



COGNIT



# THE GREAT INDIAN VACCINE R&D REVOLUTION: COVID IMPACT

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# Serum Institute Of India



**SERUM INSTITUTE  
OF INDIA PVT. LTD.**

**Corporate Office**

Pune, Maharashtra

**Website**

<https://www.seruminstitute.com/>

## About company/Institution

01

Serum Institute of India is now the world's largest vaccine manufacturer by number of doses produced and sold globally (more than 1.5 billion doses) which includes Polio vaccine as well as Diphtheria, Tetanus, Pertussis, Hib, BCG, r-Hepatitis B, Measles, Mumps and Rubella vaccines. It is estimated that about 65% of the children in the world receive at least one vaccine manufactured by Serum Institute. Vaccines manufactured by the Serum Institute are accredited by the World Health Organization, Geneva and are being used in around 170 countries across the globe in their national immunization programs, saving millions of lives throughout the world.

02

Serum Institute of India is ranked as India's No. 1 biotechnology company, manufacturing highly specialized lifesaving biologicals like vaccines using cutting edge genetic and cell based technologies, antisera and other medical specialties.

03

Serum Institute of India was founded in 1966 by Dr. Cyrus Poonawalla with the aim of manufacturing life-saving immuno-biologicals, which were in shortage in the country and imported at high prices. Thereafter, several life-saving biologicals were manufactured at prices affordable to the common man and in abundance, with the result that the country was made self-sufficient for Tetanus Anti-toxin and Anti-snake Venom serum, followed by DTP (Diphtheria, Tetanus and Pertussis) group of Vaccines and then later on MMR (Measles, Mumps and Rubella) group of vaccines.

# Serum Institute Of India (Cont'd)

## About Vaccine

- AstraZeneca has partnered with Serum Institute of India to supply, 1 billion doses of University of Oxford's potential COVID-19 vaccine, to low-and-middle-income countries (LMICs). Serum will provide 400 million doses before the end of 2020 as part of the arrangement.
- Oxford University, which is developing the potential vaccine in collaboration with AstraZeneca, has already announced the start of a Phase II/III trial of AZD1222 in about 10,000 adult volunteers. The significance of the partnership is that if all goes according to plan, millions of Indians will get their hands on COVID-19 vaccine shots produced by Serum well before the end of 2020.
- Besides securing a license to mass produce the University of Oxford vaccine, Serum has built an alliance with US biotech firm Codagenix. The latter will develop a live-attenuated vaccine (a weakened virus that doesn't cause disease but triggers immune response) to fight COVID-19, and Serum institute will invest in clinical trials, manufacturing and distribution.
- Serum has also tied up with Austrian biotech company, Themis Bioscience, for another COVID-19 vaccine candidate that uses measles virus as a vector to inject an antigen or protein of SARS-CoV-2.
- Serum also entered into a deal with Novavax. The Indian company sold its Czech Republic-based Praha Vaccines for roughly \$167 million to Novavax, an American vaccine developer, which will produce a COVID-19 vaccine candidate in that facility.

## Candidates

- AZD1222 (AstraZeneca)
- CDX-COV (Codagenix)
- ChAdOx1 nCoV-19 (Oxford vaccine)
- NVX-CoV2373 (Novavax)

## Collaboration if any

- AstraZeneca
- University of Oxford
- Codagenix
- Themis Bioscience
- Novavax

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# Indian Immunologicals



Corporate Office	Hyderabad
Website	<a href="https://www.indimmune.com/">https://www.indimmune.com/</a>

## About company/Institution

01

Indian Immunologicals Ltd (IIL) is the market leader in veterinary and human biologicals in India. It manufactures over 150+ products.

02

IIL operates one of the largest plants in the world for veterinary vaccines. IIL has adequate infrastructure and cold chain distribution capability to reach out to various parts of India and world market.

03

IIL is a major player in the human vaccine market in India, focusing on the pediatric and rabies vaccine segments. IIL is also a major supplier of pediatric vaccines to India's large Universal Immunization Programme.

04

IIL started manufacturing human vaccines in 1998 on a specific request by the Government of India. IIL is the second company in the world and first in India to launch purified Vero cell rabies vaccine (PVRV) and markets it under the brand – Abhayrab. This led to the discontinuation of use of older and unsafe sheep brain derived vaccine (also termed Nerve Tissue Vaccine – NTV) in the country.

05

Indian Immunologicals was established by the National Dairy Development Board (NDDB) in 1982, as its unit, with the objective of making vaccines available to farmers at an affordable price. The unit was corporatized as Indian Immunologicals Limited in the year 1999.

# Indian Immunologicals (Cont'd)

## About Vaccine

- Indian Immunologicals Ltd (IIL) has entered into a research collaboration agreement with Australia's Griffith University to develop a lead vaccine candidate for Coronavirus.
- Scientists from IIL and the University developing a 'Live Attenuated SARS – CoV-2 vaccine' vaccine using the latest codon de-optimization technology.
- The technology looks promising for developing a vaccine for prophylactic, active, single dose immunization against coronavirus in humans, with an enhanced safety profile.
- The vaccine is expected to provide long-lasting protection with a single dose administration with an anticipated safety profile similar to other licensed vaccines for active immunization

## Candidates

Live Attenuated SARS – CoV-2 vaccine

## Collaboration if any

Australia's Griffith University

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# Gennova Biopharmaceuticals



Corporate Office

Pune

Website

<http://gennova.bio/>

## About company/Institution

01

Gennova Biopharmaceuticals, headquartered in Pune, India, is a biotechnology company dedicated to the development, production and commercialization of bio-therapeutics to address life-threatening diseases across various indications. Company was established in 2006.

02

Since its inception, Gennova has continually focused on innovation in bio-manufacturing processes, as a means to develop safe, efficacious and affordable bio-therapeutics.

03

Incorporating recombinant DNA technologies together with innovative bio-manufacturing practices, Gennova has created a cutting-edge solution for manufacturing and successfully commercializing bio-therapeutics across cardiovascular, neurology, nephrology, and oncology markets.

04

Gennova has 7 products in the market: 5 biosimilars, 1 generic and 1 pioneering – 'first in the world' product.

05

Gennova's Tenectase® is a pioneering work where the first time globally a 3rd generation thrombolytic was approved for arterial ischemic stroke (AIS).

# Gennova Biopharmaceuticals (Cont'd)

## About Vaccine

### Vaccine 1:

- For the COVID -19 vaccine, being developed by Gennova, antibody genes will be used to produce recombinant antibodies in the laboratory, which, if successful in neutralising the virus, will become a perennial source of antibodies against this virus, both for prophylactic and therapeutic purposes.
- This work is being undertaken as part of an Anti- COVID consortium under the leadership of Vijay Chaudhary at the University of Delhi South Campus-Centre for Innovation in Infectious Disease Research, Education and Training (UDSC-CIIDRET), with the support of the Department of Biotechnology in the Ministry of Science and Technology and involving Amulya Panda at National Institute of Immunology and Sanjay Singh at Gennova Biopharmaceutical Limited, Pune (GBL)

### Vaccine 2:

- Auro Vaccines and Pune's Gennova Biopharmaceuticals got in to a collaboration to develop Covid 19 vaccine.
- Auro Vaccines' US subsidiary Profectus Biosciences has a vaccine platform called VesiculoVax that has shown to provide immune response against viruses such as Ebola and Chikungunya. It has shown to amplify B-cell immune response in diseases where rapid antibodies are needed to protect against a virus.

According to the company's website, the prototype vaccine has demonstrated single-dose protection in monkeys against a lethal challenge with Ebola and Marburg viruses, in studies conducted by a team from the US National Institute of Allergy and Infectious Diseases, Centers for Disease Control and Prevention and the Food and Drug Administration.

- Proflectus had in 2018 received funding from the Norway-based Coalition of Epidemic Preparedness Innovations to work on its vaccine candidate for the Nipah virus.
- Auro Vaccines, the Aurobindo Pharma subsidiary which acquired Proflectus in November 2019 for an upfront cash payment of \$11 million.

## Candidates

Next-generation mRNA vaccine candidate

## Collaboration if any

### Vaccine 1:

- University of Delhi South Campus-Centre for Innovation in Infectious Disease Research
- Education and Training (UDSC-CIIDRET)
- National Institute of Immunology
- With the support of the Department of Biotechnology in the Ministry of Science and Technology

### Vaccine 2:

Proflectus Biosciences (USA)

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# National Institute Of Immunology



## National Institute of Immunology राष्ट्रीय प्रतिरक्षाविज्ञान संस्थान

Corporate Office	New Delhi
Website	<a href="http://www.nii.res.in/">http://www.nii.res.in/</a>

### About company/Institution

01

The National Institute of Immunology (NII) is committed to advanced research with a view to understand body's defence mechanisms for developing modalities of immune system manipulation that can intervene with disease processes.

02

The institute's research thrust areas under immunology and related disciplines cluster in four main themes, namely, infection and immunity, molecular design, gene regulation and reproduction and development, where cutting edge research in modern biology is being carried out employing multiple overlapping disciplines of biochemistry, molecular biology, cell biology and structural biology.

03

The areas of interest under the above themes include the basic biology of T and B lymphocytes, elucidation of mechanisms used by the immune system in responding to infectious pathogens and characterization of the strategies used by a variety of pathogens to establish infection and disease. Another area of research involves analysis of the processes that control reproduction and development to understand genetic as well as epigenetic influences on development and function of the body and its defence mechanisms.

04

NII's interests also include the translational research in the area of vaccines and drug development. The research is focused on designing novel immunogens, anticancer agents and therapeutic inhibitors against pathogens of public health significance.

# National Institute Of Immunology (Cont'd)

## About Vaccine

- National Institute Of Immunology(NII), has formed a core team of ten topmost scientists from different streams which includes scientists from various fields like drug repurposing, antibody characterization, diagnostics etc., who can undertake a comprehensive research for developing a vaccine
- National Institute of Immunology has the following research plans on SARS-CoV-2 virus:
  - Design and evaluation of conjugate vaccine against Corona virus
  - Novel Vaccine evaluation platform
  - Use delivery and adjuvant system form improving the immunogenicity of candidate vaccine
  - Development of transgenic mouse model for SARS-CoV-2 virus
  - Development of antiviral against SARS-CoV-2 virus
  - Antibody based therapeutic Platform
  - Diagnostic Platform

## Other Input

BIRAC has brought in the National Institute of Immunology to develop a framework for evaluating the vaccines. All vaccine candidates that are being developed need to be evaluated in the pre-clinical stages and the NII will help in understanding the need of the manufacturers and developing various models for the same.

## Candidates

Antiviral of SARS-CoV-2

## Collaboration if any

BIRAC

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Corporate Office	Thiruvananthapuram, Kerala
Website	<a href="http://www.iisertvm.ac.in/">http://www.iisertvm.ac.in/</a>

## About company/Institution

01

The Indian Institute of Science Education and Research Thiruvananthapuram (IISER TVM) is dedicated to scientific research and science education of international standards.

02

Traditionally, teaching has been segregated from research in undergraduate science curricula in our country. The IISERs were established by the Ministry of Human Resource Development, Government of India, to bridge this dichotomy.

03

IISER TVM was founded in 2008. The institute aims to provide high quality education in modern science, integrating it with outstanding research at the undergraduate level itself, and to develop a spirit of enquiry cutting across disciplines.

04

IISER TVM is an autonomous institution offering a five-year BS-MS programme in addition to iPh.D and Ph.D. programmes in Biology, Chemistry, Mathematics, Physics and inter-disciplinary areas.

## About Vaccine

- As per the available reports on IISER (TVM), working on developing COVID -19 vaccine, a team at IISER (TVM) lead by V Stalin Raj, an Associate Professor at the Indian Institutes of Science Education and Research Thiruvananthapuram (IISER TVM) and one among a handful of Indian scientists, who are working on developing a vaccine.
- Stalin and his team began by cloning a protein called Spike which can be used to detect the antibodies for the virus. This can also be used for serological test.
- The team is also trying to develop adenoviral vaccine, which is essentially a vaccine that can be used against a multitude of diseases during the time of an outbreak.

### Candidates

Adenoviral vaccine

### Collaboration if any

None

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# Biological E.



**Biological E. Limited**  
Celebrating Life Every Day

Corporate Office

Hyderabad

Website

[www.biologicale.com](http://www.biologicale.com)

## About company/Institution

01

Established during the 'Swadeshi Movement' of India, Biological E. Limited (BE) started during a time when the nation sought access to critical healthcare products. Founded and led by Dr. DVK Raju, Biological E. Limited commenced its operations in 1953 as a biological products company manufacturing liver extracts and anti-coagulants.

02

With an objective of transitioning from treating diseases to preventing them, Biological E. Limited launched its Biotechnology Division (now Vaccines and Biologics Division) and commenced large-scale production of DPT vaccines as early as 1962.

03

Biological E. continues to evolve as an organisation and currently has four strategic business units: Branded Formulations, Speciality Generic Injectables, Synthetic Biology and Vaccines and Biologics.

04

At Biological E., the corporate philosophy is to help people celebrate life every day. To this end, they strive to develop, manufacture and make available to the public, affordable products that prevent and treat disease.

05

Its organizational efforts are focused on actualizing its corporate philosophy and its Mission, Vision and Values provide them a unifying framework for doing so.

# Biological E. (Cont'd)

## About Vaccine

- Adjuvanted protein subunit (RBD) is the type of candidate vaccine being used.
- Biologicals E are at the forefront, working with international partners to manufacture a vaccine for COVID-19.

### Candidates

Adjuvanted protein subunit (RBD)

### Collaboration if any

None

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# Panacea Biotec



Corporate Office	Delhi
Website	<a href="https://www.panaceabiotec.com/">https://www.panaceabiotec.com/</a>

## About company/Institution

01

Panacea Biotec is an Innovation driven Biotechnology Company doing Research and Development, Manufacturing, Sales, Distribution and Marketing of Pharmaceuticals, Vaccines and Biosimilars.

02

Panacea Biotec was set up in the year 1984, under the name of Panacea Drugs Private Limited with a commitment to make Innovative Products Affordable and Accessible to the masses. It got publically listed on Indian National Stock Exchanges in September 1995 as Panacea Biotec

03

Ardent Research and Development efforts have always been a great strength of Panacea Biotec. The main research areas are New Chemical Entities (NCE), New Biological Entities (NBE) Novel Drug Delivery System (NDDS) based pharmaceutical formulations, Novel peptides & human monoclonal antibodies and Vaccine development. The company has developed four distinguished, ultra-modern, state-of-art R&D centres in different locations, having internal capabilities for constant research, with over 300 highly professional and skilled scientists engaged in various aspects of research.

04

Panacea Biotec is witnessing a period of expansion across every aspect of our business from innovative products to customers in market, from manufacturing to regulatory approvals and thereby laying the foundation for translation of our vision in becoming greatest, largest and most admired biotechnology company in the World by 2020.

# Panacea Biotec (Cont'd)

## About Vaccine

- Panacea Biotec is advancing its response to address the unprecedented challenges of COVID-19 by collaborating with Refana, USA to make candidate COVID-19 vaccine widely accessible around the world in an equitable manner through a Joint Venture company based in Ireland.
- Under the collaboration, Panacea Biotec will be responsible for product development and commercial manufacturing, with the Joint Venture undertaking clinical development and regulatory submissions across the World. Both Panacea and Refana will undertake sales and distribution of the vaccine in their respective territories.
- Collaboration with Refana aims to manufacture over 500 million doses with over 40 million doses expected to be available for delivery early next year.
- Candidate vaccine is based on tried and tested technologies that have been proven over decades with existing vaccines. Whole inactivated viral vaccines have a higher probability of being safe and efficacious, given their long history and better understanding of their mechanism of action, which has been elucidated over many decades. Their vaccine leverages a dose-sparing Adjuvant to maximise the number of immunisations available for distribution.
- Additionally, intramuscular/sub-cutaneous mode of administration with pre-existing, compatible infrastructure ensures adequate supply chain availability until the last mile. This vaccine has the potential to become the Vaccine of Choice for the global fight.

## Other Input

This collaboration brings together the Panacea Biotec's expertise in vaccinology, R&D, manufacturing and distribution capabilities with Refana's Scientific team's strong ability to work on complex challenges through innovative technologies.

## Candidates

Vaccines targeting COVID-19

## Collaboration if any

Refana, USA

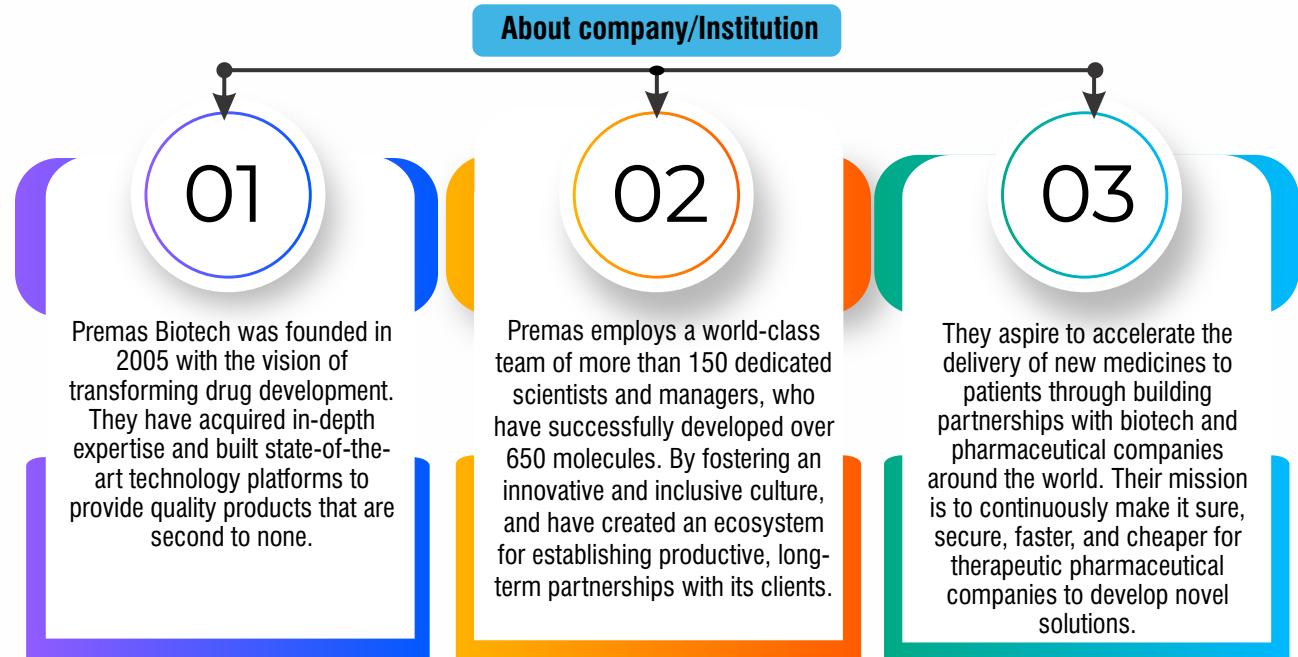
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## Premas Biotech

Corporate Office	Gurugram
Website	<a href="http://www.premasbiotech.com">www.premasbiotech.com</a>



# Premas Biotech (Cont'd)

## About Vaccine

- Premas specializes in developing recombinant proteins for vaccine development. Such proteins are often “difficult to express proteins” (DTE-Ps). Its innovative D-Crypt platform is optimized for highyield production of DTE-Ps, singularly, or in combination.
- Through a partnership with Akers Biosciences, Premas is leveraging DCrypt to develop a multicomponent recombinant protein vaccine against COVID-19.
- D-Crypt is a protein expression platform designed for high-yield production of 'difficult-to-express' proteins (DTE-Ps). Protein expression is an essential process in therapeutic and vaccine development. D-Crypt is optimized to reduce the time, cost and risk associated with producing high quality recombinant proteins for drug and vaccine development programs.
- The D-Crypt platform combines a yeast expression host with a collection of more than 20 custommade expression vectors. A protease-deficient strain of Bakers' Yeast, *Saccharomyces cerevisiae*, has been engineered by scientists at Premas. Yeast provides an ideal eukaryotic environment for expressing recombinant proteins, retaining their correct structure and function
- Marking a significant breakthrough in vaccine development efforts to combat the pandemic, the vaccine prototype is among the first in the world for VLP of SARS CoV-2 virus, the company said in a statement issued.

## Other Input

This collaboration brings together the Panacea Biotec's expertise in vaccinology, R&D, manufacturing and distribution capabilities with Refana's Scientific team's strong ability to work on complex challenges through innovative technologies.

## Candidates

SARS CoV-2 virus

## Collaboration if any

Akers Biosciences

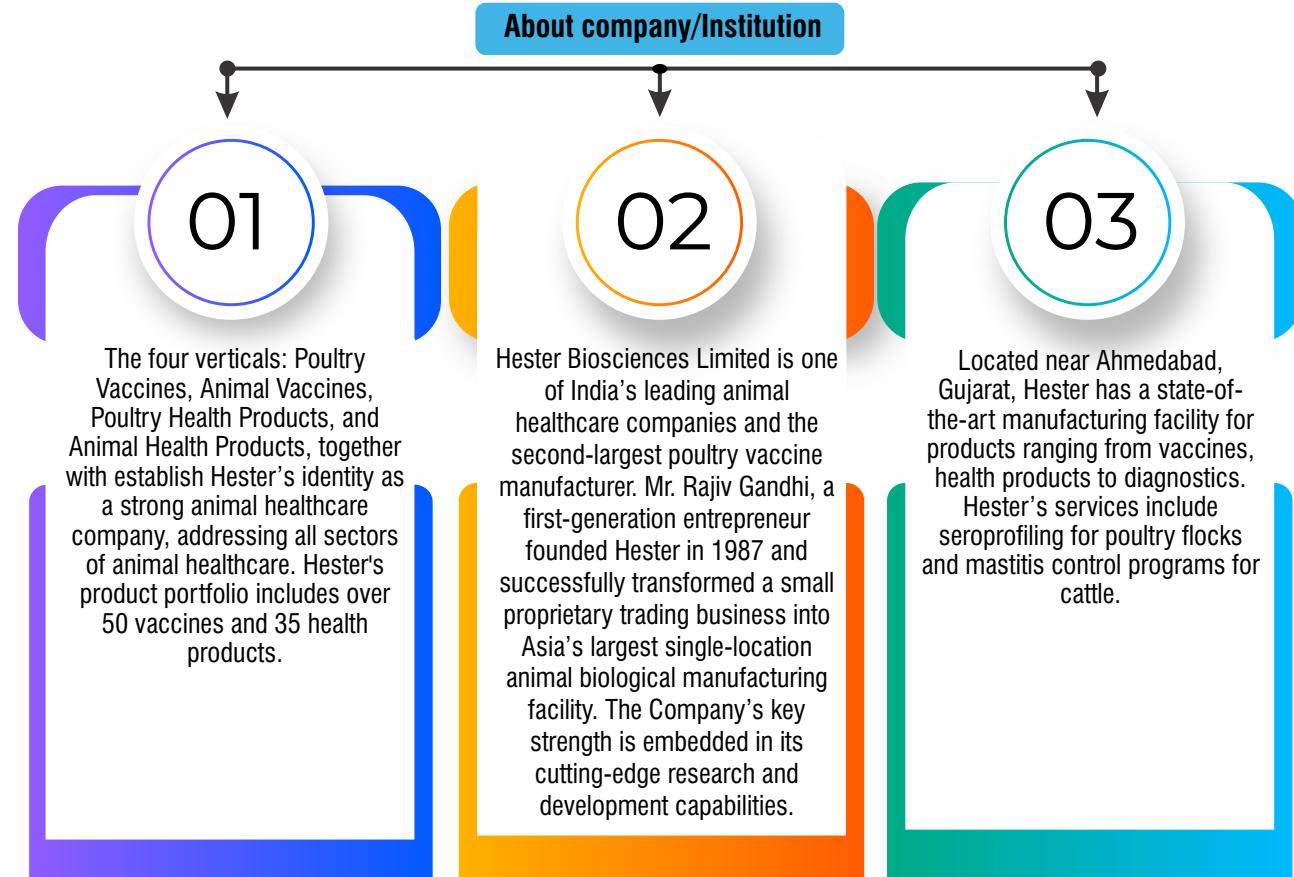
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# Hester Biosciences



Corporate Office	Ahmedabad
Website	<a href="http://www.hester.in">www.hester.in</a>



# Hester Biosciences (Cont'd)

## About Vaccine

- The vaccine is based on a recombinant avian paramyxovirus vector platform.
- IIT Guwahati and Hester Biosciences Limited expect to start animal studies by the end of this year.

### Other Input

Currently, Hester biosciences are working towards developing next-generation recombinant poultry vaccines.

### Candidates

Recombinant Avian Paramyxovirus

### Collaboration if any

IIT- Guwahati

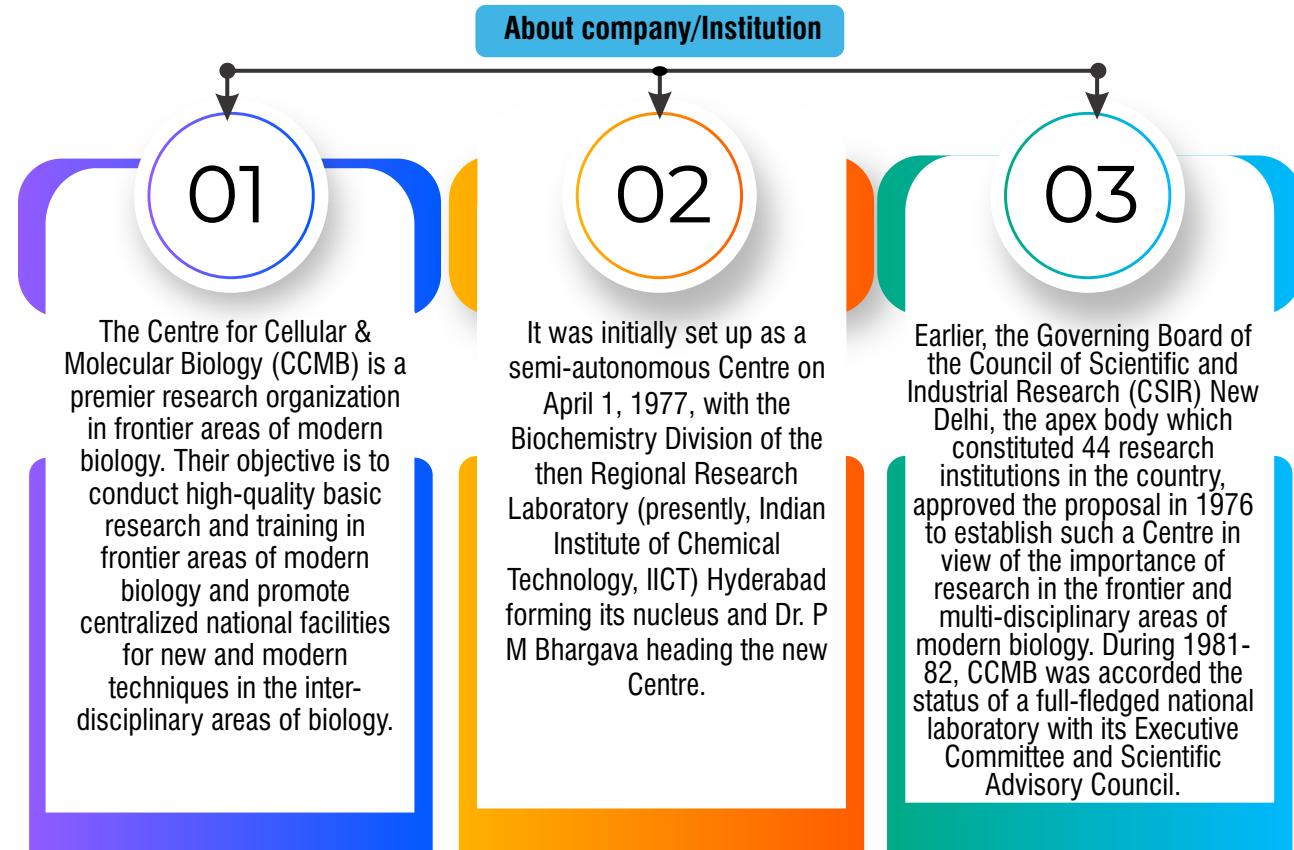
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# Centre for Cellular and Molecular Biology



Corporate Office	Hyderabad
Website	<a href="http://www.ccmb.res.in">www.ccmb.res.in</a>



## About Vaccine

- CCMB last week declared that it has established a stable culture of coronavirus that will enable it to work towards vaccine development.
- CCMB has successfully isolated the virus to culture in the lab which gives an idea that it would be able to work towards vaccine development and testing.
- They are working towards producing viruses in huge quantities that can be inactivated, and used in vaccine development and antibody production for therapeutic purposes.
- The researchers believe virus culture will also help in the testing of various disinfectants as there is a need for surface disinfectants that can kill SARS-CoV-2 on various surfaces including PPE kits and clothes.
- Virus culture is a key component in studies that can test the efficacy of several proposed disinfectants. The ability of the key ingredients of the disinfectant will be tested for their ability to kill the virus.
- SARS-CoV-2 culture will also be helpful in the testing of instruments. Ultraviolet rays (UV) are well-known agents that can effectively kill virus particles and prevent infection.
- There is a huge demand both for domestic and industrial activities to eliminate SARS-CoV-2 from various materials including packaging materials. Such instruments need to be tested for their efficiency in killing SARS-CoV-2 after exposing virus cultures to the UV rays.

## Other Input

This collaboration brings together the Panacea Biotec's expertise in vaccinology, R&D, manufacturing and distribution capabilities with Refana's Scientific team's strong ability to work on complex challenges through innovative technologies.

## Candidates

Inactivated Virus (SARS-CoV-2).

## Collaboration if any

CCMB has also started testing potential drugs with other partners such as Defence Research and Development Organization (DRDO) using this viral culture.

## Source:

1. [www.ccmb.res.in](http://www.ccmb.res.in)
2. <https://www.nationalheraldindia.com/national/ccmb-cultures-coronavirus-with-potential-for-vaccine-drug-development>



Corporate Office

Madhya Pradesh

Website

<https://www.iiti.ac.in/>

## About company/Institution

01

Indian Institute of Technology Indore (IIT Indore or IITI), located in Madhya Pradesh, is one of the Institutes of Technology established by the Government of India in 2009.

02

It is one of the eight new Indian Institutes of Technology (IIT), established by the Ministry of Human Resource Development, Government of India under The Institutes of Technology (Amendment) Act, 2011 which declares eight new IITs as well as the conversion of Institute of Technology, Banaras Hindu University to IIT.

## About Vaccine

- Faculty in Biosciences and Biomedical Engineering is involved in scrutinizing the SARS-CoV-2 protein information for designing an effective vaccine encompassing both the T-cell and B-cell epitopes.
- They have screened all the proteins of SARS-CoV-2 to search for the patches that can be used for immunity generation against this pathogen.
- After proper analysis, these patches would be useful in generating a model vaccine candidate having a propensity to elicit a protective immune response.

## Candidates

SARS-CoV-2 protein and vaccine encompassing both T- cell and B- cell.

## Collaboration if any

None

## Source:

1. <https://www.freepressjournal.in/indore/iit-indore-experiment-for-coronavirus-vaccine-protective-gears-for-corona-warriors>
2. [https://en.wikipedia.org/wiki/Indian\\_Institute\\_of\\_Technology\\_Indore](https://en.wikipedia.org/wiki/Indian_Institute_of_Technology_Indore)



Corporate Office

Ahmedabad

Website

[www.zyduscadila.com](http://www.zyduscadila.com)

## About company/Institution

01

Zydus Cadila, a leading Indian Pharmaceutical company is a fully integrated, global healthcare provider. With in-depth domain expertise in the field of healthcare, it has strong capabilities across the spectrum of the pharmaceutical value chain. From formulations to active pharmaceutical ingredients and animal healthcare products to wellness products, Zydus has earned a reputation amongst Indian pharmaceutical companies for providing comprehensive and complete healthcare solutions.

02

One of the salient features of Zydus is its rich history and lineage. The origin of the company dates all the way back to the 1950s. The company was founded in the year 1952 by Mr. Ramanbhai B. Patel (late), a first-generation entrepreneur and a doyen in the field of Indian Pharmaceuticals.

03

In 1995, the group was restructured and thus was formed Cadila Healthcare under the aegis of the Zydus group. From a humble turnover Rs. 250 crores in 1995 the group witnessed a significant financial growth and registered a turnover of over Rs. 12,700 crores in FY19.

04

Adhering to its brand promise of being dedicated to life in all its dimensions, Zydus continues to innovate with an unswerving focus to address the unmet healthcare needs. Simultaneously, it rededicates itself to its mission of creating healthier, happier communities across the globe.

# Zydus Healthcare (Cont'd)

## About Vaccine

- India-based pharmaceutical firm Zydus Cadila has launched a fast-tracked research program to develop a vaccine against the disease caused by the new coronavirus, COVID -19.
- The company's teams in India and Europe will leverage two different methods to develop the vaccine.
  - One approach involves the creation of a DNA vaccine against the viral membrane protein required for the virus's entry into the cell.
  - In host cells, the delivered plasmid DNA would translate\into the viral protein and trigger an immune response via the cellular and humoral arms of the immune system. These arms are known to help to protect from disease and viral clearance.
  - The second method will see the development of a live attenuated recombinant measles virus (rMV) vectored vaccine to fight the new coronavirus.
  - Codon-optimized proteins of the new coronavirus, expressed by rMV generated, will use reverse genetics to stimulate long-term neutralising antibodies that protect against the infection.
- A team at the company's Vaccine Technology Centre in India is working on the plasmid DNA vaccine, while its research unit at Etna Biotech in Europe is working on measles reverse genetics technology.
- Zydus Group chairman Pankaj Patel said: "There is an urgent and pressing need to develop a safe and efficacious vaccine that can prevent the spread of this deadly virus. Our researchers are working to bring a speedy solution to this most devastating outbreak in recent times."
- The company's manufacturing facilities for recombinant antigens and measles-containing vaccines will allow scale-up both vaccine candidates' production.

## Other Input

Zydus Cadila was one the 1st company of India to declare its venture into COVID Vaccine category

## Candidates

Vaccines targeting SARS-CoV-2 (Two Vaccines)

## Collaboration if any

None

## Source:

1. [www.zyduscadila.com](http://www.zyduscadila.com)
2. <https://www.genengnews.com/covid-19-candidates/zydus-cadila/>

# MYNVAX (Indian Institute of Science)



Corporate Office	Karnataka
Website	Not Available

## About company/Institution

01

Mynvax is an Indian-based biotech startup that develops next-generation vaccines for influenza. In addition, the technology allows for very rapid, large-scale, and low-cost production of vaccines that could potentially be used to protect people when there is a pandemic.

02

Mynvax, which was incubated at the Indian Institute of Science, was founded in year 2017 by Raghavan Varadarajan and Gautham Nadig.

## About Vaccine

- Mynvax has developed several candidate immunogens and completed initial animal trials.
- They are working on multiple new molecules for which they will have animal data in the next few months
- They said, these are sub unit-based vaccines. It requires testing in animals before they go to humans. They also need to look at efficacy, cost of production and scalability.
- They said that there needs to be multiple vaccine candidates as the virus is likely to be around for some time. "It is unclear at this time what the best candidates would be."
- Previous studies have shown that antibodies against the spike glycoprotein found on the surface of the earlier 2003 SARS-CoV virus inhibit viral infection in cell culture and confer protection against infection in animal models.
- Hence, Mynvax and others are attempting to design and test variants of the spike glycoprotein of SARS-CoV-2 (COVID-19) as vaccine candidates, its researchers wrote in a summary of their project.
- Drawing upon previous studies on the 2003 SARS-CoV virus, these studies have shown that the antibodies against the spike glycoprotein found on the surface of the SARS-CoV virus inhibit viral infection.
- They said "There are spike proteins on the virus. It binds to receptors called the Ace2receptors"
- They are developing various derivatives of the viral spike protein as vaccine candidates that will induce protective anti-bodies.

## Candidates

Immunogens

## Collaboration if any

Mynvax has applied for Rs 15 crore in funding from the Biotechnology Industry Research Assistance Council (BIRAC) to scale up the process

## Source:

1. [https://www.google.com/amp/s/m.economictimes.com/small-biz/startups/newsbuzz/mynvax-iisc-incubated-startup-looks-at-covid-19-vaccine-in-18-months/amp\\_articleshow/75873139.cms](https://www.google.com/amp/s/m.economictimes.com/small-biz/startups/newsbuzz/mynvax-iisc-incubated-startup-looks-at-covid-19-vaccine-in-18-months/amp_articleshow/75873139.cms)
2. <https://www.crunchbase.com/organization/mynvax#section-overview>
3. <https://www.forbesindia.com/article/coronavirus/the-race-to-make-a-covid19-vaccine-in-india/59547/1>
4. <https://www.thehindubusinessline.com/news/science/iisc-start-up-developing-vaccine-for-covid-19/article31365134.ece#>

# Bharat Biotech International

## About company/Institution



Corporate Office	Hyderabad
Website	<a href="http://www.Bharatbiotech.com">www.Bharatbiotech.com</a>

Bharat Biotech is a pioneering biotechnology company known for its world-class R&D and manufacturing capabilities.

Their mission is to deliver affordable, safe and high-quality vaccines and bio-therapeutics that help people prevail over diseases.

**They seek to lead innovation in biotechnology in order to lead the fight against disease with a focus on emerging markets.**

For over two decades, Bharat Biotech has been in the vanguard of creating breakthrough vaccines & therapeutics for challenging diseases.

**Based out of India, they are focused on protecting people around the world against emerging diseases. So far, they have delivered over 2 billion doses in over 65 countries. With a twin focus on innovation and quality, they are putting effective vaccines in the hands of physicians.**

Today, Bharat Biotech has over 160 patents.

Central to Bharat's research approach is a collaborative attitude to engaging with world-class research institutions on shared priorities. They partner with several leading Indian and global research organisations to advance science that improves public health.

### Research partnerships

All India Institute of Medical Sciences (AIIMS), New Delhi, India.  
Stanford University, School of Medicine, US.  
Centre for Vaccine Development, University of Maryland, US.  
National Institute of Allergy and Infectious Diseases, Washington DC, US  
National Institute of Health (NIH), Washington DC, US.  
Centres for Disease Control & Prevention (CDC), Atlanta, US.  
Department of Biotechnology (DBT), Government of India.  
Department of Science & Technology (DST), Government of India.  
Indian Institute of Science, Bangalore (IISc), India.  
Institute of Genomics and Integrative Biology (IGIB), New Delhi, India.  
Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India.  
National Institute of Virology (NIV), Pune, India.

**They are currently carrying out research on bio-antibiotics, combination probiotics, Lysostaphin, and recombinant Staphylokinase injection (THR-100).**

**They also support research grants and have worked with the following Organisations:**  
Children's Vaccine Program (CVP) of Bill & Melinda Gates Foundation through the Program for Appropriate Technologies in Health (PATH) – Rotavirus Vaccine Development Project Spread Program – World Bank  
Department of Biotechnology, Government of India  
Department of Science and Technology, Government of India.

# Bharat Biotech International (Cont'd)

## About Vaccine

- CoroFlu:
- The new vaccine is engineered as a vector for coronavirus proteins utilizing an existing deactivated vaccine. This is in part because a robust immune response in this vehicle or transport vaccine has been approved for the general population, including children and pregnant women.
- The vaccine was formulated in January this year by Infectious Diseases expert Professor Matthias Schnell's laboratory and recently completed preliminary tests in animal models.
- Preliminary tests demonstrated strong antibody reaction in mice in animal experiments. Researchers are currently researching whether animals are healthy from the contamination of Covid-19 and the tests are due in the coming month.
- In mice getting the vaccine demonstrated a strong reaction to the antigen. Researchers are currently testing the safety of vaccinated animals from SARS-CoV-2 infection and are scheduled to yield findings for the coming month.
- Bharat Biotech has the exclusive right, under the License Agreement, to develop, commercialize and distribute Jefferson's vaccine around the world with the exception of countries such as the United States, Europe, and Japan etc., which are where Jefferson is continuing to look.
- The vaccine underway has been developed by isolating the spike protein and by increasing the production of antibodies to combat spread.
- Bharat Biotech partnered with FluGen and the University of Wisconsin–Madison (UWMadison) to develop and evaluate a Covid-19 vaccine candidate, CoroFlu.

### Covaxin:

- India's 'first' indigenous Covid-19 vaccine Covaxin, developed by Hyderabad-based vaccine manufacturer Bharat Biotech in collaboration with the Indian Council of Medical Research (ICMR), is all set to begin human clinical trials.
- The Central Drugs Standard Control Organisation (CDSCO) had granted the company permission to initiate Phase I and II human clinical trials on 29 June, after it submitted results generated from pre-clinical studies, demonstrating the vaccine's safety and immune response to the infection.
- Bharat Biotech's Covaxin vaccine falls under the category of inactivated vaccines.
- In such vaccines, the pathogen is 'deactivated' so that it can no longer cause infection. However, parts of the virus can still be identified by the body's immune system and can trigger an immune reaction
- To develop the vaccine, scientists at Bharat Biotech have used a SARS-CoV-2 strain that was isolated at the National Institute of Virology in Pune.

## Candidates

Immunogens

## Collaboration if any

CoroFlu:  
Thomas Jefferson  
University of Philadelphia,  
USA

Bharat Biotech partnered  
with FluGen and the  
University of  
Wisconsin–Madison  
(UWMadison) to develop  
and evaluate a Covid-19  
vaccine candidate,  
CoroFlu.

Covaxin:  
Indian Council of Medical  
Research (ICMR)  
National Institute of  
Virology in Pune

## Source:

- [1. https://www.bharatbiotech.com/](https://www.bharatbiotech.com/)
- [2. https://www.thehindubusinessline.com/companies/bharat-biotech-thomasjefferson-university-ink-deal-to-develop-covid-19-vaccinecandidate/article31631406.ece#](https://www.thehindubusinessline.com/companies/bharat-biotech-thomasjefferson-university-ink-deal-to-develop-covid-19-vaccinecandidate/article31631406.ece#)
- [3. https://www.livemint.com/companies/news/bharat-biotech-thomas-jefferson-varsity-to-work-on-covid-vaccine-11589970197268.html](https://www.livemint.com/companies/news/bharat-biotech-thomas-jefferson-varsity-to-work-on-covid-vaccine-11589970197268.html)
- [4. https://www.timesnownews.com/health/article/covid19-vaccine-development-moving-positively-next-one-month-crucial-bharat-biotech/600179](https://www.timesnownews.com/health/article/covid19-vaccine-development-moving-positively-next-one-month-crucial-bharat-biotech/600179)
- [5. https://timesofindia.indiatimes.com/life-style/health-fitness/health-news/coronavirus-vaccine-update-latest-news-positive-development-for-indian-covid-19-vaccine-moderna-moves-to-second-phasetesting/photostory/76156617.cms?picid=76170234](https://timesofindia.indiatimes.com/life-style/health-fitness/health-news/coronavirus-vaccine-update-latest-news-positive-development-for-indian-covid-19-vaccine-moderna-moves-to-second-phasetesting/photostory/76156617.cms?picid=76170234)
- [6. https://www.timesnownews.com/health/article/indian-covid19-vaccine-bharat-biotech-says-will-do-everything-to-make-this-program-successful/589958](https://www.timesnownews.com/health/article/indian-covid19-vaccine-bharat-biotech-says-will-do-everything-to-make-this-program-successful/589958)
- [7. https://www.pharmaceutical-technology.com/news/bharat-biotech-covid-19-vaccine/](https://www.pharmaceutical-technology.com/news/bharat-biotech-covid-19-vaccine/)
- [8. https://theprint.in/health/all-about-bharat-biotechs-covaxin-indias-first-indigenous-covid-vaccine-candidate/455028/](https://theprint.in/health/all-about-bharat-biotechs-covaxin-indias-first-indigenous-covid-vaccine-candidate/455028/)

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