Activate Learning®

What Do Vaccines Do in Our Bodies?

Have you ever had an infection? Sometimes a cut can get infected. Sometimes a cough keeps getting worse. There are many kinds of infections. They can be caused by viruses or by some types of bacteria. Infections can make people a little sick or very, very sick. People can even die if their bodies can't fight the infection.

Vaccines

Vaccines can prevent viruses and bacteria from attacking your body. But to work, you need a vaccine before you get sick. After you are sick, it's too late.

Scientists use animals to figure out how to make vaccines for animals and for humans. Scientists have learned that when they inject dead or weak bacteria into an animal, the animal's body fights the bacteria. The same thing happens if an animal is injected with part of a virus. The bacteria or viruses they inject aren't strong enough to make the animal sick. But, they are strong enough for the animal's immune system to attack!

Here is how: The immune system makes antibodies. Antibodies are like an army. Their job is to fight anything that invades the body. Vaccines trick the body into acting like it has been invaded. When the body thinks there's an invasion, the antibody army prepares to fight. The antibody army remembers the invader, so next time, it is prepared to attack. The animal doesn't get sick because its body knows what to do.

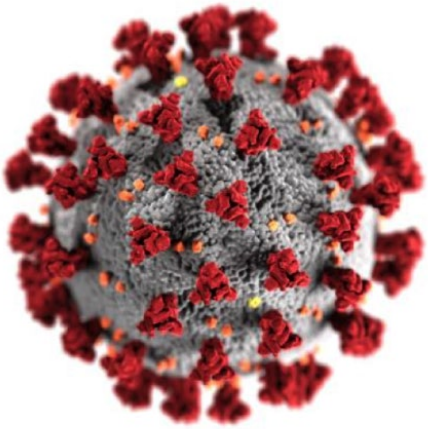
The same process happens when a person gets a vaccine. Your body knows what to do when a virus or bacteria gets inside of you. It knows because it learned from the vaccine how to fight. You may have had other vaccines. First, you got a shot. Second, your body produced antibodies. Third, those antibodies are ready to fight if the virus or bacteria ever enters your body again.

Making the mRNA Vaccine for COVID-19

COVID-19 was a disease that scientists hadn't seen before. That means there was no vaccine for COVID-19. So, scientists went into action!

They learned that a virus they named SARS-CoV-2 causes COVID-19. A protein on that virus is covered with spikes. The spikes help the virus break into the cells in

the body. Inside the cells, the virus can reproduce and cause many serious problems. Scientists had to figure out a way to keep the virus from getting into the cells. Every cell has instructions inside for making copies of itself. Inside the virus, messenger RNA (mRNA) carries those instructions. To make the vaccine for COVID-19, scientists took the instructions for making the "spike" protein from a live virus. Your cells read those mRNA instructions and start making that spike protein. Your immune system then sees this new spike protein and creates antibodies that will be ready to attack if you come into contact with the virus. Unlike other vaccines, there is no whole virus used in the COVID-19 vaccine, so you can't get the disease from it.

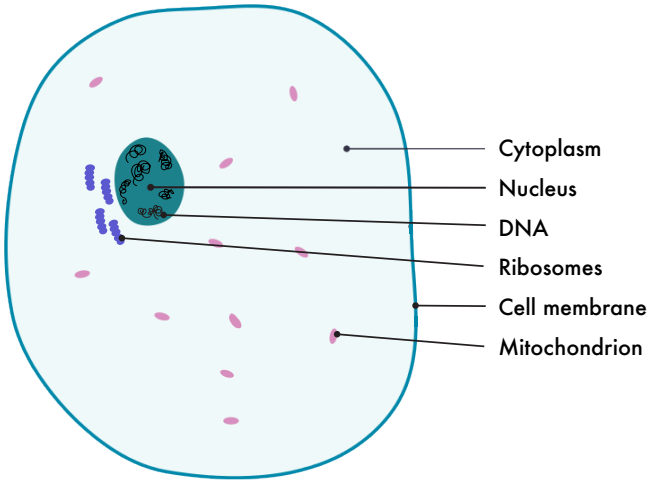


The Vaccine in Your Body

What happens when the vaccine gets into your body? Your cells read the mRNA instructions for the spike protein. A part of the cell called the ribosomes starts making the spike protein. Your immune system sees this new spike protein and starts attacking. Why? Because it recognizes that protein as an invader. After the protein is made, the cell breaks down the messenger RNA instructions. The secret message gets read and then destroyed!

It takes some time for your cells to make the spike protein. Then, it takes some more time for your immune system to attack it. That means you can still get COVID-19 for a little while after you get the vaccine. Vaccines can cause fever, chills and sore muscles, but that's because your immune system is attacking the protein. It's strange to think that fever and chills are good, but they are signs that your body is fighting like it's supposed to. Once you get the vaccine, you are on your way to being immune.

So how does this protect you? Your immune system remembers that spike protein, so if it ever sees it again, it attacks. Bam! Your cells do their job and break apart the virus so that it doesn't make you sick.



OPTIONAL:

Can vaccines affect my genes?

DNA stands for *deoxyribonucleic acid*. DNA is a molecule in the nucleus of cells. One section of DNA is called a gene. DNA contains the genetic codes for everything about you. One of those codes is for making proteins in your body. Proteins control just about everything inside you. Proteins control how your body is put together and how everything in it works. DNA stays inside every cell's nucleus. But proteins get made outside the nucleus of the cell. So, a DNA molecule makes messenger RNA (mRNA). Messenger RNA is the molecule that takes the code for proteins outside of the nucleus. The mRNA goes to the ribosome of the cell to make the new protein.

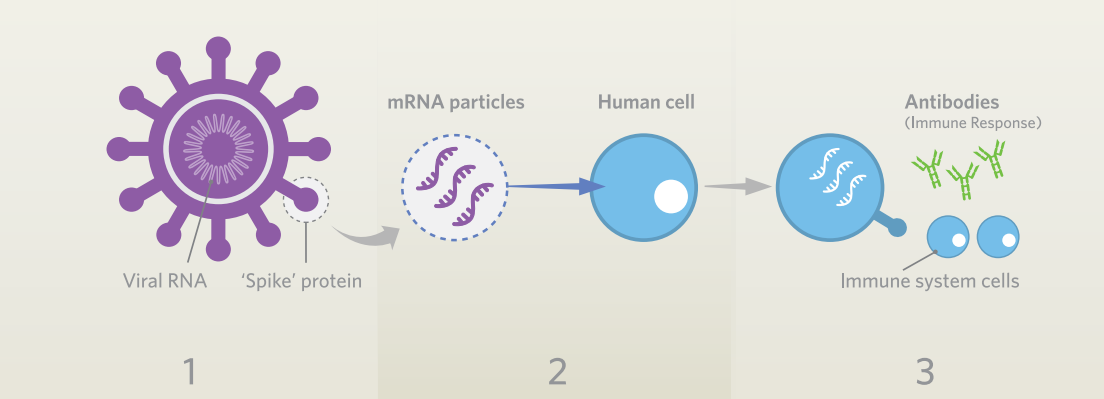
Some viruses have DNA, and some have RNA. The SARS-CoV-2 virus that causes COVID-19 has RNA. That means the vaccine contains mRNA from the virus. When you get the COVID-19 vaccine, the mRNA goes into your cells' ribosomes. There, it makes the spike protein. Then, it is broken apart by your body's systems. The mRNA never goes into your cells' nucleus. It can't change your genes, because it can't go into the nucleus where your DNA is.

Stop and Think:

1. Why is it important to get a vaccine before you get a disease? Explain your answer.

2. When should you get a vaccine?

3. How is the new mRNA vaccine different from the vaccines that have been used before?



4. Use your own words to describe what is happening at each step in the diagram.

5. Think about what you read so far about vaccines. What happens in your body after you get a COVID-19 vaccine?