

Editorial

Vaccination Strategy for COVID-19

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The main measure for combating the ongoing pandemic is to develop vaccines to create specific immunity to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19), in order to stop its transmission. More vaccine candidates have simultaneously in the pipeline for preventing COVID-19 than ever before for an infectious disease. All developers are trying to create vaccines to achieve the ability to stop transmission of the disease.

It is known that SARS-CoV-2 enters human cells by using its spike protein to bind to a cell surface receptor, angiotensin-converting enzyme 2 (ACE2).^{1,2} The receptor-binding domain of the spike protein consists of a specialized “head” region that mediates binding to ACE2. Currently, there are a few vaccines that promote the production of antibodies that recognize the head region of the spike-receptor-binding domain and block the entry of SARS-CoV-2 into cells and are thus able to stop its transmission.³⁻⁵ They do so by stimulating an immune response to an antigen molecule found on the coronavirus, typically the characteristic spike protein on its surface, which the coronavirus uses for invading host cells and transmission. Mice immunized with genetically engineered receptor-binding domain of the SARS-CoV-2 spike protein, covering its head region with additional sugar molecules, could shield the head region and boost the production of antibodies against the unshielded core region of the receptor-binding domain.⁶

Three highly notable vaccines were developed respectively by Pfizer-BioNTech, (brand name: Comirnaty), Moderna (brand name: Spikevax), and Oxford-AstraZeneca (brand name: Vaxzevria). The first two are messenger RNA vaccines containing a tiny fragment of the coronavirus’s genetic code. When injected into the body, they start

producing part of the coronavirus and thus stimulate the body to mount a defense against it.⁷

The Oxford-AstraZeneca vaccine is subtly different as it uses a harmless virus to carry the same genetic material into the body. It is the easiest of the three to use as it can be stored in a normal refrigerator and does not require specialized freezers to produce extremely cold temperatures. All three vaccines are supposed to be given as two spaced doses; however, the United Kingdom has prioritizing giving as many people as possible the first dose and has delayed the spacing between the second dose.⁸

A fourth vaccine, Janssen COVID-19 Vaccine was developed by Johnson & Johnson. It uses the same technique as Oxford-AstraZeneca, but was designed to be given as a single injection.⁴

The most recent development related to COVID-19 vaccine was the release of Novavax COVID-19 vaccine (NVX-CoV2373)⁹ (brand name: Nuvaxovid and Covovax), a protein-based vaccine engineered from the genetic sequence of the first strain of SARS-CoV-2. The vaccine was created using Novavax's recombinant nanoparticle technology to generate antigen derived from the coronavirus spike(s) protein. The vaccine is formulated with Novavax-patented saponin-based Matrix-M™ adjuvant to enhance the immune response and stimulate high levels of neutralizing antibodies. The Novavax COVID-19 vaccine contains purified protein antigen and can neither replicate nor cause COVID-19.

Of note: more recently, a scientific breakthrough against COVID-19 has been realized by Drs. Michale Mor and Ruofan Lee of the Department of Clinical Microbiology and Immunology at the Sackler Faculty of medicine, Tel Aviv University. Their study was conducted in collaboration with Dr. Ben Croker of the University of California San Diego, Professor Ye Xiang of Tsinghua University in Beijing, and Professor Meital Gal-Tanamy and Dr. Moshe Dessau of Bar-Ilan University in Tel Aviv. The report was published on August 5, 2022 in the Nature journal *Communications Biology*.¹⁰ The researchers demonstrated that antibodies isolated from the immune system of recovered COVID-19 patients are effective in neutralizing all known strains of the coronavirus. This discovery may eliminate the need for repeated booster vaccinations, according to the researchers.

Documents used for editing the article

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