 (1H, s), 8.39 (1H, s), 7.60 (1H, d, J = 3.5 Hz), 7.05 (1H, d, J = 3.5 Hz), 3.52 (2H, s), 2.79 (2H, br s), 2.68 (1H, m), 2.61 (2H, br s), 2.60 (2H, br s) ppm. Second peak retention time 0.919 min, LCMS calculated for $C_{17}H_{16}N_7(M+H)^+$: 318.1; Found 318.3. ^1H NMR (500 MHz, DMSO-d_6): δ 12.09(1H, br s), 8.85 (1H, s), 8.70 (1H, s), 8.43 (1H, s), 7.59 (1H, d, J = 3.5 Hz), 7.08 (1H, d, J = 3.5 Hz), 3.40 (2H, s), 3.07 (2H, m), 2.80 (2H, d, J = 7.0 Hz), 2.70 (1H, m), 2.34 (2H, m) ppm.

Example 48. cis- and trans-3-(cyanomethyl)-1-methyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile.



Step 1. 1-methyl-3-methylenecyclobutanecarbonitrile

To a mixture of 3-methylenecyclobutanecarbonitrile (5.00 g, 0.0537 mol) (from Bepharm Ltd., China) in tetrahydrofuran (200 mL, 2 mol) was added 2.00 M of lithium diisopropylamide in tetrahydrofuran (32.2 mL) at -78 °C. After stirring at -78 °C for 30 min, methyl iodide (4.18 mL, 0.0671 mol) was added. The reaction was stirred at -78 °C for 30 min, then allowed to warm up to rt, quenched with ammonium chloride, then extracted with ether. The combined organic layers were washed with water, brine, dried, and evaporated to dryness. The crude residue was used directly in next step.

Step 2. 1-methyl-3-oxocyclobutanecarbonitrile.

A mixture of water (60 mL, 3 mol) and 1,4-dioxane (200 mL, 2 mol), 1-methyl-3-methylenecyclobutanecarbonitrile (5.75 g, 0.0537 mol), and 0.2 M of osmium tetraoxide in water (1 mL) was stirred for 5 min, during which time the mixture became brown. While the temperature was maintained at room temperature, sodium periodate (24.1 g, 0.113 mol) was added in portions over a period of 30 min. The mixture was stirred overnight. The mixture was extracted with dichloromethane and combined organic layers were dried over $MgSO_4$. After removal of the solvents, the crude product was used directly in next step (5.50 g, 93.92%). ^1H NMR ($CDCl_3$, 400 MHz): δ 3.74 (2H, m), 3.16 (2H, m), 1.75 (3H, s) ppm.

Step 3. 3-(cyanomethylene)-1-methylcyclobutanecarbonitrile.

To a solution of 1.0 M of potassium tert-butoxide in tetrahydrofuran (52.9 mL) at 0 °C was added dropwise a solution of diethyl cyanomethylphosphonate (8.98 mL, 0.0555 mol) in tetrahydrofuran (90 mL, 1 mol). The reaction was warmed to rt and then cooled at 0 °C again. To the reaction mixture was added a solution of 1-methyl-3-oxocyclobutanecarbonitrile (5.50 g, 0.0504 mol) in tetrahydrofuran (40 mL, 0.6 mol). The reaction was allowed to warm up to rt and stirred at rt overnight. After quenching with water, the mixture was extracted with ether. The combined organic layers were washed with water,

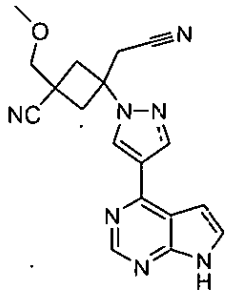
brine, dried and evaporated to dryness. The crude mixture was purified on silica gel, eluting with 0 to 60% EtOAc in hexane, to give the desired product (3.12 g, 46.84%). LCMS calculated for $C_8H_9N_2(M+H)^+$:133.1; Found: 133.1.

Step 4. 3-(cyanomethyl)-1-methyl-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile.

To a solution of 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (0.030 g, 0.000095 mol) in acetonitrile (0.5 mL, 0.01 mol) was added 3-(cyanomethylene)-1-methylcyclobutanecarbonitrile (0.0126 g, 0.0000951 mol), followed by 1,8-diazabicyclo[5.4.0]undec-7-ene (0.0142 mL, 0.0000951 mol). The resulting mixture was stirred at rt overnight, then evaporated to dryness. LCMS (M+H) 448.4.

The crude mixture was treated with 1 mL of TFA (trifluoroacetic acid) at rt for 1 h, and evaporated to dryness. The residue was stirred with 0.050 mL of ethylenediamine in 1 mL of methanol at rt overnight. The reaction mixture was applied on RP-HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give the desired products as free bases. First peak retention time 0.916 min, LCMS calculated for $C_{17}H_{16}N_7(M+H)^+$: 318.1; Found 318.4. ^1H NMR (500 MHz, DMSO-d_6): δ 12.10(1H, br s), 8.93 (1H, s), 8.71 (1H, s), 8.46 (1H, s), 7.61 (1H, d, J = 3.5 Hz), 7.08 (1H, d, J = 3.5 Hz), 3.48 (2H, dd, J = 2.0 and 12.5 Hz), 3.45 (2H, s), 2.74 (2H, dd, J = 2.0 and 12.5 Hz), 1.62 (3H, s) ppm. Second peak retention time 0.988 min, LCMS calculated for $C_{17}H_{16}N_7(M+H)^+$: 318.1; Found 318.4. ^1H NMR (500 MHz, DMSO-d_6): δ 12.10(1H, br s), 8.84 (1H, s), 8.70 (1H, s), 8.43 (1H, s), 7.61 (1H, d, J = 3.5 Hz), 7.06 (1H, d, J = 3.5 Hz), 3.52 (2H, s), 3.12 (4H, m), 1.45 (3H, s) ppm.

Example 49. cis- and trans-3-(cyanomethyl)-1-(methoxymethyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile.



Step 1. 1-(methoxymethyl)-3-methylenecyclobutanecarbonitrile

To a mixture of 3-methylenecyclobutanecarbonitrile (1.00 g, 0.0107 mol) in tetrahydrofuran (40 mL, 0.5 mol) was added 2.00 M of lithium diisopropylamide in tetrahydrofuran (6.44 mL) at -78 °C. After stirred at -78 °C for 30 min, to the resulting mixture was added chloromethyl methyl ether (1.02 mL, 0.0134 mol). The reaction was stirred at -78 °C for 30 min, then allowed to warm up to rt, quenched with ammonium chloride, then extracted with ether. The combined organic layers were washed with water, brine, dried, and evaporated to dryness. The crude residue was used directly in next step.

Step 2. 1-(methoxymethyl)-3-oxocyclobutanecarbonitrile.

A mixture of water (2 mL, 0.1 mol) and 1,4-dioxane (7 mL, 0.08 mol), 1-(methoxymethyl)-3-methylenecyclobutanecarbonitrile (0.294 g, 0.00214 mol), and 0.2 M of osmium tetraoxide in water (0.04 mL) was stirred for 5 min, during which time the mixture became brown. While the temperature was maintained at room temperature, sodium periodate (0.963 g, 0.00450 mol) was added in portions over a period of 30 min. The mixture was stirred overnight. The mixture was extracted with EtOAc and the combined organic layers were dried over $MgSO_4$. After removal of the solvents, the crude product was used directly in next step (298 mg, 99.92%). ^1H NMR (400 MHz, $CDCl_3$): δ 3.70 (2H, s), 3.68 (3H, s), 3.58 (2H, m), 3.38 (2H, m) ppm.

Step 3. 3-(cyanomethylene)-1-(methoxymethyl)cyclobutanecarbonitrile

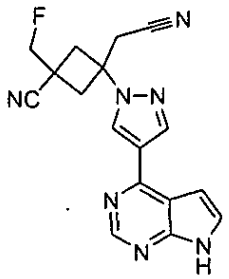
To a solution of 1.0000 M of potassium tert-butoxide in tetrahydrofuran (2.25 mL) at 0 °C was added dropwise a solution of diethyl cyanomethylphosphonate (0.381 mL, 0.00236 mol) in tetrahydrofuran (4 mL, 0.05 mol). The reaction was warmed to rt and then cooled to 0 °C again. To the reaction mixture was added a solution of 1-(methoxymethyl)-3-oxocyclobutanecarbonitrile (0.298 g, 0.00214 mol) in tetrahydrofuran (2 mL, 0.02 mol). The reaction was allowed to warm up to rt and stirred at rt overnight. After quenching with water, the mixture was extracted with ether. The combined organic layers were washed with water, brine, dried and evaporated to dryness. The crude mixture was used directly in next step. LCMS calculated for $C_9H_{11}N_2O(M+H)^+$:163.1; Found: 163.1.

Step 4. 3-(cyanomethyl)-1-(methoxymethyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile.

To a solution of 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (0.256 g, 0.000812 mol) in acetonitrile (5 mL, 0.1 mol) was added 3-(cyanomethylene)-1-(methoxymethyl)cyclobutanecarbonitrile (0.166 g, 0.00102 mol), followed by 1,8-diazabicyclo[5.4.0]undec-7-ene (0.153 mL, 0.00102 mol). The resulting mixture was stirred at rt overnight, and evaporated to dryness. LCMS (M+H) 478.4.

The crude mixture from above was treated with 1 mL of TFA at rt for 1 h, then evaporated to dryness. The residue was stirred with 0.050 mL of ethylenediamine in 1 mL of methanol at rt overnight. The reaction mixture was applied on RP-HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give the desired products as free bases. First peak retention time 0.969 min, LCMS calculated for $C_{18}H_{18}N_7O(M+H)^+$: m/z = 348.2; Found: 348.4. Second peak retention time 0.986 min, LCMS calculated for $C_{18}H_{18}N_7O(M+H)^+$: 348.2; Found: 348.4.

Example 50. cis- and trans-3-(cyanomethyl)-1-(fluoromethyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile



Step 1. 1-(hydroxymethyl)-3-methylenecyclobutanecarbonitrile.

To a mixture of 1-(methoxymethyl)-3-methylenecyclobutanecarbonitrile (1.40 g, 0.0102 mol) in methylene chloride (30 mL, 0.4 mol) was added 1.0 M of boron tribromide in methylene chloride (12.8 mL) at -78 °C. The reaction was stirred at rt for 2 h, quenched with aq. sodium bicarbonate, and extracted with dichloromethane. The combined organic layers were dried over magnesium sulfate and evaporated to dryness to give the desired product (1.26 g, 100%). ^1H NMR (400 MHz, $CDCl_3$): δ 4.81 (2H, m), 3.66 (2H, s), 3.10 (2H, m), 2.59 (2H, m) ppm.

Step 2. 1-(fluoromethyl)-3-methylenecyclobutanecarbonitrile

To a mixture of 1-(hydroxymethyl)-3-methylenecyclobutanecarbonitrile (0.252 g, 0.00205 mol) in methylene chloride (20 mL, 0.3 mol) in a plastic bottle was added 2-methoxy-N-(2-methoxyethyl)-N-(trifluoro-λ(4)-sulfanyl)ethanamine (1.13 mL, 0.00614 mol) followed by ethanol (20 µL, 0.0004 mol). The reaction was stirred at rt overnight, then quenched with aq. sodium bicarbonate, and extracted with dichloromethane. The extracts were combined and washed with water, brine, and dried over magnesium sulfate, and evaporated to dryness. The residue was used directly in next step.

Step 3. 1-(fluoromethyl)-3-oxocyclobutanecarbonitrile.

A mixture of water (2 mL, 0.1 mol) and 1,4-dioxane (6 mL, 0.08 mol), 1-(fluoromethyl)-3-methylenecyclobutanecarbonitrile (0.256 g, 0.00204 mol), and 0.2 M of osmium tetraoxide in water (0.04 mL) was stirred for 5 min, during which time the mixture became brown. While the temperature was maintained at room temperature, sodium periodate (0.919 g, 0.00430 mol) was added in portions over a period of 30 min.The mixture was stirred overnight. The mixture was extracted with EtOAc and combined organic layers were dried over $MgSO_4$. After removal of the solvents, the crude product was used directly in next step.

Step 4. 3-(cyanomethylene)-1-(fluoromethyl)cyclobutanecarbonitrile

To a solution of 1.0 M of potassium tert-butoxide in tetrahydrofuran (2.15 mL) at 0 °C was added dropwise a solution of diethyl cyanomethylphosphonate (0.364 mL, 0.00225 mol) in tetrahydrofuran (4 mL, 0.04 mol). The reaction was warmed to rt and then cooled to 0 °C again. To the reaction mixture was added a solution of 1-(fluoromethyl)-3-oxocyclobutanecarbonitrile (0.260 g, 0.00204 mol) in tetrahydrofuran (2 mL, 0.02 mol). The reaction was allowed to warm up to rt and stirred at rt overnight. After quenching with water, the mixture was extracted with ether. The combined organic layers were washed with water then brine, dried, and evaporated to dryness. The crude mixture was used directly in next step.

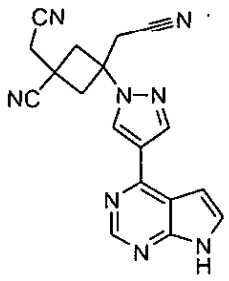
Step 5. 3-(cyanomethyl)-1-(fluoromethyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile

To a solution of 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-

pyrrolo[2,3-d]pyrimidine (0.256 g, 0.000812 mol) in acetonitrile (5 mL, 0.1 mol) was added 3-(cyanomethylene)-1-(fluoromethyl)cyclobutanecarbonitrile (0.153 g, 0.00102 mol), followed by 1,8-diazabicyclo[5.4.0]undec-7-ene (0.153 mL, 0.00102 mol). The resulting mixture was stirred at rt overnight, evaporated to dry. LCMS (M+H) 465.4.

The crude mixture was treated with 1 mL of TFA at rt for 1 h, and evaporated to dryness. The residue was stirred with 0.050 mL of ethylenediamine in 1 mL of methanol at rt overnight. The reaction mixture was applied on RP-HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give the desired products as free bases. First peak retention time 0.939 min, LCMS calculated for $C_{17}H_{15}FN_7(M+H)^+$: 336.1; Found: 336.3. ^1H NMR (400 MHz, DMSO-d_6): δ 12.08(1H, br s), 8.97 (1H, s), 8.70 (1H, s), 8.49 (1H, s), 7.61 (1H, d, J = 3.6 Hz), 7.09 (1H, d, J = 3.6 Hz), 4.81 (2H, d, J = 46.4 Hz), 3.48 (2H, s), 3.44 (2H, m), 2.90 (2H, m) ppm. Second peak retention time 0.978 min, LCMS calculated for $C_{17}H_{15}FN_7(M+H)^+$: 336.1; Found: 336.3. ^1H NMR (400 MHz, DMSO-d_6): δ 12.08(1H, br s), 8.85 (1H, s), 8.68 (1H, s), 8.43 (1H, s), 7.61 (1H, d, J = 4.4 Hz), 7.06 (1H, d, J = 4.4 Hz), 4.58 (2H, d, J = 46.4 Hz), 3.58 (2H, s), 3.26 (2H, m), 3.09 (2H, m) ppm.

Example 51. cis- and trans-1,3-bis(cyanomethyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile



Step 1. (1-cyano-3-methylenecyclobutyl)methyl methanesulfonate.

To a mixture of 1-(hydroxymethyl)-3-methylenecyclobutanecarbonitrile (0.756 g, 0.00614 mol) in methylene chloride (20 mL, 0.3 mol) was added triethylamine (1.28 mL, 0.00921 mol) followed by methanesulfonyl chloride (0.594 mL, 0.00767 mol) at 0 °C. The reaction was stirred at rt for 1 h, quenched with water, and extracted with dichloromethane. The combined organic layers were washed with water, brine, and then dried over magnesium sulfate and evaporated to dryness. The residue was used directly in next step.

Step 2. 1-(cyanomethyl)-3-methylenecyclobutanecarbonitrile.

A mixture of (1-cyano-3-methylenecyclobutyl)methyl methanesulfonate (0.41 g, 0.0020 mol) and potassium cyanide (0.66 g, 0.010 mol) in N,N-dimethylformamide (5 mL, 0.06 mol) was heated at 65 °C overnight. After diluting with water, the resulting mixture was extracted with EtOAc. The combined organic layers were washed with water, brine, dried and evaporated to dry. The residue was used directly in next step.

Step 3. 1-(cyanomethyl)-3-oxocyclobutanecarbonitrile.

A mixture of water (2 mL, 0.1 mol) and 1,4-dioxane (6 mL, 0.08 mol), 1-(cyanomethyl)-3-methylenecyclobutanecarbonitrile (0.270 g, 0.00204 mol), and 0.2 M of osmium tetraoxide in water (0.04 mL) was stirred for 5 min, during which time the mixture became brown. While the temperature was maintained at room temperature, sodium periodate (0.919 g, 0.00430 mol) was added in portions over a period of 30 min. The mixture was stirred overnight. The mixture was extracted with EtOAc and the combined organic layers were dried over $MgSO_4$. After removal of the solvents, the crude product was used directly in next step.

Step4. 1-(cyanomethyl)-3-(cyanomethylene)cyclobutanecarbonitrile.

To a solution of 1.0 M of potassium tert-butoxide in tetrahydrofuran (2.15 mL) at 0 °C was added dropwise a solution of diethyl cyanomethylphosphonate (0.364 mL, 0.00225 mol) in tetrahydrofuran (4 mL, 0.04 mol). The reaction was warmed to rt and then cooled to 0 °C again. To the reaction mixture was added a solution of 1-(cyanomethyl)-3-oxocyclobutanecarbonitrile (0.274 g, 0.00204 mol) in tetrahydrofuran (2 mL, 0.02 mol). The reaction was allowed to warm up to rt and stirred at rt overnight. After quenching with water, the mixture was extracted with ether. The combined organic layers were washed with water and brine, then dried and evaporated to dryness. The crude mixture was used directly in next step.

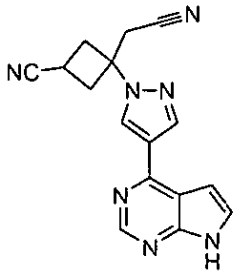
Step 5. 1,3-bis(cyanomethyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile

To a solution of 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (0.256 g, 0.000812 mol) in acetonitrile (5 mL, 0.1 mol) was added 1-(cyanomethyl)-3-(cyanomethylene)cyclobutanecarbonitrile (0.161 g, 0.00102 mol),

followed by 1,8-diazabicyclo[5.4.0]undec-7-ene (0.153 mL, 0.00102 mol). The resulting mixture was stirred at rt overnight, evaporated to dry. LCMS (M+H) 473.4.

The crude mixture was treated with 1 mL of TFA at rt for 1 h, then evaporated to dryness. The residue was stirred with 0.050 mL of ethylenediamine in 1 mL of methanol at rt overnight. The reaction mixture was applied on RP-HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give the desired products as free bases. First peak retention time 0.883 min, LCMS calculated for $C_{18}H_{15}N_8(M+H)^+$: 343.1; Found: 343.4. ^1H NMR (400 MHz, DMSO-d_6): δ 12.12(1H, br s), 8.98 (1H, s), 8.70 (1H, s), 8.48 (1H, s), 7.61 (1H, d, J = 4.0 Hz), 7.10 (1H, d, J = 4.0 Hz), 3.56 (2H, d, J = 13.2), 3.46 (2H, s), 3.42 (2H, m), 2.92 (2H, d, J = 13.2 Hz) ppm. Second peak retention time 0.897 min, LCMS calculated for $C_{18}H_{15}N_8(M+H)^+$: 343.1; Found: 343.4. ^1H NMR (400 MHz, DMSO-d_6): δ 12.08(1H, br s), 8.35 (1H, s), 8.69 (1H, s), 8.43 (1H, s), 7.61 (1H, m), 7.07 (1H, m), 3.38 (2H, s), 3.27 (2H, m), 3.14 (2H, m), 2.88 (2H, m) ppm.

Example 52. cis and trans-3-(cyanomethyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile



Step 1. 3-oxocyclobutanecarbonitrile.

A mixture of water (40 mL, 2 mol) and 1,4-dioxane (100 mL, 1 mol), 3-methylenecyclobutanecarbonitrile (3.30 g, 0.0354 mol) (commercially available from Bepharma Ltd., China), and 0.2 M of osmium tetraoxide in water (0.7 mL) was stirred for 5 min, during which time the mixture became brown. While the temperature was maintained at room temperature, sodium periodate (15.9 g, 0.0744 mol) was added in portions over a period of 30 min. The mixture was stirred for an additional 1.5 h, then extracted with dichloromethane. The combined organic layers were dried over magnesium sulfate and concentrated to give a solid (2.04 g, 60.54%). ^1H NMR (300 MHz, $CDCl_3$): δ 3.58 (4H, m),

3.25 (1H, m) ppm.

Step 2. 3-(cyanomethylene)cyclobutanecarbonitrile

To a solution of 1 M of potassium tert-butoxide in THF (67.4 mL) at 0 °C was added dropwise a solution of diethyl cyanomethylphosphonate (11.4 mL, 0.0706 mol) in tetrahydrofuran (100 mL, 1 mol). The reaction mixture was warmed up to room temperature and cooled to 0 °C again. To the resulting mixture, a solution of 3-oxocyclobutanecarbonitrile (6.10 g, 0.0641 mol) in tetrahydrofuran (20 mL, 0.2 mol) was added. The reaction mixture was allowed to warm up to room temperature and stirred for 2 hours. After quenching with water, the mixture was extracted with EtOAc. The combined organic layers were dried and concentrated. The residue was purified by flash silica gel column, eluting with 0-10% MeOH/dichloromethane to give the titled product (5.40 g, 71.26%). LCMS (M+Na) 141.3. ^{1}H NMR (400 MHz, $CDCl_3$): δ 5.30 (1H, m), 3.40 (2H, m), 3.14 (3H, m) ppm.

Step 3. 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile

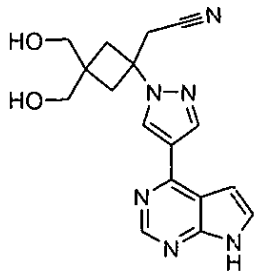
3-(Cyanomethylene)cyclobutanecarbonitrile (120 mg, 0.0010 mol) was combined with 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (0.1 g, 0.0003 mol) in acetonitrile (2 mL, 0.04 mol) and 1,8-diazabicyclo[5.4.0]undec-7-ene (6 µL, 0.00004 mol) under nitrogen. The mixture was stirred at room temperature over the weekend. After evaporation to dryness, the crude mixture was purified by flash column, eluting with 0 to 10% MeOH in dichloromethane, to give the desired product. LCMS (M+H) 434.4.

Step 4. 3-(cyanomethyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile.

A 500 mL round bottom flask fitted with stir bar, condenser, and nitrogen inlet, was charged with acetonitrile (16.3 mL, 0.311 mol), water (1.4 mL, 0.078 mol) and 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutanecarbonitrile (1.00 g, 0.00231 mol). The solution was homogeneous. After adding lithium tetrafluoroborate (2.21 g, 0.0231 mol), the resulting mixture was heated to reflux overnight, then charged with 7.2 M of ammonium hydroxide in water (1.2 mL) in portions over a period of 5 minutes at room temperature to adjust pH to 9-

10. The reaction was stirred for 2 h at room temperature. Solid was removed by filtration and the filtrate was diluted with acetonitrile, water, and MeOH: The resultant mixture was purified on Waters XBridge HPLC column (C18, 30x100 mm, 5 μM), with injection volume 5 mL (~50 mg/injection) and flow rate 60 mL/min, at gradient 10-28% B in 12 minutes (A = water with 0.15% NH_4OH; B = acetonitrile with 0.15% NH_4OH), to give the desired products as free bases. First peak retention time 0.826 min at Waters SunFire HPLC column (C18, 2.1x50 mm, 5 μM) with injection volumn 2 μL and flow rate 3 mL/min, at gradient from 2 to 80% B in 3 minutes (A = water with 0.025% TFA; B = acetonitrile). LCMS calculated for $C_{16}H_{14}N_7(M+H)^+$: 304.1; Found 304.3. ^1H NMR (500 MHz, DMSO-d_6): δ 12.10(1H, br s), 8.82 (1H, s), 8.70 (1H, s), 8.44 (1H, s), 7.61 (1H, d, J = 4.0 Hz), 7.08 (1H, d, J = 4.0 Hz), 3.59 (1H, m), 3.57 (2H, s), 3.19 (2H, m), 2.86 (2H, m) ppm. Second peak retention time 0.864 min at the same SunFire column HPLC condition, LCMS calculated for $C_{16}H_{14}N_7(M+H)^+$: 304.1; Found 304.3. ^1H NMR (400 MHz, CD_3OD): δ 8.67 (1H, s), 8.66 (1H, s), 8.40 (1H, s), 7.51 (1H, d, J = 3.6 Hz), 6.99 (1H, d, J = 3.6 Hz), 3.50 (1H, m), 3.42 (2H, s), 3.24 (2H, m), 3.00 (2H, m) ppm.

Example 53. 3,3-bis(hydroxymethyl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile



Step 1. diisopropyl 3-oxocyclobutane-1,1-dicarboxylate.

A mixture of diisopropyl 3,3-dimethoxycyclobutane-1,1-dicarboxylate (3 g, 0.01 mol) in 20 mL of trifluoroacetic acid-water (95:5) was stirred at 0 °C for 4 h. The reaction was diluted with EtOAc, washed with water, saturated $NaHCO_3$ solution, and brine, dried over $MgSO_4$ and evaporated to give crude product (2.4 g) as yellow oil, which was used directly in the next step. H NMR ($CDCl_3$, 400 MHz) δ 5.07 (2H, h, J = 6.8 Hz), 3.54 (4H, s), 1.23 (12H, d, J = 6.8 Hz) ppm.

Step 2. diisopropyl 3-(cyanomethylene)cyclobutane-1,1-dicarboxylate

To a mixture of 1.0000 M of potassium tert-butoxide in tetrahydrofuran (17 mL) and THF (10 mL) was added dropwise, at 0 °C, diethyl cyanomethylphosphonate (2.7 mL, 0.017 mol). The reaction was warmed to rt and 30 min later cooled to 0 °C again. To the reaction mixture was added a solution of diisopropyl 3-oxocyclobutane-1,1-dicarboxylate (2.7 g, 0.011 mol) in THF (10 mL). The reaction was allowed to warm up to rt gradually and stirred at rt for 2 h. The reaction was quenched with saturated aq. NH_4Cl and the organic solvent was reduced. The mixture was extracted with EtOAc. The combined organic layers were washed with brine, dried over $MgSO_4$, concentrated and purified with Combiflash (silica gel, 0-35% EtOAc/Hex) to give the desired product (2.65 g) as light yellow oil.

Step 3. diisopropyl 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutane-1,1-dicarboxylate

Diisopropyl 3-(cyanomethylene)cyclobutane-1,1-dicarboxylate (2.65 g, 0.00999 mol) was combined with 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (1 g, 0.003 mol) in acetonitrile (10 mL) and 1,8-diazabicyclo[5.4.0]undec-7-ene (0.5 mL, 0.003 mol) was added under N_2. The mixture was heated at 50 °C overnight. The reaction was concentrated and purified with Combiflash (silica gel, 0-50% EtOAc/Hex) to give the desired product (0.3 g) as colorless oil. LCMS calculated for $C_{29}H_{41}N_6O_5Si(M+H)^+$: 581.3; Found: 581.4.

Step 4. 3,3-bis(hydroxymethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile

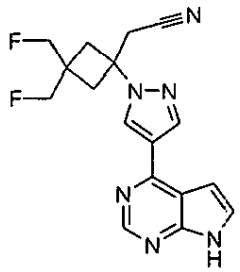
Diisopropyl 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutane-1,1-dicarboxylate (0.3 g, 0.5 mmol) was dissolved in tetrahydrofuran (15 mL, 180 mmol) and lithium tetrahydroborate (0.017 g, 0.77 mmol) was added at 0 °C. The reaction was then heated to 50 °C for 30 min. To the reaction was added MeOH (10 mL). The reaction was held at 50 °C for 15 min, then stripped to near dryness. The residue was treated with 1N HCl, then neutralized with solid $NaHCO_3$. The mixture was partitioned between water and EtOAc. The phases were separated and the aq. phase was washed with EtOAc. The combined organic phases were washed with water, then brine, dried over $MgSO_4$, concentrated and purified with Combiflash (silica gel, 0-100% EtOAc/Hex) to give the desired product (0.145 g, 60%) as colorless oil.

LCMS calculated for $C_{23}H_{33}N_6O_3Si(M+H)^+$: 469.2; Found: 469.4.

Step 5. 3,3-bis(hydroxymethyl)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile

3,3-Bis(hydroxymethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.022 g, 0.000046 mol) was treated with trifluoroacetic acid (0.5 mL, 0.006 mol) at rt for 30 min and evaporated to dryness. The residue was then mixed with ethylenediamine (0.2 mL, 0.003 mol) in MeOH (1 mL) for 2 h. The reaction was concentrated and purified on prep. LCMS (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give the desired product as free base. LCMS calculated for $C_{17}H_{19}N_6O_2(M+H)^+$: 339.2; Found: 339.3. ^1H NMR (300 MHz, CD_3OD): δ 8.72 (1H, s), 8.67 (1H, s), 8.39 (1H, s), 7.51 (1H, d, J = 3.3 Hz), 6.97 (1H, d, J = 3.3 Hz), 3.62 (2H, s), 3.46 (2H, s), 3.36 (2H, s), 2.80 (2H, d, J = 13.8 Hz), 2.54 (2H, d, J = 13.8 Hz) ppm.

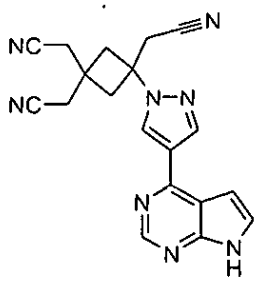
Example 54. 3,3-bis(fluoromethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile



A solution of 3,3-bis(hydroxymethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.03 g, 0.00006 mol) in dichloromethane (3 mL), contained in a Teflon bottle equipped with a nitrogen inlet tube and stirring bar, was treated with 2-methoxy-N-(2-methoxyethyl)-N-(trifluoro-λ(4)-sulfanyl)ethanamine (0.06 mL, 0.0004 mol) at rt. Ethanol (0.003 mL, 0.00006 mol) was added, and the mixture was stirred at rt overnight. The resultant mixture was concentrated and purified with prep LCMS (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give the corresponding fluorinated product, which was treated with trifluoroacetic acid (0.5 mL, 0.006 mol) at rt for 30 min. After

evaporation to dryness, the resultant residue was mixed with ethylenediamine (0.2 mL, 0.003 mol) in MeOH (1 mL) at rt for 2 h. The reaction was evaporated to dry and the residue was purified with prep. LCMS (pH=10) to give the desired porduct. LCMS calculated for $C_{17}H_{17}F_2N_2$ $(M+H)^+$: 343.1; Found: 343.4. ^{1}H-NMR (300 MHz, $CDCl_3$): δ 9.55 (1H, br s), 8.86 (1H, s), 8.49 (1H, s), 8.35 (1H, s), 7.40 (1H, m), 6.82 (1H, m), 4.54 (2H, d, J = 47.7 Hz), 4.38 (2H, d, J = 47.4 Hz), 3.14 (2H, s), 2.96 (2H, d, J = 13.8 Hz), 2.72 (2H, d, J = 13.8 Hz) ppm.

Example 55. 2,2',2''-[1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutane-1,3,3-triyl]triacetonitrile



Step 1. (3,3-dimethoxycyclobutane-1,1-diyl)dimethanol

At 0 °C, to a solution of diisopropyl 3,3-dimethoxycyclobutane-1,1-dicarboxylate (3.0 g, 0.010 mol) in THF (20 mL) was added 2.0 M of lithium tetrahydroaluminate in tetrahydrofuran (16 mL) slowly with stirring. The mixture was stirred for 2 h, allowing warm up to rt. At 0 °C, to the reaction was added dropwise water (1.2 mL), 15% NaOH solution (1.2 mL) and water (3.6 mL) successively and the resultant mixture was stirred for 20 min at rt. The mixture was filtered and the filtrate was concentration to give the desired product (1.64 g, 89%) as colorless oil which was used directly in the next step without purification.

Step 2. (3,3-dimethoxycyclobutane-1,1-diyl)bis(methylene) dimethanesulfonate

To a mixture of (3,3-dimethoxycyclobutane-1,1-diyl)dimethanol (1.64 g, 0.00931 mol) and triethylamine (7.8 mL, 0.056 mol) in dichloromethane (10 mL) was added methanesulfonyl chloride (2.2 mL, 0.028 mol) dropwise at 0 °C. The resultant mixture was stirred at rt for 1 h. The reaction was diluted with dichloromethane, washed with water and brine, dried over $MgSO_4$ and concentrated to give crude mesylate product (2.95 g, 95.4%) as brown oil. ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.38 (4H, s), 3.14 (6H, s), 3.02 (6H, s), 2.10 (4H,

s) ppm.

Step 3. 2,2'-(3,3-dimethoxycyclobutane-1,1-diyl)diacetonitrile

To a solution of (3,3-dimethoxycyclobutane-1,1-diyl)bis(methylene) dimethanesulfonate (2.9 g, 0.0037 mol) in DMSO (10 mL) was added potassium cyanide (1.7 g, 0.026 mol) and 1,4,7,10,13,16-hexaoxacyclooctadecane (6.9 g, 0.026 mol). The reaction was stirred at 60 °C over night. The reaction was quenched with water, extracted with EtOAc. The combined organic layers were washed with brine, dried over $MgSO_4$ and concentrated to give crude product (2 g) as brown oil. ^1H NMR (400 MHz, $CDCl_3$): δ 3.14 (6H, s), 2.78 (4H, s), 2.11 (4H, s) ppm.

Step 4. 2,2'-(3-oxocyclobutane-1,1-diyl)diacetonitrile

To a mixture of 2,2'-(3,3-dimethoxycyclobutane-1,1-diyl)diacetonitrile (2 g, 0.01 mol) in acetone (5 mL) was added p-toluenesulfonic acid (1 g, 0.006 mol). The mixture was stirred at rt over weekend. The reaction was neutralized with aq. saturated $NaHCO_3$ solution, extracted with EtOAc. The combined organic layers were washed with brine, dried over $MgSO_4$ and evaporated to give a crude product as brown oil.

Step 5. 2,2',2''-cyclobutane-1,1-diyl-3-ylidenetriacetonitrile

To a solution of 1.0 M of potassium tert-butoxide in tetrahydrofuran (5.1 mL) was added dropwise at 0 °C diethyl cyanomethylphosphonate (0.82 mL, 0.0051 mol). The reaction was warmed to rt and 30 min later cooled to 0 °C again. To the reaction mixture was added a solution of 2,2'-(3-oxocyclobutane-1,1-diyl)diacetonitrile (0.5 g, 0.003 mol) in THF (5 mL). The reaction was allowed to warm up to rt gradually and stirred at rt for 2 h. The reaction was quenched with saturated aq. NH_4Cl, then extracted with EtOAc. The combined organic layers were washed with brine, dried over $MgSO_4$ and concentrated to give a brown oily crude product, which was used directly in the next step.

Step 6. 2,2',2''-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutane-1,3,3-triyltriacetonitrile

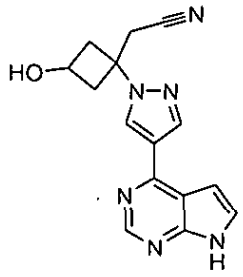
The crude 2,2',2''-cyclobutane-1,1-diyl-3-ylidenetriacetonitrile (1 g, 0.006 mol) was combined with 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (0.2 g, 0.0006 mol) in acetonitrile (10 mL) and 1,8-diazabicyclo[5.4.0]undec-7-

ene (0.1 mL, 0.001 mol) was added under nitrogen. The mixture was heated at 50 °C over night. The reaction was concentrated and purified with Combiflash (silica gel, 0-100% EtOAc/Hex) to give the desired product as light brown oil. LCMS calculated for $C_{25}H_{31}N_8OSi(M+H)^+$: 487.2; Found: 487.4.

Step 7. 2,2',2''-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutane-1,3,3-triyltriacetonitrile

2,2',2''-1-[4-(7-[2-(Trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutane-1,3,3-triyltriacetonitrile (0.03 g, 0.00006 mol) was treated with trifluoroacetic acid (0.5 mL, 0.006 mol) at rt for 30 min and then evaporated to dryness. The residue was mixed with ethylenediamine (0.2 mL, 0.003 mol) in MeOH (1 mL) at rt for 1 h. The reaction was evaporated to dryness and the residue was purified with prep. LCMS (pH=10) to give the desired product. LCMS calculated for $C_{19}H_{17}N_8(M+H)^+$: m/z = 357.1; Found: 357.4. ^{1}H NMR (400 MHz, DMSO-d_6): δ 12.06 (1H, br s), 8.79 (1H, s), 8.63 (1H, s), 8.38 (1H, s), 7.55 (1H, d, J = 3.6 Hz), 7.01 (1H, d, J = 3.6 Hz), 3.46 (2H, s), 3.03 (2H, s), 2.97 (2H, d, J = 15.2 Hz), 2.76 (2H, s), 2.57 (2H, d, J = 15.2 Hz) ppm.

Example 56. cis- and trans-3-Hydroxy-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile



Step 1. N-methoxy-N-methyl-3-oxocyclobutanecarboxamide

To a mixture of N,O-dimethylhydroxylamine hydrochloride (5.2 g, 0.054 mol), and 3-oxocyclobutanecarboxylic acid (4.0 g, 0.035 mol) in dichloromethane (30 mL) was added N-(3-dimethylaminopropyl)-N'-ethylcarbodiimide hydrochloride (10.0 g, 0.052 mol), 1-hydroxybenzotriazole (7.1 g, 0.052 mol) followed by triethylamine (34 mL, 0.24 mol) at 0 °C. The mixture was stirred at rt over night, then quenched with water. The mixture was extracted with EtOAc. The organic layers were dried over $MgSO_4$, concentrated and purified

with Combiflash (silica gel, 0-5% for 30 min followed by 5-20% EtOAc/Hex) to give the desired product (4.3 g, 78%) as light yellow oil. LCMS calculated for $C_7H_{12}NO_3(M+H)^+$: 158.1; Found: 158.3.

Step 2. 3-hydroxy-N-methoxy-N-methylcyclobutanecarboxamide

N-Methoxy-N-methyl-3-oxocyclobutanecarboxamide (1 g, 0.006 mol) was dissolved in methanol (8 mL, 0.2 mol). To the mixture, sodium borohydride (0.2 g, 0.006 mol) was added. The reaction was stirred at rt for 1 h. To the reaction mixture was added 1N aq. HCl to adjust the pH to 2. The mixture was concentrated, then extracted with EtOAc. The combined organic layers were dried over $MgSO_4$ and concentrated to give crude product (1.4 g) as light yellow oil. LCMS calculated for $C_7H_{14}NO_3(M+H)^+$: 160.0; Found: 160.3.

Step 3. 3-[tert-butyl(diphenyl)silyl]oxy-N-methoxy-N-methylcyclobutanecarboxamide

Into a solution of 3-hydroxy-N-methoxy-N-methylcyclobutanecarboxamide (0.6 g, 0.004 mol in DMF (10 mL) was added tert-butylchlorodiphenylsilane (3 mL, 0.01 mol), followed by 1H-imidazole (1 g, 0.02 mol). The mixture was stirred at rt over night. The reaction was diluted with dichloromethane and washed with sat. $NaHCO_3$, water and brine. The organic layers were dried over $MgSO_4$, concentrated and purified with Combiflash (silica gel, 0-30% EtOAc/Hex) to give the desired product (0.7 g, 50%) as cis- and trans-isomer mixtures. LCMS calculated for $C_{23}H_{32}NO_3Si(M+H)^+$: 398.2 ; Found: 398.1.

Step 4. 1-(3-[tert-butyl(diphenyl)silyl]oxycyclobutyl)ethanone

A solution of 3-[tert-butyl(diphenyl)silyl]oxy-N-methoxy-N-methylcyclobutanecarboxamide (0.7 g, 0.002 mol) in ether (10 mL) was added into 3.0 M of methylmagnesium iodide in ether (3 mL) slowly under N_2. The reaction was stirred and heated to reflux for 2 h. The mixture was quenched with ice and the ether layer separated. The aq. layer was acidified with 1N HCl and extracted several times with ether. The organic layers were combined, dried over $MgSO_4$, concentrated and purified with Combiflash (silica gel, 0-30% EtOAc/Hex) to give the desired product (0.6 g) as colorless oil. LCMS calculated for $C_{22}H_{29}O_2Si(M+H)^+$: 353.2; Found: 353.3.

Step 5. 3-[tert-butyl(diphenyl)silyl]oxycyclobutyl acetate

To a stirred solution of 1-(3-[tert-butyl(diphenyl)silyl]oxycyclobutyl)ethanone (0.65 g, 0.0018 mol) in dichloromethane (10 mL) at 0 °C was added sodium bicarbonate (0.39 g,

0.0046 mol) and m-chloroperbenzoic acid (1.0 g, 0.0046 mol) with stirring. The reaction was stirred at rt over night. LCMS showed incomplete reaction, another 2.5 eq. of mCPBA and $NaHCO_3$ were added and the reaction was stirred for another day. The reaction was quenched with 20% aq. $Na_2S_2O_3$ solution (50 mL) and stirred for a further 30 min at rt, then extracted with dichloromethane. The combined organic layers were washed with brine, dried over $MgSO_4$, concentrated and purified on silica gel with Combiflash (silica gel, 0-10% EtOAc/Hex) to give the desired product (0.3 g, 40%) as colorless oil. LCMS calculated for $C_{22}H_{29}O_3Si(M+H)^+$: 369.2; Found: 369.4.

Step 6. 3-[tert-butyl(diphenyl)silyl]oxycyclobutanol

To a solution of 3-[tert-butyl(diphenyl)silyl]oxycyclobutyl acetate (0.27 g, 0.00073 mol) in THF (5 mL) and MeOH (3 mL) was added 1.0 M of lithium hydroxide in water (10 mL). The reaction was stirred at rt for 1 h. The mixture was quenched with water and extracted with EtOAc. The combined organic layers were dried over $MgSO_4$ and concentrated to give crude alcohol product (0.3 g) as colorless oil, which was directly used in next step without further purification. LCMS calculated for $C_{20}H_{26}O_2NaSi(M+Na)^+$: 349.2; Found: 349.3.

Step 7. 3-[tert-butyl(diphenyl)silyl]oxycyclobutanone

A solution of oxalyl chloride (0.1 mL, 0.001 mol) in dichloromethane (2 mL) under N_2 was cooled to -78 °C. Dimethyl sulfoxide (0.2 mL, 0.002 mol) was added dropwise. On complete addition, the reaction was stirred for 15 min. A solution of crude 3-[tert-butyl(diphenyl)silyl]oxycyclobutanol (0.2 g, 0.0006 mol) in dichloromethane (3 mL) was added dropwise and the reaction mixture was stirred for 45 min at -78 °C. Triethylamine (0.5 mL, 0.004 mol) was added dropwise and the reaction was stirred for 15 minutes. The reaction was then allowed to warm to rt, quenched with water and extracted with dichloromethane. The organic layers were combined, washed with brine, dried over $MgSO_4$ and evaporated to give crude ketone (0.27 g) as yellow oil, which was directly used in the next step without further purification. LCMS calculated for $C_{20}H_{25}O_2Si(M+H)^+$: 325.12; Found: 325.3.

Step 8. (3-[tert-butyl(diphenyl)silyl]oxycyclobutylidene)acetonitrile

To 1.0 M of potassium tert-butoxide in tetrahydrofuran (1.2 mL) was added dropwise, at 0 °C, diethyl cyanomethylphosphonate (0.19 mL, 0.0012 mol). The reaction was warmed to rt and 30 min later cooled to 0 °C again. To the reaction mixture was added a solution of

3-[tert-butyl(diphenyl)silyl]oxycyclobutanone (0.25 g, 0.00077 mol) in THF (5 mL). The reaction was allowed to warm up to rt gradually and stirred at rt for 2 h. The reaction was quenched with saturated aq. NH4Cl, extracted with EtOAc. The combined organic layers were washed with brine, dried over $MgSO_4$, concentrated. The resultant residue was purified with Combiflash (silica gel, 0-20% EtOAc/Hex) to give the desired product (0.2 g) as colorless oil. LCMS calculated for $C_{22}H_{26}NOSi(M+H)^+$: 348.1 Found: 348.3.

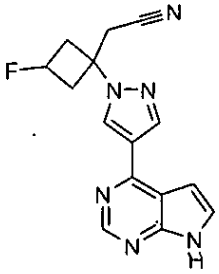
Step 9. {3-Hydroxy-1-[4-(1H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutyl}acetonitrile

(3-[tert-Butyl(diphenyl)silyl]oxycyclobutylidene)acetonitrile (0.15 g, 0.00043 mol) was combined with 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (0.14 g, 0.00043 mol) in acetonitrile (5 mL) and 1,8-diazabicyclo[5.4.0]undec-7-ene (0.064 mL, 0.00043 mol) was added under nitrogen. The mixture was heated to 50 °C over night. LCMS showed a peak with m/z of 425.4, indicating a de-silyl reaction occurred simultaneously during the Micheal addition. The reaction was concentrated and purified on combiflash (silica gel, 0-100% EtOAc/Hex) to yield the desired produt. LCMS (M+H) 425.4.

Step 10. 3-hydroxy-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile

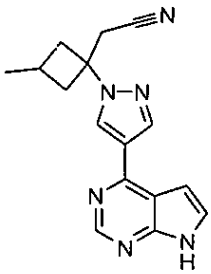
3-Hydroxy-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.020 g, 0.000046 mol) was treated with trifluoroacetic acid (0.5 mL, 0.006 mol) at rt for 30 min and evaporated to dry. The resultant residue was mixed with ethylenediamine (0.2 mL, 0.003 mol) in MeOH (1 mL) for 2 h. The reaction was concentrated and purified on prep. LCMS (pH=10) to give 2 isomers of the desired products. First peak retention time 0.714 min, LCMS calculated for $C_{15}H_{15}N_6O(M+H)^+$: 295.1; Found: 295.3. Second peak retention time 0.750 min, LCMS calculated for $C_{15}H_{15}N_6O(M+H)^+$: 295.1; Found: 295.3. ^1H NMR (400 MHz, CD_3OD): δ 8.67 (1H, s), 8.66 (1H, s), 8.38 (1H, s), 7.51 (1H, d, J = 3.6 Hz), 6.98 (1H, d, J = 3.6 Hz), 4.37 (1H, s), 3.34 (2H, s), 3.22 (2H, m), 2.48 (2H, m) ppm.

Example 57. 3-fluoro-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile



A solution of 3-hydroxy-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.01 g, 0.00003 mol) (a mixture of cis/trans isomers) in dichloromethane (3 mL), contained in a Teflon bottle equipped with a nitrogen inlet tube and stirring bar, was treated with 2-methoxy-N-(2-methoxyethyl)-N-(trifluoro-λ(4)-sulfanyl)ethanamine (0.03 mL, 0.0002 mol) at rt. Ethanol (0.002 mL, 0.00003 mol) was added, and the mixture was stirred at rt over weekend. The reaction was evaporated to dry and the residue was purified with prep. HPLC (pH=10) to give a mixture of two isomers. LCMS calculated for $C_{15}H_{14}FN_6(M+H)^+$: 297.1; Found: 297.3.

Example 58. 3-methyl-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile



Step 1. 3-(bromomethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile

To an ice-cooled mixture of 3-(hydroxymethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (1.0 g 0.0023 mol) and carbon tetrabromide (1.1 g, 0.0034 mol) in DMF (7 mL) was added triphenylphosphine (0.90 g, 0.0034 mol) and the mixture was stirred at this temp. for 30 min. To the resulting dark brown solution was added saturated aq. $NaHCO_3$ (5 mL) followed by water (5 mL) and the mixture was extracted with

dichloromethane. The organic layers were combined, washed with water, dried over Na_2SO_4, concentrated and purified with combiflash (silica gel, 0-40% EtOAc/Hex) to give the desired product (1.0 g, 87%) as light yellow solid. LCMS calculated for $C_{22}H_{30}BrN_6OSi(M+H)^+$: 501.1; Found: 501.3.

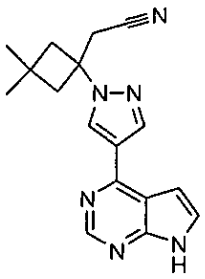
Step 2. 3-methyl-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile

3-(Bromomethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.65 g, 0.0013 mol) was reacted with sodium tetrahydroborate (0.096 g, 0.0026 mol) in DMF (5.2 mL) (~0.5 M) at rt under nitrogen for 3h. The reaction was quenched with water and extracted with dichloromethane. The organic layers were washed with water, brine, dried over $MgSO_4$ and concentrated to give a yellow oil, the desired product as cis- and trans-isomer mixtures. LCMS calculated for $C_{22}H_{31}N_6OSi(M+H)^+$: 423.2; Found: 423.4.

Step 3. 3-methyl-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile

To a mixture of 3-methyl-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.5 g, 0.001 mol) in acetonitrile (8.07 mL, 0.154 mol) and water (0.70 mL, 0.039 mol) was added lithium tetrafluoroborate (1.10 g, 0.0114 mol). The solution was warmed to reflux at 100 °C over 5 days. Charged 7.2 M of ammonium hydroxide in water (0.59 mL) in portions over a period of 5 minutes at rt adjusting pH to 9-10. The reaction mixture was stirred for 2 h at rt. The reaction was filtered and the filtrate was diluted with acetonitrile, water and MeOH and purified with prep. HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give the first isomer with retention time 1.057 min, LCMS calculated for $C_{16}H_{17}N_6(M+H)^+$: 293.2; Found: 293.3. ^1H NMR (500 MHz, $CDCl_3$): δ 10.07(1H, br s), 8.88 (1H, s), 8.45 (1H, s), 8.34 (1H, s), 7.43 (1H, d, J = 3.5 Hz), 6.85 (1H, d, J = 3.5 Hz), 3.16 (2H, s), 2.77 (2H, m), 2.55 (1H m), 2.43 (2H, m), 1.24 (3H, d, J = 6.5 Hz) ppm; then the second isomer with retention time 1.107 min; LCMS calculated for $C_{16}H_{17}N_6(M+H)^+$: 293.2; Found: 293.3. ^1H NMR (500 MHz, $CDCl_3$): δ 10.21(1H, br s), 8.89 (1H, s), 8.61 (1H, s), 8.37 (1H, s), 7.44 (1H, d, J = 3.5 Hz), 6.86 (1H, d, J = 3.5 Hz), 3.07 (2H, s), 3.05 (2H, m), 2.61 (1H, m), 2.26 (2H, m), 1.25 (3H, d, J = 7.0 Hz) ppm.

Example 59. 3,3-dimethyl-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.



Step 1. 3-(cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutane-1,1-diylbis(methylene) dimethanesulfonate.

To a mixture of 3,3-bis(hydroxymethyl)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.06 g, 0.0001 mol) and triethylamine (0.1 mL, 0.0008 mol) in dichloromethane (3 mL) was added methanesulfonyl chloride (0.03 mL, 0.0004 mol) slowly. The resultant mixture was stirred at rt for 30 min. The reaction was diluted with dichloromethane, washed with water and brine, dried over $MgSO_4$, concentrated. The residue was purified on Combiflash (silica gel, 0-100% EtOAc/Hex) to give the desired product (60 mg, 75%) as white solid. LCMS calculated for $C_{25}H_{37}N_6O_7S_2Si(M+H)^+$: 625.2; Found: 625.3.

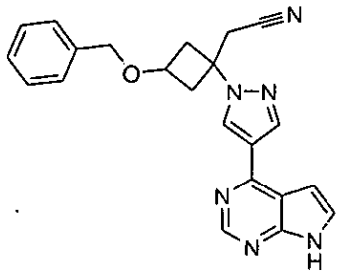
Step 2. 3,3-dimethyl-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile

3-(Cyanomethyl)-3-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutane-1,1-diylbis(methylene) dimethanesulfonate (0.06 g, 0.0001 mol) was reacted with sodium tetrahydroborate (0.02 g, 0.0004 mol) in DMF (0.8 mL) (~0.5 M) at 65 °C under nitrogen for 2h. The reaction was quenched with water, and extracted with dichloromethane. The organic layers were washed with water, dried over $MgSO_4$, concentrated. The residue was purified with Combiflash (silica gel, 0-60% EtOAc/Hex) to give the desired prouct. LCMS calculated for $C_{23}H_{33}N_6OSi(M+H)^+$: 437.2; Found: 437.4.

Step 3. 3,3-dimethyl-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.

3,3-Dimethyl-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.020 g, 0.000046 mol) was treated with trifluoroacetic acid (0.5 mL, 0.006 mol) at rt for 30 min and then evaporated to dry. The residue was then shaked with ethylenediamine (0.2 mL, 0.003 mol) in MeOH (1 mL) for 2 h. The reaction was concentrated and purified on prep HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give the desired prodcut. LCMS calculated for $C_{17}H_{19}N_6(M+H)^+$: 307.2; Found: 307.3. ^1H NMR (400 MHz, DMSO-d_6): δ 12.10 (1H, br s), 8.76 (1H, s), 8.67 (1H, s), 8.40 (1H, s), 7.58 (1H, d, J = 3.6 Hz), 7.05 (1H, d, J = 3.6 Hz), 3.35 (2H, s), 2.75 (2H, d, J = 14 Hz), 2.33 (2H, d, J = 14.0 Hz), 1.22 (3H, s), 1.02 (3H, s) ppm.

Example 60. cis- and trans-3-(benzyloxy)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.



Step 1. [2-bromo-1-(bromomethyl)ethoxy]methylbenzene

1-Bromo-2,3-epoxypropane (28 mL, 0.33 mol) and benzyl bromide (39 mL, 0.33 mol) was mixed with mercury(II) chloride (0.04 g, 0.0002 mol). The mixture was heated slowly to 155-160 °C and stirred over night. The reaction mixture was then cooled to room temperature, purified with Combiflash (silica gel, 100% hexanes) to give the desired product (63 g, 62%) as a clear oil. ^1H NMR (400 MHz, $CDCl_3$): δ 7.40 (5H, m), 4.71 (2H, s), 3.82 (1H, t, J = 4.8 Hz), 3.60 (4H, d, J = 4.8 Hz) ppm.

Step 2. ([3-(methylsulfinyl)-3-(methylthio)cyclobutyl]oxymethyl)benzene.

2.5 M of n-butyllithium in hexane (19 mL) was added to a solution of (methylsulfinyl)(methylthio)methane (5.0 g, 0.040 mol) in THF (10 mL) dropwise at -10 °C

and the mixture was stirred for 3 h. To the resultant solution was added dropwise [2-bromo-1-(bromomethyl)ethoxy]methylbenzene (4.9 g, 0.016 mol) at -70 °C over 30 min. The mixture was stirred at this temperature for 3 h and then at rt over night. The reaction was diluted with dichloromethane and washed with water. The aqueous phases were extracted with dichloromethane. The organic layers were combined, washed with brine, dried over $MgSO_4$, concentrated and purified with Combiflash (silica gel, 0-55% EtOAc/Hex) to give the desired product (2.4 g, 56%) as brown oil. LCMS (M+Na) 293.3. ^1H NMR (400 MHz, $CDCl_3$): δ 7.30 (5H, m), 4.45 (2H, s), 4.33 (1H, m), 2.75 (2H, m), 2.65 (2H, m), 2.41 (3H, s), 2.12 (3H, s) ppm.

Step 3. 3-(benzyloxy)cyclobutanone.

([3-(methylsulfinyl)-3-(methylthio)cyclobutyl]oxymethyl)benzene (2.4 g, 0.0089 mol) was dissolved in Et_2O (40 mL) and 35% perchloric acid (1.8 mL) was added. The resulting mixture was stirred at rt overnight. To the reaction mixture was added solid $NaHCO_3$ and $MgSO_4$ and stirred for a while. The insoluble solid was filtered off. The filtrate was concentrated and purified with combiflash (silica gel, 100% dichloromethane) to give the desired product (0.7 g) as light yellow oil. LCMS calculated for $C_{11}H_{13}O_2(M+H)^+$: 177.1. Found: 177.3.

Step 4. [3-(benzyloxy)cyclobutylidene]acetonitrile.

To a mixture of 1.0000 M of potassium tert-butoxide in tetrahydrofuran (0.68 mL) and THF (5 mL) was added, at 0 °C, diethyl cyanomethylphosphonate (0.11 mL, 0.00068 mol) dropwise. The reaction was warmed to rt and 30 min later cooled to 0 °C again. To the reaction mixture was added a solution of 3-(benzyloxy)cyclobutanone (0.1 g, 0.0006 mol) in THF (5 mL). The reaction was stirred over night, allowing warmed up to rt. The reaction was quenched with saturated aq. NH_4Cl solution, extracted with EtOAc. The combined organic layers were washed with water and brine, dried over $MgSO_4$ and concentrated to dryness. The crude product was used directly in next step without further purification.

Step 5. 3-(benzyloxy)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.

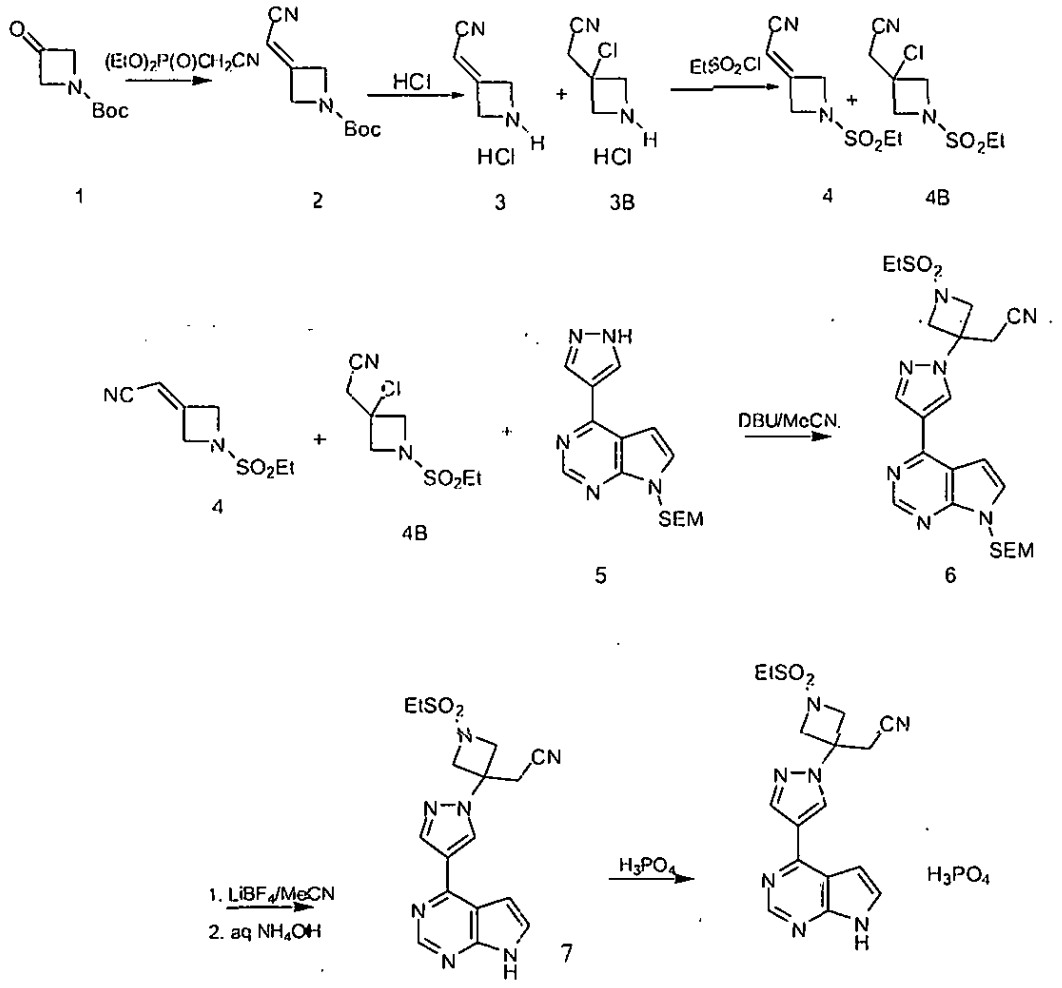
To a mixture of [3-(benzyloxy)cyclobutylidene]acetonitrile (0.1 g, 0.0005 mol) and 4-(1H-pyrazol-4-yl)-7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidine (0.1 g,

0.0003 mol) in acetonitrile (5 mL) was added 1,8-diazabicyclo[5.4.0]undec-7-ene (0.05 mL, 0.0003 mol) under nitrogen. The mixture was heated at 50 °C overnight, then concentrated under reduced pressure. The residue was purified with combiflash (silica gel, 0-55% EtOAc/Hex) to give the desired prodcuct as cis- and trans-isomer mixture. LCMS calculated for $C_{28}H_{35}N_6O_2Si(M+H)^+$: 515.3 Found: 515.4.

Step 6. 3-(benzyloxy)-1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile.

3-(Benzyloxy)-1-[4-(7-[2-(trimethylsilyl)ethoxy]methyl-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclobutylacetonitrile (0.024 g, 0.000046 mol) was treated with trifluoroacetic acid (0.5 mL, 0.006 mol) at rt for 30 min, then evaporated to dry. The residue was dissolved in MeOH (1 mL) and treated with ethylenediamine (0.2 mL, 0.003 mol) at rt for 2 h. The reaction mixture was concentrated in vacuo and the resulting residue purified on prep. HPLC (XBridge C18 column, eluting with a gradient of acetonitrile/water containing 0.15% NH_4OH) to give 2 isomers of the desired products. First peak retention time 1.406 min; LCMS calculated for $C_{22}H_{21}N_6O(M+H)^+$: 385.2; Found: 385.3. ^1H NMR (400 MHz, DMSO-d_6): δ 12.10 (1H, br s), 8.71 (1H, s), 8.67 (1H, s), 8.38 (1H, s), 7.58 (1H, d, J = 3.6 Hz), 7.33 (4H, m), 7.29 (1H, m), 7.05 (1H, d, J = 3.6 Hz), 4.43 (2H, s), 4.23 (1H, m), 3.43 (2H, s), 2.78 (2H, m), 2.74 (2H, m) ppm. Second peak retention time 1.474 min, LCMS calculated for $C_{22}H_{21}N_6O(M+H)^+$: 385.2; Found: 385.3. ^1H NMR (400 MHz, DMSO-d_6): δ 12.10 (1H, br s), 8.79 (1H, s), 8.67 (1H, s), 8.39 (1H, s), 7.59 (1H, d, J = 3.6 Hz), 7.34 (4H, m), 7.29 (1H, m), 7.06 (1H, d, J = 3.6 Hz), 4.44 (2H, s), 4.14 (1H, m), 3.44 (2H, s), 3.16 (2H, m), 2.44 (2H, m) ppm.

Example 61. Large scale preparation of {1-(ethylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile phosphoric acid salt



Step. 1 tert-Butyl 3-(cyanomethylene)azetidine-1-carboxylate (2).

Diethyl cyanomethyl phosphonate (745 g, 4.20 mol, 1.20 eqiv) and anhydrous THF (9 L) was added to a four-neck flask equipped with thermowell, addition funnel and nitrogen protection tube. The solution was cooled with an ice-methanol bath to -14 °C and a 1.0 M solution of *t*-BuOK in THF (3.85 L, 3.85 mol, 1.1 equiv) was added over 20 min keeping the temperature <-5 °C. The mixture was stirred for 3 hr at -10 °C and a solution of 1-*tert*-butoxycarbonyl-3-azetidinone (1, 600 g, 3.50 mol) in THF (2 L) was added over 2 hr while keeping the reaction temperature < -5 °C. The reaction mixture was stirred at -5 to -10 °C over 1 hr and then slowly warmed up to room temperature and stirred at room temperature for overnight. The reaction mixture was then diluted with water (4.5 L) and saturated brine (4.5 L) and extracted with ethyl acetate (2 x 9 L). The combined organic layers were combined and washed with brine (6 L), dried over anhydrous Na_2SO_4. The organic solvent was

removed under reduced pressure, diluted with dichloromethane (4 L) and adsorbed onto silica gel (1.5 kg). The product was purified by flash column chromatography (SiO_2, 3.5 kg × 2), each column was eluted with (8 L of heptane, 8 L of 5% AcOEt/heptane, 12 L of 10% AcOEt/heptane, 40 L of 25% AcOEt/heptane) to give the pure *tert*-butyl 3-(cyanomethylene)azetidine-1-carboxylate (**2**, 414.7 g, 679.8 g theoretical, 61% yield) as white solid. For **2**: ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.46 (s, 9H), 4.62 (m, 2H), 4.72 (m, 2H), 5.41 (m, 1H).

Step 2. 2-(1-(Ethylsulfonyl)azetidin-3-ylidene)acetonitrile (4).

tert-Butyl 3-(cyanomethylene)azetidine-1-carboxylate (**2**, 1000 g, 5.2 mol) was diluted with acetonitrile (7 L) and 3 N aqueous HCl (7 L). This resulting reaction mixture was stirred at room temperature for 18 h. When TLC showed the reaction was deemed complete, the reaction mixture was concentrated under reduced pressure. The residual solids were then suspended in acetonitrile (12 L) and cooled to 5°C. Diisopropyethyl amine (2.7 L, 15. 6 mol, 3 equiv) was slowly added to the suspension while keeping the temperature < 15°C. The homogeneous solution was allowed to cool to 5°C and ethanesulfonyl chloride (730 mL, 7.73 mol, 1.5 equiv) was added over 1 h while keeping the reaction temperature < 15°C. The resulting solution was allowed to slowly warm to room temperature and stirred at room temperature for overnight. The additional amount of ethanesulfonyl chloride (100 ml, 1.05 mol, 0.2 equiv) was added and the reaction mixture was stirred for an additional 2 h at room temperature. After the reaction was deemed complete, the reaction mixture was concentrated under reduced pressure to a volume of about 4 L. This solution was then placed in a 50 L separatory funnel, diluted with dichloromethane (10 L) and washed with half saturated brine (10 L). The aqueous phase was extracted with dichloromethane (5 L). The combined organic layers were dried over sodium sulphate and absorbed onto silica gel (1 Kg) under reduced pressure. The material was then loaded onto a silica gel column (2.5 Kg) and eluted with 20 % ethyl acetate in heptane (40 L), 40 % ethyl acetate in heptane (80 L) and finally 60 % ethyl acetate in heptane (40 L) to afford pure 2-(1-(ethylsulfonyl)azetidin-3-ylidene)acetonitrile (**4**, 567 g, 968.4 g theoretical, 58.6 % yield) as a off-white solid. For **4**: ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.38 (t, 3H), 3.05 (q, 2H), 4.72 (m, 2H), 4.79 (m, 2H), 5.41 (m, 1H); MS: *m/z* calcd. 187.05; found: 187.1.

Step 3. 2-(1-(Ethylsulfonyl)azetidin-3-ylidene)acetonitrile (4) and 2-(3-chloro-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (4B).

tert-Butyl 3-(cyanomethylene)azetidine-1-carboxylate (**2**, 82 g, 0.42 mol) was added to THF (850 mL) and the resulting solution was cooled to 0°C before a 4 M HCl solution in 1,4-dioxane (850 mL, 3.38 mol, 8.0 equiv) was added over 1 h while keeping the temperature < 5°C. The resulting reaction mixture was slowly warmed to room temperature and stirred at room temperature for 18 h. When the reaction was deemed complete, the reaction mixture was concentrated under reduced pressure and the residue was placed under high vacuum for an additional 3 h before being treated with THF (900 mL) and diisopropylethylamine (183 mL, 1.06 mol, 2.5 equiv) at room temperature. The resulting solution was then cooled to 0°C and ethanesulfonyl chloride (56 mL, 0.59 mol, 1.4 equiv) was added while keeping the reaction temperature < 5°C. The ice bath was removed and the reaction was stirred at room temperature for 18 h. When TLC indicated the reaction was complete, the reaction mixture was diluted with ethyl acetate (1 L) and washed with saturated brine (1 L). The aqueous layer was extracted with ethyl acetate (2 x 500 mL). The combined organic layers were dried over sodium sulphate and concentrated under reduced pressure. The residue was diluted with dichloromethane and absorbed onto silica gel (150 g). This mixture was purified by column chromatography (1.5 Kg silica gel) eluting with heptane (4 L), 10 % EtOAc in heptane (4 L), 20 % EtOAc in heptane (8L), 30 % EtOAc in heptane (12 L), and finally with 40 % EtOAc in heptane (12 L) to afford 2-(1-(ethylsulfonyl)azetidin-3-ylidene)acetonitrile (**4**) and 2-(3-chloro-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (**4B**) as a off-white solid (58.1 g, 68% yield), which was found to be an approximately one to one mixture of compound **4** and **4B**. For **4**: ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.38 (t, 3H), 3.05 (q, 2H), 4.72 (m, 2H), 4.79 (m, 2H), 5.41 (m, 1H); MS: *m/z* calcd. 187.05; found: 187.1. For **4B**: ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.38 (t, 3H), 3.05 (q, 2H), 3.1 (s, 2H), 4.15 (d, 2H), 4.37 (d, 2H); MS: *m/z* calcd. 222.9; found: 222.9.

Step 4. 2-(1-(Ethylsulfonyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl)azetidin-3-yl)acetonitrile (6).

To a solution of 2-(1-(ethylsulfonyl)azetidin-3-ylidene)acetonitrile (**4**) and 2-(3-chloro-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (**4B**) obtained from the previous reaction as an approximate one to one mixture (4 and **4B**, 184 g, 919 mmol, 1.2 equiv) and 4-(1*H*-pyrazol-4-yl)-7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidine (**5**, 241 g,

766 mmol) in acetonitrile (6 L) was added DBU (137 mL, 919 mmol, 1.2 equiv) dropwise over 30 min at room temperature. The resulting reaction mixture was stirred overnight at room temperature. When the reaction was deemed complete, the solvent was removed under reduced pressure. The resulting solid was dissolved in 6 L of ethyl acetate and 2 L of acetonitrile at 40°C and the solution was washed with a mixture of brine (3 L) and water (1 L). The aqueous layer was extracted with ethyl acetate (3 x 1.6 L). The combined organic layers were washed with brine (1.6 L) and the solvent was removed under reduced pressure. Toluene (2 L) was added to the residue and the azeotropic distillation was repeated under reduced pressure. The residue was triturated with MTBE (1.5 L, methyl t-butyl ether) and the solids were collected by filtration. The brown solid was dissolved completely in ethyl acetate (3 L) at 50°C before the solution was treated with charcoal (30 g) and silica gel (30 g). The resulting mixture was stirred at 45 °C for 1 h before being filtered hot through celite. The solvent was removed under reduced pressure and the residue was triturated with MTBE (3 L). The solids were collected by filtration and washed with MTBE (1 L). The solids were then completely dissolved in isopropanol (8.8 L) at 70°C, and the resulting solution was gradually cooled down to room temperature with stirring for overnight. The solids were collected by filtration, washed with isopropanol (1.3 L) and heptane (2 x 490 mL), and dried in an oven overnight to afford 2-(1-(ethylsulfonyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidin-3-yl)acetonitrile (6, 327 g, 384.3 g theoretical, 85% yield) as an off-white solid. For 6: ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.00 (s, 9H), 0.99 (m, 2H), 1.49 (t, 3H), 3.15 (q, 2H), 3.49 (s, 2H), 3.60 (m, 2H), 4.30 (d, 2H), 4.70 (d, 2H), 5.76 (s, 2 H), 6.83 (s, 1H), 7.50 (s, 1H), 8.40 (s, 1H), 8.50 (s, 1H), 8.90 (s, 1H); MS: *m/z* calcd. 502.20; found: 502.3

Step 5. 2-(3-(4-(7H-Pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (7).

To a solution of 2-(1-(ethylsulfonyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidin-3-yl)acetonitrile (6, 327 g, 655 mmol) in acetonitrile (3 L) and water (300 mL) was added $LiBF_4$ (614 g, 6.55 mol, 10.0 equiv). The resulting reaction mixture was stirred at 75°C for overnight. The reaction mixture was cooled to 0°C before a solution of ammonium hydroxide (NH_4OH, 570 mL) in water (2.2 L) was added slowly to keep the temperature below 10°C (pH 9-10). The mixture was stirred at room temperature for overnight. When the reaction was deemed complete, water (10 L)

was added and the resulting mixture was vigorously stirred for 3 h at room temperature. The solids were collected by filtration, washed with water (6.7 L) and heptane (6.7 L), and dried in vacuum oven at 45°C over the weekend. The dried solid was then dissolved in 20 % MeOH in dichloromethane (12 L), and was purified by column chromatography on 1.3 Kg of silica gel eluting with a 20 % MeOH in dichloromethane solution (18L) to afford 2-(3-(4-(7*H*-Pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (7, 204 g, 243.3 g theoretical, 83.8% yield) as an off-white solid. For 7: ^{1}H NMR (300 MHz, *d6*-DMSO) δ 1.25 (t, 3H), 3.25 (q, 2H), 3.75 (s, 2H), 4.25 (d, 2H), 4.65 (d, 2H), 7.10 (d, 1H), 7.65 (dd, 1H), 8.50 (s, 1H), 8.70 (s, 1H), 8.95 (s, 1H), 12.2 (bs, 1H); MS: *m/z* calcd. 372.12; found: 372.0.

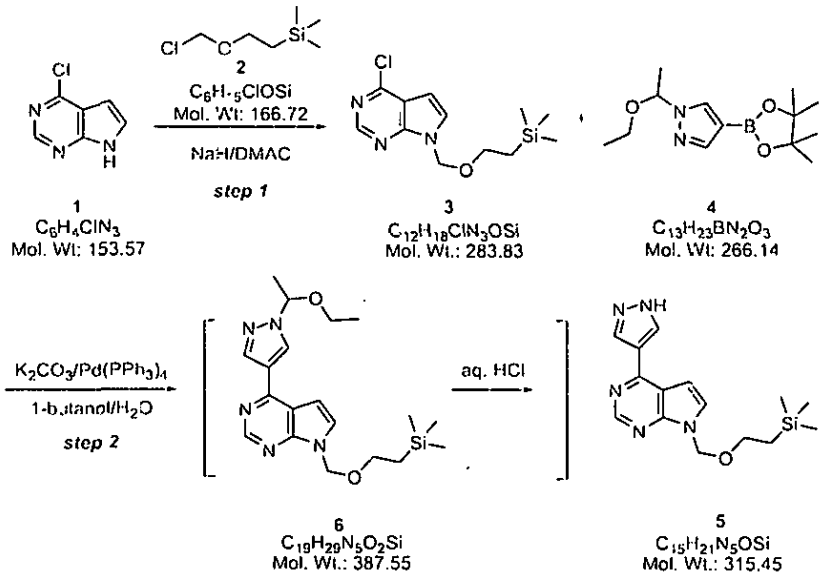
Step 6. 2-(3-(4-(7H-Pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile phosphoric acid salt.

To a solution of 2-(3-(4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (7, 204 g, 550 mmol) in acetonitrile (5.1 L) and ethanol (1.6 L) was added a solution of phosphoric acid (67.4 g, 688 mmol, 1.25 equiv) in ethanol (800 mL) slowly over 30 min at 70°C. The resulting reaction mixture was stirred at 70°C for 2 h before being gradually cooled to room temperature with stirring for overnight. The solids were collected by filtration, washed with acetonitrile (160 mL) and dried in vacuum oven at 45°C for 6 h to afford 2-(3-(4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile phosphoric acid salt (240 g, 258.2 g theoretical, 93% yield) as a white solid. For final product: ^{1}H NMR (300 MHz, d_6-DMSO) δ 1.25 (t, 3H), 3.25 (q, 2H), 3.75 (s, 2H), 4.20 (d, 2H), 4.61 (d, 2H), 7.10 (d, 1H), 7.60 (dd, 1H), 8.50 (s, 1H), 8.70 (s, 1H), 8.95 (s, 1H), 12.2 (bs, 1H); MS: *m/z* calcd. 372.12; found: 372.0.

Example 62. 4-Chloro-7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidine (3).

To a flask equipped with a nitrogen inlet, an addition funnel, a thermowell, and the mechanical stirrer was added 4-chloro-7*H*-pyrrolo[2,3-*d*]pyrimidine (1, 600 g, 3.91 mol) and *N*,*N*-dimethylacetimide (DMAC, 9.6 L) at room temperature. The mixture was cooled to 0 - 5 °C in an ice/brine bath before solid sodium hydride (NaH, 60 wt%, 174 g, 4.35 mol, 1.1 equiv) was added in portions at 0 - 5 °C. The reaction mixture went to a dark solution during

15 minutes. Trimethylsilylethoxymethyl chloride (2, SEM-Cl, 763 mL, 4.31 mol, 1.1 equiv) was then added slowly via an addition funnel at a rate that the internal reaction temperature did not exceed 5 °C. The reaction mixture was then stirred at 0 - 5 °C for 30 minutes. When the reaction was deemed complete determined by TLC and HPLC, the reaction mixture was quenched by water (1 L). The mixture was then diluted with water (12 L) and MTBE (8 L). The two layers were separated and the aqueous layer was extracted with MTBE (8 L). The combined organic layers were washed with water (2 x 4 L) and brine (4 L) and dried over sodium sulfate (Na_2SO_4). The solvents were removed under reduced pressure. The residue was then dissolved in heptane (2 L), filtered and loaded onto a silica gel (SiO_2, 3.5 Kg) column eluting with heptane (6 L), 95% heptane/ethyl acetate (12 L), 90% heptane/ethyl acetate (10 L), and finally 80% heptane/ethyl acetate (10 L). The fractions containing the pure desired product were combined and concentrated under reduced pressure to give 4-chloro-7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidine (**3**, 987 g, 1109.8 g theoretical, 88.9% yield) as a pale yellow oil which partially solidified to an oily solid on standing at room temperature. For **3**: ^{1}H NMR (DMSO-d_6, 300 MHz) δ 8.67 (s, 1H), 7.87 (d, 1H, J = 3.8 Hz), 6.71 (d, 1H, J = 3.6 Hz), 5.63 (s, 2H), 3.50 (t, 2H, J = 7.9 Hz), 0.80 (t, 2H, J = 8.1 Hz), 1.24 (s, 9H) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 151.3, 150.8, 150.7, 131.5, 116.9, 99.3, 72.9, 65.8, 17.1, -1.48 ppm; $C_{12}H_{18}ClN_3OSi$ (MW 283.83), LCMS (EI) *m/e* 284/286 (M^+ + H).



Example 63. 4-(1*H*-Pyrazol-4-yl)-7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidine (5).

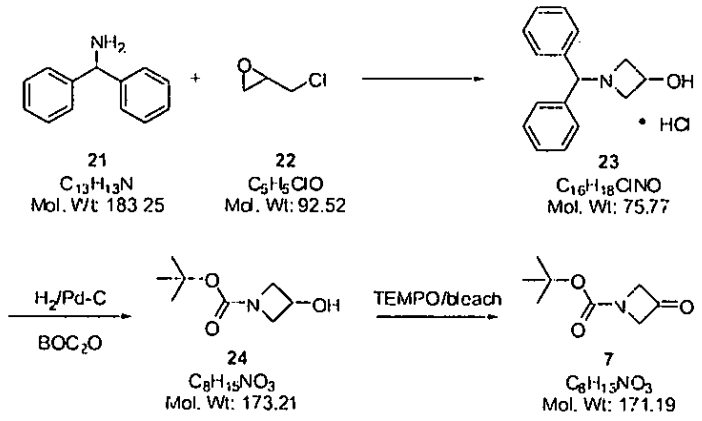
To a reactor equipped with the overhead stirrer, a condenser, a thermowell, and a nitrogen inlet was charged water (H_2O, 9.0 L), solid potassium carbonate (K_2CO_3, 4461 g, 32.28 mol, 2.42 equiv), 4-chloro-7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidine (**3**, 3597 g, 12.67 mol), 1-(1-ethoxyethyl)-4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1*H*-pyrazole (**4**, 3550 g, 13.34 mol, 1.05 equiv), and 1-butanol (27 L) at room temperature. The resulting reaction mixture was degassed three times backfilling with nitrogen each time before being treated with tetrakis(triphenylphosphine)palladium(0) ($Pd(PPh_3)_4$, 46 g, 0.040 mol, 0.003 equiv) at room temperature. The resulting reaction mixture was heated to gentle reflux (about 90 °C) for 1 - 4 hours. When the reaction was deemed complete determined by HPLC, the reaction mixture was gradually cooled down to room temperature before being filtered through a Celite bed. The Celite bed was washed with ethyl acetate (2 x 2 L) before the filtrates and washing solution were combined. The two layers were separated, and the aqueous layer was extracted with ethyl acetate (12 L). The combined organic layers were concentrated under reduced pressure to remove solvents, and the crude 4-(1-(1-ethoxyethyl)-1*H*-pyrazol-4-yl)-7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidine (**6**) was directly charged back to the reactor with tetrahydrofuran (THF, 4.2 L) for the subsequent acid-promoted de-protection reaction without further purification.

To a suspension of crude 4-(1-(1-ethoxyethyl)-1*H*-pyrazol-4-yl)-7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidine (**6**), made as described above, in tetrahydrofuran (THF, 4.2 L) in the reactor was charged water (H_2O, 20.8 L), and a 10% aqueous HCl solution (16.2 L, 45.89 mol, 3.44 equiv) at room temperature. The resulting reaction mixture was stirred at 16 – 30 °C for 2 – 5 h. When the reaction was deemed complete by HPLC analysis, the reaction mixture was treated with a 30% aqueous sodium hydroxide (NaOH) solution (4 L, 50.42 mol, 3.78 equiv) at room temperature. The resulting reaction mixture was stirred at room temperature for 1 – 2 h. The solids were collected by filtration and washed with water (2 x 5 L). The wet cake was charged back to the reactor with acetonitrile (21.6 L), and resulting suspension was heated to gentle reflux for 1 – 2 h. The clear solution was then gradually cooled down to room temperature with stirring, and solids were precipitated out from the solution with cooling. The mixture was stirred at room temperature for an additional 1 – 2 h. The solids were collected by filtration, washed with acetonitrile (2 x 3.5 L), and dried in oven under reduced pressure at 45 – 55 °C to constant

weight to afford 4-(1*H*-pyrazol-4-yl)-7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidine (**5**, 3281.7 g, 3996.8 g theoretical, 82.1% yield) as white crystalline solids (99.5 area% by HPLC). For **5**: ^{1}H NMR (DMSO-d_6, 400 MHz) δ 13.41 (br. s, 1H), 8.74 (s, 1H), 8.67 (br. s, 1H), 8.35 (br. s, 1H), 7.72 (d, 1H, J = 3.7 Hz), 7.10 (d, 1H, J = 3.7 Hz), 5.61 (s, 2H), 3.51 (t, 2H, J = 8.2 Hz), 0.81 (t, 2H, J = 8.2 Hz), 0.13 (s, 9H) ppm; $C_{15}H_{21}N_5OSi$ (MW, 315.45), LCMS (EI) *m/e* 316 (M^+ + H).

Example 64. 1-Benzhydrylazetidin-3-ol hydrochloride (23).

A solution of diphenylmethanamine (**21**, 2737 g, 15.0 mol, 1.04 equiv) in methanol (MeOH, 6 L) was treated with 2-(chloromethyl)oxirane (**22**, 1330 g, 14.5 mol) from an addition funnel at room temperature. During the initial addition a slight endotherm was noticed. The resulting reaction mixture was stirred at room temperature for 3 days before being warmed to reflux for an additional 3 days. When TLC showed that the reaction was deemed complete, the reaction mixture was first cooled down to room temperature and then to 0 - 5 °C in an ice bath. The solids were collected by filtration and washed with acetone (4 L) to give the first crop of the crude desired product (**23**, 1516 g).The filtrate was concentrated under reduced pressure and the resulting semisolid was diluted with acetone (1 L). This solid was then collected by filtration to give the second crop of the crude desired product (**23**, 221 g). The crude product, 1-benzhydrylazetidin-3-ol hydrochloride (**23**, 1737 g, 3998.7 g theoretical, 43.4 % yield), was found to be sufficiently pure to be used in the subsequent reaction without further purification. For **23**: ^{1}HNMR (DMSO-d_6, 300 MHz), δ 12.28 (br. d, 1H), 7.7 (m, 5H), 7.49 (m, 5H), 6.38 (d, 1H), 4.72 (br. s, 1H), 4.46 (m, 1H), 4.12 (m, 2H), 3.85 (m, 2H) ppm; $C_{16}H_{18}ClNO$ (free base of **23**, $C_{16}H_{17}NO$ MW, 239.31), LCMS (EI) *m/e* 240 (M^+ + H).



Example 65. ***tert*-Butyl 3-hydroxyazetidine-1-carboxylate (24).**

A suspension of 1-benzhydrylazetidin-3-ol hydrochloride (**23**, 625 g, 2.27 mol) in a 10 % solution of aqueous sodium carbonate (Na_2CO_3, 5 L) and dichloromethane (CH_2Cl_2, 5 L) was stirred at room temperature until all solids were dissolved. The two layers were separated, and the aqueous layer was extracted with dichloromethane (CH_2Cl_2, 2 L). The combined organics extracts were dried over sodium sulfate (Na_2SO_4) and concentrated under reduced pressure. This resulting crude free base of **23** was then dissolved in THF (6 L) and the solution was placed into a large Parr bomb. Di-*tert*-butyl dicarbonate (BOC_2O, 545 g, 2.5 mol, 1.1 equiv) and 20 % palladium (Pd) on carbon (125 g, 50 % wet) were added to the Parr bomb. The vessel was charged to 30 psi with hydrogen gas (H_2) and stirred under steady hydrogen atmosphere (vessel was recharged three times to maintain the pressure at 30 psi) at room temperature for 18 h. When HPLC showed that the reaction was complete (when no more hydrogen was taken up), the reaction mixture was filtered through a Celite pad and the Celite pad was washed with THF (4 L). The filtrates were concentrated under reduced pressure to remove the solvent and the residue was loaded onto a Biotage 150 column with a minimum amount of dichloromethane (CH_2Cl_2). The column was eluted with 20 – 50 % ethyl acetate in heptane and the fractions containing the pure desired product (**24**) were collected and combined. The solvents were removed under reduced pressure to afford *tert*-butyl 3-hydroxyazetidine-1-carboxylate (**24**, 357 g, 393.2 g theoretical, 90.8% yield) as colorless oil, which solidified upon standing at room temperature in vacuum. For **24**: ^{1}HNMR ($CDCl_3$, 300 MHz), δ 4.56 (m 1H), 4.13 (m, 2H), 3.81 (m, 2H), 1.43 (s, 9H) ppm.

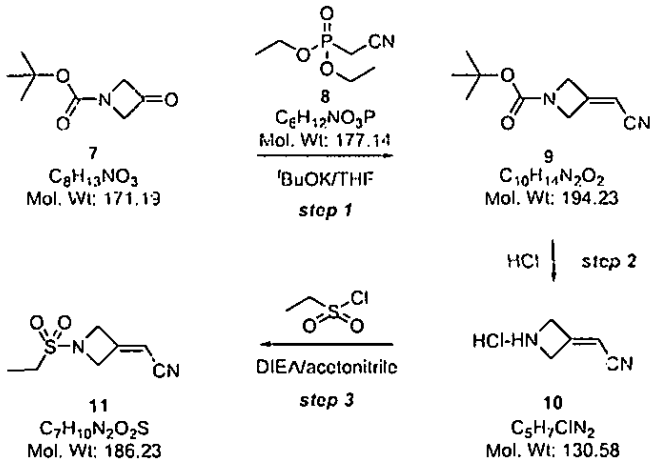
Example 66. ***tert*-Butyl 3-oxoazetidine-1-carboxylate (7).**

A solution of *tert*-butyl 3-hydroxyazetidine-1-carboxylate (**24**, 50 g, 289 mmol) in ethyl acetate (400 mL) was cooled to 0 °C. The resulting solution was then treated with solid TEMPO (0.5 g, 3.2 mmol, 0.011 equiv) and a solution of potassium bromide (KBr, 3.9 g, 33.2 mmol, 0.115 equiv) in water (60 mL) at 0 – 5 °C. While keeping the reaction temperature between 0 - 5 °C a solution of saturated aqueous sodium bicarbonate ($NaHCO_3$, 450 mL) and an aqueous sodium hypochlorite solution (NaClO, 10 - 13 % available chlorine, 450 mL) were added. Once the solution of sodium hypochlorite was added, the color of the reaction mixture was changed immediately. When additional amount of sodium hypochlorite solution was added, the color of the reaction mixture was gradually faded. When TLC showed that all of the starting material was consumed, the color of the reaction mixture was

no longer changed. The reaction mixture was then diluted with ethyl acetate (EtOAc, 500 mL) and two layers were separated. The organic layer was washed with water (500 mL) and the saturated aqueous sodium chloride solution (500 mL) and dried over sodium sulfate (Na_2SO_4). The solvent was then removed under reduced pressure to give the crude product, *tert*-butyl 3-oxoazetidine-1-carbcxylate (7, 48 g, 49.47 g theoretical, 97% yield), which was found to be sufficiently pure and was used directly in the subsequent reaction without further purification. For crude **7**: ^{1}H NMR ($CDCl_3$, 300 MHz), δ 4.65 (s, 4H), 1.42 (s, 9H) ppm.

Example 67. ***tert*-Butyl 3-(cyanomethylene)azetidine-1-carboxylate (9).**

Diethyl cyanomethyl phosphonate (**8**, 745 g, 4.20 mol, 1.20 equiv) and anhydrous tetrahydrofuran (THF, 9 L) was added to a four-neck flask equipped with a thermowell, an addition funnel and the nitrogen protection tube at room temperature. The solution was cooled with an ice-methanol bath to -14 °C and a 1.0 M solution of potassium *tert*-butoxide (*t*-BuOK) in anhydrous tetrahydrofuran (THF, 3.85 L, 3.85 mol, 1.1 equiv) was added over 20 min while keeping the reaction temperature below -5 °C. The resulting reaction mixture was stirred for 3 h at -10 °C and a solution of 1-*tert*-butoxycarbonyl-3-azetidinone (7, 600 g, 3.50 mol) in anhydrous tetrahydrofuran (THF, 2 L) was added over 2 h while keeping the internal temperature below -5 °C. The reaction mixture was stirred at -5 to -10 °C over 1 h and then slowly warmed up to room temperature and stirred at room temperature for overnight. The reaction mixture was then diluted with water (4.5 L) and saturated aqueous sodium chloride solution (NaCl, 4.5 L) and extracted with ethyl acetate (EtOAc, 2 x 9 L). The combined organic layers were washed with brine (6 L) and dried over anhydrous sodium sulfate (Na_2SO_4). The organic solvent was removed under reduced pressure and the residue was diluted with dichloromethane (CH_2Cl_2, 4 L) before being absorbed onto silica gel (SiO_2, 1.5 Kg). The crude product, which was absorbed on silica gel, was purified by flash column chromatography (SiO_2, 3.5 Kg, 0 – 25% EtOAc/hexanes gradient elution) to afford *tert*-butyl 3-(cyanomethylene)azetidine-1-carboxylate (**9**, 414.7 g, 679.8 g theoretical, 61% yield) as white solid. For **9**: ^{1}H NMR ($CDCl_3$, 300MHz), δ 5.40 (m, 1H), 4.70 (m, 2H), 4.61 (m, 2H), 1.46 (s, 9H) ppm; $C_{10}H_{14}N_2O_2$ (MW, 194.23), LCMS (EI) *m/e* 217 (M^+ + Na).



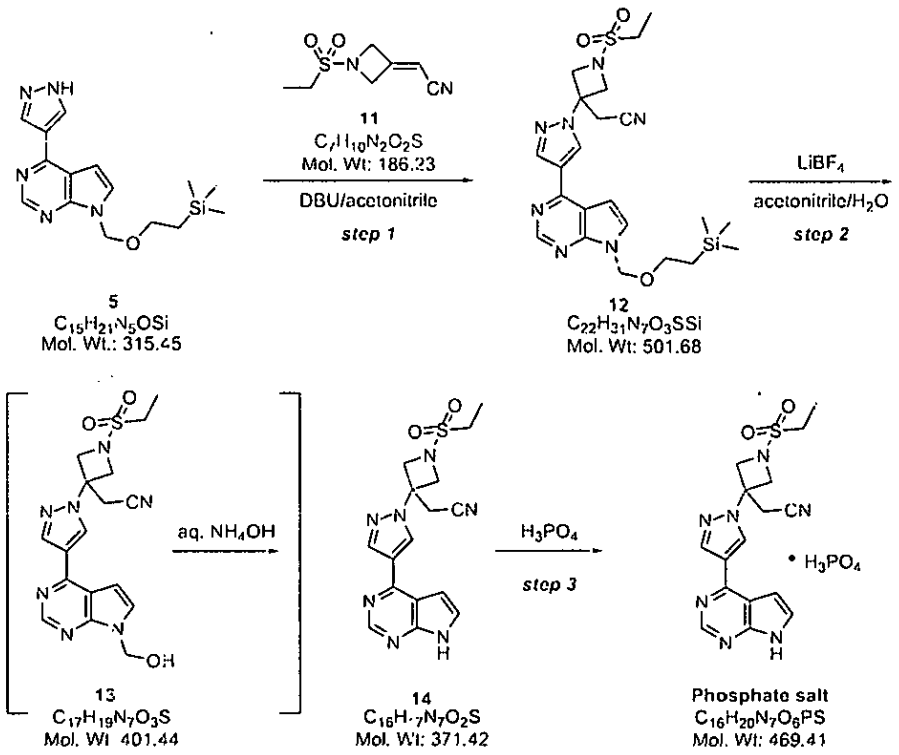
Example 68. 2-(1-(Ethylsulfonyl)azetidin-3-ylidene)acetonitrile (11).

A solution of *tert*-butyl 3-(cyanomethylene)azetidine-1-carboxylate (**9**, 1000g, 5.2 mol) in acetonitrile (7 L) and a 3 N aqueous HCl solution (7 L) was stirred at room temperature for 18 h. When HPLC showed that all the starting material (**9**) was consumed, the reaction mixture was concentrated under reduced pressure to dryness. The residue, which contains the crude desired deprotection product (**10**), was then suspended in acetonitrile (12 L) and the resulting suspension was cooled to 0 - 5 °C. Diisopropyethylamine (DIEA, 3.14 L, 18.03 mol, 3.5 equiv) was then slowly added while keeping the internal temperature below 5 °C. The resulting homogeneous solution was allowed to cool down to 0 °C and ethane sulfonyl chloride ($EtSO_2Cl$, 730 mL, 7.73 mol, 1.5 equiv) was added over 1 h while keeping the internal temperature below 5 °C. The resulting reaction mixture was allowed to gradually warm to room temperature and stirred at room temperature for overnight. When HPLC showed that the reaction was complete, the reaction mixture was concentrated under reduced pressure to a volume of approximately 2 L. The bath temperature of the rotary evaporator is set to not exceed 45 °C. The concentrated residue was then diluted with dichloromethane (CH_2Cl_2, 10 L) and the resulting dichloromethane solution was washed with aqueous sodium chloride solution (10 L). The aqueous phase was back extracted with dichloromethane (CH_2Cl_2, 5 L). The combined organic layers were dried over anhydrous sodium sulfate (Na_2SO_4) and the residue was absorbed onto silica gel (SiO_2, 1 Kg) under reduced pressure. The bath temperature of the rotary evaporator was set to not exceed 45 °C. The material was then loaded onto a silica gel column (SiO_2, 2.5 Kg) and eluted with 20 – 60 % ethyl acetate in heptane to afford 2-(1-(ethylsulfonyl)azetidin-3-ylidene)acetonitrile (**11**, 882 g, 968.4 g theoretical, 91 % yield) as off-white solids. For **11**: ^{1}H NMR ($CDCl_3$, 300 MHz) δ 5.46 (m,

1H), 4.77 (m, 2H), 4.70 (m, 2H), 3.05 (q, 2H), 1.39 (t, 3H) ppm; $C_7H_{10}N_2O_2S$ (MW, 186.23), LCMS (EI) *m/e* 187 (M^+ + H).

Example 69. 2-(1-(Ethylsulfonyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidin-3-yl)acetonitrile (12).

Method A. To a suspension of 4-(1*H*-pyrazol-4-yl)-7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidine (**5**, 440 g, 1.395 mol) and 2-(1-(ethylsulfonyl)azetidin-3-ylidene)acetonitrile (**11**, 312.4 g, 1.68 mol, 1.2 equiv) in acetonitrile (4.4 L) was added DBU (249.8 mL, 1.67 mol, 1.2 equiv) drop wise to keep the reaction temperature between 15 – 25 °C. After adding DBU, the reaction mixture became homogeneous, but a precipitate appeared in 30 min. The reaction mixture was stirred for 3 h at room temperature. When HPLC showed that the reaction was deemed complete, the reaction mixture was quenched with water (11 L). The resulting mixture was stirred at room temperature for additional 30 min and then filtered. The solid cake was washed with water (4 L), MTBE (2 L) and dried in vacuum oven at 35 °C for 24 h to afford crude 2-(1-(ethylsulfonyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidin-3-yl)acetonitrile (**12**, 681 g, 699.8 g theoretical, 97.3 % yield) as white solids, which was found to be sufficiently pure for the subsequent reaction without further purification. For **12**: ^{1}HNMR ($CDCl_3$, 300 MHz), δ 8.86 (s, 1H), 8.45 (s, 1H), 8.35 (s, 1H), 7.43 (d, 1H), 6.80 (d, 1H), 5.68 (s, 2H), 4.65 (d, 2H), 4.27 (d, 2H), 3.55 (s, 2H), 3.4 (t, 2H), 3.07 (m, 2H), 1.42 (m, 3H), 0.92 (m, 2H), -0.05 (s, 9H) ppm; $C_{22}H_{31}N_7O_3SSi$ (MW, 501.68), LCMS (EI) *m/e* 502 (M^+ + H).



Example 70. 2-(3-(4-(7*H*-Pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (14).

Method A. To a solution of 2-(1-(ethylsulfonyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidin-3-yl)acetonitrile (**12**, 400 g, 797 mmol) in acetonitrile (3.6 L) and water (360 mL) was added solid lithium tetrafluoroborate ($LiBF_4$, 747.5 g, 7.97 mol, 10.0 equiv) at room temperature. The resulting reaction mixture was warmed to 80 °C and stirred at 80 °C for overnight. When HPLC showed the first stage of deprotection was complete, which afforded the corresponding hydroxymethyl intermediate **13**, the reaction mixture was cooled down to room temperature gradually and subsequently to 0 °C. A solution of ammonium hydroxide (28 – 30% aqueous NH_4OH, 680 mL) in water (2.7 L) was added slowly to the reaction mixture to adjust pH to 9-10 while keeping the internal temperature below 10 °C. The resulting mixture was stirred at room temperature for overnight. When HPLC showed that the second stage of deprotection was complete, the reaction mixture was added into water (10 L), and the resulting mixture was vigorously stirred at room temperature for 3 h. The solids were collected by filtration, washed with water (8 L) and heptane (8 L), and dried in convection oven at 35 °C over the weekend. The dried solids were dissolved in 20 % MeOH in dichloromethane (16 L) before

being purified by column chromatography on 1.6 Kg of silica gel (SiO_2). The column was eluted with a 20 % MeOH in dichloromethane solution (CH_2Cl_2, 18 L) to give 2-(3-(4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (**14**, 239.5 g, 296.1 g theoretical, 80.9% yield) as off-white solids. For **14**: ^{1}H NMR (DMSO-d_6, 300 MHz) δ 12.15 (s, 1H), 8.94 (s, 1H), 8.72 (s, 1H), 8.49 (s, 1H), 7.63 (d, 1H), 7.09 (d, 1H), 4.62 (d, 2H), 4.25 (d, 2H), 3.71 (s, 2H), 3.24 (q, 2H), 1.26 (t, 3H) ppm; $C_{16}H_{17}N_7O_2S$ (MW, 371.42), LCMS (EI) *m/e* 372 (M^+ + H).

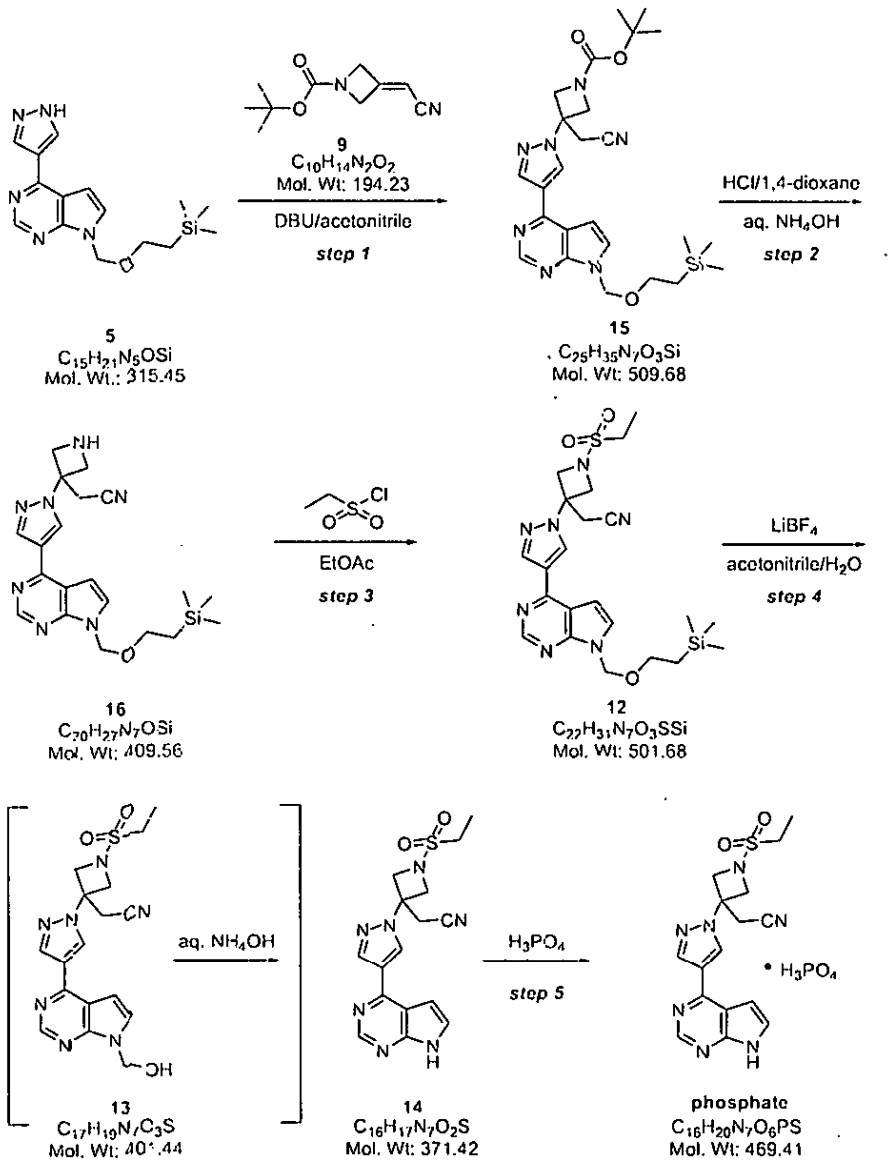
Example 71. 2-(3-(4-(7*H*-Pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile phosphate salt.

To a solution of 2-(3-(4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (**14**, 471.2 g, 1268.6 mmol) in acetonitrile (10.86 L) and ethanol (3.75 L) was added an 85 % aqueous solution of phosphoric acid (H_3PO_4, 191.6 g, 1661.7 mmol, 1.31 equiv) in ethanol (EtOH, 1.68 L) slowly over 50 min at 70 °C. The resulting reaction mixture was cooled down to room temperature slowly and stirred at room temperature for overnight. The solids were collected by filtration and washed with acetonitrile (500 mL). The resulting wet cake was then suspended in ethanol (EtOH, 7.0 L) before being treated with an aqueous 85 % solution of phosphoric acid (H_3PO_4, 95.1 g, 824.6 mmol, 0.65 equiv) in ethanol (EtOH, 1.23 L) at room temperature. The resulting mixture was then warmed to reflux and stirred at reflux for 1 h before being cooled down to room temperature slowly and stirred at room temperature for overnight. The solids were collected by filtration, washed with ethanol (2 L) and heptane/ethanol (v/v 2/1, 2.1 L), and dried in vacuum oven at 40 °C for overnight to afford 2-(3-(4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile phosphate salt (534.8 g, 595.5 g theoretical, 89.8% yield) as white crystalline solids. For **phosphate salt**: mp: 187 °C; elemental analysis for $C_{16}H_{20}N_7O_6PS$, Calcd: C, 40.94; H, 4.29; N, 20.89; P, 6.60; S, 6.83; Found: C, 40.65; H, 4.22; N, 20.71; P, 6.53; S, 6.95; FTIR (νmax, cm^{-1}): 3123 (-CH-), 2254 (CN), 1627 and 1441 (heteroaromatic C=N), 1600 and 1559 (heteroaromatic C=C), 1312 (-SO_2-); ^{1}H NMR (DMSO-d_6, 300 MHz) δ 12.19 (s, 1H), 8.94 (s, 1H), 8.71 (s, 1H), 8.48 (s, 1H), 7.62 (dd, 1H, J = 3.5, 2.3 Hz), 7.08 (dd, 1H, J = 3.6, 1.5 Hz), 4.60 (d, 2H, J = 9.3, 9.2 Hz), 4.23 (d, 2H, J = 9.3, 9.2 Hz), 3.69 (s, 2H), 3.23 (q, 2H, J = 7.2 Hz), 1.23 (t, 3H, J = 7.3 Hz) ppm; ^{13}C NMR (DMSO-d_6, 75 MHz) δ 152.3, 150.9, 149.4, 140.0, 129.7, 127.1, 122.2,

116.8, 113.1, 100.1, 58.6, 56.1, 43.3, 26.9, 7.5 ppm; $C_{16}H_{17}N_7O_2S$ (free base, MW, 371.42), LCMS (EI) *m/e* 372 (M^+ + H).

Example 72. tert-Butyl 3-(cyanomethyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7H-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidine-1-carboxylate (15).

To a suspension of *tert*-butyl 3-(cyanomethylene)azetidine-1-carboxylate (**9**, 417.2 g, 2.15 mol, 1.05 equiv) and 4-(1*H*-pyrazol-4-yl)-7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidine (**5**, 645 g, 2.04 mol) in acetonitrile (4.9 L) was added DBU (30.5 mL, 0.204 mol, 0.1 equiv) drop wise at room temperature. The resulting reaction mixture was then stirred at room temperature for 3 h. After about 1 h, a clear, brown solution was obtained. When LCMS showed that no starting material remained, silica gel (SiO_2, 1 Kg) was added and the mixture was concentrated to dryness under reduced pressure. This material, which contains the crude desired product (**15**), was then loaded onto a pre-packed silica column (SiO_2, 2.5 Kg) and the column was eluted with 60 – 80% of ethyl acetate/heptane. The fractions containing the pure desired product (**15**) were combined and concentrated under reduced pressure to give the desired product as thick oil which was then stirred in heptane at room temperature until crystallization occurred. The solids were collected by filtration and washed with heptane to afford *tert*-butyl 3-(cyanomethyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidine-1-carboxylate (**15**, 1014.9 g, 1039.7 g theoretical, 97.6% yield) as white solids. For **15**: ^{1}H NMR (DMSO-d_6, 300 MHz) δ 8.93 (s, 1H), 8.77 (s, 1H), 8.47 (s, 1H), 7.80 (d, 1H, J = 3.8 Hz), 7.20 (d, 1H, J = 3.7 Hz), 5.63 (s, 2H), 4.50 (d, 2H, J = 9.3 Hz), 4.21 (d, 2H, J = 9.3 Hz), 3.66 (s, 2H), 3.52 (t, 2H, J = 7.8 Hz), 1.40 (s, 9H), 0.82 (t, 2H, J = 8.1 Hz), -0.12 (s, 9H) ppm; $C_{25}H_{35}N_7O_3Si$ (MW, 509.68), LCMS (EI) *m/e* 510 (M^+ + H) and 532 (M^+ + Na).



Example 73. 2-(3-(4-(7-((2-(Trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidin-3-yl)acetonitrile (16).

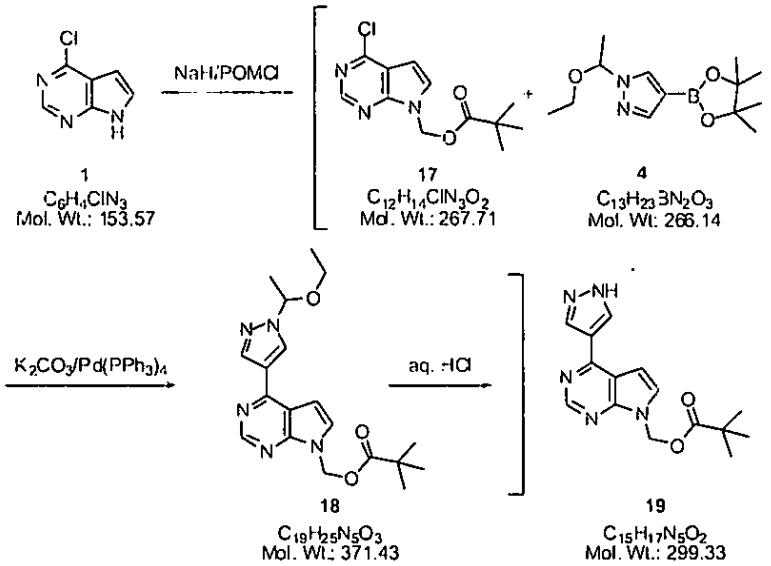
To a solution of *tert*-butyl 3-(cyanomethyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidine-1-carboxylate (15, 389.6 g, 0.765 mol) in dichloromethane (CH_2Cl_2, 7 L) was added a solution of hydrogen chloride (HCl) in dioxane (4 M, 1.15 L, 4.6 mol, 6.0 equiv) drop wise at room temperature. The resulting reaction mixture was stirred at room temperature for 48 h. When LCMS showed that all of the starting material had been consumed, the reaction mixture was transferred in portions to a 22 L separation funnel containing aqueous ammonium hydroxide (NH_4OH, about 4% v/v, 2.5 L). Gas was evolved but the funnel stayed

cool to the touch. Ice cubes were periodically added as a precaution. Once all of the reaction mixture was added, stirring was continued for about 15 min. The pH of the aqueous layer was found to be close to 11. The two layers were separated and the organic layer was washed with brine (2 L), dried over anhydrous sodium sulfate (Na_2SO_4) and concentrated under reduced pressure to a minimum volume. Heptane (about 3 L) was added to the residue and the resulting suspension was concentrated to dryness under reduced pressure to give crude 2-(3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidin-3-yl)acetonitrile (**16**, 268.2 g, 313.3 g theoretical, 85.6% yield) as an orange oil which was used directly for the subsequent reaction without further purification. For crude **16**: ^{1}H NMR (300 MHz, $CDCl_3$): δ 8.92 (s, 1H), 8.45 (s, 1H), 8.39 (s, 1H), 7.47 (d, 1H), 6.87 (d, 1H), 5.74 (s, 2H), 4.36 (d, 2H), 3.95 (d, 2H), 3.77 (s, 2H), 3.62 (t, 2H), 1.9 (br. s, 1H), 0.99 (t, 2 H), 0.01 (s, 9H) ppm; $C_{20}H_{27}N_7OSi$ (MW, 409.56), LCMS (EI) *m/e* 410 (M^+ + H).

Example 75. 2-(1-(Ethylsulfonyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidin-3-yl)acetonitrile (12).

Method B. To a solution of crude 2-(3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidin-3-yl)acetonitrile (**16**, 423.7 g, 1.03 mol) in ethyl acetate (EtOAc, 6.5 L) at 0 - 5 °C was added a solution of ethane sulfonyl chloride ($EtSO_2Cl$, 117 mL, 1.23 mol, 1.2 equiv) in ethyl acetate (110 mL) drop wise. The resulting reaction mixture was allowed to warm gradually to room temperature and stirred at room temperature for overnight. When LCMS analysis showed that no starting material remained and the reaction mixture was transferred to a 22 L separation funnel and washed with water (4 L), brine (2 L) and saturated aqueous sodium bicarbonate solution ($NaHCO_3$, 2 L). The combined aqueous layer was back extracted with ethyl acetate (EtOAc, 2 L). The combined organic layers were washed with brine, dried over anhydrous sodium sulfate (Na_2SO_4) and concentrated under reduced pressure. The crude material was purified on silica gel eluted with dichloromethane/ethyl acetate (100/0 to 0/100). The fractions containing the pure desired product (**12**) were combined and concentrated under reduced pressure to a minimum volume before being treated with heptane at room temperature. The solids were collected by filtration and washed with heptane to afford 2-(1-(ethylsulfonyl)-3-(4-(7-((2-(trimethylsilyl)ethoxy)methyl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)azetidin-3-yl)acetonitrile (**12**, 397 g, 516.7 g theoretical, 76.8% yield) as white solids, which was found

to be identical to the material prepared by method A in every comparable aspect . For **12**: ^{1}H NMR ($CDCl_3$, 300 MHz), δ 8.86 (s, 1H), 8.45 (s, 1H), 8.35 (s, 1H), 7.43 (d, 1H), 6.80 (d, 1H), 5.68 (s, 2H), 4.65 (d, 2H), 4.27 (d, 2H), 3.55 (s, 2H), 3.4 (t, 2H), 3.07 (m, 2H), 1.42 (m, 3H), 0.92 (m, 2H), -0.05 (s, 9H) ppm; $C_{22}H_{31}N_7O_3SSi$ (MW, 501.68), LCMS (EI) *m/e* 502 (M^+ + H).



Example 76. [4-(1*H*-Pyrazol-4-yl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-7-yl]methyl pivalate (19). To a oven dried 3 L 4-neck round bottom flask equipped with a stirring bar, a septa, a thermocouple, a 500 mL addition funnel and the nitrogen inlet was charged solid sodium hydride (NaH, 60 wt% in mineral oil, 32.82 g, 0.82 mol, 1.20 equiv) and anhydrous 1,2-dimethoxyethane (DME, 500 mL, 4.8 mol) and the resulting mixture was cooled to 0 - 3 °C. To a oven dried 1 L round bottom flask was charged 4-chloro-7*H*-pyrrolo[2,3-*d*]pyrimidine (**1**, 105.0 g, 0.684 mol) and 1,2-dimethoxyethane (DME, 750 mL, 7.2 mol) and the resulting slurry was then portion wise added to the suspension of sodium hydride in DME via large bore canula over 30 minutes at 5 – 12 °C. The resulting reaction mixture was heterogeneous. Following the addition, the cold bath was removed and the mixture was gradually warmed to room temperature and allowed to stir at room temperature for 1 hour before being cooled to 0 – 5 °C. Chloromethyl pivalate (pivaloyloxymethyl chloride, POM-Cl, 112 ml, 0.752 mol, 1.1 equiv) was then added drop wise into the reaction mixture over 30 minutes with stirring at 0 – 5 °C. The addition of chloromethyl pivalate was mildly exothermic and the reaction temperature went up to as high as 14 °C. After addition of chloromethyl pivalate, the cooling bath was removed and the reaction mixture was allowed to return to room temperature and

stirred at room temperature for 90 min. When the reaction was deemed complete after confirmed by HPLC, the reaction mixture was carefully quenched with water (100 mL) and this quenched reaction mixture, which contains crude POM-protected chlorodeazapurine (**17**), was used directly in the subsequent Suzuki coupling reaction without further work-up and purification.

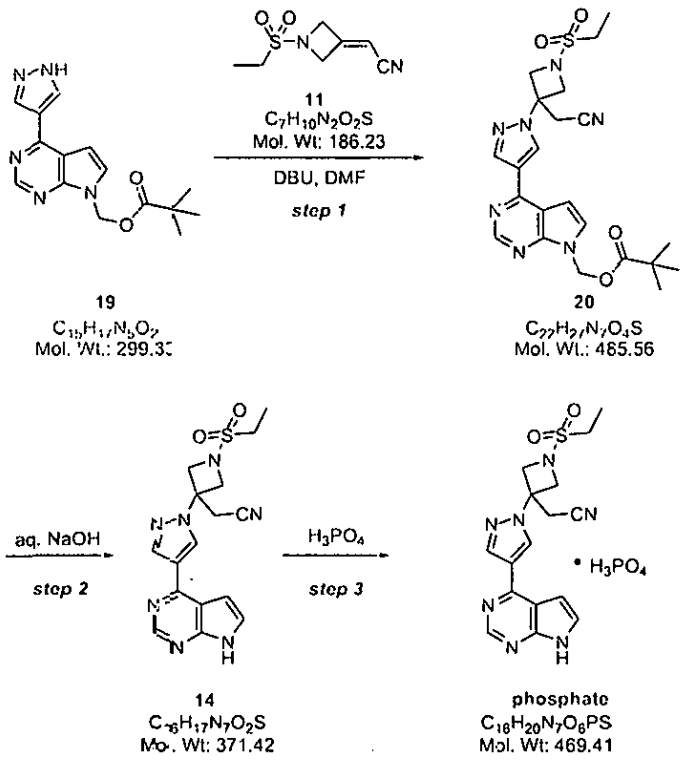
To the quenched reaction mixture, which contains crude POM-protected chlorodeazapurine (**17**) made as described above, was added 1-(1-ethoxyethyl)-4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl) –1*H*-pyrazole (**4**, 200 g, 0.75 mol, 1.10 equiv) and solid potassium carbonate (K_2CO_3, 189 g, 1.37 mol, 2.0 equiv) at room temperature. The resulting mixture was degassed by passing a stream of nitrogen through the solution for 15 minutes before being treated with tetrakis(triphenylphosphine)palladium(0) ($Pd(PPh_3)_4$, 7.9 g, 0.68 mmol, 0.01 equiv) and the resulting reaction mixture was heated at reflux (about 82 °C) for 10 hours. When the reaction was deemed complete by TLC (1:1 hexanes/ethyl acetate) and LCMS, the reaction mixture was cooled to room temperature, diluted with ethyl acetate (2 L) and water (1 L). The two layers were separated, and the aqueous layer was extracted with ethyl acetate (500 mL). The combined organic layers were washed with water (2 x 1 L) and brine (1 L) before being concentrated under reduced pressure to afford crude {4-[1-(1-ethoxyethyl)-1*H*-pyrazol-4-yl]-7*H*-pyrrolo[2,3-*d*]pyrimidin-7-yl]methyl pivalate (**18**) as a pale-yellow oil, which was directly used in the subsequent de-protection reaction without further purification.

A solution of crude **18** in THF (1 L, 12.3mol) was treated with a 4 N aqueous HCl solution (500 mL) at room temperature. The resulting reaction mixture was subsequently stirred at room temperature for 5 h. When the reaction was deemed complete, the reaction mixture was cooled to 0 – 5 °C before the pH was adjusted to 9 -10 with a 1 M aqueous sodium hydroxide (NaOH) solution (2 L). The mixture was then concentrated under reduced pressure to remove most of the THF and the resulting suspension was stirred at room temperature for 2 h. The solids were collected by filtration, washed with water (3 x 500 mL), and dried in vacuum oven to afford [4-(1*H*-pyrazol-4-yl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-7-yl]methyl pivalate (**19**, 157.5 g, 204.43 g theoretical, 77% yield for three steps) as off-white solids, which was found to be sufficiently pure (> 98 area% by HPLC) to do the subsequent reaction without further purification. For **19**: ^{1}H NMR (DMSO-d_6, 400 MHz) δ 13.42 (br s, 1H), 8.76 (s, 1H), 8.67 (s, 1H), 8.33 (s, 1H), 7.68 (d, 1H, J = 3.8 Hz), 7.11 (d, 1H, J = 3.8 Hz), 6.21 (s, 2H), 1.06 (s, 9H) ppm; ^{13}C NMR (DMSO-d_6, 100 MHz) δ 177.74, 152.31,

152.09, 151.91, 139.52, 130.39, 120.51, 113.93, 101.91, 67.26, 38.98, 27.26 ppm; $C_{15}H_{17}N_5O_2$ (MW, 299.33), LCMS (EI) *m/e* 300 (M^+ + H).

Example 77. (4-(1-(3-(Cyanomethyl)-1-(ethylsulfonyl)azetidin-3-yl)-1*H*-pyrazol-4-yl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-7-yl)methyl pivalate (20).

To a suspension of [4-(1*H*-pyrazol-4-yl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-7-yl]methyl pivalate (**19**, 10.0 g, 33.4 mmol) and 2-(1-(ethylsulfonyl)azetidin-3-ylidene)acetonitrile (**11**, 6.22 g, 33.4 mmol, 1.0 equiv) in *N*,*N*-dimethylformamide (DMF, 20 mL) was added DBU (254 mg, 1.67 mmol, 0.05 equiv) drop wise to keep the reaction temperature between 15 – 25 °C. After adding DBU, the reaction mixture became homogeneous within 90 min. The reaction mixture was stirred for 3 h at room temperature. When HPLC showed that the reaction was deemed complete, the reaction mixture was quenched with water (120 mL) and acetonitrile (80 mL). The resulting mixture was stirred at room temperature for an additional 30 min. The solids were collected by filtration, washed with a mixture of acetonitrile and water (2/3 by volume, 2 x 20 mL), and dried in vacuum oven at 40 - 45 °C for 24 h to afford crude (4-(1-(3-(cyanomethyl)-1-(ethylsulfonyl)azetidin-3-yl)-1*H*-pyrazol-4-yl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-7-yl)methyl pivalate (**20**, 14.5 g, 16.2 g theoretical, 89.5 % yield) as white solids, which was found to be sufficiently pure (> 98.0% by HPLC) for the subsequent reaction without further purification. For **20**: ^{1}HNMR ($CDCl_3$, 300 MHz), δ 8.87 (s, 1H), 8.43 (s, 1H), 8.37 (s, 1H), 7.51 (d, 1H, J = 3.6 Hz), 6.76 (d, 1H, J = 3.6 Hz), 6.26 (s, 2H), 4.64 (d, 2H, J = 9.6 Hz), 4.25 (d, 2H, J = 9.6 Hz), 3.41 (s, 2H), 3.09 (q, 2H, J = 7.6 Hz), 1.42 (t, 3H, J = 7.6 Hz), 1.17 (s, 9H) ppm; $C_{22}H_{27}N_7O_4S$ (MW, 485.56), LCMS (EI) *m/e* 486 (M^+ + H).



Example 78. 2-(3-(4-(7*H*-Pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (14).

Method B. A suspension of (4-(1-(3-(cyanomethyl)-1-(ethylsulfonyl)azetidin-3-yl)-1*H*-pyrazol-4-yl)-7*H*-pyrrolo[2,3-*d*]pyrimidin-7-yl)methyl pivalate (**20**, 1.0 g, 2.06 mmol) in methanol (MeOH, 5 mL) and tetrahydrofuran (THF, 20 mL) was treated with a 1 M aqueous sodium hydroxide solution (NaOH, 2.3 mL, 2.3 mmol, 1.12 equiv) at room temperature, and the resulting reaction mixture was stirred at room temperature for 2 – 3 h. When HPLC showed that the reaction was deemed complete, the reaction mixture was quenched with water (10 mL) and a 1 N aqueous HCl solution (0.2 mL) to adjust pH to 7 – 7.5 at room temperature. The resulting mixture was stirred at room temperature for 30 min before the solids were collected by filtration. The solids were washed with a mixture of acetonitrile and water (2/3 by volume, 2 x 4 mL) and dried in vacuum at 40 - 45 °C for 24 h to afford crude 2-(3-(4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (**14**, 658 mg, 765 mg theoretical, 86% yield) as off-white solids, which was found to be identical to the material prepared by Method A. For crude **14**: ^{1}H NMR (DMSO-d_6, 300 MHz) δ 12.15 (s, 1H), 8.94 (s, 1H), 8.72 (s, 1H), 8.49 (s, 1H), 7.63 (d, 1H), 7.09 (d,

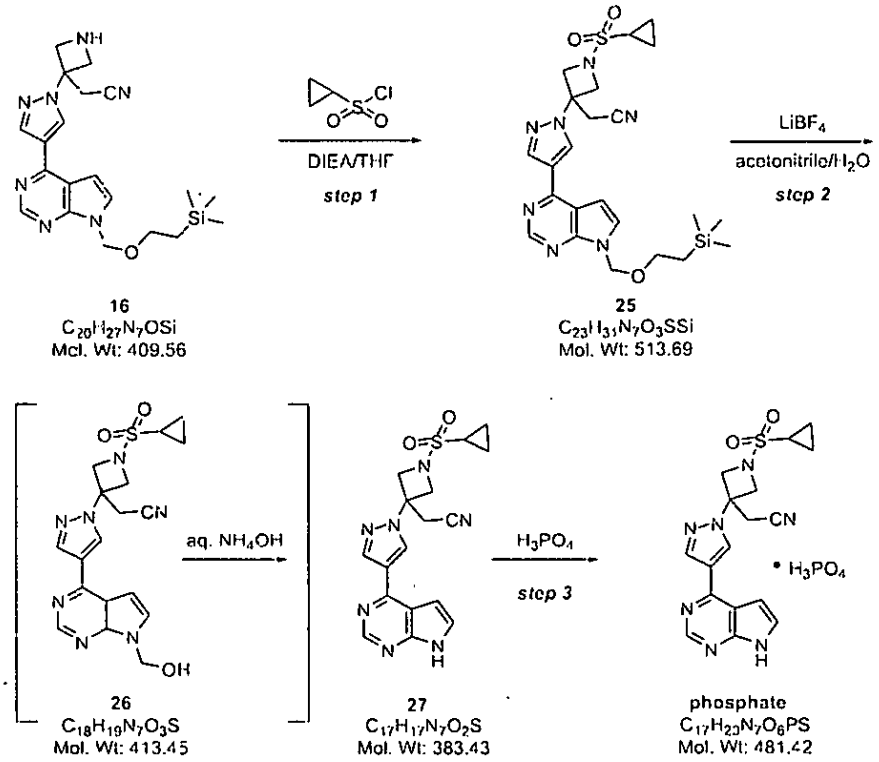
1H), 4.62 (d, 2H), 4.25 (d, 2H), 3.71 (s, 2H), 3.24 (q, 2H), 1.26 (t, 3H) ppm; $C_{16}H_{17}N_7O_2S$ (MW, 371.42). LCMS (EI) *m/e* 372 ($M^+ + H$).

Method C. Alternatively, a suspension of (4-(1-(3-(cyanomethyl)-1-(ethylsulfonyl)azetidin-3-yl)-1H-pyrazol-4-yl)-7H-pyrrolo[2,3-d]pyrimidin-7-yl)methyl pivalate (**20**, 10.0 g, 20.6 mmol) and lithium hydroxide monohydrate (2.59 g, 61.8 mmol) in acetonitrile (CH_3CN 40 mL) and isopropyl alcohol (10 mL) was heated at 45 – 50 °C for 6 hours. When HPLC showed that the reaction was deemed complete, the reaction mixture was cooled to room temperature and 1M hydrochloric acid aqueous solution (41 mL) as added to adjust the pH to 6 – 7 at temperature below 25 °C. After the acid addition, the mixture was stirred at room temperature for 1 h and the precipitates were isolated by filtration. The wet cake was washed with water (50 mL) and dried in vacuum oven at 50 °C to give crude 2-(3-(4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl)-1-(ethylsulfonyl)azetidin-3-yl)acetonitrile (**14**, 6.0 g, 7.65 g theoretical, 78% yield) as off-white solids, which was found to be identical to the material prepared by Method A.

Example 79. {1-(Cyclopropylsulfonyl)-3-[4-(7-{[2-(trimethylsilyl)ethoxy]methyl}-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl]azetidin-3-yl}acetonitrile (25).

To a oven dried 2 L round bottom flask equipped with the overhead stirring, a nitrogen inlet, a septa and a thermocouple was charged anhydrous tetrahydrofuran (THF, 800 mL); {3-[4-(7-{[2-(trimethylsilyl)ethoxy]methyl}-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl]azetidin-3-yl}acetonitrile (**16**, 38.6 g, 94.2 mmol) and *N*,*N*-diisopropylethylamine (DIEA, 22.0 mL, 126 mmol, 1.34 equiv) at room temperature. The resulting solution was then cooled to 0 – 5 °C before being charged with cyclopropanesulfonyl chloride (14.3 mL, 134 mmol, 1.42 equiv) portion wise over eight minutes via syringe at 0 – 5 °C. After 10 minutes, the ice bath was removed and the reaction mixture was allowed to warm gradually to room temperature. When HPLC showed that the reaction was complete after 22 h, the reaction mixture was concentrated under reduced pressure to remove about 400 mL of solvent. The residue was treated with ethyl acetate (EtOAc, 500 mL) and the resulting solution was washed with 20% aqueous sodium chloride solution (NaCl, 300 mL). The aqueous layer was back extracted with ethyl acetate (EtOAc, 150 mL). The combined organic fractions were dried over magnesium sulfate ($MgSO_4$) and concentrated under reduced pressure to yield the crude product (**25**) as an amber oil. The crude product was then purified by flash column chromatography (SiO_2, 50% to 70% ethyl acetate/hexane gradient elution) to afford {1-(cyclopropylsulfonyl)-3-[4-(7-{[2-

(trimethylsilyl)ethoxy]methyl}-7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl]azetidin-3-yl}acetonitrile (**25**, 39.4 g, 48.4 g theoretical, 81.4% yield) as a light yellow oil, which solidified upon standing at room temperature in vacuum. For **25**: ^{1}H NMR (DMSO-d_6, 300 MHz) δ 8.98 (s, 1H), 8.78 (s, 1H), 8.50 (s, 1H), 7.81 (d, 1H, J = 3.8 Hz), 7.20 (d, 1H, J = 3.6 Hz), 5.63 (s, 2H), 4.66 (d, 2H, J = 9.5 Hz), 4.28 (d, 2H, J = 9.3 Hz), 3.69 (s, 2H), 3.52 (t, 2H, J = 7.8 Hz), 2.84 (m, 1H), 1.01 (m, 4H), 0.82 (t, 2H, J = 8.4 Hz), -0.12 (s, 9H) ppm; $C_{23}H_{31}N_7O_3SSi$ (MW, 513.69), LCMS (EI) *m/e* 514 (M^+ + H) and 536 (M^+ + Na).



16
$C_{20}H_{27}N_7OSi$
Mol. Wt: 409.56

25
$C_{23}H_{31}N_7O_3SSi$
Mol. Wt: 513.69

26
$C_{18}H_{19}N_7O_3S$
Mol. Wt: 413.45

27
$C_{17}H_{17}N_7O_2S$
Mol. Wt: 383.43

phosphate
$C_{17}H_{20}N_7O_6PS$
Mol. Wt: 481.42

Example 80. 2-(3-(4-(7*H*-Pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(cyclopropylsulfonyl)azetidin-3-yl)acetonitrile (27).

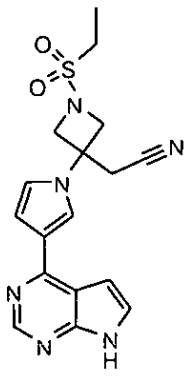
To a 500 mL round bottom flask equipped with a stir bar, a condenser, a thermocouple and a nitrogen inlet was charged {1-(cyclopropylsulfonyl)-3-[4-(7-{[2-(trimethylsilyl)ethoxy]methyl}-7*H*-pyrrolo[2,3-d]pyrimidin-4-yl)-1*H*-pyrazol-1-yl]azetidin-3-yl}acetonitrile (**25**, 17.5 g, 34.1 mmol), acetonitrile (254 mL) and water (23.9 mL) at room temperature. The resulting reaction mixture was charged with solid lithium tetrfluoroborate ($LiBF_4$, 32.6 g, 341 mmol, 10.0 equiv) in one portion at room temperature. The resulting reaction mixture was warmed to reflux and stirred at reflux for 21 h. When HPLC showed that the first stage of deprotection reaction was complete, which produced the corresponding

hydroxymethyl intermediate **26**, the reaction mixture was allowed to gradually cool to room temperature before the solution pH was adjusted to 9 - 10 with a 20% aqueous NH_4OH solution (45 mL) at room temperature. The resulting reaction mixture was then stirred at room temperature for overnight. When HPLC showed that the second stage of deprotection reaction was complete, the reaction mixture was filtered through a Celite pad and the Celite pad was washed with ethyl acetate (EtOAc, 50 mL). The filtrates were then diluted with a 20% aqueous sodium chloride solution (NaCl, 200 mL) and ethyl acetate (EtOAc, 200 mL). The two layers were separated, and the aqueous layer was extracted with ethyl acetate (EtOAc, 200 mL). The combined organic fractions were washed with 1 M aqueous sodium bicarbonate solution ($NaHCO_3$, 200 mL) and water (200 mL). The combined aqueous solution was back extracted with ethyl acetate (EtOAc, 100 mL). The combined organic fractions were then dried over magnesium sulfate ($MgSO_4$) and concentrated under reduced pressure to give the crude product (**27**) as light yellow solids. The crude solids were then treated with acetonitrile (200 mL) and the resulting suspension was warmed to 60 °C for 15 minutes before being cooled down to room temperature and stirred at room temperature for 60 minutes. The solids were collected by filtration and washed with a small volume of acetonitrile to give the first crop of the desired product (**27**, 6.9 g). The combined filtrates were then concentrated to afford yellow solids, which was treated with acetonitrile (100 mL) and warmed to 60 °C for 30 minutes. The suspension was cooled down to room temperature and stirred at room temperature for 60 minutes. The solids were collected by filtration and washed with a small volume of acetonitrile to give the second crop of the desired product (**27**, 3.0 g). The filtrate was then concentrated and the residue was purified by flash column chromatography (SiO_2, 50% ethyl acetate/acetonitrile elution) to give the third crop of the desired product (**27**, 1.4 g). This reaction afforded 2-(3-(4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(cyclopropylsulfonyl)azetidin-3-yl)acetonitrile (**27**, 11.3 g, 13.07 g theoretical, 86.5% overall yield) as off-white solids. For **27**: ^{1}H NMR (DMSO-d_6, 400 MHz) δ 12.16 (br. s, 1H), 8.95 (s, 1H), 8.70 (s, 1H), 8.48 (s, 1H), 7.62 (dd, 1H, J = 3.6, 2.3 Hz), 7.08 (dd, 1H, J = 3.5, 1.4 Hz), 4.66 (d, 2H, J = 9.4 Hz), 4.28 (d, 2H, J = 9.4 Hz), 3.69 (s, 2H), 2.84 (m, 1H), 1.01 (m, 4H) ppm; $C_{17}H_{17}N_7O_2S$ (MW, 383.43), LCMS (EI) *m/e* 384 (M^+ + H).

Example 81. 2-(3-(4-(7*H*-Pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(cyclopropylsulfonyl)azetidin-3-yl)acetonitrile phosphoric acid salt.

To a 1 L round bottom flask equipped with a stir bar, an addition funnel, a nitrogen inlet and a condenser was charged 2-(3-(4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(cyclopropylsulfonyl)azetidin-3-yl)acetonitrile (27, 11.3 g, 29.5 mmol) and acetonitrile (275 mL) at room temperature. The resulting mixture was warmed to 70 °C before being charged with ethanol (EtOH, 150 mL) in three portions at 70 °C. The resulting homogeneous solution was filtered into a clean 1 L round bottom flask equipped with the overhead stirring, an addition funnel, a nitrogen inlet and a condenser. The mixture was then warmed to 67 °C producing a homogeneous solution again. A solution of phosphoric acid (H_3PO_4, 3.03 g, 30.9 mmol, 1.05 equiv) in ethanol (EtOH, 30 mL) was then charged drop wise to the solution over ten minutes at 67 °C. The solution was still homogeneous after the end of the addition of phosphoric acid ethanol solution. The resulting reaction mixture was stirred at 67 °C for 10 minutes before being gradually cooled down to room temperature and stirred at room temperature for 19 h. The solids were collected by filtration and washed with acetonitrile (2 x 40 mL). The wet cake was partially dried under high vacuum and then transferred to a 75 °C vacuum oven and dried to constant weight to afford 2-(3-(4-(7*H*-pyrrolo[2,3-*d*]pyrimidin-4-yl)-1*H*-pyrazol-1-yl)-1-(cyclopropylsulfonyl)azetidin-3-yl)acetonitrile phosphate (12.0 g, 14.2 g theoretical, 84.5% yield) as white solids. For **Phosphate**: ^{1}H NMR (DMSO-d_6, 500 MHz) δ 12.13 (br. s, 1H), 9.20 (br. s, 3H), 8.94 (s, 1H), 8.70 (s, 1H), 8.47 (s, 1H), 7.61 (dd, 1H, J = 3.4, 2.3 Hz), 7.07 (dd, 1H, J = 3.6, 1.6 Hz), 4.65 (d, 2H, J = 9.1 Hz), 4.28 (d, 2H, J = 9.7 Hz), 3.68 (s, 2H), 2.82 (m, 1H), 1.01 (m, 4H) ppm; ^{13}C NMR (DMSO-d_6, 125 MHz) δ 152.9, 151.6, 150.0, 140.6, 130.3, 127.7, 122.9, 117.3, 113.8, 100.7, 59.7, 57.1, 27.6, 25.4, 4.9 ppm; $C_{17}H_{20}N_7O_6PS$ (MW, 481.42; $C_{17}H_{17}N_7O_2S$ for free base, MW, 383.43), LCMS (EI) *m/e* 384 (M^+ + H).

Example 82: {1-(Ethylsulfonyl)-3-[3-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrrol-1-yl]azetidin-3-yl}acetonitrile



Step 1. 4-(1H-pyrrol-3-yl)-7-{[2-(trimethylsilyl)ethoxy]methyl}-7H-pyrrolo[2,3-d]pyrimidine

A mixture of 4-chloro-7-{[2-(trimethylsilyl)ethoxy]methyl}-7H-pyrrolo[2,3-d]pyrimidine (12.9 g, 45.4 mmol) (prepared as in WO 2007/070514, Ex.65) and [1-(triisopropylsilyl)-1H-pyrrol-3-yl]boronic acid (Frontier Scientific) (10.4 g, 38.9 mmol) and sodium carbonate (4.36 g, 41.2 mmol) in 1,2-dimethoxyethane (100 mL) and water (35 mL) was degassed by purging with a stream of nitrogen for 20 minutes. Tetrakis(triphenylphosphine)palladium(0) (2.25 g, 1.94 mmol) was then added and the reaction was heated to reflux for 9 hours. As the coupling reaction proceeded, the TIPS protecting group was also slowly removed. The solvent was removed by rotary evaporation and the product was purified by flash column chromatography, eluting with a gradient from 10-50% ethyl acetate in hexanes to afford the desired product (7 g, 57%).

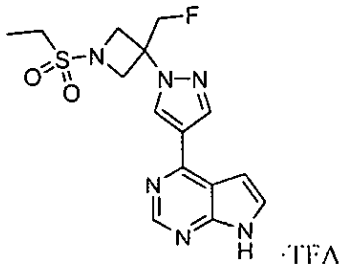
^{1}H NMR (300 MHz, $CDCl_3$): δ 8.93 (br s, 1H), 8.84 (s, 1H), 7.73-7.69 (m, 1H), 7.33 (d, 1H), 7.04-7.00 (m, 1H), 6.94 (dd, 1H), 6.85 (d, 1H), 5.66 (s, 2H), 3.55 (m, 2H), 0.92 (m, 2H), -0.06 (s, 9H). LCMS (M+H)+: 315.2.

Step 2.

A solution of 4-(1H-pyrrol-3-yl)-7-{[2-(trimethylsilyl)ethoxy]methyl}-7H-pyrrolo[2,3-d]pyrimidine (0.100 g, 0.318 mmol) and [1-(ethylsulfonyl)azetidin-3-ylidene]acetonitrile (0.118 g, 0.636 mmol, prepared as in Example 68) in acetonitrile (1 mL) was treated with 1,8-diazabicyclo[5.4.0]undec-7-ene (24 µL, 0.16 mmol). The mixture was stirred for 4 hours. The solvent was evaporated. The residue was partitioned between ethyl acetate and saturated sodium bicarbonate solution, then extracted with two further portions of ethyl acetate. The combined extracts were dried over sodium sulfate, decanted and concentrated. The crude product was stirred with 25% TFA / DCM (8 mL) overnight. The solvents were evaporated. The product was then stirred with ethylenediamine (0.3 mL) in methanol (5 mL). Preparative HPLC-MS (eluting with a gradient of methanol and water containing 0.15% NH_4OH) was used to purify the product.

^{1}H NMR (300 MHz, $CDCl_3$): δ 8.59 (s, 1H), 7.54 (dd, 1H), 7.27 (d, 1H), 6.95 (dd, 1H), 6.82 (dd, 1H), 6.74 (d, 1H), 4.49 (d, 2H), 4.15 (d, 2H), 3.24 (s, 2H), 3.02 (q, 2H), 1.33 (t, 3H); LCMS (M+H)+: 371.1.

Example 83: 4-{1-[1-(Ethylsulfonyl)-3-(fluoromethyl)azetidin-3-yl]-1H-pyrazol-4-yl}-7H-pyrrolo[2,3-d]pyrimidine trifluoroacetic acid salt



·TFA

Step 1. tert-butyl 3-[fluoro(phenylsulfonyl)methylene]azetidine-1-carboxylate

To a mixture of fluoromethyl phenyl sulfone (0.50 g, 2.9 mmol) and phosphorochloridic acid, diethyl ester (0.415 mL, 2.87 mmol) in tetrahydrofuran (6 mL, 70 mmol) was added 1.000 M of lithium hexamethyldisilazide in tetrahydrofuran (6.2 mL, 6.2 mmol) dropwise at -78 °C. After the mixture was stirred at -78 °C for 1 h, a solution of tert-butyl 3-oxoazetidine-1-carboxylate (0.378 g, 2.21 mmol) in tetrahydrofuran (1.3 mL, 16 mmol) was added. The reaction was allowed to warm to ambient temperature and stirred for 2 h at rt. The reaction was poured into an ice-cold mixture of EtOAc and sat. ammonium chloride. The organic layer was separated and the aq. layer was extracted with EtOAc. The combined organic layers were washed with brine, and dried over sodium sulfate. The solvent was removed under reduced pressure and the resulting residue was purified on silica gel, eluting with 0 to 50% EtOAc in hexane, to give the desired product (560 mg, 77.5%). LCMS calculated for $C_{15}H_{18}FNO_4SNa(M+Na)^+$: m/z = 350.1; Found (M+Na) 350.3.

Step 2. tert-butyl 3-[fluoro(phenylsulfonyl)methyl]-3-[4-(7-{[2-(trimethylsilyl)ethoxy]methyl}-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidine-1-carboxylate

A mixture of 4-(1H-pyrazol-4-yl)-7-{[2-(trimethylsilyl)ethoxy]methyl}-7H-pyrrolo[2,3-d]pyrimidine (0.40 g, 1.3 mmol), tert-butyl 3-[fluoro(phenylsulfonyl)methylene]azetidine-1-carboxylate (0.56 g, 1.7 mmol), and 1,8-diazabicyclo[5.4.0]undec-7-ene (0.182 mL, 1.22 mmol) in acetonitrile (6 mL, 100 mmol) was stirred at rt for 3 h. After evaporation to dryness, the residue was purified on silica gel, eluting with 0 to 100% EtOAc in hexane, to give the desired product (820 mg, 100%). LCMS calculated for $C_{30}H_{40}FN_6O_5SSi(M+H)^+$: m/z = 643.3; Found: 643.4. ^1H NMR ($CDCl_3$, 300 MHz) δ 8.92 (1H, s), 8.55 (1H, s), 8.32 (1H, s), 7.87 (2H, m), 7.68 (1H, m), 7.55 (2H, m), 7.47 (1H, d, J = 3.6 Hz), 6.84 (1H, d, J = 3.6 Hz), 5.77 (1H, d, J = 45.6 Hz), 5.74 (2H, s), 4.93

(1H, d, J = 10.2 Hz), 4.73~4.58 (3H, m), 3.60 (2H, t, J = 8.1 Hz), 1.51 (9H, s), 0.98 (3H, t, J = 8.1 Hz), 0.07 (9H, s) ppm. ^{19}F NMR ($CDCl_3$, 300 MHz) δ -181.84 (1F, d, J = 48.6 Hz) ppm.

Step 3. tert-butyl 3-(fluoromethyl)-3-[4-(7-{[2-(trimethylsilyl)ethoxy]methyl}-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidine-1-carboxylate

To a mixture of tert-butyl 3-[fluoro(phenylsulfonyl)methyl]-3-[4-(7-{[2-(trimethylsilyl)ethoxy]methyl}-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidine-1-carboxylate (0.312 g, 0.485 mmol) and disodium hydrogen phosphate (1.38 g, 9.71 mmol) in methanol (7.5 mL, 180 mmol) was added sodium mercury amalgam (2.17 g, 9.71 mmol), under nigtrogen, at -20 °C. The reaction was stirred at -20 to 0 °C for 1 h, diluted with EtOAc, then quenched with sat. ammonium chloride. The mixture was filtered through Celite and the solid collected was treated with elemental sulfur powder to destroy the mercury residue. The filtrate layers were separated and the organic layers were washed with brine, dried over sodium sulfate and evaporated. The residue was purified on silica gel, eluting with 0 to 80% EtOAc in hexane, to give the desired product (120 mg, 49.2%). LCMS calculated for $C_{24}H_{36}FN_6O_3Si(M+H)^+$: m/z = 503.3; Found: 503.2.

Step 4. 4-{1-[1-(ethylsulfonyl)-3-(fluoromethyl)azetidin-3-yl]-1H-pyrazol-4-yl}-7-{[2-(trimethylsilyl)ethoxy]methyl}-7H-pyrrolo[2,3-d]pyrimidine

tert-Butyl 3-(fluoromethyl)-3-[4-(7-{[2-(trimethylsilyl)ethoxy]methyl}-7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidine-1-carboxylate (0.120 g, 0.239 mmol) was treated with 4.00 M of hydrogen chloride in 1,4-dioxane (1.0 mL, 4.0 mmol) at rt for 1h, then evaporated to dryness under reduced pressured. LCMS (M+H) 403.4. To the resultant crude HCl salt in acetonitrile (4 mL, 80 mmol) was added triethylamine (0.0998 mL, 0.716 mmol) followed by ethanesulfonyl chloride (0.0317 mL, 0.334 mmol). The mixture was stirred at rt for 30 min. After quenching with aq. sodium bicarbonate, the mixture was extracted with dichloromethane. The combined organic layers were washed with water, brine and dried over sodium sulfate, evaporated to dry. The residue was used directly in next step. LCMS calculated for $C_{21}H_{32}FN_6O_3SSi(M+H)^+$: m/z = 495.2; Found: 495.4.

Step 5. 4-{1-[1-(ethylsulfonyl)-3-(fluoromethyl)azetidin-3-yl]-1H-pyrazol-4-yl}-7H-pyrrolo[2,3-d]pyrimidine

4-{1-[1-(Ethylsulfonyl)-3-(fluoromethyl)azetidin-3-yl]-1H-pyrazol-4-yl}-7-{[2-(trimethylsilyl)ethoxy]methyl}-7H-pyrrolo[2,3-d]pyrimidine (0.060 g, 0.12 mmol) was treated with 2 mL of TFA at rt for 30 min. The reaction mixture was evaporated to dryness. LCMS (M+H) 395.3. The resulting residue was dissolved in 3 mL of methanol and treated with ethylenediamine (0.0811 mL, 1.21 mmol) at rt for 30 min. The mixture was purified on RP-HPLC (XBridge C18 column, eluting with a gradient of acetone/water containing 0.2% TFA) to give the desired product as TFA salt. LCMS calculated for $C_{15}H_{18}FN_6O_2S(M+H)^+$ (free base): m/z = 365.1; Found: 365.3. ^1H NMR (DMSO-d_6, 300 MHz) δ 12.57 (1H, br s), 8.94 (1H, s), 8.81 (1H, s), 8.53 (1H, s), 7.75 (1H, br s), 7.21 (1H, br s), 5.03 (2H, d, J = 46.8 Hz), 4.53 (1H, dd, J = 9.0 and 2.7 Hz), 4.24 (1H, d, J = 9.0 Hz), 3.25 (2H, q, J = 7.2 Hz), 1.23 (3H, t, J = 7.2 Hz) ppm. ^{19}F NMR (DMSO-d_6, 300 MHz) δ -74.98 (3F, s), -225.56 (1F, t, J = 48.3 Hz) ppm.

Example A: *In vitro* JAK Kinase Assay

Compounds herein were tested for inhibitory activity of JAK targets according to the following *in vitro* assay described in Park *et al.*, *Analytical Biochemistry* 1999, *269*, 94-104. The catalytic domains of human JAK1 (a.a. 837-1142), JAK2 (a.a. 828-1132) and JAK3 (a.a. 781-1124) with an N-terminal His tag were expressed using baculovirus in insect cells and purified. The catalytic activity of JAK1, JAK2 or JAK3 was assayed by measuring the phosphorylation of a biotinylated peptide. The phosphorylated peptide was detected by homogenous time resolved fluorescence (HTRF). IC_{50}s of compounds were measured for each kinase in the reactions that contain the enzyme, ATP and 500 nM peptide in 50 mM Tris (pH 7.8) buffer with 100 mM NaCl, 5 mM DTT, and 0.1 mg/mL (0.01%) BSA. The ATP concentration in the reactions was 90 μM for Jak1, 30 μM for Jak2 and 3 μM for Jak3. Reactions were carried out at room temperature for 1 hr and then stopped with 20 μL 45 mM EDTA, 300 nM SA-APC, 6 nM Eu-Py20 in assay buffer (Perkin Elmer, Boston, MA). Binding to the Europium labeled antibody took place for 40 minutes and HTRF signal was measured on a Fusion plate reader (Perkin Elmer, Boston, MA). The compounds of Examples 1-60, 82, and 83 were found to have IC_{50} values less than 60 nM for at least one of JAK1, JAK2, and JAK3.

Example B: Cellular Assays

One or more compounds herein were tested for inhibitory activity of JAK targets according to at least one of the following cellular assays.

Cancer cell lines dependent on cytokines and hence JAK/STAT signal transduction, for growth, were plated at 6000 cells per well (96 well plate format) in RPMI 1640, 10% FBS, and 1 nG/mL of appropriate cytokine. Compounds were added to the cells in DMSO/media (final concentration 0.2% DMSO) and incubated for 72 hours at 37 °C, 5% CO_2. The effect of compound on cell viability was assessed using the CellTiter-Glo Luminescent Cell Viability Assay (Promega) followed by TopCount (Perkin Elmer, Boston, MA) quantitation. Potential off-target effects of compounds were measured in parallel using a non-JAK driven cell line with the same assay readout. All experiments were performed in duplicate.

The above cell lines can also be used to examine the effects of compounds on phosphorylation of JAK kinases or potential downstream substrates such as STAT proteins, Akt, Shp2, or Erk. These experiments can be performed following an overnight cytokine starvation, followed by a brief preincubation with compound (2 hours or less) and cytokine stimulation of approximately 1 hour or less. Proteins are then extracted from cells and analyzed by techniques familiar to those schooled in the art including Western blotting or ELISAs using antibodies that can differentiate between phosphorylated and total protein. These experiments can utilize normal or cancer cells to investigate the activity of compounds on tumor cell survival biology or on mediators of inflammatory disease. For example, with regards to the latter, cytokines such as IL-6, IL-12, IL-23, or IFN can be used to stimulate JAK activation resulting in phosphorylation of STAT protein(s) and potentially in transcriptional profiles (assessed by array or qPCR technology) or production and/or secretion of proteins, such as IL-17. The ability of compounds to inhibit these cytokine mediated effects can be measured using techniques common to those schooled in the art.

Compounds herein can also be tested in cellular models designed to evaluate their potency and activity against mutant JAKs, for example, the JAK2V617F mutation found in myeloid proliferative disorders. These experiments often utilize cytokine dependent cells of hematological lineage (*e.g.* BaF/3) into which the wild-type or mutant JAK kinases are ectopically expressed (James, C., *et al. Nature* 434:1144-1148; Staerk, J., *et al.* JBC 280:41893-41899). Endpoints include the effects of compounds on cell survival, proliferation, and phosphorylated JAK, STAT, Akt, or Erk proteins.

Certain compounds herein have been or can be evaluated for their activity inhibiting T-cell proliferation. Such as assay can be considered a second cytokine (*i.e.* JAK) driven

proliferation assay and also a simplistic assay of immune suppression or inhibition of immune activation. The following is a brief outline of how such experiments can be performed. Peripheral blood mononuclear cells (PBMCs) are prepared from human whole blood samples using Ficoll Hypaque separation method and T-cells (fraction 2000) can be obtained from PBMCs by elutriation. Freshly isolated human T-cells can be maintained in culture medium (RPMI 1640 supplemented with10% fetal bovine serum, 100 U/ml penicillin, 100 µg/ml streptomycin) at a density of 2 x 10^6 cells/ml at 37 °C for up to 2 days. For IL-2 stimulated cell proliferation analysis, T-cells are first treated with Phytohemagglutinin (PHA) at a final concentration of 10 µg/mL for 72h. After washing once with PBS, 6000 cells/well are plated in 96-well plates and treated with compounds at different concentrations in the culture medium in the presence of 100 U/mL human IL-2 (ProSpec-Tany TechnoGene; Rehovot, Israel). The plates are incubated at 37 °C for 72h and the proliferation index is assessed using CellTiter-Glo Luminescent reagents following the manufactory suggested protocol (Promega; Madison, WI).

Example C: *In vivo* anti-tumor efficacy

Compounds herein can be evaluated in human tumor xenograft models in immune compromised mice. For example, a tumorigenic variant of the INA-6 plasmacytoma cell line can be used to inoculate SCID mice subcutaneously (Burger, R., *et al. Hematol* J. 2:42-53, 2001). Tumor bearing animals can then be randomized into drug or vehicle treatment groups and different doses of compounds can be administered by any number of the usual routes including oral, i.p., or continuous infusion using implantable pumps. Tumor growth is followed over time using calipers. Further, tumor samples can be harvested at any time after the initiation of treatment for analysis as described above (Example B) to evaluate compound effects on JAK activity and downstream signaling pathways. In addition, selectivity of the compound(s) can be assessed using xenograft tumor models that are driven by other know kinases (*e.g.* Ber-Abl) such as the K562 tumor model.

Example D: Murine Skin Contact Delayed Hypersensitivity Response Test

Compounds herein can also be tested for their efficacies (of inhibiting JAK targets) in the T-cell driven murine delayed hypersensitivity test model. The murine skin contact delayed-type hypersensitivity (DTH) response is considered to be a valid model of clinical contact dermatitis, and other T-lymphocyte mediated immune disorders of the skin, such as psoriasis (*Immunol Today*. 1998 Jan;19(1):37-44). Murine DTH shares multiple

characteristics with psoriasis, including the immune infiltrate, the accompanying increase in inflammatory cytokines, and keratinocyte hyperproliferation. Furthermore, many classes of agents that are efficacious in treating psoriasis in the clinic are also effective inhibitors of the DTH response in mice (Agents Actions. 1993 Jan;38(1-2):116-21).

On Day 0 and 1, Balb/c mice are sensitized with a topical application, to their shaved abdomen with the antigen 2,4,dinitro-fluorobenzene (DNFB). On day 5, ears are measured for thickness using an engineer's micrometer. This measurement is recorded and used as a baseline. Both of the animals' ears are then challenged by a topical application of DNFB in a total of 20 μL (10 μL on the internal pinna and 10 μL on the external pinna) at a concentration of 0.2%. Twenty-four to seventy-two hours after the challenge, ears are measured again. Treatment with the test compounds was given throughout the sensitization and challenge phases (day -1 to day 7) or prior to and throughout the challenge phase (usually afternoon of day 4 to day 7). Treatment of the test compounds (in different concentration) was administered either systemically or topically (topical application of the treatment to the ears). Efficacies of the test compounds are indicated by a reduction in ear swelling comparing to the situation without the treatment. Compounds causing a reduction of 20% or more were considered efficacious. In some experiments, the mice are challenged but not sensitized (negative control).

The inhibitive effect (inhibiting activation of the JAK-STAT pathways) of the test compounds can be confirmed by immunohistochemical analysis. Activation of the JAK-STAT pathway(s) results in the formation and translocation of functional transcription factors. Further, the influx of immune cells and the increased proliferation of keratinocytes should also provide unique expression profile changes in the ear that can be investigated and quantified. Formalin fixed and paraffin embedded ear sections (harvested after the challenge phase in the DTH model) are subjected to immunohistochemical analysis using an antibody that specifically interacts with phosphorylated STAT3 (clone 58E12, Cell Signaling Technologies). The mouse ears are treated with test compounds, vehicle, or dexamethasone (a clinically efficacious treatment for psoriasis), or without any treatment, in the DTH model for comparisons. Test compounds and the dexamethasone can produce similar transcriptional changes both qualitatively and quantitatively, and both the test compounds and dexamethasone can reduce the number of infiltrating cells. Both systemically and topical administration of the test compounds can produce inhibitive effects, *i.e.*, reduction in the number of infiltrating cells and inhibition of the transcriptional changes.

Example E: *In vivo* anti-inflammatory activity

Compounds herein can be evaluated in rodent or non-rodent models designed to replicate a single or complex inflammation response. For instance, rodent models of arthritis can be used to evaluate the therapeutic potential of compounds dosed preventatively or therapeutically. These models include but are not limited to mouse or rat collagen-induced arthritis, rat adjuvant-induced arthritis, and collagen antibody-induced arthritis. Autoimmune diseases including, but not limited to, multiple sclerosis, type I-diabetes mellitus, uveoretinitis, thyroditis, myasthenia gravis, immunoglobulin nephropathies, myocarditis, airway sensitization (asthma), lupus, or colitis may also be used to evaluate the therapeutic potential of compounds herein. These models are well established in the research community and are familiar to those schooled in the art (Current Protocols in Immunology, Vol 3., Coligan, J.E. *et al*, Wiley Press.; *Methods in Molecular Biology*: Vol. 225, Inflammation Protocols., Winyard, P.G. and Willoughby, D.A., Humana Press, 2003.).

Example F: **Animal Models for the Treatment of Dry Eye, Uveitis, and Conjunctivitis**

Compounds may be evaluated in one or more preclinical models of dry eye known to those schooled in the art including, but not limited to, the rabbit concanavalin A (ConA) lacrimal gland model, the scopolamine mouse model (subcutaneous or transdermal), the Botulinumn mouse lacrimal gland model, or any of a number of spontaneous rodent auto-immune models that result in ocular gland dysfunction (e.g. NOD-SCID, MRL/lpr, or NZB/NZW) (Barabino et al., Experimental Eye Research 2004, 79, 613-621 and Schrader et al., Developmental Opthalmology, Karger 2008, 41, 298-312, each of which is incorporated herein by reference in its entirety). Endpoints in these models may include histopathology of the ocular glands and eye (cornea, etc.) and possibly the classic Schirmer test or modified versions thereof (Barabino et al.) which measure tear production. Activity may be assessed by dosing via multiple routes of administration (e.g. systemic or topical) which may begin prior to or after measurable disease exists.

Compounds may be evaluated in one or more preclinical models of uveitis known to those schooled in the art. These include, but are not limited to, models of experimental autoimmune uveitis (EAU) and endotoxin induced uveitis (EIU). EAU experiements may be performed in the rabbit, rat, or mouse and may involve passive or activate immunization. For instance, any of a number or retinal antigens may be used to sensitize animals to a relevant immunogen after which animals may be challenged ocularly with the same antigen. The EIU model is more acute and involves local or systemic administration of lipopolysaccaride at

sublethal doses. Endpoints for both the EIU and EAU models may include fundoscopic exam, histopathology amongst others. These models are reviewed by Smith et al. (Immunology and Cell Biology 1998, 76, 497-512, which is incorporated herein by reference in its entirety). Activity is assessed by dosing via multiple routes of administration (e.g. systemic or topical) which may begin prior to or after measurable disease exists. Some models listed above may also develop scleritis/episcleritis, chorioditis, cyclitis, or iritis and are therefore useful in investigating the potential activity of compounds for the therapeutic treatment of these diseases.

Compounds may also be evaluated in one or more preclinical models of conjunctivitis known those schooled in the art. These include, but are not limited to, rodent models utilizing guinea-pig, rat, or mouse. The guinea-pig models include those utilizing active or passive immunization and/or immune challenge protocols with antigens such as ovalbumin or ragweed (reviewed in Groneberg, D.A., et al., Allergy 2003, 58, 1101-1113, which is incorporated herein by reference in its entirety). Rat and mouse models are similar in general design to those in the guinea-pig (also reviewed by Groneberg). Activity may be assessed by dosing via multiple routes of administration (e.g. systemic or topical) which may begin prior to or after measurable disease exists. Endpoints for such studies may include, for example, histological, immunological, biochemical, or molecular analysis of ocular tissues such as the conjunctiva.

Example G: Comparative Data

Table 3 below provides potency data for the compound of Example 1 compared with other JAK inhibitors described in US Pat. App. Pub. No. 2007/0135461.

Table 3

Compound	JAK2 IC_{50} (nM)	JAK1 IC_{50} (nM)	INA-6 IC_{50} (nM)
Example 1	0.3	1.1	148
Example 82	0.3	1.3	NA
Example 83	1.5	5.5	NA
Comparative 1	1.4	7.6	1138
Comparative 2	1.2	2.2	505
Comparative 3	22	93	1900
Comparative 4	2.4	6.3	431
Comparative 5	3.7	1	2250

The JAK1 and JAK2 data in Table 3 was obtained using the *in vitro* assay procedures described in Example A above. The INA-6 data in Table 3 was obtained using the cellular assay procedure of Example B above, where the cancer cells used were INA-6 cells (Burger et al., *The Hematology Journal* (2001), 2, 42-53). Comparative 1 corresponds to the compound {1-[4-(1H-pyrrolo[2,3-b]pyridin-4-yl)-1H-pyrazol-1-yl]cyclopentyl}acetonitrile; Comparative 2 corresponds to the compound {1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclopentyl}acetonitrile; Comparative 3 corresponds to the compound 3-{1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclopentyl}propanenitrile; Comparative 4 corresponds to the compound {1-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]cyclohexyl}acetonitrile; and Comparative 5 corresponds to the compound N'-cyano-4-(cyanomethyl)-4-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]piperidine-1-carboximidamide.

Various modifications of the invention, in addition to those described herein, will be apparent to those skilled in the art from the above description. Each reference cited in the present application is incorporated herein by reference in its entirety.

Cc-91/2661/2013

We claim:

1. {1-(Ethylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile, or pharmaceutically acceptable salt thereof.
2. {1-(Ethylsulfonyl)-3-[4-(7H-pyrrolo[2,3-d]pyrimidin-4-yl)-1H-pyrazol-1-yl]azetidin-3-yl}acetonitrile, phosphoric acid salt.
3. A composition comprising a compound of claim 1 or a salt of claim 2, and at least one pharmaceutically acceptable carrier.
4. The composition of claim 3 which is suitable for topical administration.
5. The composition of claim 3 which is suitable for oral administration.

Dated this 1st day of September, 2010

AMRISH TIWARI
Of K & S Partners
Attorney for the Applicant

15 MAR 2013

ANNEXURE - 12 Colly

FORM 27
THE PATENT ACT, 1970
(39 OF 1970)
&
THE PATENTS RULES, 2006
STATEMENT REGARDING THE WORKING
OF THE PATENTED INVENTION ON A COMMERCIAL SCALE IN INDIA
(See Section 146(2) and rule 131(1)

In the matter of Patent No **270765 of 10/03/2009**

We, **ELI LILLY AND COMPANY, a corporation of the State of Indiana, United States of America, of Lilly Corporate Center, City of Indianapolis, State of Indiana 46285, United States of America**, the licensee under Patent No. 270765 hereby furnish the following statement regarding the working of the patented invention referred to above on a commercial scale in India for the year 2019:

The patented invention: ***"AZETIDINE AND CYCLOBUTANE DERIVATIVES AS JAK INHIBITORS"***

(i) **(√) Worked.** ( ) Not worked (tick mark the relevant box)

(ii) ~~If not worked reasons for not working and steps being taken for working of the invention:~~

(iii) If worked: quantum and value (in Rupees), of the patented product:

Product Description	**Rcvd Qty**	**Invoice Value**
OLUMIANT TAB 2 MG	263	849,569
OLUMIANT TAB 4 MG	7997	25,832,709
Olumiant physician samples	810	2,616,543

Manufactured in India: **NO**
Imported from other countries (Give country wise details): **Spain**

(iv) The licenses and sub-licenses granted during the year: We have already been granted exclusive license to develop and commercialize the patented technology.

(v) State whether public requirement has been met partly/adequately/to the fullest extent at reasonable price: **To the best of our knowledge, public requirement has been met adequately to the fullest extent at a reasonable price.**

The facts and matters stated above are true to the best of our knowledge, information and belief.

Dated this 1st day of January 2021

Digitally signed and filed through e-filing

ANUPAM TRIVEDI
OF K & S PARTNERS
ATTORNEY FOR EXCLUSSIVE LICENSEE
IN/PA-1003

TO
THE CONTROLLER OF PATENTS
THE PATENT OFFICE
MUMBAI

FORM 27
THE PATENT ACT, 1970 (39 OF 1970)
&
THE PATENTS RULES, 2006 STATEMENT REGARDING THE WORKING OF THE PATENTED INVENTION ON A COMMERCIAL SCALE IN INDIA
(See Section 146(2) and rule 131(1)

In the matter of Patent No **270765 of 10/03/2009**

We, **ELI LILLY AND COMPANY, a corporation of the State of Indiana, United States of America, of Lilly Corporate Center, City of Indianapolis, State of Indiana 46285, United States of America** the licensee under Patent No. 270765 hereby furnish the following statement regarding the working of the patented invention referred to above on a commercial scale in India for the year 2018:

The patented invention: **"AZETIDINE AND CYCLOBUTANE DERIVATIVES AS JAK INHIBITORS"**

(i) **(√) Worked.** ( ) Not worked (tick mark the relevant box)

(ii) ~~If not worked reasons for not working and steps being taken for working of the invention:~~

(iii) If worked: quantum and value (in Rupees), of the patented product: Our Indian affiliate, Eli Lilly & Company (India) Pvt. Limited received a Registration certificate and import license from the Drugs Controller General of India (DCGI) for Olumiant on September 5, 2018

Product Description	**Rcvd Qty**	**Invoice Value**
OLUMIANT TAB 2 MG	1,627	5,255,698
OLUMIANT TAB 4 MG	5,763	18,616,219
OLUMIANT TAB 4 MG samples	995	3,214,149

Manufactured in India: **NO**
Imported from other countries (Give country wise details): **Spain**

(iv) The licenses and sub-licenses granted during the year: We have already been granted an exclusive license to develop and commercialize the patented technology.

(v) State whether public requirement has been met partly/adequately/to the fullest extent at reasonable price: To the best of our knowledge, public requirement has been met adequately to the fullest extent at a reasonable price.

The facts and matters stated above are true to the best of our knowledge, information and belief.

Dated this 1st day of January 2021

Digitally signed and filed through e-filing



ANUPAM TRIVEDI
OF K & S PARTNERS
ATTORNEY FOR THE EXCLUSIVE LICENSEE
IN/PA-1003

TO
THE CONTROLLER OF PATENTS
THE PATENT OFFICE
AT MUMBAI

File No. SND/MA/20/000350
Government of India
Directorate General of Health Services
Central Drugs Standard Control Organization
(Subsequent New Drug Division)

FDA Bhawan, Kotla Road,
New Delhi-110002.
Dated: 01-May-2021

To,
M/s. Natco Pharma Limited,
Natco House, Road No 2, Banjara Hills,
Hyderabad, Telangana (India) - 500034.

Sub: Grant of Permission to manufacture and marketing of Baricitinib API- Regarding.

Ref: Your application no. SND/CT21/BD/2020/22860 dated 02-12-2020.

Sir,

Please find enclosed herewith permission no. **MF/API/SND/65/2021 dated 01-May-2021** in Form CT-22 under Drugs & Cosmetics Acts and Rules thereunder and New Drug and Clinical Trial Rules, 2019 there under granted based on evaluation in consultation with Subject Expert Committee (SEC) as part of accelerated approval process considering the emergency situation and unmet medical need in light of Covid 19 outbreak for restricted emergency use in the country.

Please acknowledge receipt of the same.

Yours faithfully

(Dr. V. G. Somani)
Central Licensing Authority

Copy to:

1. **The Director, Drugs Control Administration, Drugs Control Bhavan, Vengalrao Nagar, Hyderabad – 500038.**
2. **DDC(I), CDSCO, Zonal office, Hyderabad, Telangana.**

सत्यमेव जयते

File No. SND/MA/20/000350

GOVERNMENT OF INDIA
Central Drugs Standard Control Organisation
Ministry of Health & Family Welfare
FDA BHAWAN, NEW DELHI – 110002 (INDIA)

FORM CT-22

(See rules 81, 82, 83 and 84)

PERMISSION TO MANUFACTURE NEW ACTIVE PHARMACEUTICAL INGREDIENT FOR SALE OR FOR DISTRIBUTION

Permission Number: MF/API/SND/65/2021 dated 01-May-2021

The Central Licencing Authority hereby grant permission to **M/s Natco Pharma Limited., Natco House, Road No 2, Banjara Hills, Hyderabad - 500034** (Name and full address with contact details of the manufacturer) to manufacture for sale the new active pharmaceutical ingredient manufactured by manufacturer specified below.

2. Details of manufacturer and its manufacturing site under this permission.

Serial number	Name and address of manufacturer (full name and address with telephone and e-mail address of manufacturer).	Name and address of manufacturing site (full name and address with telephone and e-mail address of manufacturing site).
1.	M/s. Natco Pharma Limited, Natco House, Road No.2, Banjara Hills, Hyderabad – 500034, Telephone No.: 040-23547532, Fax: 040-23545298, E-Mail: clinical@natcopharma.co.in	M/s NATCO Pharma Limited (CHEMICAL DIVISION), MEKAGUDA(V), NANDIGAMA(M), RANGA REDDY(DIST.), Telangana (India) - 509 223 Telephone No.: 8548-249493 FAX: 8548-249496

3. This is subject to the conditions prescribed in Chapter X of the New Drugs and Clinical Trials Rules, 2019 under the Drugs and Cosmetics Act,1940.

4. Details of the new active pharmaceuticals ingredient to be manufactured –**Baricitinib.**

Place: New Delhi
Date: 01-May-2021

(Dr. V. G. Somani)
Central Licensing Authority
Stamp

Dr. V. G. SOMANI
Drugs Controller General (India)
Dte. General of Health Services
Ministry of Health and Family Welfare
FDA Bhawan, Kotla Road, I.T.O.
New Delhi-110002

CDSCO CDSCO

Condition of Permission

1. The raw material (new bulk drug substance) shall confirm to the specifications approved by the Licensing Authority.
2. The labeling of the drugs shall confirm to the requirements specified in the Drugs and Cosmetics Rules, 1945.
3. The raw material (new bulk drug substance) can be sold to only those manufacturers who have permission, in writing, from Licensing Authority, either to use the drug for development purpose/Clinical trial/Bio-equivalence study or to manufacture the formulation for sale and distribution.
4. For manufacture of the formulation in the country, separate approval under Rule 81of New Drugs and Clinical Trial Rules, 2019 shall be obtained from the Licensing Authority.
5. If long-term stability data submitted do not cover the proposed shelf-life of the product, the stability study shall continued to firmly establish the shelf-life and the complete stability data shall be submitted.
6. **The firm should submit IPC test report of Baricitinib API to CDSCO.**

CDSCO CDSCO
सत्यमेव जयते
MINISTRY OF HEALTH, GOVERNMENT OF INDIA
CENTRAL DRUGS STANDARD CONTROL ORGANISATION
CDSCO CDSCO
सत्यमेव जयते
MINISTRY OF HEALTH, GOVERNMENT OF INDIA

File No. SND/MA/20/000344
Government of India
Directorate General of Health Services
Central Drugs Standard Control Organization
(Subsequent New Drug Division)

FDA Bhawan, Kotla Road
New Delhi- 110002
Dated: 01-May-2021

To,

M/s. Natco Pharma Limited, Natco House,
Road No 2, Banjara Hills,
Hyderabad, Telangana (India) - 500034.

Sub: **Grant of Permission to manufacturing and marketing of Baricitinib Tablets 1mg, 2mg & 4mg - regarding.**

Ref: Your application no. SND/CT21/FF/2020/22814 dated 21.11.2020

Sir,

Please find enclosed herewith permission No. **MF/FF/SND/66/2021dated 01-May-2021** in Form CT-23 under Drugs & Cosmetics Acts and Rules thereunder and New Drug and Clinical Trial Rules, 2019 there under granted based on evaluation in consultation with Subject Expert Committee (SEC) as part of accelerated approval process considering the emergency situation and unmet medical need in light of Covid 19 outbreak for restricted emergency use in the country.

Please acknowledge receipt of the same.

Yours faithfully

(Dr. V. G. Somani)
Central Licensing Authority

Copy To:

1. **The Director, Drugs Control Administration, Drugs Control Bhavan, Vengalrao Nagar, Hyderabad - 500038**
2. **DDC(I), CDSCO, Zonal office, Hyderabad, Telangana.**

सत्यमेव जयते

File No. SND/MA/20/000344

GOVERNMENT OF INDIA
Central Drugs Standard Control Organization Ministry of Health & Family Welfare FDA BHAWAN, NEW DELHI – 110002 (INDIA)

FORM CT-23

(See rules 81, 82, 83 and 84)

PERMISSION TO MANUFACTURE PHARMACEUTICAL FORMULATION OF NEW DRUG FOR SALE OR FOR DISTRIBUTION

Permission Number: MF/FF/SND/66/2021dated 01-May-2021

The Central Licensing Authority hereby grant permission to **M/s Natco Pharma Limited., Natco House, Road No 2, Banjara Hills, Hyderabad - 500034** (Name and full address of authorised agent with contact details of the manufacturer) to manufacture for sale of pharmaceutical formulation manufactured by an manufacturer specified below.

2. Details of manufacturer and its manufacturing site under this licence.

Serial number	Name and address of manufacturer (full name and address with telephone and e-mail address of manufacturer).	Name and address of manufacturing site (full name and address with telephone and e-mail address of manufacturing site).
1.	M/s. Natco Pharma Limited, Natco House, Road No.2, Banjara Hills, Hyderabad – 500034, Telephone No.: 040-23547532, Fax: 040-23545298	M/s Natco Pharma limited, Pharma Division, Kothur, Telangana (India) – 509228. Telephone No.: 8548257289 FAX: 8548257290

3. Details of pharmaceutical formulation:

Name of the new drug to be manufactured:	Baricitinib Tablets 1mg, 2mg, & 4 mg
Dosage form:	Tablet
Composition:	Each Film Coated Tablet Contains: Baricitinib.....1mg/2mg/4 mg
Indication:	Baricitinib, in combination with Remdesivir, for treatment of suspected or laboratory confirmed coronavirus disease 2019 (COVID-19) in hospitalized adults requiring supplemental oxygen, invasive mechanical ventilation, or extracorporeal membrane oxygenation (ECMO).
Shelf life with storage condition:	24 month, Store below 30° C, Keep out of reach of children.

4. This is subject to the conditions prescribed in Chapter X of the New Drugs and ClinicalTrials Rules, 2019 under the Drugs and CosmeticsAct,1940.

Place: New Delhi
Date: 01-May-2021

(Dr. V. G. Somani)
Central Licensing Authority
Stamp

Dr. V. G. SOMANI
Drugs Controller General (India)
Dte. General of Health Services
Ministry of Health and Family Welfare
FDA Bhawan, Kotla Road, I.T.O.
New Delhi-110002

Condition for Grant of Approval/Permission

(i) The new drugs shall conform to the specifications approved by the Central Licencing Authority;

(ii) The labeling of the drugs shall conform to the requirements specified in the Drugs and Cosmetics Rules, 1945;

(iii) The label on the immediate container of the drug as well as the packing in which the container is enclosed should contain the following warning:

"WARNING: To be sold by retail on the prescription of specialist for use in Hospital/ Institutional set up only" and the warning shall be in box with red back ground

(iv) As post marketing surveillance, the applicant shall submit Periodic Safety Update Reports as specified in the Fifth Schedule;

(v) All reported serious unexpected adverse reactions related to the drug shall be intimated to the Central Licencing Authority and regulatory action resulting from their review shall be complied with;

(vi) No claims except those mentioned above shall be made for the drug without prior approval of the Central Licencing Authority;

(vii) Specimen of the carton, labels, package insert that will be adopted for marketing the drug in the country shall be got approved from the Central Licencing Authority before the drugs is marketed;

(viii) If long-term stability data submitted do not cover the proposed shelf-life of the product, the stability study shall be continued to firmly establish the shelf-life and the complete stability data shall be submitted.

(ix) **Specimen of the carton, labels, package insert that will be adopted for marketing the drug in the county shall be got approved from the Central Licensing Authority before the drugs is marketed.**

(x) **Updated stability study data shall be submitted at periodic interval. If long-term stability data submitted do not cover the proposed shelf-life of the product, the stability study shall be continued to firmly establish the shelf-life and the complete stability data shall be submitted.**

(xi) **Written informed consent from each patient/or his representative prior to administration of the drug shall be obtained. Informed consent form to be used should contain in a language understandable to the patient/ or his representative the factual detail about the drug, its restricted emergency use approval, alternative therapy available etc. The copy of the informed consent form should be submitted to CDSCO before launching the drug product for marketing.**

(xii) **The Label of the product should mention "For use in hospital/ institutional set up only".**

(xiii) **The Package Insert containing all details including the information as above and Informed Consent Form should be provided along with the drug product for use in hospital/ institutional.**

(xiv) **Active surveillance data of all treated patients should be submitted to CDSCO on monthly basis.**

(xv) **The Risk Management Plan including active Post Marketing Surveillance (PMS) and reporting of Serious Adverse Events (SAEs) etc. should be submitted to CDSCO within one month of approval of the drug product.**

(xvi) **Firm should conduct Phase IV Clinical Trial study and accordingly, the firm should submit Phase IV CT protocol to CDSCO within 15 days of approval.**

Re: Indian Patent 270765 - Request for Voluntary License

4 messages

Guruswamy Nataraj <guru@gnataraj.com> Fri, Dec 11, 2020 at 6:47 PM
To: ipo@knspartners.com, gurgaon@knspartners.com
Cc: caltrider@lilly.com, b-roll@lilly.com, Inbound Mail <mail@gnataraj.com>
Bcc: litigation team <litigation@gnataraj.com>

WITHOUT PREJUDICE

Dear Sirs,

Re: Voluntary License on Indian Patent 270765 - Baricitinib

We write on behalf of our clients, Natco Pharma Limited and state as under:

1. Natco Pharma Limited, a Company incorporated under the Indian Companies Act, 1956 has its registered office at Natco House, Road No.2, Banjara Hills, Hyderabad-500 034.
2. Natco Pharma is in the business of manufacturing and marketing many pharmaceutical products dedicated to the interest of the middle and low income groups of patients in India. Natco Pharma has a stellar portfolio of products including lifesaving drugs and is manufacturing and marketing all such products. Natco Pharma is equipped with the state of the art manufacturing facilities and has won several awards for its capabilities and achievements.
3. Natco Pharma has a team of scientists and production personnel of suitable calibre who deliver high quality products. Natco Pharma has a market force that penetrates every part of India to ensure access to affordable quality medicines to patients in need thereof.
4. Natco Pharma has learnt that you are registered as the assignees on Indian Patent 270765 for a product Baricitinib.
5. Natco Pharma has also recently learnt that Baricitinib has been approved for emergency protocol treatment by the USFDA to be used along with Remdesivir particularly for Covid -19 patients who are in critical care observation.
6. he Indian Government and our patent law focuses on protection of public health as a matter of utmost priority. The Patents Act, 1970 has special provisions with respect to pharmaceutical inventions. The regime for protection of inventions in respect of pharmaceutical products is more stringent compared to non-pharmaceutical products. The Patents Act, 1970 was enacted keeping in mind the protection of inter alia public health as well as socio-economic and technological development of India.
7. One of the key features is patents are to be granted to make the benefit of the patented invention available at reasonable affordable prices to the public amongst others. Included in such provisions are mandates such as compulsory licensing provisions both outside of, and in pandemic situations.
8. These exist to ensure that much needed life-saving drugs are made available to the public at reasonable prices and in sufficient quantities across India. Natco Pharma intends pricing its product at a cost of INR 29.00 (Indian Rupees Twenty Nine only) per day for the patient which would make this product available for vast sections of the population in India.
9. On instructions of our clients Natco Pharma Limited, we are writing to you to seek a voluntary license in favour of our clients in respect of IN 270765, on which you have declared Baricitinib. Natco Pharma is willing to offer the legally recognized standard of 7% net sales as royalty payment. Production of API, formulation and packaging will be done entirely by Natco Pharma. This offer includes and is in relation to IN 270765 and any other patents/applications that you may have in India for Baricitinib – and you are requested to make us aware of such patents/applications and their status.
10. We also note from the records of the Indian Patent Office M/s Eli Lilly & Company is identified as a licensee on IN 270765. Therefore, as a measure of professional courtesy, a copy of this letter is also being marked to Eli Lilly & Company.
11. In view of the aforesaid and on instructions of Natco Pharma Limited, we request you to grant a voluntary license to them to manufacture and market the product on such reasonable terms and conditions which would not prevent Natco Pharma from making the drug available to the public at an affordable price at this time of global pandemic.
12. Please also note that this request for a voluntary license does not in any manner imply, and is not to be construed as an admission that your patent IN 270765 is valid.

We would appreciate your positive early response to this request. A formal letter which is also being sent by courier is attached to this email.

Yours sincerely

Guru Nataraj
Advocate for Natco Pharma Limited

CC: (by email and courier)
Mr. Steven P. Caltrider
Vice President and General Patent Counsel
Eli Lilly & Company
Lilly Corporate Center
Indianapolis, Indiana 46285, USA
Email: caltrider@lilly.com and b-roll@lilly.com
(disclaimer: Mr. Caltrider's *email id was obtained from public sources on the world wide web. The "b-roll" id is obtained from www.lilly.com.*)

LAW CHAMBERS OF G.NATARAJ
914 Mahagun Maestro
Plot F 21/A, Sector 50
NOIDA 201307
Phone: 9811808373

BARICITINIB - REQUEST FOR VOLUNTARY LICENSE - INCYTE.pdf

LAW CHAMBERS OF
G. NATARAJ
INTELLECTUAL PROPERTY ATTORNEYS

914 Siena, Mahagun Maestro
Plot F-21/A, Sector 50
NOIDA – 201307, NCR
TEL: +91 9811808373
E-MAIL: mail@gnataraj.com

INCYTE HOLDINGS CORPORATION
1801 Augustine Cut Off
Wilmington, Delaware 19803
USA

December 11, 2020

WITHOUT PREJUDICE

BY EMAIL AND COURIER

Through:
K&S Partners
IP Attorneys
B1-601, 6th Floor, Marathon Nextgen Innova
Opposite Peninsula Corporate Park
Off GK Marg, Lower Parel
Mumbai 400 013
Email: ipo@knspartners.com & gurgaon@knspartners.com

Dear Sirs,

Re: Voluntary License on Indian Patent 270765 - Baricitinib

We write on behalf of our clients, Natco Pharma Limited and state as under:

1. Natco Pharma Limited, a Company incorporated under the Indian Companies Act, 1956 has its registered office at Natco House, Road No.2, Banjara Hills, Hyderabad-500 034.
2. Natco Pharma is in the business of manufacturing and marketing many pharmaceutical products dedicated to the interest of the middle and low income groups of patients in India. Natco Pharma has a stellar portfolio of products including lifesaving drugs and is manufacturing and marketing all such products. Natco Pharma is equipped with the state of the art manufacturing facilities and has won several awards for its capabilities and achievements.
3. Natco Pharma has a team of scientists and production personnel of suitable calibre who deliver high quality products. Natco Pharma has a market force that penetrates every part of India to ensure access to affordable quality medicines to patients in need thereof.
4. Natco Pharma has learnt that you are registered as the assignees on Indian Patent 270765 for a product Baricitinib.
5. Natco Pharma has also recently learnt that Baricitinib has been approved for emergency protocol treatment by the USFDA to be used along with Remdesivir particularly for Covid -19 patients who are in critical care observation.
6. The Indian Government and our patent law focuses on protection of public health as a matter of utmost priority. The Patents Act, 1970 has special provisions with respect to pharmaceutical inventions. The regime for protection of inventions in respect of pharmaceutical products is more stringent compared to non-pharmaceutical products. The Patents Act, 1970 was enacted keeping in mind the protection of inter alia public health as well as socio-economic and technological development of India.

7. One of the key features is patents are to be granted to make the benefit of the patented invention available at reasonable affordable prices to the public amongst others. Included in such provisions are mandates such as compulsory licensing provisions both outside of, and in pandemic situations.
8. These exist to ensure that much needed life-saving drugs are made available to the public at reasonable prices and in sufficient quantities across India. Natco Pharma intends pricing its product at a cost of INR 29.00 (Indian Rupees Twenty Nine only) per day for the patient which would make this product available for vast sections of the population in India.
9. On instructions of our clients Natco Pharma Limited, we are writing to you to seek a voluntary license in favour of our clients in respect of IN 270765, on which you have declared Baricitinib. Natco Pharma is willing to offer the legally recognized standard of 7% net sales as royalty payment. Production of API, formulation and packaging will be done entirely by Natco Pharma. This offer includes and is in relation to IN 270765 and any other patents/applications that you may have in India for Baricitinib – and you are requested to make us aware of such patents/applications and their status.
10. We also note from the records of the Indian Patent Office M/s Eli Lilly & Company is identified as a licensee on IN 270765. Therefore, as a measure of professional courtesy, a copy of this letter is also being marked to Eli Lilly & Company.
11. In view of the aforesaid and on instructions of Natco Pharma Limited, we request you to grant a voluntary license to them to manufacture and market the product on such reasonable terms and conditions which would not prevent Natco Pharma from making the drug available to the public at an affordable price at this time of global pandemic.
12. Please also note that this request for a voluntary license does not in any manner imply, and is not to be construed as an admission that your patent IN 270765 is valid.

We would appreciate your positive early response to this request.

Yours sincerely



Guru Nataraj
Advocate for Natco Pharma Limited

CC: (by email and courier)
Mr. Steven P. Caltrider
Vice President and General Patent Counsel
Eli Lilly & Company
Lilly Corporate Center
Indianapolis, Indiana 46285, USA
Email: caltrider@lilly.com and b-roll@lilly.com
(disclaimer: Mr. Caltrider's *email id was obtained from public sources on the world wide web. The "b-roll" id is obtained from www.lilly.com.*)

2.0 SYNOPSIS

Name of Sponsor/ Company: Natco Pharma Limited, India	**Individual Study Table Referring to Part of the Dossier Volume:** **Page:**	***(For National Authority use only)***
Name of Finished Product: Baricitinib Tablets 4 mg		
Name of the Active Ingredient: Baricitinib		

Title of Study:

An open label, balanced, randomized, two-treatment, two-period, two-sequence, single-dose, crossover bioequivalence study of Baricitinib Tablets 4 mg of Natco Pharma Limited, India comparing with Olumiant™ (baricitinib) 4 mg film-coated tablets of Lilly, S.A., Alcobendas, Madrid, Spain in normal, healthy, adult, human subjects under fasting conditions.

Investigators:

Principal Investigator: Dr. K. Krishna Moorthy, MBBS,

Bioanalytical Investigator: Mr. V. Srikanth Reddy, M. Sc.,

Pharmacokinetic and statistical Investigator: Mr. BVVSN Prasad, M. Pharm.,

STUDY CENTRE(S)

Clinical, Bioanalytical Facility and Final Report

ZenRise Clinical Research Private Limited,
Plot No.: 201, Mythrinagar, Madinaguda,
Miyapur, Hyderabad. India. 500049.
Phone No.: +91 40 48507772
Fax No.: +91 40 23041234

Pharmacokinetic and Statistical Services

GK Analytics,
Flat No.: 401, Rishitha Enclave,
Road No.: 5, Boduppal, Hyderabad, India- 500039
Phone No.: +91 8019189999

Diagnostic services (for Screening and Post study clinical assessment)

Likhitha's Diagnostics & Speciality Lab,

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Name of Sponsor/ Company: Natco Pharma Limited, India	**Individual Study Table Referring to Part of the Dossier Volume:** **Page:**	***(For National Authority use only)***
Name of Finished Product: Baricitinib Tablets 4 mg		
Name of the Active Ingredient: Baricitinib		

MIG 252, Rd Number 4, opposite J.K. Hospital,

K P H B Phase 1, Kukatpally, Hyderabad, Telangana- 500072

Phone No.: 040-23057701, 23053591

X-RAY

ZenRise Clinical Research Private Limited,

Plot No.: 201, Mythrinagar,

Madinaguda, Miyapur, Hyderabad. India. 500049

Phone No.: +91 40 48507772

Fax No.: +91 40 23041234

Ethics Committee

Vasavi Institutional Ethics Committee,

Vasavi Medical & Research Centre,

Vasavi hospital, opp. to Sensation theatre,

Lakdikapool, Khairatabad, Hyderabad, Telangana–500004

Publication (Reference): None

Date of study activities:

S. No.	Study Events	Period-I	Period-II
Clinical Phase			
01	Date of Check-in	07 Dec 2020	14 Dec 2020
02	Date of Dosing	08 Dec 2020	15 Dec 2020
03	Date of Check out (24.00 hours post dose)	09 Dec 2020	16 Dec 2020
04	Ambulatory blood sample (at 48.00 hours)	10 Dec 2020	17 Dec 2020
05	Date of post study sample collection	17 Dec 2020	

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Name of Finished Product: Baricitinib Tablets 4 mg		
Name of the Active Ingredient: Baricitinib		

Bio-analytical Phase		
01	Analysis Start date	04 Jan 2021
02	Analysis End date	10 Jan 2021

Phase of development: Bioequivalence study

Objectives:

Primary Objective:

To evaluate the oral bioequivalence of Baricitinib Tablets 4 mg of Natco Pharma Limited, India comparing with Olumiant™ (baricitinib) 4 mg film-coated tablets of Lilly, S.A., Alcobendas, Madrid, Spain in normal, healthy, adult, human subjects under fasting conditions.

Secondary Objective:

To monitor the safety and tolerability of a single oral dose of Baricitinib Tablets 4 mg in normal, healthy, adult, human subjects under fasting condition.

Methodology:

The Study Protocol No.: 100-20, Version No.: 01, Dated: 14 Oct 2020 and Informed Consent Form, Version No.: 01, Dated: 14 Oct 2021 was reviewed and approved by Institutional Ethics Committee (Vasavi Institutional Ethics Committee) on 25 Nov 2020.

A total of 28 +02 standby subjects were enrolled into the study to ensure the dosing of 28 subjects as per ethics committee approved protocol and standby subjects were checked out from the clinical facility after completion of dosing activity for all 28 subjects in period-I.

Subjects were housed in the clinical facility from at least 11.00 hours prior to dosing to 24.00 hours post-dose in each study period.

The study personnel tried to enroll the female volunteers in the study, but due to unavailability of the female volunteers, only male volunteers have been included in the study. This will not have any impact on the study.

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Name of the Active Ingredient: Baricitinib		

In each study period, all the subjects fasted for at least 10.00 hours before dosing and till 04.00 hours post dose.

In each study period after 10 hours overnight fasting, a single oral dose of either the Test product (T) or the Reference product (R) was administered (according to the randomization schedule) with 240 ± 2 mL of drinking water, to the subjects, in sitting posture at ambient temperature.

All Subjects had swallowed the whole tablet with 240 ± 2 mL of drinking water. This activity was followed by mouth check with the help of tongue depressor and torch light to assess compliance to dosing.

A washout of 07 days between the dosing days of both periods was maintained in the study.

In each study period, study subjects were served dinner on check-in day (Day-01) and subsequent standard meals on day 02 (lunch, snacks and dinner) at around 4.00, 8.00 and 12.00 hours post dose and all the served meals were identical in both periods of the study.

Drinking water was restricted from at least 1.00 hour prior to dosing until 1.00 hours post-dose, except for 240 ± 2 mL of drinking water provided for dosing. However, at all other times drinking water was provided *ad libitum*. Posture restriction of seated position was maintained for first 2.00 hours post-dose by all the subjects in all periods of the study. Thereafter, subjects were allowed to move freely during the remaining duration of the in-house stay, in each study period. Even after the restriction period was completed, they were not allowed to participate in any kind of strenuous exercise/activity. Subjects were continuously monitored for their well-being and safety throughout the duration of clinical phase of the study.

For all the necessary study activities required to be performed by subjects, they were accompanied by delegated custodian/ study personnel.

In each study period, 24 blood samples per subject were collected at scheduled sampling points which included one pre-dose (0.00 hour) sample and 23 post dose samples.

The pre-dose blood sample at 0.00 hour (05 mL) was collected within 120 minutes prior to dosing

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Name of the Active Ingredient: Baricitinib		

for all the subjects.

The post-dose blood samples (05 mL each) were collected at 0.17, 0.33, 0.50, 0.66, 0.83, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.50, 2.75, 3.00, 3.50, 4.00, 5.00, 6.00, 10.00, 12.00, 16.00, 24.00 and 48.00 hours post-dose in each period.

All the samples were collected in pre-labeled K_2EDTA – vacutainers via an indwelling cannula placed in one of the forearm veins of the subjects. Intravenous indwelling cannula was kept *in situ* as long as possible by injecting about 0.5 mL of 5 IU / mL of heparin in normal saline solution to maintain the cannula potency for collection of the post-dose samples. In such cases blood samples were collected after discarding the first 0.5 mL of heparinized saline containing blood. Cannula was removed after 24.00 hours post dose sample was drawn. Vacutainers were placed upright in a rack kept in wet ice bath until start of centrifugation.

Note: For all subjects the pre-dose sample (0.00 hour) and the post dose blood samples till 24.00 hours were collected via intravenous indwelling cannula. The 48.00 hours post dose blood sample was collected by direct vein puncture.

A volume of 07 mL of blood was collected for post study safety assessment for all study subjects at the end of the study i.e. 48.00 hours post dose of Period II on 17 Dec 2020.

Post-study laboratory assessment included hematology and biochemistry parameters.

Total blood loss did not exceed 294.0 mL for each subject for the entire study. The scheduled and actual time of blood collection at each time point for each subject is provided in the individual CRFs.

The blood samples were kept in a wet ice bath after collection until start of centrifugation and after centrifugation until plasma aliquot storage in the deep freezer. The blood sample vacutainers were centrifuged at 4000 RPM for 10 minutes at 4°C to separate the plasma.

After centrifugation, the plasma samples were split into two aliquots (approx. 1.0 mL in aliquot-1 and rest of the plasma in aliquot-2) and transferred to pre-labeled polypropylene tubes (1 analytical and 1 replicate) and were stored in the deep freezer at -70ºC ± 15ºC.

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Name of Sponsor/ Company: Natco Pharma Limited, India	**Individual Study Table Referring to Part of the Dossier Volume:** **Page:**	***(For National Authority use only)***
Name of Finished Product: Baricitinib Tablets 4 mg		
Name of the Active Ingredient: Baricitinib		

Quality Assurance audits were conducted at different phases of study to ensure that the study was performed in compliance with GCP, IEC approved protocol and applicable regulatory requirements and SOPs which were laid down at ZenRise.

No. of subjects (planned and completed):

No. of subjects planned	:	28 +02 Standby subjects (S1 & S2)
No. of subjects enrolled	:	28 +02 Standby subject (S1 & S2)
No of subjects dosed in Period I	:	28
No of subjects dosed in Period II	:	28
No. of subjects completed the study	:	28
No. of subjects withdrawn/dropout in particular period	:	Nil

Main Criteria for Inclusion:

- Healthy, adult, human subjects aged between 18 to 45 years (inclusive of both).
- Body mass index of ≥ 18.50 kg/m^2 and ≤ 30.0 kg/m^2 (inclusive of both) and weight ≥ 45 kgs.
- Healthy according to the laboratory results and physical examination, performed within 28 days prior to the commencement of the check-in in Period-I.
- Subjects having normal 12-lead electrocardiogram (ECG).
- Subjects having normal chest X- Ray (P/A view).
- Subjects able to communicate effectively.
- Subjects willing to give written informed consent and adhere to all the requirements of this protocol.

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Name of Sponsor/ Company: Natco Pharma Limited, India	**Individual Study Table Referring to Part of the Dossier Volume:** **Page:**	***(For National Authority use only)***
Name of Finished Product: Baricitinib Tablets 4 mg		
Name of the Active Ingredient: Baricitinib		

- Subjects willing to adhere to protocol requirements as evidenced by written informed consent approved by an Ethics Committee (EC).

Investigational Products Dose and Mode of Administration:

Test Product (T): Baricitinib Tablets 4 mg

Manufactured by: Natco Pharma Limited, Kothur-509228, India.

Batch No.: RD/D/066

Manufactured date: Sep 2020

Expiry date: Aug 2021

Dose and Mode of Administration: A single oral dose of test product (T) was administered with 240 ± 2 mL of drinking water at ambient temperature, to the subjects, in sitting posture under fasting condition as per randomization schedule.

Reference Product(R): ^{Rx} Baricitinib Olumiant^{TM} 4 mg Tablets

Manufactured by: Lilly, S.A., Alcobendas, Madrid, Spain.

Lot No.: D263686

Manufactured date: Dec 2019

Expiry date: Nov 2022

Dose and Mode of Administration: A single oral dose of reference product (R) was administered with 240 ± 2 mL of drinking water at ambient temperature, to the subjects, in sitting posture under fasting condition as per randomization schedule.

Duration of Treatment:

Subjects were administered with a single oral dose of either test product (T) or reference product (R) on 08 Dec 2020 in period-I and on 15 Dec 2020 in period-II as per randomization schedule. Clinical study was conducted over a duration of 11 days with washout period of 07 days between the dosing days of two periods of the study.

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Name of Sponsor/ Company: Natco Pharma Limited, India	**Individual Study Table Referring to Part of the Dossier Volume:** **Page:**	***(For National Authority use only)***
Name of Finished Product: Baricitinib Tablets 4 mg		
Name of the Active Ingredient: Baricitinib		

Safety Evaluation:

Particulars	Check-in	Pre-Dose (hours)	In-house (hours)	Check-out (hours)	Ambulatory (hours)
Scheduled hours	--	0.00	(2.00, 6.00 & 10.00)	24.00	48.00
Seated blood pressure	✓	✓	✓	✓	✓
Radial pulse rate	✓	✓	✓	✓	✓
Body Temperature	✓	✓	---	✓	✓
Well being	✓	✓	✓	✓	✓

✓: Activity performed.

All subjects had their vitals within the normal range in both periods of the study. Adverse events monitoring was done throughout the entire duration of the clinical phase of the study. The same has been documented in the individual subject case report forms.

As per protocol, to ensure the safety of the subjects, Post-study laboratory assessment was performed for all study subjects at the end of the study i.e. 48.00 hours post dose of Period II on 17 Dec 2020. Post-study laboratory assessment included hematology and biochemistry parameters.

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Name of Sponsor/ Company: Natco Pharma Limited, India	**Individual Study Table Referring to Part of the Dossier Volume:** **Page:**	***(For National Authority use only)***
Name of Finished Product: Baricitinib Tablets 4 mg		
Name of the Active Ingredient: Baricitinib		

Pharmacokinetic Results:

The following pharmacokinetic parameters C_{max}, AUC_{0-t}, $AUC_{0-\infty}$, T_{max}, $t_{½}$, K_{el}, AUC_% Extrapolation were calculated on data obtained from 28 subjects for test and reference products of Baricitinib using SAS® for windows (SAS Institute Inc., USA) version 9.4. These results were further subjected to statistical analysis.

The statistical analysis was performed using 28 (T Vs R) subjects to prove the bioequivalence. These results are appended in appendix 16.1.9.

Table 1: Summary of Pharmacokinetic Profile of Test product (T), Baricitinib

Pharmacokinetic Parameter	N	Arithmetic Mean	Standard Deviation	Coefficient of Variation	Minimum	Median	Maximum	Geometric Mean
Cmax (ng/mL)	28	52.28	11.841	22.65	25.63	54.16	66.84	50.80
AUC $_{0-t}$ (hr.ng /mL)	28	308.86	55.402	17.94	232.12	301.73	473.27	304.39
AUC $_{0-\infty}$ (hr.ng /mL)	28	329.69	58.780	17.83	237.44	320.76	479.91	324.76
T1/2(hr)	28	6.28	1.246	19.83	4.14	6.12	9.76	6.17
Tmax (hr)	28	0.98	0.640	65.35	0.50	0.83	3.00	0.86
Kel (1/hr)	28	0.11	0.021	18.67	0.07	0.11	0.17	0.11
AUC_% Extrapolation	28	6.24	2.592	41.55	1.38	6.36	10.72	5.61

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Name of Sponsor/ Company: Natco Pharma Limited, India	**Individual Study Table Referring to Part of the Dossier Volume:** **Page:**	***(For National Authority use only)***
Name of Finished Product: Baricitinib Tablets 4 mg		
Name of the Active Ingredient: Baricitinib		

Table 2: Summary of Pharmacokinetic Profile of Reference product (R), Baricitinib

Pharmacokinetic Parameter	N	Arithmetic Mean	Standard Deviation	Coefficient of Variation	Minimum	Median	Maximum	Geometric Mean
Cmax (ng/mL)	28	54.52	11.149	20.45	37.16	55.62	75.75	53.40
AUC $_{0-t}$ (hr.ng /mL)	28	310.76	51.013	16.42	208.94	306.22	427.36	306.84
AUC $_{0-\infty}$ (hr.ng /mL)	28	331.75	55.966	16.87	216.82	328.48	441.15	327.16
T1/2(hr)	28	6.43	1.505	23.41	4.20	6.12	10.46	6.27
Tmax (hr)	28	0.90	0.447	49.52	0.50	0.75	2.00	0.81
Kel (1/hr)	28	0.11	0.024	21.16	0.07	0.11	0.16	0.11
AUC_% Extrapolation	28	6.18	2.649	42.89	2.06	5.95	12.38	5.60

Table 3: Statistical Results of Test product (T) versus Reference product (R) for Baricitinib

Pharmacokinetic Parameter	N	Geometric Least Square Mean		ISCV (%)	T/R Ratio (%)	Power (%)	90% Confidence Interval	Outcome
		Test Product (T)	Reference Product (R)					
C_{max} (ng/mL)	28	50.80	53.40	20.09	95.13	99.03	86.88 - 104.15	Bioequivalent
AUC $_{0-t}$ (hr.ng /mL)	28	304.39	306.84	6.40	99.20	>99.99	96.35 - 102.14	Bioequivalent
AUC $_{0-\infty}$ (hr.ng /mL)	28	324.76	327.16	6.26	99.27	>99.99	96.48 - 102.14	Bioequivalent

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Name of Sponsor/ Company: Natco Pharma Limited, India	**Individual Study Table Referring to Part of the Dossier Volume:** **Page:**	***(For National Authority use only)***
Name of Finished Product: Baricitinib Tablets 4 mg		
Name of the Active Ingredient: Baricitinib		

Figure 1: Linear plot of mean plasma concentration vs. time for Baricitinib (N=28)

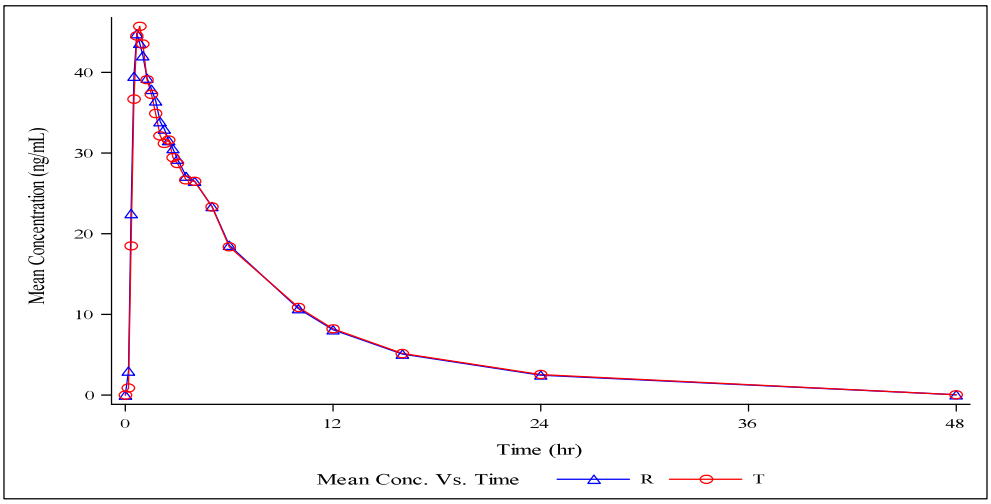
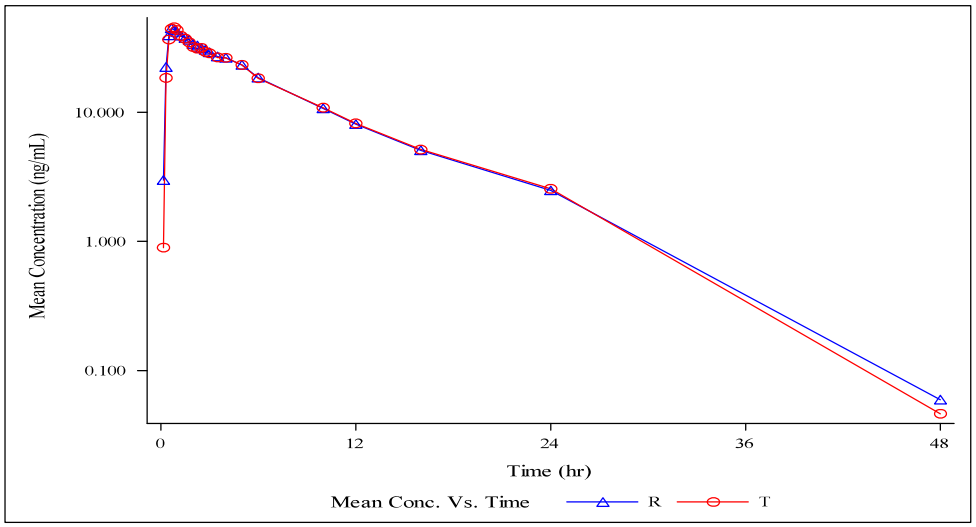


Figure 2: Semi-log plot of mean plasma concentration vs. time for Baricitinib (N=28)



Note: Results for summary of statistics were appended in appendix 16.1.9

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Name of the Active Ingredient: Baricitinib		

Safety Results:

A total of 28 + 02 (standby subject) healthy, adult, human subjects in the age ranged between 20-43 years were enrolled in the study. Of these 28 subjects, all 28 subjects had completed both periods of the study. The clinical study was conducted over a duration of 11 days with a washout of 07 days between the dosing days of two periods of the study.

Details of adverse events:

Only one adverse event (AE) was reported for subject number 01 during washout period and no post study safety assessment AEs were reported.

AE reported for subject number 01 during washout period was resolved without sequelae.

No SAEs (serious adverse events) were reported during the course of the study.

For complete details on adverse events refer section 14.3.1

Summary Conclusion:

Upon completion of the clinical phase of the study, assessment of the vital sign measurements, post-study laboratory test results and the overall state of health of all the participated subjects were concluded to be clinically fit. Test and reference products were found to be safe and well tolerated in participated subjects.

Based on the statistical results obtained, the test product (T); Baricitinib Tablets 4 mg of Natco Pharma Limited, India is bioequivalent to reference product (R); ℞ Baricitinib Olumiant™ 4 mg Tablets of Lilly, S.A., Alcobendas, Madrid, Spain in normal, healthy, adult, human subjects under fasting conditions.

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