Understanding COVID-19 Vaccines

Vaccines can prevent serious illness, or prevent serious complications from infection, and are an important part of family and public health across the globe.

Currently, three COVID-19 vaccines, Pfizer-BioNTech, Moderna, and Janssen/Johnson & Johnson are approved for Emergency Use in the United States. Additionally, Novavax and Oxford-AstraZeneca are currently testing their vaccines in Phase 3 clinical trials. There are many other COVID-19 vaccines being tested or are already approved for use in other countries. For current, up-to-date information on the status of COVID-19 vaccines across the world, you can visit The New York Times Coronavirus Vaccine Tracker **here**.

The 3 Types of COVID-19 Vaccines in the United States are:

1. **Viral Vector:** Johnson & Johnson and Oxford-AstraZeneca
2. **Nucleic Acid (mRNA):** Pfizer-BioNTech and Moderna
3. **Protein-based:** Novavax

Types of Vaccines	Viral Vector	Nucleic Acid (mRNA)	Protein-based
How it Works	This approach takes a modified virus and uses it to deliver viral genes to build immunity	This vaccine uses RNA molecules to teach the immune system to target key viral proteins	This vaccine uses a piece of a virus' surface to focus your immune system on a single target
Existing Examples	• Ebola • Veterinary Medicine	• COVID-19	• Pertussis • Human Papillomavirus (HPV)
Sponsor of the COVID-19 vaccine being tested in USA	• Johnson & Johnson • Oxford-AstraZeneca	• Pfizer-BioNTech • Moderna	• Novavax

Viral Vector

Viral vector vaccines insert genetic material from the COVID-19 virus into a weakened known virus (such as adenovirus). The weakened virus is used as a vector (or carrier) and is not able to cause disease. Once the vaccine is injected, the COVID-19 genetic material within the vector gives cells instructions to make B-Cells and T-Cells that will remember how to fight the virus if ever infected. The Johnson & Johnson COVID-19 vaccine is a viral vector vaccine.

Nucleic Acid (mRNA)

Nucleic Acid vaccines contain mRNA directions that give your body's cells instructions on how to make a unique Coronavirus protein. When the mRNA vaccine is injected, your body makes copies of the COVID-19 spike protein, prompting an immune response. Once your body makes copies of the protein, the mRNA material is destroyed, and if infected with the COVID-19 virus, your body will be able to fight the virus far better and faster than without the vaccination. Interesting to know, mRNA vaccine technology is not new; scientists have studied mRNA vaccines for decades. Also, mRNA vaccines do not use live virus, so the COVID-19 virus would not enter your body by injecting the vaccine. The Pfizer-BioNTech and Moderna vaccines are mRNA vaccines.

Protein-based

Protein-based vaccines include viral protein subunits. To work, these vaccines use the COVID-19 spike protein or a receptor protein of the COVID-19 virus and an ingredient (an adjuvant) to create a stronger immune response. When you receive this type of vaccine, your immune system recognizes that the protein does not belong in your body and will begin making T-Cells and antibodies to fight it, allowing your immune system to recognize any future infection. The Novavax vaccine is a protein-based vaccine.

This information was last reviewed on March 2nd, 2021 by the NephCure COVID-19 Medical Advisory Committee. NephCure will provide updated information as it becomes available.

References:
1. https://www.nature.com/articles/d41586-020-01221-y
2. https://www.nytimes.com/interactive/2020/science/coronavirus-vaccine-tracker.html
3. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/
4. https://www.sandiegouniontribune.com/news/science/story/2020-06-06/race-for-vaccine
5. https://www.nature.com/articles/nrd.2017.243
6. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/mrna.html
7. https://www.cnn.com/2021/02/24/health/johnson-vaccine-fda-analysis/index.html