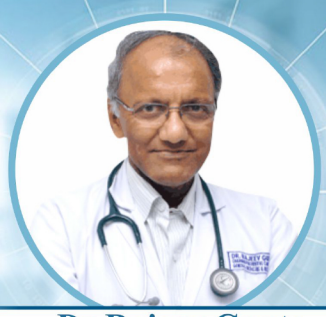
# COVID 19 Vaccines: Latest update



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Since its emergence, the Covid-19 disease or second severe acute respiratory syndrome due to novel coronavirus (SARS nCoV-2) has progressed rapidly. It has emerged as one of the largest pandemics that the world has seen and is still ongoing.

By the end of November 2020, more than 50 million cases have been reported, resulting in more than 1.4 million deaths. In India, the disease has led to more than 135,000 deaths and 9 million cases so far. Initial response to this was focused on preventive measures including physical or social distancing, quarantining, ventilation of indoor spaces, covering coughs and sneezes, use of face masks and coverings, hand washing, and keeping unwashed hands away from the face.

Developing an effective vaccine is crucial and considered the only practical way of establishing herd immunity. The spike(S) protein, especially its receptor-binding domain (RBD), is responsible for attachment to the host cell and was identified as an antigenic target for developing a vaccine against SARS-CoV-2 at a very early stage.

A worldwide effort has been put to develop the vaccine, and as of now, 52 vaccine trials are in the clinical stage, and 162 trials are in the preclinical stage. Traditionally, vaccines are manufactured either as inactivated, live attenuated, or subunit. Various institutions and manufacturers are still trying next generation techniques, e.g., nucleic acid technologies (nucleoside-modified messenger RNA and DNA), non-replicating viral vectors, peptides, and recombinant proteins.

Three vaccines are in advanced development and have progressed to phase-3 trials. These vaccines include the Pfizer-BioNTec mRNA-based vaccine, Moderna mRNA-based vaccine, and Oxford Alliance-AstraZeneca adenovirus vector-based vaccine. A handful of vaccines now have been authorized around the globe; many more remain in development.

The first vaccine to be approved was BNT162b2; a nucleoside modified mRNA-based vaccine developed by BioNTech and Pfizer. The vaccine is given as an intramuscular injection in two doses 21 days apart. Phase 3 data of 43,448 participants published in NEJM showed BNT162b2 was 95% effective with fewer side effects. The United Kingdom was the first country to authorize it for emergency use. Approximately 138,000 people had received the Pfizer-BioNTech COVID-19 vaccine during the first week of their vaccination programme as of December 16, 2020. This vaccine has also been approved for emergency use by Bahrain, Canada, Mexico, the USA, Saudi Arabia, and Kuwait.

AstraZeneca and the Oxford Vaccine Group at the University of Oxford are developing AZD1222 (previously ChAdOx1), a chimpanzee adenovirus vaccine. Interim data from Phase 3 trials in the UK, Brazil, and South Africa indicate the vaccine has an overall efficacy of 70% and has an acceptable safety profile. Serum Institute of India has applied for emergency use authorization in India from the Drugs Controller General of India. It is being considered in other countries as well.



Moderna has developed mRNA-1273 based on prior studies of related coronaviruses such as those that cause severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS). An interim analysis of 95 participants in the Phase 3 trial indicates mRNA-1273 has an efficacy of 94.5% with no significant safety concerns. However, it is non-peer-reviewed data. It is under consideration for emergency use authorization by the FDA in the USA.

Other important vaccine candidates include BBIBP-CorV by the Beijing Institute of Biological Products, currently being approved in China, UAE, and Bahrain. Sputnik V by Gamaleya Research Institute in Russia and approved in Russia and CoronaVac by the China-based biotechnology company Sinovac Biotech which is approved in China as part of an emergency use program in the country.

**But to vaccinate the whole world population is far from easy and numerous challenges lie ahead.**

A vaccine usually takes 10 - 15 years to develop and approve, but pandemic nature has forced to accelerate the process in an unprecedented way.

New technologies are being used like RNA and DNA, that have never been used before at such a huge level. This approach has left many unanswered scientific questions on the vaccines' short and long-term safety, duration of the immunity, and whether it prevents transmission. Various international alliances have facilitated collaboration, research, and communication and are raising billions of dollars of funds from the public, private, philanthropic, and civil society organizations. WHO also implemented Covid-19 Vaccines Global Access (COVAX) program for coordinating global vaccine development, and 189 countries are a part of it.

It is ensuring fair and equitable distribution of an eventually licensed vaccine, assuring that each participating country would receive a guaranteed share of doses to vaccinate the most vulnerable 20% of its population by the end of 2021. Manufacturing billions of doses and the logistical part of vaccine handling and monitoring, cold chain management, and safety of distribution within the vaccination network is also a huge challenge. Despite all the challenges discussed here, we are in the process of making safe and effective vaccines and distributing them to the population at an unprecedented pace. Perhaps by this time next year, we can celebrate the global control of SARS-CoV-2 in person.

**References**

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