DBT’s Efforts to combat COVID-19
Overview

Taking note of the unprecedented scenario of the COVID19 pandemic, the Department of Biotechnology (DBT) prepared a roadmap early on with a focus on diagnosis, treatment and most importantly, prevention. DBT, its Autonomous Institutions (AIs) and the Public Sector Undertaking, Biotechnology Industry Research Assistance Council (BIRAC), have been working relentlessly over the past one year to develop effective interventions for combating the pandemic. Highlights of major activities include:

- Support for >100 projects in the thematic areas of vaccines, diagnostics and therapeutics. Enabling 7 vaccine candidates by industry and 8 candidates by academia
- 5 vaccine candidates, 19 clinical trial sites, 6 facilities for immunogenicity assays and animal challenge models, facility augmentation for Covaxin production, supported under Mission COVID Surksha.
- THSTI bio-assay laboratory recognized by Coalition for Epidemic Preparedness Innovations (CEPI), under their network of 7 global laboratories.
- Organized training programs for strengthening clinical trial capacities in neighboring countries under PACT initiative
- COVID 19 testing at 9 DBT AIs, approved as Hubs for their respective City/Regional clusters.
- Rapid scale-up of manufacturing of indigenous COVID-19 diagnostic kits with a production capacity of about 15 Lakh kits/day and deployment of nation’s first infectious disease mobile laboratory in Haryana.
- Supporting genomic surveillance of emerging variants of SARS-CoV-2, through INSACOG initiative
- 5 COVID19 Biorepositories with ~57,000 samples available to academia and industry.
- Development of therapeutics from natural products in partnership with M/o AYUSH.
- Nearly 50 BIRAC supported start-ups have developed innovative products for COVID19.

A summary of the activities undertaken by DBT, DBT-AIs and BIRAC, in combating the pandemic is provided in the document. Major updates on the COVID-19 related activities of DBT as on October 14, 2021 are included as Annexure-I. A brief on services / facilities offered by DBT AIs is enclosed as Annexure -II.
COVID-19 – Delivering Solutions for Healthcare Challenges

I. Supporting COVID-19 research activities under DBT-BIRAC COVID-19 Research Consortium

- The Department of Biotechnology (DBT) and its Public Sector Undertaking, Biotechnology Industry Research Assistance Council (BIRAC), have published a "Request for Proposal (RFP) for COVID-19 Research Consortium" as part of the comprehensive efforts to facilitate development of indigenous research solutions to tackle COVID-19. A total of 103 proposals across academia, public funded research institutions and industry are being supported across the thematic areas of vaccines and supporting ecosystem (17); diagnostics and facilities for scale-up (45); therapeutics, repurposing and supporting ecosystem (22); other biomedical interventions (23). The outcomes of the projects being supported are summarized in the respective sections.
- 10th Vaccine Expert Committee (VEC) meeting was held on July 27, 2021 for progress review of the COVID-19 vaccine proposals funded under COVID-19 Research Consortium.
- The BRICS virtual meeting on “Immunization & COVID-19 Vaccine” was held on 23rd July to deliberate on issues pertaining to Virtual Vaccine R&D Centre for BRIC Countries; and IT enabled vaccine delivery platforms.
- Continued support is being provided to the recommended projects for further development.

II. Facilitating National efforts for COVID-19 vaccine development

a) Support for COVID-19 Vaccine development and manufacturing under Mission COVID Suraksha

- ‘Mission COVID Suraksha- the Indian COVID-19 Vaccine Development Mission’, was announced by Government of India (GOI) as part of the third stimulus package, Atmanirbhar 3.0, for promoting research and development of Indian COVID-19 vaccines. The Mission is led by the Department of Biotechnology (DBT) and is implemented by BIRAC, a Public Sector Undertaking (PSU) of DBT, at a total cost of Rs. 900 Cr. for 12 months. The goal of the Mission is to accelerate the development of at least 5-6 COVID-19 vaccine candidates and ensure that some of these are brought closer to licensure and introduction in the market for consideration of regulatory authorities and for introduction in public health systems.
- 5 vaccine candidates are being supported, including: mRNA platform-based vaccine by Gennova Biopharmaceuticals Ltd., Pune; Recombinant protein Subunit vaccine by Biological E; DNA Vaccine by Cadila Healthcare Limited; Novel intra nasal vaccine by Bharat Biotech International Limited; VLP vaccine candidate by Genique Life sciences Pvt. Ltd.
- 3 Immunogenicity Assay Laboratories for SARS-CoV-2 clinical immunogenicity studies are being supported at: IRSHA Pune; Syngene International Ltd, Bengaluru; THSTI, New
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Delhi. The assays being established include Total IgG measurement, pseudovirus neutralization assays, PRNT assays, microneutralization assay, cell free surrogate assays, ELISPOT and CMI assays. THSTI and IRSHA are already providing the services to vaccine developers.

- 3 Animal Challenge facilities at ILS Bhubneshwar; NCBS / inStem, Bangalore; and IISc, Bangalore are being supported for: development of hamster models; generation of indigenous transgenic mice; maintenance and breeding of imported transgenic mice. 19 clinical trial sites are also being supported.

- Further, in order to enhance capacities for augmented vaccine production, support to BBIL and three Public Sector Enterprises (PSEs), (Indian Immunologicals, Hyderabad; Haffkine Biopharmaceuticals, Mumbai; Bharat Immunologicals and Biologicals, Bulandshar), is being provided to make them ready with enhanced capacities to support augmented production of Covaxin, over the next 6-8 months. The Department of Biotechnology (DBT) is also facilitating technology transfer for Covaxin production to Gujarat COVID Vaccine Consortium (GCVC), comprising of Hester Biosciences, OmniBRx Biotechnologies Pvt Ltd, and Gujarat Biotechnology Research Centre (GBRC), Department of Science and Technology, Govt. of Gujarat.

- The process of technology transfer for COVAXIN production from BBIL to the PSEs is in progress, as part of the voluntary licensing process. The efforts are expected to boost the production capacity of COVAXIN from current 15-18 million/month to 80 million/month by year end.

- The Republic Day tableau for 2021, by the Department of Biotechnology depicting ‘India’s Fights against COVID-19’ was adjudged the best tableau amongst the Ministries and Departments of Government of India.

b) Support for Vaccine development under DBT-BIRAC COVID-19 Research Consortium

- 17 proposals were supported under the DBT-BIRAC COVID-19 Research Consortium Call for vaccine development and research resources, with funding being routed through National Biopharma Mission and Ind-CEPI Mission. Seed funding was provided for pre-clinical development of vaccine candidates including: DNA vaccine candidate (ZyCoV-D by Zydus Cadila); mRNA vaccine candidate (HGCO19 by Gennova Biopharma); Vesiculovax platform (Aurobindo Pharma); Recombinant subunit vaccine (Biological E); Recombinant Adeno associated virus based vaccine (Intas Pharmaceuticals); Active virosome vaccine (Seagull BiosolutionsPvt Ltd); Intranasal Mucosal Vaccine for COVID-19 Infection (Institute of Chemical Technology) Virus Like Particle vaccine candidate by National Institute of Biomedical Genomics; repurposing of BCG vaccine for COVID-19; mRNA Vaccine candidate (CMC, Vellore). Additionally, projects encompassing development of animal models, pseudovirus platforms, devices for vaccine administration and large-scale manufacturing of Spike protein have also been supported.

c) Upgradation of DBT’s laboratories as Central Drug Laboratories (CDLs) for Vaccine Testing
Based on the recommendation of the Cabinet Secretariat, two DBT Autonomous Institutes - National Institute of Animal Biotechnology (NIAB), Hyderabad and National Centre for Cell Science (VSV platform), Pune, have been identified for upgradation as Central Drug Laboratories (CDLs), for vaccine testing. Based on the Detailed Project Report (DPR) from NIAB and NCCS, shared with MoHFW, in principle approval has been accorded by the PMO, whereby, the PM CARES Funds Trust has transferred Rs. 9,22,00,000/- and Rs. 11,19,60,000/- to the dedicated bank accounts of NIAB and NCCS, Pune, respectively, on March 6, 2021.

NIAB and NCCS have been notified as Central Drug laboratories by Ministry of Health and Family Welfare.

At NIAB, Hyderabad: Civil work for permanent facility is underway. A presentable clean room paneled structure is ready for dummy physicochemical testing runs. Functionality preparedness activities including training of personnel at CDSCO and arrangement of equipment in the lab, are complete.

At NCCS, Pune: Sterility testing for the mandatory fourteen days period and mock runs of testing for confirmation of functionality of the facility have been completed.

d) Regulatory facilitation by DBT

The Department has proactively taken several steps to support researchers and industries involved in research on COVID-19 and issued Biosafety Regulations for COVID 19, in close coordination with CDSCO, for facilitating expedited approvals / clearances. The following Biosafety Regulations for COVID 19 have been provided by the Review Committee on Genetic Manipulation (RCGM) and Drugs Controller General of India (DCGI):

- Rapid Response Regulatory Framework: to provide expedited regulatory approvals for all diagnostics drugs and vaccines
- Regulations and Guidelines for recombinant DNA Research & Biocontainment-Interim Guidelines of laboratory biosafety to handle COVID 19 specimens for R & D purpose
- Also, the Department of Biotechnology has worked with the NITI Aayog to provide Guidelines for sharing of Bio-specimen & Data for Research on COVID-19.

e) Cooperation with Russia for clinical development of the Russian vaccine Sputnik V

Based on discussions of Government of India with Russian Direct Investment Fund (RDIF), a Confidentiality Disclosure Agreement (CDA) was signed between Biotechnology Industry Research Assistance Council (BIRAC)- a Public Sector Undertaking (PSU) of DBT and RDIF, for advancing the development of Sputnik V in India.

Dr. Reddy’s Laboratories Ltd. (DRL) has been identified to undertake late-stage clinical trials of Sputnik V in India. DRL has partnered with BIRAC for advisory support on clinical
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trials and Translational Health Science and Technology Institute (THSTI), an Autonomous Institute of DBT, has been identified to provide immunological assessment for the clinical trials of Sputnik V.

- Emergency Use Authorisation for Sputnik V, in India, was approved in April, 2021.
- To expand the manufacturing capacity of Sputnik V in India, 6 Indian manufacturers have been identified including Hetero Biopharma, Virchow Biotech, Stelis Biopharma, Gland Pharma, Panacea Biotec and Shilpa Medicare. Technology transfer by Russian Direct Investment Fund (RDIF) is in process. The domestic production of Sputnik V is expected to begin by August, 2021.
- Sputnik V has been launched on a soft pilot basis in nearly 50 cities and towns in India. Nearly 195,000 doses of Sputnik V have been administered in India so far.
- RDIF and Serum Institute of India, have partnered for production of Sputnik V in India. Technology transfer following DCGI approval, is underway and the first batches are expected in September.
- The Gamaleya Research Institute of Epidemiology and Microbiology reported that the neutralizing capacity of Sputnik V is effective against new variants of SARS-CoV-2. The results were was published on 12th July 2021, in a leading international Journal, which may be accessed at the link https://doi.org/10.3390/vaccines9070779.
- The 32nd Standing Technical Sub-Committee Meeting of the National Technical Advisory Group on Immunization (NTAGI) was held on 29th July, 2021 to deliberate on issues pertaining to the current status of manufacturing of Sputnik V, by Indian CROs and regulatory issues for introduction of Sputnik Light in India; Review dosing interval between two doses of COVID-19 vaccines; Number of COVID-19 doses required for individuals completely recovered from confirmed COVID-19 in past; and Single arm Vaccine Efficacy Trial; COVID-19 vaccine development and manufacturing; and JE vaccine formulation.

f) Efforts for vaccine development by DBT- Autonomous Institutes

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Institute</th>
<th>Platform</th>
<th>Current status</th>
</tr>
</thead>
</table>
| 1.    | National Institute of Immunology (NII), New Delhi | Protein-based subunit    | • Developed a novel indigenous RBD based candidate vaccine using E.coli. The process of evaluating the efficacy of protein-based subunit vaccine in animal model is being studied.  
• CDA with Cadila Pharma signed for pre-clinical development. |
| 2.    | National institute of Biomedical genomics (NIBMG), Kalyani | Virus Like Particle (VLP) | • Novel baculovirus expressed VLP based vaccine candidate being developed. VLP characterization has been completed; preliminary immunogenicity study is started; Generation of VLPs incorporating |
| 3. | International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi | VLP | • Developing yeast-expressed RBD-VLP based COVID-19 vaccine candidate; pre-clinical studies in progress. |
| 4. | Translational Health Science and Technology Institute (THSTI), Faridabad | Self-amplifying mRNA | • Pre-clinical studies underway |
| 5. | National Centre for Cell Sciences (NCCS), Pune | VSV platform | • Pseudovirus production established; Mice immunized with the pseudovirus and strong antibody response observed and tested. Subsequent booster dose induced a potent IgG response and also, IgM & IgA antibodies induced. |

### III. International Partnerships for accelerating COVID-19 vaccine development

#### a) Participation of the Government of India in the ACT -Accelerator (ACT-A)
- The Access to COVID-19 Tools (ACT) Accelerator is a collaborative taskforce launched by World Health Organization (WHO) to promote the development, production and equitable distribution of vaccines, diagnostics and therapeutics for COVID-19.
- The key partners in this initiative are WHO, Coalition for Epidemic Preparedness Innovations (CEPI), Bill & Melinda Gates Foundation (BMGF), Wellcome Trust and Global Alliance for Vaccines and Immunizations (GAVI).
- The ACT accelerator has three verticals, one each for Vaccines, Therapeutics and Diagnostics. In June, 2020, the intent of Government of India to partner in this alliance was conveyed, whereby, DBT was identified as the focal point for the R&D and manufacturing.
- The ACT-Accelerator is represented by Dr Vinod Paul, Member (Health), NITI Aayog; Professor K. Vijay Raghavan, Principal Scientific Adviser to the Government of India; Dr.Renu Swarup, Secretary DBT and Sh. Rajesh Bhushan, Secretary, Ministry of Health and Family Welfare.
- The ACT-A Facilitation Council (FC) has been constituted to provide oversight and review the progress of the accelerator, mobilize resources and engage with stakeholders. The
Government of India has nominated Sh. Lav Agarwal, Joint Secretary, Ministry of Health and Family Welfare, as national focal point from India for ACT-A Facilitation Council.

- So far six meetings of the ACT-A FC have been held and a high-level finance ministries’ meeting were held. The meetings are intended to help the international community address key strategic, policy and financial issues relating to development, production, procurement and distribution of vaccines, therapeutic and diagnostic equipment.

- The ‘Vaccine Pillar’ of the ACT Accelerator is known as COVAX and is co-led by Coalition for Epidemic Preparedness Innovations (CEPI) and Gavi (The Vaccine Alliance). The COVAX facility aims to get 2 billion doses of COVID vaccine by the end of 2021 and assures the participating countries for vaccine doses to cover 20% of their country’s population.

- In the G7 Leaders’ summit held on 13th June, 2021, a commitment of 870 million doses of COVID vaccines was made for COVAX facility, for the years 2021 and 2022, with the aim to deliver at least half the doses, by the end of 2021. As of 25th June, 2021, a commitment of USD 17.7 billion was received by the ACT-A.

- Through a communication to Government of India, CEO Gavi, confirmed that India is eligible to receive official development assistance (ODA) support through the COVAX AMC, to receive doses of COVID-19 vaccines through the COVAX Facility.

- A strategic review of ACT Accelerator to inform decision-making on enhancing its current functioning and about its potential role beyond the 1st quarter of 2022, is being proposed by the ACT-A. In this regard, responses for the Request for Proposals, published on the United Nations Global Marketplace website are being invited.

- A meeting between Representatives of Quad Vaccine Partnership, Gavi, CEPI and WHO was held on 13th July 2021, as part of reiteration of support by Quad Vaccine Partnership to the COVAX facility, in combating COVID-19.

- WTO-WHO High-Level Dialogue on Expanding COVID-19 Vaccine Manufacture to Promote Equitable Access was held on July 21, 2021. The meeting involved discussions on amplifying work of COVAX Manufacturing Task Force; Engaging key players from governments, private sector, international organizations and civil society in cooperative effort to advance global equitable and sustainable access to COVID-19 vaccines; Maintaining momentum towards more systematic and coordinated international action.

- To provide political support the COVAX Manufacturing Task Force led by the WHO, Gavi and CEPI, the Access to Covid Tools Accelerator (ACT-A) Facilitation Council Vaccine Manufacturing Working Group (VMWG) was set up, which was also politically mandated by G20.

- The ACT-A FC VMWG focuses on short-, medium and long-term measures to address COVID-19 vaccine manufacturing challenges. So far, eight meetings of the VMWG have been held since August 2021. Based on the extensive discussions and inputs received from member countries, the VMWG developed the recommendations to the G20 in respect of vaccine manufacturing to optimize and strengthen supply chains. Ahead of the 7th ACT-FC Meeting on 15th October, 2021 and the G20 Summit, the VMWG has circulated the ‘Working Group Report to the G20’, elaborating on the workstream recommendations.
b) Participation of DBT in the Quad partnership

- The Quad Cooperation is an alliance between four countries including the United States, Australia, India, and Japan to accelerate the global COVID-19 response and to build longer term global health security.
- A major focus was on international cooperation to ensure equitable access to COVID-19 vaccines. Considering India’s strengths in vaccine manufacturing, India has been identified to provide manufacturing support.
- DBT participated in the first Quad Leaders’ Summit held in March, 2021, whereby, it was proposed that a Quad Vaccine Expert Group (VEG) may be constituted to execute Quad partnership activities to improve availability and delivery of COVID-19 vaccines globally and within the Indo-Pacific region. 03 meetings of the Quad VEG have been held so far.
- As an outcome of the Summit, Biological E has agreed to work with the US Development Finance Corporation (DFC) to enhance production of Johnson & Johnson’s COVID-19 vaccine candidate. Further, DBT is closely coordinating with MEA on strengthening the manufacturing capacities in India as a part of Quad Initiative.

c) India-PACT-Programme (Partnerships for Accelerating Clinical Trials)

- The Partnerships for Advancing Clinical Trials (PACT) programme is a science diplomacy initiative of the Department of Biotechnology, implemented by BIRAC and Clinical Development Services Agency (CDSA).
- The national partners include Ministry of External Affairs, Ministry of Health and Family Welfare, Indian Council of Medical Research (ICMR), Central Drugs Standard Control Organisation (CDSCO), and the international partners include Coalition for Epidemic Preparedness Innovations (CEPI), World Health Organization (WHO) and National Institute of Health (NIH).
- The programme is aimed at advancing vaccine development activities in neighbouring countries and conducting training programmes to strengthen clinical trial capacity in neighbouring countries. The trainings envisaged an in-depth coverage of ‘Good Clinical Practice; Ethical considerations in clinical research; Good Clinical Laboratory Practice; Novel vaccine development and immunization policy in a pandemic’.
- Series 1 of the PACT training program was held during Sep-Dec 2020 wherein, a total of 771 candidates from Afghanistan, Bangladesh, Bhutan, Maldives, Mauritius, Nepal and Sri Lanka, participated in the 10 sessions.
- The 2nd E-course series was held during Feb-Apr, 2021, whereby, 1758 candidates participated across the 10 sessions of from Afghanistan, Bahrain, Bhutan, Gambia, Kenya, Myanmar, Nepal, Oman, Somalia, Vietnam and USA.

IV. Efforts for COVID-19 Testing and Diagnostics

a) Testing for COVID-19

- DBT has identified 21 City /Regional clusters to scale up covid testing as a part of the Hub and Spoke model. Nine Autonomous Institutes (AIs) of DBT have been approved as testing
centres for COVID-19 diagnosis. These DBT AIs have also been identified as hubs for their respective regions.

- For the July-Dec 2020 duration, 12 hubs/spokes performing COVID tests have been supported by the Department for the manpower component. For Jan-June 2021 duration, 11 hubs/spokes have been supported, for the manpower and consumable component.
- The information pertaining to testing activity for the 14 city/regional clusters in the week from Sep 17, 2021 to Oct 13, 2021 is given below:

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<th>S.No</th>
<th>Title of the activity</th>
<th>KPIs</th>
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<td></td>
<td>Punjab (Mohali)</td>
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<td>254</td>
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**750 samples were tested in Faridabad region by the Mobile testing I-Lab. 79,171 samples were tested in the 13 city/regional clusters during the past one week. Total samples tested so far through this hub and spoke model since 15th April, 2020 are 65,74,625.

- Andhra Pradesh Med Tech Zone (AMTZ) is a common shared facility to manufacture diagnostic kits and ventilators. AMTZ is operationalizing indigenous manufacturing of kits and reagents for testing. COVID-19 related activities were taken up by AMTZ under the DBT-BIRAC-AMTZ-COMManD (COVID Medtech Manufacturing Development) strategy.
- Andhra Med Tech Zone (AMTZ) has achieved a production capacity of >10 Lakh RT-PCR COVID-19 diagnostic tests/day and >1 Lakh VTM/day. AMTZ has so far manufactured the following: RT-PCR tests – 8.2 Cr tests, Viral Transport Medium – 8 lakh units, IR Thermometers – 2500 units, Ventilators – 10923 units, Pulse – Oximeters 200 units.
- AMTZ also developed the Nation’s first first I-lab (infectious disease diagnostic lab) to ramp up the Covid testing in rural and inaccessible areas. The first I-Lab is attached to the THSTI hub. A total of 26993 tests have been performed by the mobile lab from Faridabad region.

b) Constitution of National Biomedical Resource Indigenization Consortium (NBRIC)
The Department of Biotechnology (DBT) constituted NBRIC in a Public-Private Partnership mode to foster indigenous innovation focused on developing reagents, diagnostics, vaccines and therapeutics for COVID19.

NBRIC is led by ABLE (Association of Biotechnology Led Enterprises) and CII (Confederation of Indian Industry), and is hosted by C-CAMP (Centre for Cellular and Molecular Platforms).

More than 300 Indian Manufacturers registered under the consortium for the manufacturing of nearly 15 major components/reagents.8 NBRIC members have developed, manufactured and deployed novel, low-cost, gold standard RT-PCR test kits, ELISA rapid antibody testing kits and enzymes/reagents key to running these test kits.

c) Support for development of diagnostics under DBT-BIRAC COVID-19 Research Consortium call

- 45 projects are being supported through DBT-BIRAC COVID-19 Research Consortium Call for production of PCR and serology-based diagnostic kits at mass scale and indigenous development of good quality primers and probes.
- First Indigenous kit for diagnosis of COVID-19 developed by a BIRAC supported start up (MyLab) in Pune, is producing nearly one lakh kits per week. More than 90 lakh kits manufactured till date.
- Ubio Biotechnology Systems and Dhiti Life Sciences developed indigenous Antibody and Antigen detection kits are in market. Apart from this, Molecular Transport Medium (MTM) and Nucleic acid extraction kits developed by HuwellLifesciences are also available in market.
- The number of products manufactured till date by DBT-BIRAC supported companies are mentioned below:
  - Mylab: RT PCR - 36 Lakhs and Antigen detection test 54 Lakhs
  - Ubio Biotechnology Systems: Antibody detection test: 80000, Antigen detection test: 2000000 and RT-PCR tests: 500000
  - Dhiti Life Sciences: 35 lakhs Ag detection test, 3 Lakhs Antibody detection tests

d) Efforts for development of diagnostics by DBT Autonomous Institutes

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Institute</th>
<th>Current status</th>
</tr>
</thead>
</table>
| 1.    | Translational Health Science and Technology Institute (THSTI), Faridabad | • Developed a panel of Aptamers for diagnosing Coronavirus disease  
• DNAzyme Visual detection-based method developed. |
| 2.    | International Centre for Genetic Engineering and Biotechnology | • Developed an indigenous total antibody test kit called ‘COVID-19 [IgM, IgG, IgA] MICROLISA’ test  
• MoU established between ICGEB and J Mitra& Co and efforts underway for the development of an antigen test for COVID-19. |
<table>
<thead>
<tr>
<th>Institution</th>
<th>Location</th>
<th>Achievements</th>
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<tbody>
<tr>
<td>(ICGEB), New Delhi</td>
<td></td>
<td></td>
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<tr>
<td>3. Rajiv Gandhi Centre for Biotechnology (RGCB), Trivandrum</td>
<td></td>
<td>Developed COVID-Anosmia Checker: A rapid and low-cost alternative tool for mass screening of COVID-19</td>
</tr>
<tr>
<td>4. Institute for Stem Cell Science and Regenerative Medicine (InStem), Bangalore</td>
<td></td>
<td>• Combinatorial sensing protocol algorithm validated by scientists at inStem • Partnering with CCAMP in the InDx programme to review quality and quantity of indigenously developed kits.</td>
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<tr>
<td>5. National institute of Animal Biotechnology (NIAB), Hyderabad</td>
<td></td>
<td>• Working on improving biosensor-based tools and device for detection of S protein antigen of SARS-CoV-2, for better sensitivity and specificity. • Developed a mammalian cell system expressing S protein, for performing fusion assays with lung or other cells, which can be used for screening molecules which can block interaction of SARS-CoV-2 with cellular receptor.</td>
</tr>
<tr>
<td>6. National Agri-food Biotechnology Institute (NABI), Mohali</td>
<td></td>
<td>• Developed lateral flow assay (LFA) strip; using aptamers against nucleocapsid peptide molecules and citrate gold nanoparticles to enhance detection limit.</td>
</tr>
<tr>
<td>7. National Institute of Immunology (NII), New Delhi</td>
<td></td>
<td>• A low cost point-of-care serology test (Hemagglutination (HAT) assay) for measuring IgG, IgM and IgA</td>
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V. Facilitating research efforts for COVID-19 Therapeutics

a) Support for development of therapeutics under DBT-BIRAC COVID-19 Research Consortium call
• 22 projects are being supported under DBT-BIRAC COVID-19 Research Consortium call for development of novel indigenous therapeutic interventions for COVID-19. Commercial scale purification and clinical trials of immunoglobulin G (IgG) from convalescent
individuals, manufacturing equine hyper immunoglobulin against COVID 19 infection and development of 3D Lung Organoid models are noteworthy.

- Virchow Biotech, supported under National Biopharma Mission, was approved by the Drug Controller General of India for conducting Phase II Randomised controlled multicentric Clinical Trials to evaluate safety and efficacy of COVID-19 Hyper-immunoglobulin in COVID-19 patients.
- DBT-BIRAC supported anti-viral drug - Virafin (pegylated interferon alpha-2b) by Zydus Cadila has been approved for emergency use for moderate COVID-19 infection.
- DBT-BIRAC supported Eyestem Research Pvt. Ltd. has developed human iPSC derived lung airway and alveolar epithelial cells for disease modelling and for testing potential therapeutics against COVID-19.

b) Development of COVID-19 Therapeutics by DBT Autonomous Institutes

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<tr>
<th>S.No.</th>
<th>Institute</th>
<th>Current status</th>
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<tbody>
<tr>
<td>1.</td>
<td>Institute of Life Sciences (ILS), Bhubaneshwar</td>
<td>- Immuno-profiling of COVID-19 positive patients using combination of approaches employing ELISA, Bioplex and mass cytometry to study immune response</td>
</tr>
</tbody>
</table>
| 2.    | Institute for Bioresource and Sustainable Development (IBSD), Manipur | - Preparation of several extracts of NER medicinal plants with anti-viral properties  
- Monograph on medicinal plants of North-East Region prepared and is available on the DBT portal.  
- Project entitled “Sub-Network 1: Studies on anti-SARS-CoV-2 activity of selected medicinal plants and formulations in cell culture model of virus infection” under “DBT-AYUSH Network on R&D Activities related to SARS-CoV-2 Virus and COVID-19 Disease” to be implemented and work is under progress. |
| 3.    | National Centre for Cell Sciences (NCCS), Pune | - Generation of virus-neutralizing human monoclonal antibodies against SARS-CoV-2: positive B cell clones secreting RBD-specific antibodies selected and neutralization efficacy studies underway. Almost 10 clones showed neutralization with the real virus, which are being characterized further. Four more clones were obtained, which yielded antibodies that bind strongly to the RBD. Their supernatants have been sent to BBIL to test for neutralization.  
- Developed Peptide-based therapeutics using machine learning to identify possible therapeutics for COVID-19. Out of the three peptides tested by an industry partner, one of the peptides, “P2”, showed 23% neutralizing of the COVID-19 pseudovirus at a concentration of 1000 µg/ml, while the neat peptide (without any dilution) at a
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| 4. | National Institute of Plant Genome Research (NIPGR), New Delhi | - Potential flavonoids have been purified and their antiviral activity is being tested, two flavonoids have shown significant viral inhibition in cell culture experiment. The 7-point IC50 determination of the selected flavonoids to check the minimal inhibitory concentration is going on.  
- Glucosinolates, glucomoringin (Moringa oleifera) and glucoraphanin (Brassica species) purified and efficacy of these molecules is being tested in animal cell line infected with SARS CoV2. Out of six tested biomolecules, one glucosinolate has shown significant viral inhibition in the cell culture experiment. |
| 5. | International Centre for Genetic Engineering and Biotechnology, Delhi | - Phase-2 trials on AQCH, a phyto-pharmaceutical drug as potential treatment for COVID-19 patients were initiated. The ethical clearance for one site has been obtained and the site-initiation is in progress.  
- Generated over 100 productive monoclonal antibody clones  
- Developing a cell-based assay for screening of chemical libraries for identifying new drugs/leads  
- SARS-CoV-2 Mpro protease was purified and novel inhibitors screened using Surface Plasmon Resonance kinetics and a 96-well format Enzyme inhibition assay  
- SARS-CoV-2 viral infections in VERO-E6 cell line were established |
| 6. | National Institute of Immunology (NII), New Delhi | - T-cell assays have been developed for studying the T-cell correlates-of-protection in COVID-19 and measuring the vaccine efficacy. |

concentration of 3mg/ml showed 57% neutralizing. These outcomes serve as a proof-of-concept, which could be scaled up as a project subsequently. Using the diverse sequences, 4 peptides have been identified, which have shown strong binding affinity against the main protease of SARS-CoV-2 (Mpro). Simulation studies suggest that the peptides are stable and further extended computational studies are required.  
- Development of Nanobodies as prophylactic and therapeutic candidates against SARS-CoV-2 virus. Screening of high-affinity nanobodies (Nbs) against SARS-CoV-2 proteins from the synthetic yeast surface display library and their characterization is underway. These nanobodies could potentially be used as neutralizing agents for SARS-COV-2 virus.
VI. Research efforts on SARS-CoV-2 genomics

a) PAN India 1000 genome sequencing initiative

- The Department of Biotechnology had launched PAN-India 1000 SARS--CoV-2 RNA Genome Sequencing programme in May, 2020.
- The consortium coordinated by National Institute of Biomedical Genomics (NIBMG-Kalyani), West Bengal and Five other National clusters including: ILS-Bhubaneswar;
Centre for DNA Fingerprinting and Diagnostics (CDFD)-Hyderabad; inStem- National Centre for Biological Sciences (NCBS)-IISc-Bangalore; NCCS-Pune. Other National Institutes and hospitals have also collaborated in this effort.

- As on date, the Consortium has successfully completed its initial goal of completing the sequencing of 2000 SARS-CoV-2 genomes with samples across 10 states covering different zones. Multiple lineages of SARS-CoV-2 were observed to be circulating in India, with a predominance of the A2a haplotype (20A/B/C) with D614G mutation.

b) Indian SARS-CoV-2 Genomics Consortium (INSACOG)

- The Indian SARS-CoV-2 Genomics Consortium (INSACOG) is a consortium of 37 Regional Genome Sequencing Laboratories (RGSLs) established with the overall aim is to sequence SARS-CoV2 from Covid-19 infections in India to monitor the emergence and community circulation of viral variants and variants of concern (VOC).
- A datahub for centralized storage, analysis and management of SARS-CoV-2 sequences from different Indian institutes has been established at NIBMG and IGIB.
- As on 13th September, 2021, INSACOG partner institutions have sequenced 82,983 samples and the line list with Pangolin lineage information for 60,043 sequences have been submitted to NCDC. Till date, 65,057 viral genome sequences from India shared in the global repository of sequences, GISAID. Of these 65,057 viral genome sequences, 50,970 are shared with INSACOG Tag in GISAID.
- INSACOG activities have been expanded covering the various aspects for sentinel surveillance, targeted sampling (Surge, Vaccine-breakthrough etc.), Hospital network samples sequencing for clinical correlation, and environmental surveillance (sewage samples etc.). This will allow good representative sampling to be done and also clinical cohort to be connected to understand the virus mutation epidemiologically.
- Discussions are underway to further expand the sequencing network as a ‘Hub and Spoke’ model, whereby, inclusion of private sequencing laboratories in INSACOG is being explored.

VII. COVID-19 solutions supported by BIRAC’s BioNEST network

- 50 BioNEST incubators spread across the country have responded to the Covid situation and collectively this network has nurtured 100+ Startup solutions for Covid.
- BIRAC recognizing the efforts has considered co-funding requests from two of the BioNEST Incubator Partners
  (i) IKP Knowledge Park for I-Co Fund to support upto 15 Startup solutions and
  (ii) C-CAMP for C-CIDA to support upto 10 Startups.
- 200+ Webinars have been conducted for business mentoring, Fund raising, Industry Connect, Legal advice and how to sustain in the Covid and post-Covid times. Over 20,000 Startups, Entrepreneurs, Researchers, Stakeholders have been reached.
- Regulatory facilitation of 250+ Startups through FIRST HUB and RIFC was done.
- BioNEST Incubators recognizing Startups difficult financial situation, have waived off 25-100% of incubation rentals for 3 months.
A new mask with germicidal fabric “G-fab” that traps and destroys microbes including COVID-19 has been manufactured by C-CAMP incubatee, M/s Color Threads Pvt. Ltd. The technology was developed by scientists at DBT-inStem.

CCAMP COVID-19 Accelerator (CCIDA) supported Dozee Health was awarded the Economic Times Innovation Award under New product/ Service innovation category, for their contactless health monitoring device, that can remotely monitor symptoms of COVID-19 even when asleep.

VIII. DBT-BIRAC support to Start-ups and Co-funding Partners

In view of a need to identify and provide fast track support to Health-Tech Startup solutions for immediate deployment (0-3 months) to address challenges of COVID-19, a Fast track Internal Review Committee was constituted at BIRAC to review and recommend the proposals that can be supported under COVID fund.

Funding has been disbursed to 7 Startups till now:
- Aarna Biomedical Products,
- Alpha Corpuscles,
- MicroGO,
- Ubiqare Health
- Ayu Devices
- Health Sensei
- DNA Xperts Private Limited

Two of the start-ups supported under the BIRAC’s Fast Track Internal Review Initiative- Aarna Biomedical Products and MicroGO LLP got a privilege to interact and present their product details before Hon’ble PM Shri Narendra Modiji at the DPIIT International Summit-Prarambh organized on 15th Jan 2021.

Additionally, BIRAC has also approved support to two Co-funding partners IKP and CCAMP for co-funding upto 25 Startups under the BIRAC’s mandate to foster market deployment of innovative solutions addressing Covid-19 challenges.

CCAMP supported start-up Shanmukha's mobile COVID testing lab Mitr, with ability to test 300 samples per day was launched in Uttarakhand.

Two of BIRAC supported Startup technologies - Blackfrog and Alfa corpuscles, were showcased to Secretary Pharma Dept. for evaluation and possible adoption for Immunization program based on merit.

C-CAMP COVID-19 Innovations Deployment Accelerator’s (CCIDA) start-up CoeoLabs developed a novel, multimodal & portable Continuous Positive Airway Pressure (CPAP) respirator that has been deployed in multiple hospitals across India. Efforts are on to incorporate automation in the device, to enhance functionality.

IX. Meetings, Webinars and Press-releases
The BRICS virtual meeting on “Immunization & COVID-19 Vaccine” was held on 23rd July to deliberate on issues pertaining to Virtual Vaccine R&D Centre for BRIC Countries; and IT enabled vaccine delivery platforms.

The IBSD jointly with Society for Ethnopharmacology (SFE), India and International Society for Ethnopharmacology (ISE), Switzerland had organised the Session-41 of the International Webinar Series - Reimagine Ethnopharmacology.
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**ANNEXURE-I**

Major updates on the COVID-19 related activities of DBT (as on 14.10.2021)

<table>
<thead>
<tr>
<th>DBT’s efforts to combat COVID-19 – Major updates of the week at a glance</th>
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<tbody>
<tr>
<td><strong>Vaccines</strong></td>
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</table>
Also, the 7th ACT-Accelerator Facilitation Council meeting is scheduled on 15th October 2021. The meeting will be focused on issues pertaining to stock availability and optimize ACT-A functioning considering Strategic Review findings and to align the new strategy and budget for Sep 2022. Ahead of the FC Meeting and the G20 Summit, the VMWG has circulated the ‘Working Group Report to the G20’, elaborating on the workstream recommendations.

As per the communication received from the COVAX Facility, the latest forecast depicts approximately 850M doses to be available in Q4 2021. The COVAX Facility is overseeing the supply management including scale-up, supporting successful delivery, connecting with supplier’s manufacturers and high-income countries to increasing supplies, continued pressure from bilateral deals with higher income countries and prioritisation of these deals over supply to COVAX, supporting efforts for obtaining regulatory approval.

Setting up of Vaccine testing Facility (VTF)

Regarding up-gradation of labs at National Institute of Animal Biotechnology (NIAB), Hyderabad and National Centre for Cell Sciences (NCCS), Pune as Central Drug Labs:
- NIAB and NCCS have been notified as Central Drug laboratories by Ministry of Health and Family Welfare
- At NIAB, Hyderabad: Civil work for permanent facility is underway. A presentable clean room paneled structure is ready for dummy physicochemical testing runs. Functionality preparedness activities including training of personnel at CDSCO and arrangement of equipment in the lab, are complete.
- At NCCS, Pune: Sterility testing for the mandatory fourteen days period and mock runs of testing for confirmation of functionality of the facility as have been completed.

COVID testing services
- 65.74 lakh samples tested as on date across the hubs.
- 26993 samples tested in I-lab.
<table>
<thead>
<tr>
<th>Therapeutics</th>
<th>At NCCS, Pune development of Nanobodies as prophylactic and therapeutic candidates against SARS-CoV-2 virus is underway.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genomics</td>
<td>Indian SARS-CoV-2 Genomics Consortium (INSACOG) is a consortium of 28 regional genome sequencing laboratories (RGSLs) jointly established by DBT and MoHFW along with CSIR and ICMR in January, 2021</td>
</tr>
<tr>
<td></td>
<td>The sequences are analysed to detect Variants of Concern (VoCs) such as B.1.1.7 (UK), B.1.351 (South Africa), P.1 (Brazil), and Variant of Interest such as B.1.617 (first reported from India) and other emerging Variants of Interest (VoIs).</td>
</tr>
<tr>
<td></td>
<td>Since inception INSACOG labs have sequenced 76,588 SARS-CoV-2 genomes. Out of these, 54,605 samples have been analyzed and assigned Pangolin lineage classification and submitted to the National Centre for Disease Control (NCDC) for public health correlation.</td>
</tr>
<tr>
<td></td>
<td>NIBMG, has sequenced 8,468 samples till date and the data for the same has been submitted to the consortium.</td>
</tr>
<tr>
<td></td>
<td>As part of the sequencing efforts, inStem, Bengaluru and NCCS, Pune has sequenced 360 and 117 samples respectively. The data for all the samples were submitted to the consortium.</td>
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<td></td>
<td>IBSD has started the INSACOG Sequencing facility at IBSD, Imphal. The facility was inaugurated by the Hon’ble Chief Minister of Manipur on 10th July, 2021.</td>
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<tr>
<td></td>
<td>IBSD has started sequencing process for 100 samples for SARS-CoV-2 in the institute. Sequencing of another 100 samples is being carried out in collaboration with ILS for the SARS-CoV-2 genome sequencing.</td>
</tr>
<tr>
<td></td>
<td>IBSD is providing technical support for establishing an INSACOG SARS-Cov2 Sequencing Laboratory at Pasteur Institute, Shillong, by the Govt of Meghalaya. This is expected to be ready by mid-August 2021.</td>
</tr>
<tr>
<td>Meetings, Webinars and Press Releases</td>
<td>The IBSD jointly with Society for Ethnopharmacology (SFE), India and International Society for Ethnopharmacology (ISE), Switzerland had organised the Session-41 of the International Webinar Series- Reimagine Ethnopharmacology.</td>
</tr>
</tbody>
</table>
Annexure -II

Biomedical interventions and Services / Facilities offered by DBT Autonomous Institutions

Since the beginning of the pandemic, the Autonomous Institutes (AIs) of the Department of Biotechnology have been engaged in performing cutting-edge research for development of effective interventions for COVID-19, along with provision of facilities and services to external biomedical researchers from industry and academia.

06 AIs of DBT, viz., Translational Health Science and Technology Institute (THSTI), Rajiv Gandhi Centre for Biotechnology (RGCB), Institute of Life Sciences (ILS), Regional Centre for Biotechnology (RCB), Institute for Bioresource and Sustainable Development (IBSD), International Centre for Genetic Engineering and Biotechnology (ICGEB) have been notified for evaluation of novel investigational products against COVID-19.

Additionally, 05 Autonomous Institutes (AIs) of DBT, viz., RGCB, ILS, THSTI, inStem and ICGEB have been identified to provide support as COVID-19 diagnostic kit validation centres.

04 AIs have been notified as COVID-19 biorepositories.

An overview of the development of other biomedical interventions for combating COVID-19 by DBT AIs and the facilities or services provided by DBT AIs is summarized below.

a) Other biomedical interventions

<table>
<thead>
<tr>
<th>Institute</th>
<th>Efforts</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi</td>
<td>• Artificial-Intelligence Based Classification of Chest X-ray Images into COVID-19 and Other Infectious Disease</td>
</tr>
<tr>
<td>Translational Health Science and Technology Institute (THSTI), Faridabad</td>
<td>• MoU with IISER, Pune for the project entitled “Epidemiological and Serological Surveillance of COVID-19 in Pune”.</td>
</tr>
<tr>
<td></td>
<td>• Collaborated with Maulana Azad Medical College, LokNayak Hospital, New-Delhi for the project entitled “Understanding human Covid-19 infections: a DBT India Consortium”.</td>
</tr>
<tr>
<td></td>
<td>• Developed standardized serological assays for immune profiling of clinical human samples</td>
</tr>
<tr>
<td></td>
<td>• THSTI entered into a Material Transfer Agreement to provide services to companies/institutes (Bharat</td>
</tr>
<tr>
<td>Institution</td>
<td>Activities</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>DEPARTMENT OF BIOTECHNOLOGY</strong>&lt;br&gt;MINISTRY OF SCIENCE &amp; TECHNOLOGY</td>
<td><strong>serums and Vaccines Limited, M/s VINS Bioproducts Ltd., M/s Syngene International Limited, M/s JSS Medical research India Pvt. Ltd., M/s SamarthaKrupa Life Sciences Pvt. Ltd., IIT Delhi</strong>&lt;br&gt;• Supporting population survey for COVID-19 IgG positivity in districts of Haryana</td>
</tr>
<tr>
<td><strong>Institute for Stem Cell Science and Regenerative Medicine (InStem), Bangalore</strong></td>
<td><strong>• A software pipeline named CoVa, to streamline sequencing was developed in partnership with NCBS and tested with data generated at InStem.</strong>&lt;br&gt;<strong>• Technology that binds a germicidal chemical to fabric (mask), developed</strong></td>
</tr>
<tr>
<td><strong>Institute for Bioresource and Sustainable Development (IBSD), Manipur</strong></td>
<td><strong>• Distributed masks, sanitizers and disinfectants to different sections of society</strong></td>
</tr>
<tr>
<td><strong>National Institute of Immunology (NII), New Delhi</strong></td>
<td><strong>• Efforts underway to study the response of SARS-COV-2 infection on Indian population and establishing the COVID-19-specific T cells as correlates-of-protection by using deep immunophenotyping and functional immunoprofiling of T cells.</strong>&lt;br&gt;<strong>• Initiated setting up BSL3 facility for Non-human primates, construction of facility is underway. 80% of the construction of ABSL3 facility for Non-Human primates have been accomplished and by September end it will be fully functional. This facility will be used for testing various infectious diseases including COVID 19 using monkeys.</strong>&lt;br&gt;<strong>• Breeding of mice expressing ACE2 receptor is underway to get stable lines for vaccine evaluation. NII has ACE2 receptor expressing mouse ready to carry out research work. NII have established required breeders of ACE2 Tg mice and at present NII is able to produce enough ACE2 Tg mice for various COVID 19 research.</strong></td>
</tr>
<tr>
<td><strong>National Centre for Cell Science (NCCS), Pune</strong></td>
<td><strong>• Study undertaken on microbial genomics of COVID-19-infected and uninfected individuals and findings were published in journal 'Microbes and Infection'.</strong></td>
</tr>
<tr>
<td><strong>Rajiv Gandhi Centre for Biotechnology (RGCB),</strong></td>
<td><strong>• FRET based cell line expressing ACE2 – Cerulean (FRET Donor) to study the kinetics of interaction</strong></td>
</tr>
</tbody>
</table>
Thiruvananthapuram | between h ACE2 and Soluble Spike (S1 Orange Fluorescent protein).
- A new SARS CoV2 pseudovirion platform using HeLa hACE2 - Histone m cherry stable cells
- A real time cell based assay for SARS CoV2 neutralising antibody quantitation developed and validated

b) Immunoassay laboratories at DBT AIs

<table>
<thead>
<tr>
<th>Institute</th>
<th>Tests Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total IgG</td>
</tr>
<tr>
<td>THSTI, Faridabad *</td>
<td>✓</td>
</tr>
<tr>
<td>RGCB, Trivandrum</td>
<td>✓</td>
</tr>
</tbody>
</table>

* Provided services to nearly 6 manufacturers

c) Animal Challenge facilities

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Institute</th>
<th>Animal models available</th>
<th>Current Status</th>
</tr>
</thead>
</table>
| 1.    | inStem& NCBS, Bengaluru      | ✓                       | Breeder pairs available for re-distribution
Preliminary characterization of transgenic mouse expressing the human ACE2 receptor
demonstrates symptoms
following SARS-CoV-2 infection that recapitulate the response of the hACE2 transgenic mouse from the Jackson Laboratory post infection

<table>
<thead>
<tr>
<th>No.</th>
<th>Institute</th>
<th>Type of kits validated</th>
<th>Number of kits validated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Institute of Life Science, Bhubaneswar</td>
<td>✓ ✓</td>
<td>Colonies of transgenic mouse and hamster models established</td>
</tr>
</tbody>
</table>
| 3   | National Institute of Immunology (NII), New Delhi       | ✓                       | ACE 2 Tg mouse infection models have been bred and characterized  
Breeding pairs is available for redistribution to other Institutes for COVID 19 related research |
| 4   | Translational Health Science and Technology Institute (THSTI), Faridabad | ✓ ✓                     | Hamster challenge studies offered as service to vaccine manufacturers |

**d) Diagnostic kit validation services**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Institute</th>
<th>Type of kits validated</th>
<th>Number of kits validated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Translational Health Science and Technology Institute (THSTI), Faridabad</td>
<td>RT-PCR and RT LAMP, TrueNAT, CRISPR, Antigen, Antibody, RNA Cartridge, VTM</td>
<td>10, 1, 1, 4, 5, 1, 3</td>
</tr>
<tr>
<td>2</td>
<td>Rajiv Gandhi Centre for Biotechnology</td>
<td>Antigen, ELISA</td>
<td>8, 2</td>
</tr>
</tbody>
</table>
### DEPARTMENT OF BIOTECHNOLOGY
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<table>
<thead>
<tr>
<th>S.No.</th>
<th>Institute</th>
<th>Type of Testing</th>
<th>Cytotoxicity testing</th>
<th>Antiviral testing</th>
<th>IC50 determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Regional Centre for Biotechnology (RCB), Faridabad</td>
<td>Cytotoxicity</td>
<td>1585</td>
<td>685</td>
<td>25</td>
</tr>
<tr>
<td>2.</td>
<td>International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi</td>
<td>Cytotoxicity</td>
<td>89</td>
<td>71</td>
<td>22</td>
</tr>
<tr>
<td>3.</td>
<td>Rajiv Gandhi Centre for Biotechnology (RGCB), Trivandrum</td>
<td>Cytotoxicity</td>
<td>60</td>
<td>32</td>
<td>--</td>
</tr>
</tbody>
</table>

#### 3.
Institute for Stem Cell Science and Regenerative Medicine (InStem), Bangalore
- RT-PCR
- CRISPR
- LAMP assay
- Saliva

**Validation of indigenously developed kits and reagents (InDx)**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Institute</th>
<th>Type of Testing</th>
<th>Cytotoxicity testing</th>
<th>Antiviral testing</th>
<th>IC50 determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Institute for Stem Cell Science and Regenerative Medicine (InStem), Bangalore</td>
<td>Cytotoxicity</td>
<td>60</td>
<td>32</td>
<td>--</td>
</tr>
</tbody>
</table>

#### 4.
Institute for Stem Cell Science and Regenerative Medicine (InStem), Bangalore
- RT-PCR

**Validation of indigenously developed kits and reagents (InDx)**

![Table of Institutes and Tests](image-url)
### COVID-19 Biorepositories

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Institute</th>
<th>Disease Status / Phenotype</th>
<th>No. of Samples Archived</th>
<th>Type of Samples</th>
<th>No. of samples Shared</th>
<th>Shared with</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>THSTI, Faridabad and RCB, Faridabad</td>
<td>RT-PCR confirmed COVID-19 positive</td>
<td>12581</td>
<td>Serum, NP/OP swab, Plasma, PBMCs</td>
<td>~ 11302 (Academia) &amp; Industry</td>
<td>Academia &amp; Industry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RT-PCR confirmed COVID-19 negative</td>
<td>3367</td>
<td>Serum, NP/OP swab</td>
<td>~ 4354 (Industry)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RT-PCR confirmed COVID-19 positive- Virus Isolates</td>
<td>3</td>
<td>Virus Isolates</td>
<td>3 (Academia)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post Vaccination Cohort</td>
<td>144</td>
<td>Plasma, PBMCs</td>
<td>144 (Academia)</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>ILS, Bhubaneshwar</td>
<td>RT-PCR confirmed COVID-19 positive patients (202)</td>
<td>RT-PCR confirmed positive patients = 202</td>
<td>Serum (202 individual patients)</td>
<td>Serum (150 individual patient specimen)</td>
<td>ILS scientists</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Symptomatic (91)</td>
<td>RT-PCR</td>
<td>Plasma (150 individual patients)</td>
<td>Plasma (150 individual patient specimen)</td>
<td>Imgenex, Bhubaneswar</td>
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<tr>
<td>DEPARTMENT OF BIOTECHNOLOGY</td>
<td>MINISTRY OF SCIENCE &amp; TECHNOLOGY</td>
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<tr>
<td><strong>Asymptomatic</strong> (111)</td>
<td>negative persons = 50</td>
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<td></td>
<td>Convalescent patients (after 1-2 months of recovery) = 35</td>
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<tr>
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<td>PBMC (50 individual patients)</td>
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<td></td>
<td>Oropharyngeal swab (150 individual patients)</td>
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<tr>
<td></td>
<td>Urine (120 individual patients)</td>
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<td></td>
<td>Stool (110 individual patients)</td>
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<tr>
<td><strong>Convalescent patients</strong></td>
<td>PBMC (20 individual patient specimen)</td>
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<tr>
<td></td>
<td>Oropharyngeal swab (150 individual patient specimen)</td>
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<tr>
<td></td>
<td>Urine (none)</td>
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<tr>
<td></td>
<td>Stool (100 individual patient specimen)</td>
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</table>

<table>
<thead>
<tr>
<th>3. ILBS, New Delhi</th>
<th>Covid positive</th>
<th>411</th>
<th>Serum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>12000</td>
<td>Nasopharyngeal swab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>51+</td>
<td>25</td>
</tr>
</tbody>
</table>

Prantae solutions, Bhubaneswar

Academia
<table>
<thead>
<tr>
<th>Code</th>
<th>Material</th>
<th>Value</th>
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<tbody>
<tr>
<td>7240</td>
<td>Plasma</td>
<td>128</td>
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<tr>
<td>2031</td>
<td>Buffy coat</td>
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<tr>
<td>315</td>
<td>Saliva</td>
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<tr>
<td>188</td>
<td>Stool</td>
<td>04</td>
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<tr>
<td>806</td>
<td>Urine</td>
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<tr>
<td>16</td>
<td>Pleural fluid</td>
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<td>30</td>
<td>PBMC</td>
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<td>53</td>
<td>Whole blood</td>
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<td></td>
<td>Convalescent serum</td>
<td>9084</td>
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<tr>
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<td>Convalescent plasma</td>
<td>3776</td>
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<td>Covid negative</td>
<td>4657</td>
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<td></td>
<td>Nasopharyngeal swap</td>
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</tr>
<tr>
<td>No.</td>
<td>Institution</td>
<td>Test Type</td>
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<td>------------------------------------------------</td>
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<tr>
<td>4.</td>
<td>InSTEM Bangalore</td>
<td>RT PCR confirmed COVID 19 positive</td>
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<tr>
<td></td>
<td></td>
<td>RT PCR Negative COVID 19 positive</td>
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<td>Post vaccination cohort</td>
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<tr>
<td>5.</td>
<td>NCCS Pune</td>
<td>SARS-CoV-2-infected &amp; convalescent</td>
</tr>
</tbody>
</table>
| patients | sharedsofar: 2 | (i) NCCS faculty: 107
(ii) Gennova Biopharmaceuticals Ltd, Pune: 15
b) PBMC samples were shared with -
(i) NCCS faculty: 2 |