

COVID-19 Vaccines in Brazil

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COVID-19, a disease caused by the Coronavirus SARS-CoV-2, is defined as a pandemic by the World Health Organization (WHO), leading to a high morbidity and mortality worldwide. According to the Brazilian Ministry of Health, approximately 16 million cases of COVID-19 have been confirmed and deaths reach approximately 450,000 deaths with a lethality of 2.8%. Measures such as social distancing, isolation, mask use and alcohol use 70% became essential to prevent the spread of the virus, however the absence of immunity caused several waves of Infection by SARS-CoV-2 to arise. The lack of effective treatment has prompted several scientists to develop vaccines that would be effective and safe in order to avoid a global health crisis.

It was not the first time that humanity had found itself in the face of such a need. In the early 17th century, smallpox was one of the most fearsome communicable diseases in the world with a high mortality rate. Lady Mary Montagu, wife of the British ambassador in Istanbul, noted that the disease could be prevented through a technique used by Muslims, with the introduction, in the skin of healthy individuals, of liquid extracted from smallpox crusts of an infected patient. This process, known as "variation", probably originated in China and was taken to Western Europe, where, although it caused several cases of smallpox death, it was used in England and the USA until the first investigations of the English physician Edward Jenner, published in the work *Variolae Vaccinae*, in 1798. Jenner studied peasants who developed a benign condition known as vaccinia due to contact with cows infected with bovine smallpox (cowpox), developing the first immunization techniques. Although without the bioethical precepts defined later, his contribution to the history of medicine was undeniable. However, the cause-effect relationship between the presence of pathogenic microorganisms and diseases was only established by Louis Pasteur and Robert Koch, approximately in 1870. To honor Jenner, Pasteur named the vaccine (such as the Jenner vaccine virus) any preparation of an agent that was used for immunization of an infectious disease.

In the current scenario, it is observed the need for the development of vaccines against SARS-CoV-2 in view of the little knowledge of the disease and the lack of a specific treatment. As a result of this demand, there are currently 183 vaccines in the pre-clinical phase and 181 in the clinical phase, and 19 are already in advanced stages of studies, with some in emergency use already approved by the health authorities against COVID-19.

Vaccination in Brazil began in January 2021, with emergency use, authorized by the National Health Surveillance Agency (ANVISA) of Coronavac/Sinovac, Oxford/Astrazeneca and Pfizer/BioNTech. The country announced the first Brazilian vaccine developed by the Butantan Institute, Butanvac, which is still in the pre-clinical phase and cannot yet be used. Coronavac is an inactivated virus vaccine containing SARS-CoV-2 combined with aluminum solutions aiding in the immune response. The virus is inactivated through heat, radiation or chemicals, thus is able to trigger an immune response in the body without causing replication and infection. Oxford/Astrazeneca is a chimpanzee adenovirus viral vector vaccine that expresses the Spike Protein of SARS-CoV-2, triggering an immune response without causing the disease. The viral vector chosen are harmless viruses like adenovirus that carries an external gene in your genome capable of expressing the protein that will stimulate the immune response. The Pfizer/BioNTech vaccine uses messenger RNA (mRNA), being a new

technology that has proven to be very effective. mRNA is incorporated into a lipid particle and it enters the cell triggering Spike protein synthesis, thus stimulating antibody production.

According to ANVISA, the Oxford/Astrazeneca vaccine was 64.2% effective against COVID-19 in clinical studies conducted in Brazil. The efficacy of the immunizer, according to the situation, varies between 30.6% and 81.5%. According to the study released by the manufacturer of Pfizer/BioNTech, the vaccine has 91.3% efficacy to prevent coronavirus contagion for at least six months after the application of the second prevent dose going in 100% severe cases. The range recommended by Pfizer manufacturers and the WHO is 21 days in the United States and Germany the second dose is applied in 42 days and in the United Kingdom in 84. The Brazilian government recommended the same interval followed by the britains, using as a basis the high efficacy of the vaccine after the first dose. In studies conducted in Brazil with health professionals, Coronavac has shown a general efficacy of 50.38%. This percentage was obtained by comparing the results between those who received the vaccine and those who took placebo. The efficacy for mild cases in patients who need to receive some medical care is 77.96%. It is indicated that the application of the second dose occurs in an interval of 14 to 28 days.

According to official information, Brazil has already secured for 2021 about 520 million doses, divided into six different suppliers. In addition to direct negotiation with pharmaceutical companies, the country will also receive 42.5 million doses by Covax Facility, a consortium created by WHO and other institutions for the distribution of immunizations to less developed countries. There is still the promise and negotiations for the purchase of another 13 million doses of the Modern laboratory. If all deadlines are met, Brazil will have more than 575 million doses by the end of the year. The current scenario highlights the importance of vaccines for society, as it is one of the main factors of health promotion and prevention of diseases, elucidating that the benefits of vaccination outweigh the risks attributed to them.

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