

OCTOBER 2020



**R&D EFFORTS OF DSIR  
APPROVED INDUSTRIES  
ON COVID-19**

**A REPORT**



**FISCAL INCENTIVES (FI) DIVISION**

**Department of Scientific &  
Industrial Research (DSIR)**

**Ministry of Science & Technology**

**New Delhi; Website: [www.dsir.gov.in](http://www.dsir.gov.in)**

# PREFACE



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Government of India

Ministry of Science and Technology

**Council of Scientific & Industrial Research**

Department of Scientific & Industrial Research




## Foreword

DSIR has been in the forefront in supporting industrial R&D by granting recognition and approval to in-house R&D units established by private industries. This opens gateway for industries to avail various fiscal incentives and exemptions. One such provision for private industries has been the weighted tax deduction on the expenditure incurred on scientific research, as specified under Section 35(2AB) of Income Tax Act, 1961. This sub-section provided for weighted tax deduction of a sum equal to two times (200%) of any expenditure incurred on scientific research. It may be noted that the weighted tax deduction has been modified to 150% from 200%, w.e.f. 01.04.2017 to 31.03.2020. This has further modified to one-time (100%) w.e.f. 01.04.2020. Over the years, this scheme has enabled industries to increase their R&D investment and played a key role in building a strong R&D infrastructure across the country.

The present study report is an attempt to share the research efforts of DSIR approved industries in combating Covid-19 such as drug development, early diagnosis, development of indigenous vaccines against Covid-19, etc. I hope, this document would provide useful information and facilitate exploring new opportunities for these industries.

DSIR welcomes feedback/suggestions for the improvements and requests the industries to keep sharing their research contributions with DSIR.

  
[ Shekhar C. Mande ]

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DSIR welcomes Feedback/suggestions for improvements and further research contributions. Companies interested in sharing their research activities and achievements may submit the same to the Department it may be compiled for the next volume of report.

For any specific information on Fiscal incentives for scientific research, write to:

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**ACKNOWLEDGEMENTS:**

DSIR acknowledges all the industries for providing the data as per the questionnaire for this report.

**DISCLAIMER:**

The contents of the report are collated based on the information submitted by the industries in the online questionnaire format. Due efforts have been made to provide information as accurate as possible and any mistake is inadvertent. The presentation of the data, facts in this publication and the opinion expressed therein are based on the data submitted by the industries and not necessarily those of DSIR and cannot be held accountable for above.

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# 1 INTRODUCTION

- The ongoing COVID-19 pandemic has presented daunting challenges particularly to research community since neither standard treatment nor vaccine is presently available. As a result, every country is adopting its own approach to tackle the situation.
- DSIR has been forefront in supporting industrial R&D and has been thriving industry to bring in more and more innovative products through various fiscal incentives and exemptions. DSIR is the nodal department for granting recognition and approval to in-house R&D units established by private industries. DSIR recognition and approval opens the gateway for industries to avail various fiscal incentives announced by Government of India to promote industrial R&D. One such scheme which makes R&D an attractive proposition is the introduction of a sub-section (2AB) in Section 35 of the IT Act 1961 in Finance Bill of 1997. This sub-section provided for weighted tax deduction of a sum equal to two times (200%) of any expenditure incurred on scientific research (not being expenditure in the nature of cost of any land or building) in certain areas specified by section 35(2AB) of IT Act, by companies on in-house R&D centres, approved by the 'Prescribed Authority'. The eligible sectors are drugs, pharmaceuticals, electronic equipment, computers, telecommunication equipment, chemicals, design & development of aircraft or any other article notified by the CBDT. It may be noted that the weighted tax deduction has been reduced to one-and-a half times (150%) w.e.f. 01.04.2017 to 31.03.2020. This has further reduced to one-time (100%) w.e.f. 01.04.2020.
- Secretary, DSIR has been designated as the 'Prescribed Authority' for purposes of Section 35(2AB) of I.T. Act will report the R&D expenditure incurred by the company under this sub-section to CC-IT, giving the break-up of land & building, machinery & revenue expenditure during each assessment year in Form 3CL. As per the provisions, any industrial undertaking approved under the section will have to enter into agreement of cooperation in R&D with Secretary, DSIR in Form 3CM. The section 35(2AB) also has a provision that Secretary, DSIR will report the R&D expenditure incurred by the company under this sub-section to CC-IT, giving the break-up of land & building, machinery & revenue expenditure during each assessment year in Form 3CL. It may be noted that DSIR has given approval to more than 1500 companies in form 3CM under Section 35(2AB) of Income Tax Act and certifies their R&D expenditure for each assessment year in Form 3CL.
- Our industry stakeholders are putting tremendous effort for not only developing cutting-edge technologies in research & manufacturing, but also in utilization of CSR funds for combating COVID-19. These companies have been recognized by DSIR and have been availing weighted tax deductions under Section 35(2AB) of Income Tax Act, 1961, which are certified by DSIR.
- Recognizing their efforts of Indian pharmaceutical industry, DSIR has initiated to bring out this report highlighting the research efforts towards Covid-19 of industries approved u/s 35(2AB) through the in-house efforts of FI division. A questionnaire was designed and circulated by email to the industries. In the first phase, questionnaire was circulated primarily to pharmaceutical companies and positive response was received. On the basis of received responses, following report has been compiled. However, many companies have also submitted nil information.
- The research report presents the various research areas, details of research projects, R&D achievements & stages of regulatory approvals. The collaborating partners in the projects are also presented. The report also points out the challenges being faced by industries to continue their operation during the pandemic & lockdown. The companies have done tremendous societal contributions through Corporate Social responsibility (CSR) and a section has been also dedicated to it.

- The Indian pharmaceutical industry is the world's third largest drug producer by volume. Indian pharmaceutical industry supplies more than 50% of vaccines such as Tetanus and Pertussis (DPT) and Bacillus Calmette Guerin (BCG) vaccines, measles vaccine, globally. India supplies affordable and low-cost generic drugs to millions of people around the globe.

Covid-19 Pandemic made several challenges particularly to the pharmaceutical sector due to the lockdowns in the country for about 3 – 4 months. It is a challenging time for the operations of these pharmaceutical industries to keep supply chain of medicines to the masses. The major issue for these pharma sectors is availability of Active pharmaceutical ingredient (API). Indian manufacturers rely heavily on APIs from China for the production of their medicine formulation. Due to the border issues with China, Government has imposed several restrictions on imports from China. This has affected the pharma sector the worst. Being all these constraints, the pharma sector supplied the medicines uninterruptedly to the entire nation as well as exported the medicines to more than 180 countries. One such efforts of Indian Pharma industry is supply of Hydroxychloroquine (HCQ) medicine to over 180 countries. It may also be noted that the Indian pharma sector is tirelessly working on development of vaccine against Covid-19. As mentioned above, Indian pharmaceutical sector has vast experience of developing vaccines for various diseases and entire world is dependent on India for vaccines. Keeping in view of the expertise available with the Indian pharmaceutical industry, we have taken lead for development of vaccine in collaboration with various partners across the globe. These efforts can be seen from the following vaccine development:

- In collaboration with the Indian Council of Medical Research and the National Institute of Virology, the Indian company Bharat Biotech International Ltd, designed a vaccine called Covaxin based on an inactivated form of the coronavirus.
- Serum Institute of India has already begun manufacturing the Oxford vaccine (ChAdOx1 nCoV-19) for novel coronavirus.
- Indian vaccine-maker Zydus Cadila has created a DNA-based vaccine.

The Covid-19 pandemic has also opened opportunity to Indian industry to make indigenously Personal Protection Kits (PPEs), Hand Sanitizers, Masks, etc. which is essential to the frontline healthcare workers.

The various research areas in which companies are doing R&D efforts long with the details of research projects & achievements is tabulated below:

#### (i) Vaccine Research

The vaccine development is a herculean task, risky and time consuming. The development life cycle of vaccine has the following stages:

**Pre-Clinical Trials:** In vaccine development, the first step is to identify a vaccine candidate.

**Phase I Vaccine Studies:** This first attempt to assess the candidate vaccine in humans involves a small group, usually between 20-80 subjects.

**Phase II Vaccine Trials:** The goals of Phase II are to study the candidate vaccine's safety, immunogenicity, proposed doses, schedule of immunizations, and method of delivery.

**Phase III Vaccine Trials:** Based on the success of Phase II, the candidate vaccines move on to further research and studies, enrolling from three to tens of thousands of people.

**Approval and Licensure:** After a successful Phase III trial, the vaccine researcher will submit a dossier to the national competent authority which will undergo review and approval.

**Phase IV or Pharmacovigilance:** Once on the market, the vaccine manufacturer will perform pharmacovigilance activities in order to continuously assess the vaccine's safety and detect any risk of adverse event following the use of the vaccine.

The vaccine has to pass through these phases in order to release the vaccine in the market. Indian industry is ready to take the risk and investing heavily on the development & commercialization of vaccine and release the vaccine in the market at an early date, which is the only source to control the Covid-19. Entire world is waiting for the success of the vaccine and get as early as possible to come out of the distress.

The following companies have been engaged in development of vaccines against Covid-19.

1	<b>Name of company : M/s Hester Biosciences Ltd.,</b> <b>Location of R&amp;D :</b> Village: Merda-Adraj, Taluka:Kadi, District: Mehsana, Mehsana, Gujarat	
	Research projects	Achievement/ Stage of development & approvals
	To develop a vaccine for Covid 19 virus, which would be a recombinant paramyxovirus with expression of immunogenic protein of SARS-CoV-2.	Under development
2	<b>Name of company : M/s Serum Institute of India Pvt. Limited</b> <b>Location of R&amp;D :</b> 212/2, Off Soli Poonawala Road, Hadapsar, Pune	
	Research projects	Achievement/ Stage of development & approvals
	COVID19 vaccine (Live, Measles-based): This vaccine is based on expression of the spike protein of SARS-CoV-2 in the live attenuated vaccine strain of measles virus  Live attenuated de-optimized vaccine: This vaccine is developed based on the concept of viral de-optimization to synthesize "rationally designed," live-attenuated vaccines.	All vaccines are under various stages of development.  <b>Collaborator :</b> Codagenix Inc, USA
3	<b>Name of company : M/s Cadila Healthcare Limited</b> <b>Location of R&amp;D :</b> (i) PTC, Plot No.106-107, Road No.21, Opp. Central Excise Office, Wagle Estate, Thane, Maharashtra; (ii) Zydus Research Centre, S.No. 396P & 403P, Sarkhej, Bavla Road, Vill. Moraiya, Tal. Sanand, Ahmedabad; (iii) PTC, Sarkhej, Bavla N.H. No.8A, Vill. Moraiya, Tal. Sanand, Dist. Ahmedabad; (iv) API Unit, Plot No.26,29 to 31, Dabhasa, Dabhasa-Umraya Road, Post: Dabhasa, Tal:Padra, Dist. Vadodara; (v)PTC, Block No.2,3,4,5, Sigma House, Ambli-Bhopal Road, Nr.Iskcon Cross Roads, Ahmedabad, Gujarat and (vi) VTC, Plot Survey No.No.40/P, 23, 25/P, 37, 42 Changodar Road, Opp. Ramdev Masala, Sarkhej-Bavla N.H. No.8A, Ta:Sanand, Distt. Ahmedabad	
	Research projects	Achievement/ Stage of development & approvals
	Developing a novel vaccine and making it accessible to the Indian population.	Animal POC testing done; Pre-clinical safety studies ongoing.
4	<b>Name of company : M/s Gennova Biopharmaceuticals Limited</b> <b>Location of R&amp;D :</b> Gennova Vaccine Formulation Centre and Research Laboratory, BTS 2, Building Chrysalis Enclave, Block 2,Plot No 2,International Biotech Park, Phase-II, MIDC, Hinjewadi, Pune	
	Research projects	Achievement/ Stage of development & approvals
	To Develop a next generation mRNA based vaccine for mass vaccination against COVID-19 infection and neutralizing antibody with therapeutic potential for COVID-19. Further, the platform and technology developed here can be used for other disease model in future.	Both the projects are approved by IBSC for the submission to RCGM. The company is hoping to have the clinical trial for vaccine by Jan 2021 and for therapeutic antibody by end of 2021.  <b>Collaborator:</b> mRNA vaccine – HDT, BioCorp, USA Therapeutic antibody – Delhi University, South Campus, India

## (ii) New Drug Discovery

The Indian industry is engaged in development of drugs / medicines for treatment of Covid-19. The Indian industry has been engaged in development of novel molecules for treating critically-ill patients from Covid-19. The following company has been engaged in discovering drug against Covid-19.

1	<p><b>Name of company : M/s Cadila Healthcare Limited</b>  <b>Location of R&amp;D :</b> (i) PTC, Plot No.106-107, Road No.21, Opp. Central Excise Office, Wagle Estate, Thane, Maharashtra; (ii) Zydus Research Centre, S.No. 396P &amp; 403P, Sarkhej, Bavla Road, Vill. Moraiya, Tal. Sanand, Ahmedabad; (iii) PTC, Sarkhej, Bavla N.H. No.8A, Vill. Moraiya, Tal. Sanand, Dist. Ahmedabad; (iv) API Unit, Plot No.26,29 to 31, Dabhasa, Dabhasa-Umraya Road, Post: Dabhasa, Tal:Padra, Dist. Vadodara; (v)PTC, Block No.2,3,4,5, Sigma House, Ambli-Bhopal Road, Nr.Iskcon Cross Roads, Ahmedabad, Gujarat and (vi) VTC, Plot Survey No.No.40/P, 23, 25/P, 37, 42 Changodar Road, Opp. Ramdev Masala, Sarkhej-Bavla N.H. No.8A, Ta:Sanand, Distt. Ahmedabad</p>				
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## (iii) Biologics

The biologic medicines hold promising avenues for the treatment of severe diseases, offering new hope for patients. The real challenge is about access this class of drugs. The Indian industry is engaged in development of monoclonal antibodies, bio-similar products at an affordable price for treatment and prevention of Covid-19. The following companies have been engaged in development of monoclonal antibodies, biosimilar against Covid-19.

1	<p><b>Name of company: M/s Cadila Healthcare Limited</b>  <b>Location of R&amp;D :</b> (i) PTC, Plot No.106-107, Road No.21, Opp. Central Excise Office, Wagle Estate, Thane, Maharashtra; (ii) Zydus Research Centre, S.No. 396P &amp; 403P, Sarkhej, Bavla Road, Vill. Moraiya, Tal. Sanand, Ahmedabad; (iii) PTC, Sarkhej, Bavla N.H. No.8A, Vill. Moraiya, Tal. Sanand, Dist. Ahmedabad; (iv) API Unit, Plot No.26,29 to 31, Dabhasa, Dabhasa-Umraya Road, Post: Dabhasa, Tal:Padra, Dist. Vadodara; (v)PTC, Block No.2,3,4,5, Sigma House, Ambli-Bhopal Road, Nr.Iskcon Cross Roads, Ahmedabad, Gujarat and (vi) VTC, Plot Survey No.No.40/P, 23, 25/P, 37, 42 Changodar Road, Opp. Ramdev Masala, Sarkhej-Bavla N.H. No.8A, Ta:Sanand, Distt. Ahmedabad</p>				
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(iv) Synthesis & Bulk Drugs

**The Indian companies are working towards** supplying Active Pharmaceutical Ingredients (APIs) & Key Starting Materials (KSMs) and help the licensed Indian formulators to quickly bring the drug to the market. The key priorities include to supply intermediates based on the development timelines of the formulators. This would be followed by Scale-up and regulatory filings. The outcomes would be helping improve treatment of Covid 19 patients, Increase exports of India to other pandemic-hit countries & faster availability of the drug in the market. As a result, patients will recover faster and the disease can be controlled quickly, flattening the daily new cases curve in a quick manner.

1	<p><b>Name of company : M/s BDR Life Science Private Limited</b>  <b>Location of R&amp;D :</b> R.S. # 578, NEAR Effluent Channel Road, At Village Luna, Dist. Vadodara, Vadodara, Gujarat</p>	
	Research projects	Achievement/ Stage of development & approvals
	<p>To manufacture following bulk drug                      1. Favipiravir                      2. Oseltamavir                      3. Remdesivir</p> <p>In long term, backward integration plan of above Generic bulk drugs by developing formulations for the same.</p>	<p>Process for manufacturing above drugs are developed and R&amp;D batches completed for above three product. The company has plans to produce around 500 kg – bulk drug in next 6 months.</p> <p>1. Favipiravir : Applied for DCGI. Once approval received, plan to manufacture around 250 kg- 400kg in next 3 month.</p> <p>2. Remdesivir: We completed the development and applied to DCGI. Once approved we plan to produce approx. 25-50kg in next 3-4 month.</p>
2	<p><b>Name of company : M/s Cadila Healthcare Limited</b>  <b>Location of R&amp;D :</b> (i) PTC, Plot No.106-107, Road No.21, Opp. Central Excise Office, Wagle Estate, Thane, Maharashtra; (ii) Zydus Research Centre, S.No. 396P &amp; 403P, Sarkhej, Bavla Road, Vill. Moraiya, Tal. Sanand, Ahmedabad; (iii) PTC, Sarkhej, Bavla N.H. No.8A, Vill. Moraiya, Tal. Sanand, Dist. Ahmedabad; (iv) API Unit, Plot No.26,29 to 31, Dabhasa, Dabhasa-Umraya Road, Post: Dabhasa, Tal:Padra, Dist. Vadodara; (v)PTC, Block No.2,3,4,5, Sigma House, Ambli-Bhopal Road, Nr.Iskcon Cross Roads, Ahmedabad, Gujarat and (vi) VTC, Plot Survey No.No.40/P, 23, 25/P, 37, 42 Changodar Road, Opp. Ramdev Masala, Sarkhej-Bavla N.H. No.8A, Ta:Sanand, Distt. Ahmedabad</p>	
	Research projects	Achievement/ Stage of development & approvals
	<p>Developing a novel small-molecule drug for treating critically-ill COVID-19 patients</p>	<p>The products are under various stages of development.</p> <p>The company also ramped up the production of Hydroxychloroquine, the Group which is one of the largest producers of this drug worldwide, increased its production from 3 metric tons to 30 metric tonnes.</p>
3	<p><b>Name of company : M/s FDC Limited</b>  <b>Location of R&amp;D :</b> (i) Plot No. 54EFGH, Govt.Industrial Estate, Charkop,Kandivali (W), Mumbai (ii) Plot No.19 &amp; 20/2, MIDC Industrial Area Road, Roha, Dist. Raigad; Maharashtra (iii) Goa Unit III, Plant Phase III/A, Plot No.L-121/B, Salcette, Verna Indl. Estate, Verna, Goa and (iv) Synthesis and Food R&amp;D Division, Plot No. 54EFGH, Govt. Industrial Estate, Charkop, Kandivali (W), Mumbai</p>	
	Research projects	Achievement/ Stage of development & approvals
	<p>Developing API for Hydroxylchloroquine and Ritonavir.</p>	<p>Under development</p>
4	<p><b>Name of company : M/s Gland Pharma Ltd.,</b>  <b>Location of R&amp;D :</b> Survey No.143, 148, 150 &amp; 151, D.P. Palli, Dundigal Post, Quthbullapur Mandal, Ranga Reddy Distt., Telangana.</p>	
	Research projects	Achievement/ Stage of development & approvals
	<p>To develop process for three key intermediates of Remdesivir</p>	<p>Under development</p>

5	<b>Name of company : M/s Jubilant Generics Limited</b> <b>Location of R&amp;D :</b> (1) Plot No. 56, Industrial Area, Nanjangud, Mysore, Karnataka; (2) C-26, Sector - 59, Noida, Uttar Pradesh - 201301, Noida, Uttar Pradesh; (3) D-12, Sector - 59, Noida, Uttar Pradesh; (4) C-46, Sector - 62, Noida, Uttar Pradesh	
	Research projects	Achievement/ Stage of development & approvals
	<ul style="list-style-type: none"> <li>• Development of API as well as the dosage form (lyophilized powder for injection) for Remdesivir</li> <li>• Azithromycin monohydrate &amp; Azithromycin dehydrate:</li> </ul>	<p>The API will be manufactured at the manufacturing site 56, Industrial area Nanjangud, District-Mysore, 571302, Karnataka, India.</p> <p>Collaborator: Jubilant has signed a voluntary licensing agreement with Gilead for this antiviral product.</p> <p>Already commercialized / being manufactured</p>
6	<b>Name of company : M/s Caplin Point Laboratories Limited</b> <b>Location of R&amp;D :</b> (i) Unit II,19, Chinnapuliur Village, Gummidipoondi, Thiruvallur District Tamil Nadu; (ii) Unit IV,Guruvarajakandigai, Sirupuzhalpettai(Post), Gumidipoondi Taluk, District - Thiruvallur, Tamil Nadu	
	Research projects	Achievement/ Stage of development & approvals
	To develop process for development of Favipiravir.	Process for the preparation Favipiravir drug substance has been developed and further scale-up in larger scale is being planned. Applied for test licenses/ manufacturing licenses.
7	<b>Name of company : M/s CTX Lifesciences Pvt Ltd</b> <b>Location of R&amp;D :</b> Block No.251-252, Sachin-Magdalla Road, GIDC, Sachin, Surat, Gujarat	
	Research projects	Achievement/ Stage of development & approvals
	<p>To develop following APIs and KSMs:</p> <ul style="list-style-type: none"> <li>• Hydroxychloroquine sulfate (HCQS)</li> <li>• Azithromycin</li> <li>• 4,7-Dichloroquinoline (KSM of HCQS)</li> <li>• 2-((4-Aminopentyl) (ethyl)amino)ethanol (KSM of HCQS)</li> <li>• Remdesvir</li> <li>• Favipiravir</li> </ul>	Under Development
8	<b>Name of company : M/s Neuland Laboratories Limited</b> <b>Location of R&amp;D :</b> (i) Bonthapalli Vill., Veerabhadra Swamy Temple Road, Jinnaram (M), Dist. Medak, Telangana; (ii) Unit II, Plot Nos. 92-94, 257-259, IDA Pashammylaram, Isnapur, Patancheru (M), Medak Dist, Telangana;	
	Research projects	Achievement/ Stage of development & approvals
	To synthesize KSM's of Labetalol, Ciprofloxacin, Levofloxacin, Linezolid, Salbutamol and Levettiracetam in-house without importing from Chinese companies.	Under Development
9	<b>Name of company : M/s Emcure Pharmaceuticals Limited</b> <b>Location of R&amp;D :</b> (i) Formulation facility Plot No.2, Phase II, ITBT Park, Hinjewadi, Pune, Maharashtra, (ii) API facility, Plot No.2, Phase II, ITBT Park, Hinjewadi, Pune, Maharashtra, (iii) Formulation facility, Premises of Arihant School of Pharmacy & Bio-Research Institute Uvarsad Square, Sarkhej-Gandhinagar Highway Adalaj, Dist. Gandhinagar, Gandhinagar, Gujarat and (iv) C-10/12, First Floor, MIDC, Bhosari, Pune	
	Research projects	Achievement/ Stage of development & approvals
	<p>Working on the development of the following API projects for Domestic Market</p> <p>I) Remdesivir (API)</p> <p>II) Ritonavir (API)</p>	<p>Remdesivir (API) process: Synthesis all RM &amp; intermediate. No purchase from China</p> <p>Ritonavir (API) technology is developed and commercially available for sale</p>

10	<b>Name of company : M/s Vasudha Pharma Chem Limited</b> <b>Location of R&amp;D :</b> Research and Development Building, Ramky Commercial Hub, Road No.13, J N Pharma City, Parwada	
	Research projects	Achievement/ Stage of development & approvals
	To develop a robust process for Drug substance Favipiravir API.	Under Development
11	<b>Name of company : M/s PI Industries Ltd</b> <b>Location of R&amp;D :</b> Udaisagar Road, Udaipur	
	Research projects	Achievement/ Stage of development & approvals
	To develop and manufacture processes for intermediates & APIs for Favipiravir & Hydroxychloroquine at the earliest	Under Development
12	<b>Name of company : M/s Mylan Laboratories Limited</b> <b>Location of R&amp;D :</b> (i) 38,39,50 &51, Jeedimetla, IDA Phase IV, Hyderabad (ii) EDF R&D and API R&D, Plot No. 31, 32, 33 & 34A, Anrich Industrial Estate, Bollaram, Jinnaram Mandal, Medak Dist. (Telangana) (iii) Clinical Research Center, Saradhi Chambers, A-4 Rukmini Puri, Near Poulomi Hospital, AS Rao Nagar, Hyderabad, Telangana, (iv) "Strides House", Opp. To IIM-B, Bilekahalli, Bannerghatta Road, Bangalore and (v) API R&D, Survey No. 10 & 42, Gaddapotharam Village, Kazipally Indl. Area, Jinnaram Mandal, Medak Dist. Telangana (vi) Injectables R&D centre, Plot No. 31, 32, 33 & 34A. Anrich Industrial Estate, Bollaram, Jinnaram Mandal, Sangareddy District, Telangana	
	Research projects	Achievement/ Stage of development & approvals
	Development of API for following Covid-19 treatment/Therapeutic molecules: <ul style="list-style-type: none"> <li>• Hydroxychloroquine</li> <li>• Remdesivir</li> <li>• Favipiravir</li> <li>• Umifenovir HCl</li> <li>• Baloxavir marboxil</li> </ul>	Development is in progress for all the above-mentioned products at API.  Collaborator: IICT, Mumbai on Remdesivir, Umifenovir and Baloxavir to develop chemistry.
13	<b>Name of company : M/s Metrochem API Pvt. Ltd.,</b> <b>Location of R&amp;D :</b> Plot.No. 298/P, Dr.No. 01-173/3/1, Phase-I, I.D.A., Jeedimetla, R.R.District, Hyderabad, Telangana	
	Research projects	Achievement/ Stage of development & approvals
	The company is working on two drug substances for Covid-19: <ul style="list-style-type: none"> <li>• Remdesivir</li> <li>• Favipiravir</li> </ul>	Test license received for Favipiravir & Remdesivir
14	<b>Name of company : M/s Piramal Enterprises Limited</b> <b>Location of R&amp;D :</b> (i) Ennore Express Highway, Chennai; (ii) A-Wing, Lighthall Hirandani Business Park,Saki Vihar, Chandivali, Andheri (East),Mumbai (iii) Shirish Research Campus, Plot # 18 & 19, PHARMEZ Village, Matoda, Sarkhej Bavla, NH#8A, Taluka Sanand, Ahmedabad	
	Research projects	Achievement/ Stage of development & approvals
	<ol style="list-style-type: none"> <li>1. Developing an atom, cost and volumetrically efficient process for a Ph-II molecule that will enter into clinical trials from JUN 2020.</li> <li>2. To initiate a hit-to-lead optimization work on novel COVID cure within one year.</li> <li>3. To create innovative chemistries for fast tracking 3 Phase-II molecules as potential COVID-19 cures by improving the routes of synthesis, in terms of simpler chemistries, less environmental load, and lowered cost of API.</li> </ol>	Innovative chemistries have been proposed for the above projects that will result in faster, simpler processing and cheaper products.  Currently Phase-II molecule will be approved by the US FDA post successful clinical trials.  Collaborator: <ol style="list-style-type: none"> <li>1. A Norway-based Company</li> <li>2. Grants United States - India Science and Technology Endowment Fund Ignition (USISTEFI) Grant for COVID-19</li> <li>3. Global leading philanthropic foundation</li> </ol>

#### (v) R&D in Pharmaceutical Formulations

Indian industry has also been engaged in development of formulations for treatment of Covid-19. The Indian industry is engaged in development of formulations for Hydroxychloroquine and Ritonavir, Vitamin C, Zinc tablets, Azithromycin Tablets, etc. which are required for treatment of Covid-19 or supportive immune against the Covid-19. The following companies have been engaged in development of formulations for treating Covid-19.

1	<b>Name of company : M/s FDC Limited</b> <b>Location of R&amp;D :</b> (i) Plot No. 54EFGH, Govt.Industrial Estate, Charkop,Kandivali (W), Mumbai (ii) Plot No.19 & 20/2, MIDC Industrial Area Road, Roha, Dist. Raigad; Maharashtra (iii) Goa Unit III, Plant Phase III/A, Plot No.L-121/B, Salcette, Verna Indl. Estate, Verna, Goa and (iv) Synthesis and Food R&D Division, Plot No. 54EFGH, Govt. Industrial Estate, Charkop, Kandivali (W), Mumbai	
	Research projects	Achievement/ Stage of development & approvals
	Hydroxylchloroquine and Ritonavir	Formulation development has started
2	<b>Name of company : M/s Aspiro Pharma Ltd</b> <b>Location of R&amp;D :</b> Sy. No. 321, Bio Tech Park, Phase-III, Karkapatla (V), Markook (MndI),Siddipet District (Telangana)	
	Research projects	Achievement/ Stage of development & approvals
	Liquid & Lyophilized Injectable formulation of the Remdesivir	Formulation developed, Permission for manufacturing awaited
3	<b>Name of company : M/s Cadila Healthcare Limited</b> <b>Location of R&amp;D :</b> (i) PTC, Plot No.106-107, Road No.21, Opp. Central Excise Office, Wagle Estate, Thane, Maharashtra; (ii) Zydus Research Centre, S.No. 396P & 403P, Sarkhej, Bavla Road, Vill. Moraiya, Tal. Sanand, Ahmedabad; (iii) PTC, Sarkhej, Bavla N.H. No.8A, Vill. Moraiya, Tal. Sanand, Dist. Ahmedabad; (iv) API Unit, Plot No.26,29 to 31, Dabhasa, Dabhasa-Umraya Road, Post: Dabhasa, Tal:Padra, Dist. Vadodara; (v)PTC, Block No.2,3,4,5, Sigma House, Ambli-Bhopal Road, Nr.Iskcon Cross Roads, Ahmedabad, Gujarat and (vi) VTC, Plot Survey No.No.40/P, 23, 25/P, 37, 42 Changodar Road, Opp. Ramdev Masala, Sarkhej-Bavla N.H. No.8A, Ta:Sanand, Distt. Ahmedabad	
	Research projects	Achievement/ Stage of development & approvals
	<ul style="list-style-type: none"> <li>• Providing Hydroxychloroquine tablets in large quantities which was found as an effective medication to contain COVID-19 symptoms</li> <li>• Developing Vit.C and Zinc Chewable tablets to increase immunity level in COVID-19 patients so that they can fight infection</li> <li>• To obtain Local FDA approval and produce the drug in large quantities to cater the current huge demand</li> </ul>	Development Completed, Product Permission Received for manufacturing the Finished Goods at Site Batches ongoing at site Finished Goods Delivery Targeted for May end
4	<b>Name of company : M/s Jubilant Generics Limited</b> <b>Location of R&amp;D :</b> (1) Plot No. 56, Industrial Area, Nanjangud, Mysore, Karnataka; (2) C-26, Sector - 59, Noida, Uttar Pradesh - 201301, Noida, Uttar Pradesh; (3) D-12, Sector - 59, Noida, Uttar Pradesh; (4) C-46, Sector - 62, Noida, Uttar Pradesh	
	Research projects	Achievement/ Stage of development & approvals
	<ul style="list-style-type: none"> <li>• Remdesivir Lyophilized Powder for Injection</li> <li>• Azithromycin Tablets &amp; capsules</li> <li>• Hydroxychloroquine Tablets</li> </ul>	The drug product formulation is currently under development and is expected to be filed with Central Drugs Standard Control Organisation (CDSCO) and subsequently commercialized in India over the next few months.  Collaborator: Jubilant has signed a voluntary licensing agreement with Gilead for this antiviral product.  Already developed  Product is under development for multiple markets
5	<b>Name of company : M/s Alkem Laboratories Ltd</b> <b>Location of R&amp;D :</b> C-6/1,6/2,17/7, MIDC Estate, Taloja, Dist. Raigadh	
	Research projects	Achievement/ Stage of development & approvals
	The company has initiated development of: <ul style="list-style-type: none"> <li>• Hydroxychloroquine sulphate tablets</li> <li>• Hand sanitiser</li> </ul>	Hand sanitizer has been developed & launched for Indian population.
6	<b>Name of company : M/s Gland Pharma Ltd</b> <b>Location of R&amp;D :</b> Survey No.143, 148, 150 & 151, D.P. Palli, Dundigal Post, Quthbullapur Mandal, Ranga Reddy Distt., Telangana.	
	Research projects	Achievement/ Stage of development & approvals
	Remdesivir	Formulation development has started

7	<b>Name of company : M/s Cadila Pharmaceuticals Limited</b> <b>Location of R&amp;D :</b> 1389, Trasad Road, Dholka, Ahmedabad	
	Research projects	Achievement/ Stage of development & approvals
	<p>Development of Mycobacterium W for management of COVID-19 infection across the disease spectrum by modulating innate immune response.</p> <p>Study – 1: To evaluate the efficacy of Mw in improving organ dysfunction and reducing overall mortality associated with COVID-19 infection.</p> <p>To reduce duration of disease and prevent / minimize transfer to ICU of COVID-19 infected patients and thereby reduce morbidity related to disease and burden on health care system for better management of COVID19 PANDEMIC.</p> <p>Prophylactic To prevent COVID-19 infections in “close contacts (at risk)” of COVID-19 infected patients</p> <p>To develop a treatment of thromboembolism (DVT/PE) in COVID-19 patients by managing the dysregulated blood coagulation.</p>	<p>Under development</p> <p>A conjugated product is developed having possible efficacy on D-dimer level and other parameters to treat the thromboembolism (DVT/PE). Product development and preclinical safety evaluation is already completed. Product is ready and protocol for clinical trial is underway.</p>
9	<b>Name of company : M/s Emcure Pharmaceuticals Limited</b> <b>Location of R&amp;D :</b> (i) Formulation facility Plot No.2, Phase II, ITBT Park, Hinjewadi, Pune, Maharashtra, (ii) API facility, Plot No.2, Phase II, ITBT Park, Hinjewadi, Pune, Maharashtra, (iii) Formulation facility, Premises of Arihant School of Pharmacy & Bio-Research Institute Uvarsad Square, Sarkhej-Gandhinagar Highway Adalaj, Dist. Gandhinagar, Gandhinagar, Gujarat and (iv) C-10/12, First Floor, MIDC, Bhosari, Pune	
	Research projects	Achievement/ Stage of development & approvals
	<p>To develop formulation projects for Domestic Market</p> <ul style="list-style-type: none"> <li>• Hydroxychloroquine</li> <li>• Lopinavir+Ritonavir</li> <li>• Remdesivir</li> <li>• Favipiravir</li> </ul>	<p>Remdesivir Mfg process required Specialized Freeze dryer technology.</p> <p>Approval Status of Drug Product for Domestic Market: Ritonavir - Approved Hydroxychloroquine - Approved Lopinavir+Ritonavir - Approved</p>
10	<b>Name of company : M/s Centurion Laboratories Pvt Ltd</b> <b>Location of R&amp;D :</b> P-2, Biotech Park, GIDC Savli Manjusar, Vadodara, Gujarat	
	Research projects	Achievement/ Stage of development & approvals
	<p>To develop Oseltamivir Phosphate capsules as well as dry syrup product.</p>	<p>Oseltamivir capsules 30mg and 75mg has approved by DGCI but Oseltamivir phosphate capsule 45mg and dry syrup to be apply under DCGI.</p>
11	<b>Name of company : M/s Windlas Biotech Private Limited</b> <b>Location of R&amp;D :</b> 40/1, Mohabewala Industrial Area, Dehradun	
	Research projects	Achievement/ Stage of development & approvals
	<ol style="list-style-type: none"> <li>1. Vitamin C &amp; Zinc Chewable Tablets</li> <li>2. Vitamin C Chewable Tablets</li> <li>3. Vitamin C, Zinc &amp; Vitamin D3 Tablets</li> <li>4. Vitamin C, Vitamin D3 &amp; Zinc Effervescent Tablets</li> </ol>	<p>Development of Anti-reteroviral products using inhalation technology is underway</p>
12	<b>Name of company : M/s Globela Pharma Pvt. Ltd</b> <b>Location of R&amp;D :</b> First Floor, Plot No.357, Road No.3, GIDC, Sachin, Surat	
	Research projects	Achievement/ Stage of development & approvals
	<ol style="list-style-type: none"> <li>1. Hydroxychloroquine Phosphate Tablets</li> <li>2. Lopinavir And Ritonavir Tablets</li> <li>3. Favipiravir Tablets</li> </ol>	<p>Lopinavir and Ritonavir Tablets approval received from Food and Drug Control Administration Gandhinagar, Gujarat</p>

13	<b>Name of company : M/s Caplin Point Laboratories Limited</b> <b>Location of R&amp;D :</b> (i) Unit II, 19, Chinnapuliur Village, Gummidipoondi, Thiruvallur District Tamil Nadu; (ii) Unit IV, Guruvarakandigai, Sirupuzhalpettai(Post), Gumidipoondi Taluk, District - Thiruvallur, Tamil Nadu	
	Research projects	Achievement/ Stage of development & approvals
	<p>To develop Drug products of Favipiravir, Hydroxychloroquine sulfate, Ivermectin and combination therapy of Lopinavir &amp; Ritonavir.</p>	<p>Favipiravir Drug Product Technology for the manufacturing of Favipiravir tablets 200 mg has been developed using in-house Favipiravir drug substance. Process scale-up would be initiated from in-house Favipiravir API.</p> <p>Hydroxychloroquine sulfate Drug Product Technology for the manufacturing of Hydroxychloroquine sulfate tablets USP 200/400 mg has been developed. Process scale-up studies and commercialization is being planned.</p> <p>Ivermectin Drug Product: Manufacturing process for the preparation Ivermectin tablets USP 6 mg and Ivermectin oral solution BP 6mg/5ml has been developed. Further, scale-up studies is being planned.</p> <p>Applied for test licenses/ manufacturing licenses with concerned regulatory departments and awaiting for approval</p>
14	<b>Name of company : M/s Pell Tech Healthcare Pvt Ltd</b> <b>Location of R&amp;D :</b> Plot No. 20-B, Tansa Farm Estate, Village Met, Bhiwandi - Wada Road, Taluka Wada, Thane	
	Research projects	Achievement/ Stage of development & approvals
	<ul style="list-style-type: none"> <li>• To develop the generic tablets of Rivaroxaban 10 mg equivalent to the innovator .</li> <li>• To develop the generic tablets of Betrixaban 160 mg equivalent to the innovator .</li> <li>• To develop Hydroxychloroquin with Azithromycin with vitamin C</li> </ul> <ul style="list-style-type: none"> <li>• To develop Lopinavir /ritonavir pellets in sachets: Pellets of both drugs are used as sprinkles in children dosages and company intends to develop the same</li> <li>• To develop a product for export and local market of Favilavir tablets (favipiravir)</li> </ul>	<ul style="list-style-type: none"> <li>• Under development</li> <li>• Under development</li> <li>• All tablets are already developed. The company intends to make a kit packing for the same for use by the frontliners as a convenient form of use.</li> <li>• Under development</li> <li>• Under development</li> </ul>
15	<b>Name of company : M/s Lupin Ltd</b> <b>Location of R&amp;D :</b> (i) A-28, MIDC, Chikalthana, dist. Aurangabad; (ii) 124, GIDC Industrial Estate, Ankleshwar, Dist. Bharuch (Gujarat); (iii) Lupin Research Park, Survey No. 46A/47A, Vill. Nande, Mulshi Taluka, Dist. Pune (iv) Plot T-142, MIDC Indl. Estate, Tarapur, Distt. Thane, (v) 202, New Indl. Area II, Mandideep, Dist. Raisen (MP) (vi) Plot No.9, GIDC Ankleshwar, Dist. Bharuch, Gujarat; (vii) Gotawade Vill., Gat #1156, Tal. Mulshi, Pune; (viii) Trinity, A Wing, Unit 1,2 & 3, Sr. No. 146/2/1B, Pashan, Pune (ix) Bloc No. 21, Dabhasha, Padra Taluka, Vadodara; (x) Biotechnology Testing and Analytical Facility, 1st Floor, Block-A, Ganga Silicon, Square, Sr. No. 249/250, Waked, Pune (xi) Plot No.2, Phase II, Special Economic Zone, Misscellaneous Zone, Apparel Park, Pithampur Dist., Dhar (MP) (xii) Plot No. 130, Road no.11, Jawaharlal Nehru Pharma City, Parawada, Visakhapatnam, Andhera Pradesh.	
	Research projects	Achievement/ Stage of development & approvals
	<ul style="list-style-type: none"> <li>• To Continue R&amp;D support to manufacturing Plant for all products that are considered drugs for Covid 19 treatment B.</li> <li>• To Identify newer approach to repurpose existing molecules for targeted delivery to respiratory tract, screen them and short-list promising leads</li> <li>• Development of inhalation products (Antibiotics and antibacterial). Product is aimed for giving the antibiotic/antibacterial drug directly to Lungs which can be achieved by reduced dose, resulting into lower side effects.</li> </ul>	<p>In the past, therapeutic products like Hydroxychloroquine capsules and Azithromycin tablets/Suspension have been developed at R&amp;D and the technology transferred to Manufacturing Plants. Routine support is being provided as necessary. The new products under development are required to go through the clinical trials and will require about 2 years to come to commercialization.</p>

16	<b>Name of company : M/s Aeon Formulations Pvt. Ltd</b> <b>Location of R&amp;D :</b> R.S.NO. 515/1, 515/2 & 514, No.152/7, Vinayagar Koil Street, Thirubuvanaipalayam, Mannadipet Commune, Puducherry - 605107	
	Research projects	Achievement/ Stage of development & approvals
	A. Favipiravir-200mg, 400mg and 800mg SR B. Oseltamavir-700/35mg-bilayer product C. Complex polyherbal formulation comprising of Willow bark extract, Artemisia, Terminalia chebula, andrographis paniculata & glycyrrhiza glabra,	Developed products for:  1.Denfesun 2.Hydroxychloroquine Sulphate 3.Oseltamavir 4.Azithromycin  Approved by State Licensing authority of Pondicherry.
17	<b>Name of company : M/s Mylan Laboratories Limited</b> <b>Location of R&amp;D :</b> (i) 38,39,50 &51, Jeedimetla, IDA Phase IV, Hyderabad (ii) EDF R&D and API R&D, Plot No. 31, 32, 33 & 34A, Anrich Industrial Estate, Bollaram, Jinnaram Mandal, Medak Dist. (Telangana) (iii) Clinical Research Center, Saradhi Chambers, A-4 Rukmini Puri, Near Poulomi Hospital, AS Rao Nagar, Hyderabad, Telangana, (iv) "Strides House", Opp. To IIM-B, Bilekahalli, Bannerghatta Road, Bangalore and (v) API R&D, Survey No. 10 & 42, Gaddapotharam Village, Kazipally Indl. Area, Jinnaram Mandal, Medak Dist. Telangana (vi) Injectables R&D centre, Plot No. 31, 32, 33 & 34A. Anrich Industrial Estate, Bollaram, Jinnaram Mandal, Sangareddy District, Telangana	
	Research projects	Achievement/ Stage of development & approvals
	Oral Solid Dosage (OSD) Formulations for following molecules: • Hydroxychloroquine • Remdesivir • Favipiravir • Umifenovir HCl • BaloxavirMarboxil  R&D – Injectables  To develop a therapeutic equivalent version of Remdesivir finished dosage form (FDF) in sterile powder lyophilized vials.	Development is in progress for all the above-mentioned products at formulation R & D.  Lyophilized injectable product being developed for use in COVID-19 patients.  Technical documents under preparation for submission and approval.  Collaborator: Have collaboration with Gilead Inc. through voluntary license for providing access to Remdesivir treatment in India and other countries, as per agreement.
18	<b>Name of company : M/s Lincoln Pharmaceuticals Limited</b> <b>Location of R&amp;D :</b> 9,10,12, 13 Trimul Estate, Vadsar Road, Khatrej Chowkdi, Tal. Kadi, Dist. Gandhinagar	
	Research projects	Achievement/ Stage of development & approvals
	1. Hydroxychloroquine tablets of different strengths 200 mg, 300 mg. 400 mg 2. Hydroxychloroquine sulphate synthesis 3. EKApplus(ayurvedic formulation) existing Lincoln domestic product have potential activity covid-19, which has been proved on the literature and the formulation will be under patent 4. Comostat Mesylate 100 mg formulation development. 5. Ivermectin tablet USP 3 mg, 6 12 mg. 6. Alcohol based sanitizer has been developed	Developed & got permission to manufacture  1. Hydroxychloroquine sulfate Tablet different strength like 200 mg, 300 mg and 400 mg 2. Comostat mesylate API under Procurement for tablet formulation.  Ivermectin API as per USP received and tablet formulation as per USP under development.  Alcohol based sanitizer technology transfer for commercial level.
19	<b>Name of company : M/s Vasu Healthcare Pvt. Ltd.</b> <b>Location of R&amp;D :</b> A2/624-625/2, GIDC, Makarpura, Vadodara, Gujarat	
	Research projects	Achievement/ Stage of development & approvals
	Re-assessment of Anti-tuberculosis Polyherbal Chewable Tablet in correlation to Covid-19 pandemic condition	Standardization and Formulation development completed  In-vitro study on causative TB organism done.
20	<b>Name of company : M/s Troikaa Pharmaceuticals Ltd</b> <b>Location of R&amp;D :</b> Village - Thol, Taluk - Kadi, Dist. - Mehsana (Gujarat)	
	Research projects	Achievement/ Stage of development & approvals
	To develop a generic version of Favipiravir tablet 200mg Ascorbic acid sustained release tablet with Zinc and Selenium:	Favipiravir tablet 200 mg is under development at our in-house R&D facility. Product already developed through matrix technology and will soon be ready for supply in the domestic market. The long-Acting formula will provide round the clock blood levels of immune enhancers. Approval of Ascorbic acid sustained release tablet with Zinc and Selenium received from DCGI Office New Delhi and Gujarat FDCA

## (vi) R&D in Diagnostics

Presently, in order to detect the Covid-19, the following two methods have been widely used:

Reverse transcription polymerase chain reaction (RT-PCR) first uses reverse transcription to obtain DNA, followed by PCR to amplify that DNA, creating enough to be analyzed. RT-PCR can thereby detect SARS-CoV-2, which contains only RNA. The RT-PCR process generally requires a few hours.

Serology Tests: The potential role of antibody testing for determining if a person is immune to COVID-19 is not clear and the ability to detect SARS-COV-2 antibodies in people recovering from an infection, people who are asymptomatic, and those who had mild symptoms.

The Indian Industry are also engaged in Development of in-vitro diagnostic test kits for the detection of antibodies to Covid 19, development of Covid Kavach, etc. for detection of Covid-19.

The following companies have been engaged in development of diagnostic kits for detection of Covid-19.

1	<b>Name of company : M/s J. Mitra &amp; Co. Pvt. Ltd</b> <b>Location of R&amp;D : A-180-181, Okhla Indl. Area, Phase -1. New Delhi</b>	
	Research projects	Achievement/ Stage of development & approvals
	Development of in-vitro diagnostic test kits for the detection of antibodies to Covid 19.  1) COVID IgM MICROLISA 2) COVID IgG MICROLISA 3) COVID 19 (IgM + IgG + IgA) MICROLISA 4) COVID IgM Card 5) COVID IgG Card 6) COVID IgM Quanti Card 7) COVID IgG Quanti Card 8) COVID IgM & IgG Duo Card 9) COVID (IgM+IgG+IgA) Card 10) COVID (IgM+IgG+IgA) Quanti Card	ELISA & Rapid Tests have been developed for the detection of Covid 19 antibodies for surveillance and diagnostic purpose. Literature survey & planning of the experiments done.  COVID IgM MICROLISA kit has been developed & evaluated from ICMR-NARI PUNE under test license. Applied to CDSCO for obtaining the manufacturing license & this is under review.  COVID IgG MICROLISA has been developed & submitted to ICMR -NARI PUNE for evaluation. Results awaited.
2	<b>Name of company : M/s Lars Medicare Pvt. Ltd</b> <b>Location of R&amp;D : Killa No.16 &amp;17, Village Sultanpur, Near Bahalgarh Chowk, Sonipat, Haryana, 131021</b>	
	Research projects	Achievement/ Stage of development & approvals
	i) Safety goggles. ii) Sanitizer Preparation iii) Infrared Thermometers	The existing moulding facility for manufacturing of components for preparation of various medical devices is utilized with additional moulds for production of safety goggles & infrared thermometres. Sanitisers have been developed for internal & commercial use.
3	<b>Name of company : M/s Cadila Healthcare Limited</b> <b>Location of R&amp;D : (i) PTC, Plot No.106-107, Road No.21, Opp. Central Excise Office, Wagle Estate, Thane, Maharashtra; (ii) Zydus Research Centre, S.No. 396P &amp; 403P, Sarkhej, Bavla Road, Vill. Moraiya, Tal. Sanand, Ahmedabad; (iii) PTC, Sarkhej, Bavla N.H. No.8A, Vill. Moraiya, Tal. Sanand, Dist. Ahmedabad; (iv) API Unit, Plot No.26,29 to 31, Dabhasa, Dabhasa-Umraya Road, Post: Dabhasa, Tal:Padra, Dist. Vadodara; (v)PTC, Block No.2,3,4,5, Sigma House, Ambli-Bhopal Road, Nr.Iskcon Cross Roads, Ahmedabad, Gujarat and (vi) VTC, Plot Survey No.No.40/P, 23, 25/P, 37, 42 Changodar Road, Opp. Ramdev Masala, Sarkhej-Bavla N.H. No.8A, Ta:Sanand, Distt. Ahmedabad</b>	
	Research projects	Achievement/ Stage of development & approvals
	Development of Covid Kavach ELISA	Market authorization granted for COVID19 Kits, COVID KAVACH, (Project-3) by DCGI.
	Manufacturing of Qualitative diagnostic kit for detection of Anti SARS CoV-2 antibody in COVID-19 positive patients  ELISA based detection of Anti SARS CoV-2 antibody in Human Sera sample	Kits have been manufactured and validated by NIV. Currently field trials are being undertaken by ICMR  Kits ready for commercial supply



4	<b>Name of company : M/s Venus Remedies Limited</b> <b>Location of R&amp;D :</b> Hill Top Industrial Estate, Near Jharmajri, EPIP, Phase-I (Extn.) Village Bhatoli Kalan, Baddi, HP	
	Research projects	Achievement/ Stage of development & approvals
	To develop following products: <ul style="list-style-type: none"> <li>• VRP-033: is an IV infusion injection having antiinflammatory, bronchodilator, immunomodulatory, antioxidant, vasodilator and antiviral properties that can be used as a supplementary therapy with Standardof-Care for treating mild to moderate COVID-19 patients</li> <li>• VRP-043- is for high risk exposure to Covid-19 was developed as safe and efficacious nasal spray formulation</li> <li>• HOCl based disinfectant (Sterloc):</li> <li>• Hand Sanitizer (Swachh Guard)</li> </ul>	VRP-033: Will be deployed: 3-4 months, pre CT grant VRP-043: Under review with regulatory agency.  HOCl based disinfection (Sterloc): Launched in India Alcohol based Hand Sanitizer (Swachh Guard): Launched in India  Filed patent for VRP033

### (vii) R&D towards Foods, Preventive, Immuno-boosting medicine

It is very crucial to mention hygiene standards like washing your hands frequently, wearing the masks, social distancing, etc. Enhancing the body's natural defence system (immunity) plays an important role in maintaining optimum health. Also, the food we eat plays a key aspect in determining your overall health and immunity. Some of the Ayurvedic products such as Kada, etc. have been proved to be effective for preventive health measures and boosting immunity with special reference to respiratory health. These were also recommended by the Ministry of AYUSH, Government of India. The following companies have been engaged in development of ayurvedic formulations for improving the immunity against Covid-19.

1	<b>Name of company : M/s Charak Pharma Pvt. Ltd.,</b> <b>Location of R&amp;D :</b> Evergreen Indl. Estate, Shakti Mills Lane, Dr.E.Moses Road, Mahalaxmi, Mumbai	
	Research projects	Achievement/ Stage of development & approvals
	Herbal tea/granules with anti-infective properties.	Enhanced formula over the Ayushqwith recommended by AYUSH Ministry.
2	<b>Name of company : M/s Pharamanza Herbal Pvt Ltd</b> <b>Location of R&amp;D :</b> Plot No:214, Near Vadadla Patia, Borsad-Tarapur Road, Kania-388435, Tal:Petlad, Dist Anand, Anand, Gujarat	
	Research projects	Achievement/ Stage of development & approvals
	Working on following herbal products for prophylactic & add-on therapy:  (i) Anti-viral activity of High concentration extract of Withania somnifera  (ii) Antiviral activity of Tinospora cordifolia	Looking after Quality aspect and analysis of products for trial  Collaborator: Stanford University  AYUSH Dept
3	<b>Name of company : M/s FDC Limited</b> <b>Location of R&amp;D :</b> (i) Plot No. 54EFGH, Govt.Industrial Estate, Charkop,Kandivali (W), Mumbai (ii) Plot No.19 & 20/2, MIDC Industrial Area Road, Roha, Dist. Raigad; Maharashtra (iii) Goa Unit III, Plant Phase III/A, Plot No.L-121/B, Salcette, Verna Indl. Estate, Verna, Goa and (iv) Synthesis and Food R&D Division, Plot No. 54EFGH, Govt. Industrial Estate, Charkop, Kandivali (W), Mumbai	
	Research projects	Achievement/ Stage of development & approvals
	<ul style="list-style-type: none"> <li>• Developing oral formulations with Immune-booster ingredients and Probiotic Ingredients</li> <li>• Development of hand sanitiser</li> </ul>	Fortification with Immune-booster ingredients such as Vitamin C & D, Curcumin, Ginseng Extract and Zinc in current formulation by increasing their dosage which helps by enhancing immune cell function and supporting anti-inflammatory pathways in the body.  Probiotic Ingredients: Lactobacillus rhamnosus (also known as Lactobacillus GG) is the best warrior against viral infections, particularly in the upper respiratory tract.  Work has been initiated

4	<b>Name of company : M/s Polymedicure Limited</b> <b>Location of R&amp;D :</b> Design R&D at Plot No.104-105 and Prototype, Testing and Validation R&D facilities at Plot No. 80-81, Sector -59, Ballabhgarh, Faridabad, Haryana	
	Research projects	Achievement/ Stage of development & approvals
	<ul style="list-style-type: none"> <li>• VTM Tube</li> <li>• Face Shield</li> <li>• PPE Kits</li> <li>• Ventilator Setters</li> </ul>	The company has already started selling Face shields & PPE kits.
5	<b>Name of company : M/s Rallis India Limited</b> <b>Location of R&amp;D :</b> Plot No.15A, MIDC, TTC, Thane Belapur Road, Turbhe, Navi Mumbai	
	Research projects	Achievement/ Stage of development & approvals
	To develop WHO recommended formulation of Ethyl alcohol based hand sanitizer by the R&D formulation development	<p>Hand sanitizer has been developed to combat COVID-19 by the R&amp;D formulation Development Department.</p> <p>Produced at our manufacturing units Akola, Maharashtra; and Ankaleshwar, Gujarat.</p> <p>Total Quantity produced: 1,75,000 litres as on 30th of April,2020</p>
6	<b>Name of company : M/s Cadila Pharmaceuticals Limited</b> <b>Location of R&amp;D :</b> 1389, Trasad Road, Dholka, Ahmedabad	
	Research projects	Achievement/ Stage of development & approvals
	To develop WHO recommended formulation of Ethyl alcohol based hand sanitizer by the R&D formulation development	<p>Hand sanitizer has been developed to combat COVID-19 by the R&amp;D formulation Development Department.</p> <p>Produced at our manufacturing units Akola, Maharashtra; and Ankaleshwar, Gujarat.</p> <p>Total Quantity produced: 1,75,000 litres as on 30th of April,2020</p>

#### (viii) Research on Protective Gears, Personal Safety devices, Disinfectants & sanitisers

It is very crucial to mention hygiene standards like washing your hands frequently, wearing the masks, social distancing, etc. Frequent sanitization with alcohol based sanitizers can prevent contracting the corona virus. Also, in order to protect healthcare workers, doctors, nurses, etc. from contracting the covona virus, they need to be protected through Personal Protection Kit (PPE), Gloves, hand sanitizers, N95 masks, head gear, etc. Indian industries are also engaged in development of these protective kits to support the healthcare workers.

The following companies have been engaged in development of ayurvedic formulations for improving the immunity against Covid-19.

1	<b>Name of company : M/s Amber Enterprises India Pvt. Ltd.,</b> <b>Location of R&amp;D :</b> C-1, Phase -2, Focal Point, Rajpura, Punjab, India – 140401	
	Research projects	Achievement/ Stage of development & approvals
	Disinfection: Healthy Air Delivery With UV-C Integrated Air conditioner	Development & Test Validation of Proto Sample Integrate in AC for UV –C Light is going on.

2	<b>Name of company : M/s Kansai Nerolac Paints Ltd.,</b> <b>Location of R&amp;D :</b> (i) Nerolac House, Ganpatrao Kadam Marg, Lower Parel, Mumbai (ii) B1, B2, Jainpur Indl. Estate, Kanpur Dehat, Kanpur (iii) F/2, MIDC, Lote Parsuram, Taluka Khed, Dist. Ratnagiri and (iv) 36, Sector 7, HSIDC, Bawal, Dist. Rewari, (Haryana),(v) Plot E17 (Gate No.2), Phase II, Expansion II, SIPCOT Industrial Complex, Hosur (TN) and (vi) F/3, MIDC, Lote Parshuram Industrial Area, Taluka: Khed, Ratnagiri (Maharashtra)	
	Research projects	Achievement/ Stage of development & approvals
	Anti-Bacteria/Anti-Virus emulsion paint:  To develop paint with Special ingredients used sterilize Virus and Bacteria, control humidity and remove bad odors. Additionally it should have excellent air purifying ability through CO2 adsorption and very good air detoxification which Improves the indoor air quality	All the three products have been developed. Anti Bacteria/Anti Virus emulsion paint : Product being launched. - Nerolac Hand Sanitizer : Approval process going on  -Nerolac Disinfectant HSW 256 Approval process going on
3	<b>Name of company : M/s Thirumalai Chemicals Limited</b> <b>Location of R&amp;D :</b> 25-A, Sipcot Industrial Complex, Ranipet, Tamil Nadu	
	Research projects	Achievement/ Stage of development & approvals
	<ul style="list-style-type: none"> <li>• Formulation of a cost effective affordable Hand Sanitizer.</li> <li>• Preparation of a nose mask which will filter bacteria, virus and fungus.</li> <li>• Development of a cleaning method with easily available Chemicals so that the mask can be reused effectively</li> </ul>	Development of a precursor for chlorinated substitute compound to combat Covid-19 trials are under progress. Lab experiments under progress.  Study is under progress
4	<b>Name of company : M/s Berger Paints India Limited</b> <b>Location of R&amp;D :</b> 14&15, Swarnamoyee Road, PO Botanical Garden, Shibpur, Howrah	
	Research projects	Achievement/ Stage of development & approvals
	Development of personal and home hygiene products: 1. Alcohol based hand sanitizer 2. Floor Cleaner 3. Multi-purpose sanitizer	Name of products developed : 1. BreatheEasy+ Hand Sanitizer 2. BreatheEasy+ Virus Guard Hand Sanitier 3. BreatheEasy+ Floor Cleaner 4. Silk Breathe Easy Luxury Emulsion with pollution abetment, low VOC and anti-bacterial property 5. Product at 1 & 2 have been approved by Controller of Drugs, Govt of West Bengal
5	<b>Name of company : M/s Litel Infrared Systems Pvt.Ltd.</b> <b>Location of R&amp;D :</b> J-284, MIDC, Bhosari, Pune	
	Research projects	Achievement/ Stage of development & approvals
	Development of Automated Human body temperature detection with alarm manufacturing in India using infra-red technology	Development under process
6	<b>Name of company : M/s Tide Water Oil Co. (India) Ltd.</b> <b>Location of R&amp;D :</b> (i) C-441, T.T.C. Industrial Area, Indira Nagar, Turbhe, Navi Mumbai, (ii) Plot No. B-18, SIPCOT Industrial Park, Oragadam, Kancheepuram- Dist, Tamil Nadu	
	Research projects	Achievement/ Stage of development & approvals
	Development of Hand Sanitizers, Car Sanitizer and Car Disinfectants.	We are working on the project VEEDOLL CARE, which is introduction of Hand Sanitizers, Car Sanitizer and Car Disinfectants. Habits and trend of using Personal care products.

7	<b>Name of company : M/s Apex Laboratories Private Limited</b> <b>Location of R&amp;D :</b> B-59, SIDCO Industrial Park, Irunguattukottai, Sriperumbudur Taluk, Kanchipuram District, Tamil Nadu	
	Research projects	Achievement/ Stage of development & approvals
	Sanitizers with 70% Isopropyl Alcohol  Herbal Drink – Kabasurakudineer As per AYUSH and TN government guidelines Kabasurakudineer is recommended for boosting immunity	Herbal Sanitizers –Formulated & after Regulatory approval launched during Apr'20  Herbal Drink- Formulated and after Regulatory approval launched during May'20
8	<b>Name of company : M/s Tata Chemicals Limited</b> <b>Location of R&amp;D :</b> i) Mithapur (Okhamandal), Dist. Jamnagar, Gujarat;(i) Center for Agri-Solutions and Technology, Indiradham, Babrala Industrial Area, Babrala, Distt. Sambhal and (iii) Innovation Centre, Survey No. 315, Hissa No. 1-14, Ambedveth, Paud Road, Mulshi, Pune.	
	Research projects	Achievement/ Stage of development & approvals
	1) Anti-viral coating on PPE: Coating of ZnO on fabric used for protective clothing especially facemask and testing of its anti-viral effects to make anti-viral facemasks and other cloths for health-workers and masses.  2) Anti-microbial material development for skin touch application: Antimicrobial product range consists of elastic rubber tapes, tourniquets, bandages, rubber sheets for hospital beds and exercise mats & bands	1) ZnO coating process is developed to make the anti-viral products and efficacy testing is in progress  2) Development of anti-microbial product for stretch-able elastomers used in skin touch applications is on progress and being the samples are being test with an industrial partner.
9	<b>Name of company : M/s Piramal Enterprises Limited</b> <b>Location of R&amp;D :</b> (i) Ennore Express Highway, Chennai; (ii) A-Wing, Lighthall Hiranani Business Park,Saki Vihar, Chandivali, Andheri (East),Mumbai (iii) Shirish Research Campus, Plot # 18 & 19, PHARMEZ Village, Matoda, Sarkhej Bavla, NH#8A, Taluka Sanand, Ahmedabad	
	Research projects	Achievement/ Stage of development & approvals
	1. To develop Germ Protect Wipes and Disinfectant Spray by July 2020 to protect themselves from the possible viral contamination from the hard surfaces they frequently touch.  2. To develop Tri active Hand sanitizer	1. The product has been developed and expected to launch in next 1 month  2. Sanitiser has been already commercialized

### 3

## CHALLENGES FACED BY VARIOUS INDUSTRIES DURING PANDEMIC

The companies are facing many challenges during pandemic. A few of them include:

#### (i) Man power availability:

Companies are currently operating their R&D center at reduced capacity due to the lack of man power. Although ready to work, there is constraint in movement of people due to inter-state border restrictions.

#### (ii) Availability of Raw materials:

Most of the plants were shut down in the month of April due to the pandemic because of which industries are facing shortages of raw materials in the current months. The lockdown has impacted the production of all firms across the supply chain. Now, the market is slowly picking up.

#### (iii) Logistics:

Industries are unable to get the chemicals/ raw materials because of the lack of transport. Most of the logistics companies that they work with have expressed concerns over how they are unable to make their deliveries.

#### (iv) Cash flow:

As the market suspended for almost two months, the cash flows of the companies have been severely impacted. In general, this will lead to a decrease in R&D activity as firms will focus more on immediate return areas.

Section 35(1)(iv) allow deduction for any capital nature expenditure laid out or expended on scientific research

## SUPPORT REQUIRED FROM POLICY MAKERS

The Indian industry is in dire need of support from government in these times of crisis. Government of India announced the 24 March 2020 certain relief measures in view of COVID-19 outbreak. Other suggestions received from industry stakeholders are as follows:

### (i) Regulations/Exemptions:

The companies are requesting for exemption for Pharma related goods to help ease the flow of goods across states and countries. Also, the companies have sought financial, technical & regulatory assistance in clinical trials of drug products and vaccines.

### (ii) Grants:

The companies have submitted that they may be provided with funding for COVID 19 related R&D activities. This will help companies that want to develop but are unable to due to lack of the funds in this lockdown situation.

### (iii) Request of stakeholders for exemptions on R&D:

The companies / industry associations have been requesting DSIR to provide incentives such as extension of provisions under Section 35(2AB) of Income Tax Act. As per the current notification of Ministry of Finance, the benefit of weighted tax deduction under Section 35(2AB) of Income Tax Act was allowed only upto 31.03.2020. Several other incentives / measures available to companies which are as follows:

- i. Under section 35 of the Act, 100% deduction for expenditure incurred on scientific research is allowed.
- ii. Under Section 115BBF of the Act, a concessional tax regime is provided for royalty income earned by a tax payer from the patent developed and registered in India. Under the said regime, royalty income from patent is taxed at concessional tax rate of 10%.
- iii. Section 35(1)(i) allow deduction for any expenditure (not be of capital nature) laid out or expended on scientific research
- iv. Section 35(1)(iv) allow deduction for any capital nature expenditure laid out or expended on scientific research

### (iv) Government driven strong pharma supply chain:

In the present scenario, Indian pharma companies are depending on Imports from various countries such as China for drugs/intermediates/raw materials. Indian companies that manufacture these products in India are unable to compete with the import market in terms of pricing & capacities. As a result, only a few established companies are able to manufacture certain raw materials/chemicals/APIs that are generally imported. Many companies are not able to grow and sometimes even survive under such conditions. The proposed solution is to Identify the products/ intermediates/ raw materials that cater to the needs of Indian markets; Focus on these products and if possible, promote that such products should be manufactured in India & Incentivize via funding the development of such products, government subsidies for certain key materials, guidelines to be granted to keep the R&D activities in India at the top & developing technology through Indian Institutions and partnering with Indian manufacturers.

### (v) Accelerated path for approval of products related to Covid-19:

A special accelerated path for approval of products related to Covid-19 may be made to move new treatments to patients as quickly as possible, while at the same time finding out whether they are helpful or harmful. The clinical trials that are testing new treatments for COVID may be supported so that valuable knowledge about products' safety and effectiveness is obtained.

The companies have done major CSR activities which include donations to PM cares fund, State Minister's Fund, distribution of Sanitizers, Masks, Immunity boosters, Food donation, Food prep kits-(Groceries & Vegetables), providing medical equipment, and sanitisation of localities on regular basis. The companies have also created awareness among the people on social distancing.

In the ongoing fight against Coronavirus, a 100 bed quarantine facility has been created at the Zydus Medical Hospital, Dahod. The hospital, located at a vantage point close to the Panchmahal and Chhota Udepur Districts in Gujarat, Jhabua District and Alirajpur district of Madhya Pradesh and Banswara of Rajasthan, Dahod has been serving as a healthcare hub for needy and underprivileged patients. In 2018, Dahod was adopted as one of the 'aspirational districts' among 108 others by NitiAayog.

Several companies amid the unprecedented crisis, have gone all out to extend support and provide essential commodities where the need is the most. The company has enabled supply of food, medicines, personal protective equipment (PPE), etc. to the underprivileged, meals to the returning migrant population and support to the frontline warriors, across regions.

PI Industries has joined forces with local administrations in several states to fight corona. PI Industry teams swiftly obtained permissions from the government and demonstrated the potential of our hi-tech spraying application services in covering large areas for sanitization. Starting with Andhra Pradesh and Telangana, sanitization drives are continuing around the country in Punjab, Haryana, Gujarat and Delhi-NCR region.

It is pertinent to understand that access to as much information as possible will help in better management of health of people in current situation and this report would provide useful information, would help in dissemination of knowledge, explore new opportunities and also encourage the R&D people associated with these industries. Also, the institutes, NGOs, government departments and industry need to work in synergy for a coordinated COVID-19 response to overcome this crisis.

#### Acknowledgements:

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#### Disclaimer:

The contents of the report are collated based on the information submitted by the industries in the online questionnaire format. Due efforts have been made to provide information as accurate as possible and any mistake is inadvertent. The presentation of the data, facts in this publication and the opinion expressed therein are based on the data submitted by the industries and not necessarily those of DSIR and cannot be held accountable for above.



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