



# Understanding How COVID-19 Vaccines Work

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## What You Need to Know

- COVID-19 vaccines are [safe](#) and [effective](#).
- You may have [side effects](#) after vaccination, but these are normal.



## The Immune System—The Body’s Defense Against Infection

To understand how [COVID-19 vaccines](#) work, it helps to first look at how our bodies fight illness. When germs, such as the virus that causes [COVID-19](#), invade our bodies, they attack and multiply. This invasion, called an infection, is what causes illness. Our immune system uses several tools to fight infection. Blood contains red cells, which carry oxygen to tissues and organs, and white or immune cells, which fight infection. Different types of white blood cells fight infection in different ways:

- **Macrophages** are white blood cells that swallow up and digest germs and dead or dying cells. The macrophages leave behind parts of the invading germs, called “antigens”. The body identifies antigens as dangerous and stimulates antibodies to attack them.
- **B-lymphocytes** are defensive white blood cells. They produce antibodies that attack the pieces of the virus left behind by the macrophages.
- **T-lymphocytes** are another type of defensive white blood cell. They attack cells in the body that have already been infected.

The first time a person is infected with the virus that causes COVID-19, it can take several days or weeks for their body to make and use all the germ-fighting tools needed to get over the infection. After the infection, the person’s immune system remembers what it learned about how to protect the body against that disease.

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

## How COVID-19 Vaccines Work

[COVID-19 vaccines](#) help our bodies develop immunity to the virus that causes COVID-19 without us having to get the 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 after vaccination for the body to produce T-lymphocytes and B-lymphocytes. 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 signs the body is building immunity.

Learn more about [getting your vaccine](#).

## Types of Vaccines

Currently, there are three main types of COVID-19 vaccines that are approved or authorized for use in the United States or that are undergoing large-scale (Phase 3) clinical trials in the United States.

Below are the three types of COVID-19 vaccines and a description of how each type of vaccine prompts our bodies to recognize and help protect us from the virus that causes COVID-19. None of these vaccines can give you COVID-19.

<b>mRNA vaccines (Pfizer-BioNTech or Moderna)</b>	<b>Protein subunit vaccines (Novavax)</b>	<b>Vector vaccines (Johnson &amp; Johnson's Janssen)</b>
<ul style="list-style-type: none"><li>• These vaccines contain material from the virus that causes COVID-19 that gives our cells instructions for how to make a harmless protein that is unique to the virus.</li><li>• After our cells make copies of the protein, they destroy the genetic material from the vaccine.</li><li>• Our bodies recognize that the protein should not be there and build T-lymphocytes and B-lymphocytes that will remember how to fight the virus that causes COVID-19 if we are infected in the future.</li></ul>	<ul style="list-style-type: none"><li>• These vaccines include harmless pieces (proteins) of the virus that causes COVID-19 instead of the entire germ.</li><li>• Once vaccinated, our bodies recognize that the protein should not be there and build T-lymphocytes and antibodies that will remember how to fight the virus that causes COVID-19 if we are infected in the future.</li></ul>	<ul style="list-style-type: none"><li>• These vaccines contain a modified version of a different virus than the one that causes COVID-19. This is called a “viral vector”</li><li>• Inside the shell of the modified virus, there is genetic material from the virus that causes COVID-19.</li><li>• Once the viral vector is inside our cells, the genetic material gives the cells instructions to make a protein that is unique to the virus that causes COVID-19.</li><li>• Using these instructions, our cells make copies of the protein. This prompts our bodies to build T-lymphocytes and B-lymphocytes that will remember how to fight that virus if we are infected in the future.</li></ul>

While COVID-19 vaccines were developed rapidly, [all steps have been taken to ensure their safety and effectiveness.](#)

## Booster Shots and Additional Primary Doses

**Booster shots** enhance or restore protection against COVID-19 which may have decreased over time.

An **additional primary dose** is for people who are [moderately to severely immunocompromised](#) and did not build enough or any protection from their primary vaccine series.

Use [CDC's COVID-19 booster tool](#) to learn if and when you can get boosters to stay up to date with your COVID-19 vaccines. [Staying up to date](#) means getting all recommended COVID-19 vaccines including boosters when eligible.

[People who are moderately or severely immunocompromised have specific COVID-19 vaccine recommendations](#), which include a third dose to complete their primary series, as well as two booster doses for those eligible.



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