COVID-19 Vaccines

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To understand how vaccines work, it helps to first understand a bit about how the immune system operates. When a virus (or other pathogens, including bacteria), infect the body, they replicate using normal cells of the body, causing illness. The white (immune) cells in blood fight infection. Different types of white blood cells fight infection in different ways:

- **Macrophages** are destructive white blood cells that swallow up and digest pathogens and dead or dying cells. The macrophages leave behind parts of the invading pathogens called antigens, which the body then recognizes as dangerous and stimulates antibodies to attack and neutralize them.
- **B-lymphocytes** are defensive white blood cells that produce the antibodies.
- **T-lymphocytes** are another defensive white blood cell that attack cells in the body that have already been infected, preventing the virus from spreading and continuing to replicate.

The first time a person is infected with COVID-19, it can take several days to weeks for the body to make and use all the immune system tools needed to get over the infection. After the infection, the person's immune system remembers how to protect the body against that disease.

The body keeps a few T-lymphocytes, called memory cells, that go into action immediately if the body encounters the same virus again. When the familiar antigens are detected, B-lymphocytes produce antibodies to neutralize them. Experts are still learning how long these memory cells protect a person against the virus that causes COVID-19.

COVID-19

COVID-19 vaccines help the body develop immunity to COVID-19 without producing illness. Different types of vaccines work in different ways to offer protection, but with all types of vaccines, the body is left with a supply of "memory" T-lymphocytes as well as B-lymphocytes that will remember how to fight that virus in the future.

It typically takes a few weeks for the body to produce T-lymphocytes and B-lymphocytes after vaccination. Therefore, it is possible that a person could be infected with the virus that causes COVID-19 just before or just after vaccination and then get sick because the vaccine did not have enough time to provide protection.

Sometimes after vaccination, the process of building immunity can cause symptoms, such as fever. These symptoms are normal and are a sign that the body is building immunity.

Types of Vaccines

Currently, there are three main types of COVID-19 vaccines that are in large-scale (Phase 3) clinical trials in the United States. Below is a description of how each type of vaccine works against COVID-19. None of these vaccines can give you COVID-19.

- **mRNA vaccines** (Moderna, Pfizer) contain snips of the genetic material from COVID-19 that gives our cells instructions for how to make a harmless protein unique to the virus. After our cells make copies of the protein, they destroy the genetic material from the vaccine (the mRNA DOES NOT get into human genetic material at all). Our bodies recognize the foreign viral protein to prime T-lymphocytes and B-lymphocytes to remember how to recognize and neutralize COVID-19 if we are infected in the future.
- **Protein subunit vaccines** include harmless pieces (proteins) of COVID-19 instead of the entire germ. Once vaccinated, our immune system recognizes the foreign proteins and begins making T-lymphocytes and antibodies. If we are ever infected in the future, memory cells will recognize and fight the virus.
- **Vector vaccines** (AZ, Janssen, others) contain a weakened version of a live virus—a different virus than the one that causes COVID-19—that has genetic material from COVID-19 inserted in it (this is called a viral vector). Once the viral vector is inside our cells, the genetic material gives cells instructions to make a protein that is unique to the virus that causes COVID-19 (the genetic material DOES NOT get into human genetic material at all). Using these instructions, the body's cells make copies of the protein, prompting T-lymphocytes and B-lymphocytes to fight that virus if we are infected in the future. This is similar to many of the traditional childhood vaccines.

Most COVID-19 Vaccines Require More Than One Shot

All but one of the COVID-19 vaccines currently in Phase 3 clinical trials in the United States use two shots. The first shot starts building protection; the booster shot (a few weeks later) is necessary to get maximum protection from the vaccine. One vaccine in Phase 3 clinical trials (Janssen) only needs one shot.

What Does % Effectiveness Mean?

The Moderna and Pfizer vaccines have both showed, after analysis of the Phase 3 clinical trial data, that the vaccines are "95%" effective. That means they are expected to be effective in 95% of the population (for comparison, flu vaccines annually are between 20-60% effective). If you like data: from the Pfizer study, which had a total of 43,000 people equally divided between receiving the active vaccine (ARV) and the placebo vaccine (ARU):

- COVID infections in ARV 8/21,500 = 0.04%
- COVID infections in ARU 162/21,500 = 0.75%
- The reduction from 0.75% to 0.04% is 95% = central estimate of vaccine efficacy

Returning to Full Worship

At a recent series of conferences, Dr. Fauci emphasized that the timeline to return to large crowd activities, including theatre and worship, hinged on the country reaching an effective level of herd immunity, which he defined as completing vaccination in between 70-85% percent of the **population** (including the booster). This is NOT 85% of your congregation.