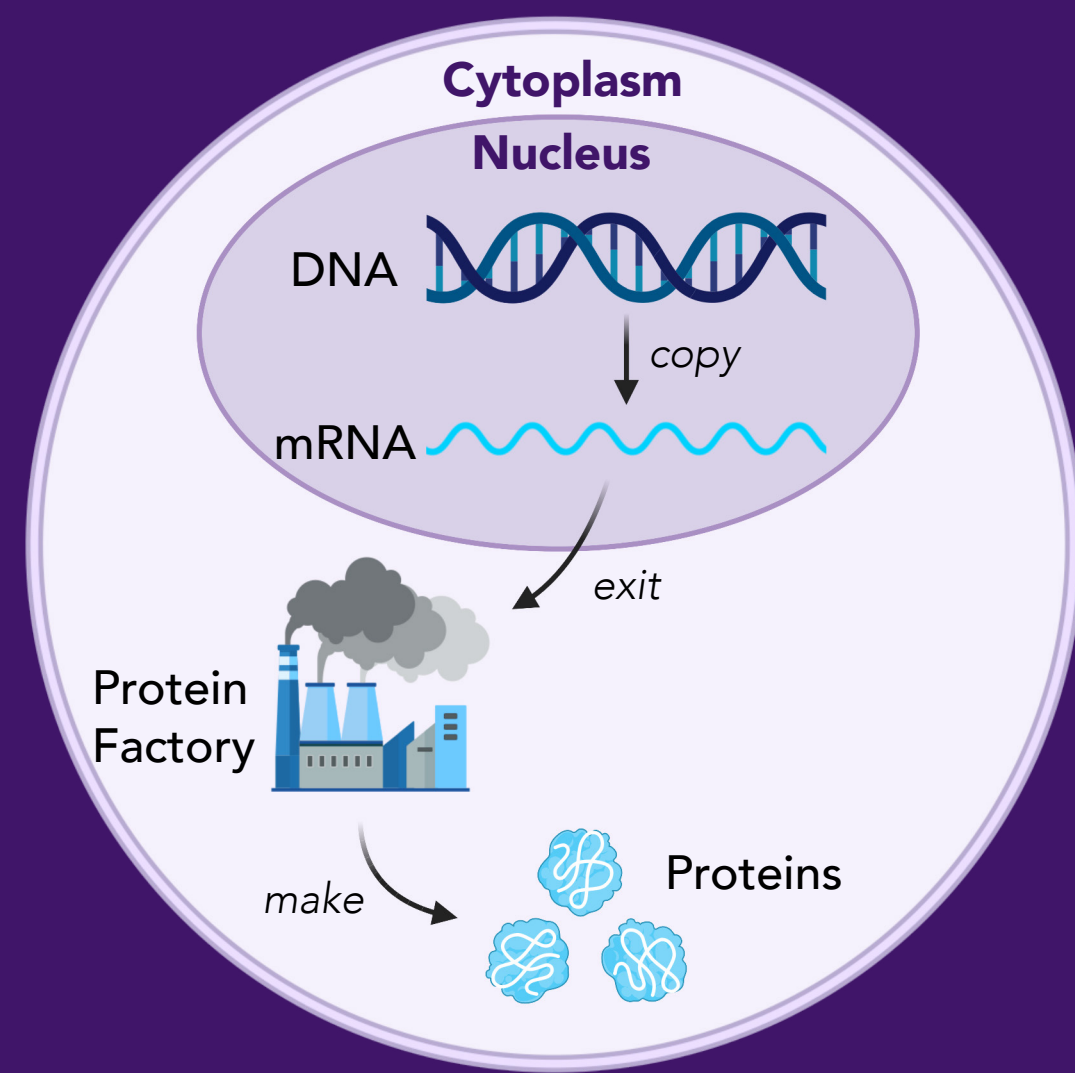


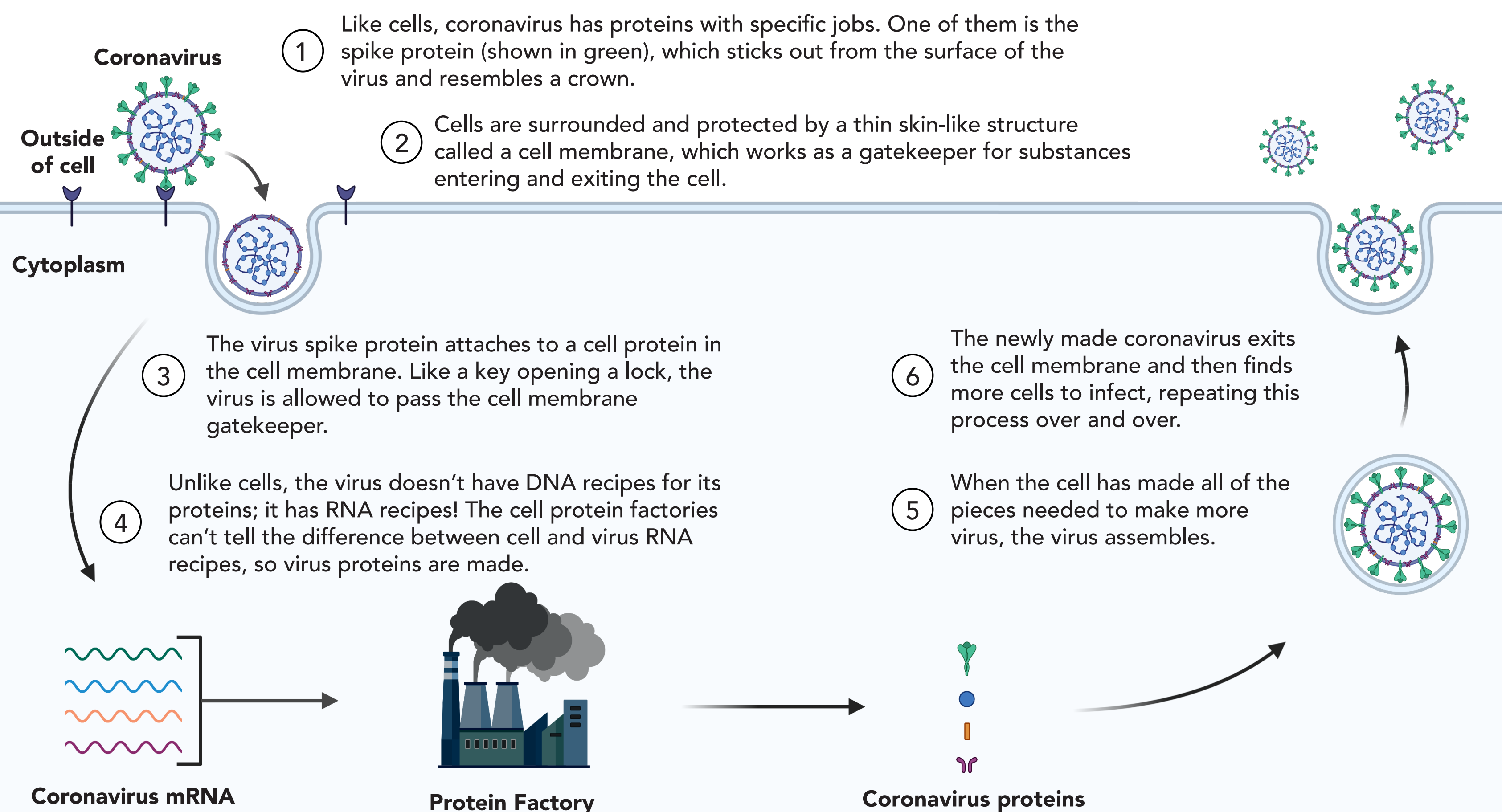
COVID-19 mRNA vaccines: how they work and why they are safe

How your cells make proteins: the basics!



Proteins do important, specific jobs to keep cells alive. They are made by factories in the cell cytoplasm. However, the recipes for cell proteins are found in the DNA, which stays inside the nucleus for safekeeping. So, how are proteins made by factories in the cytoplasm if the instructions never leave the nucleus? The answer is mRNA (aka messenger RNA)! Because mRNA is allowed to exit the nucleus, it delivers the copied recipe to protein factories in the cytoplasm where they make proteins for the cell. Let's explore why this information is important for understanding SARS-CoV-2, the coronavirus that causes COVID-19 disease!

How coronavirus hijacks your cells



Like cells, coronavirus has proteins with specific jobs. One of them is the spike protein (shown in green), which sticks out from the surface of the virus and resembles a crown.

Cells are surrounded and protected by a thin skin-like structure called a cell membrane, which works as a gatekeeper for substances entering and exiting the cell.

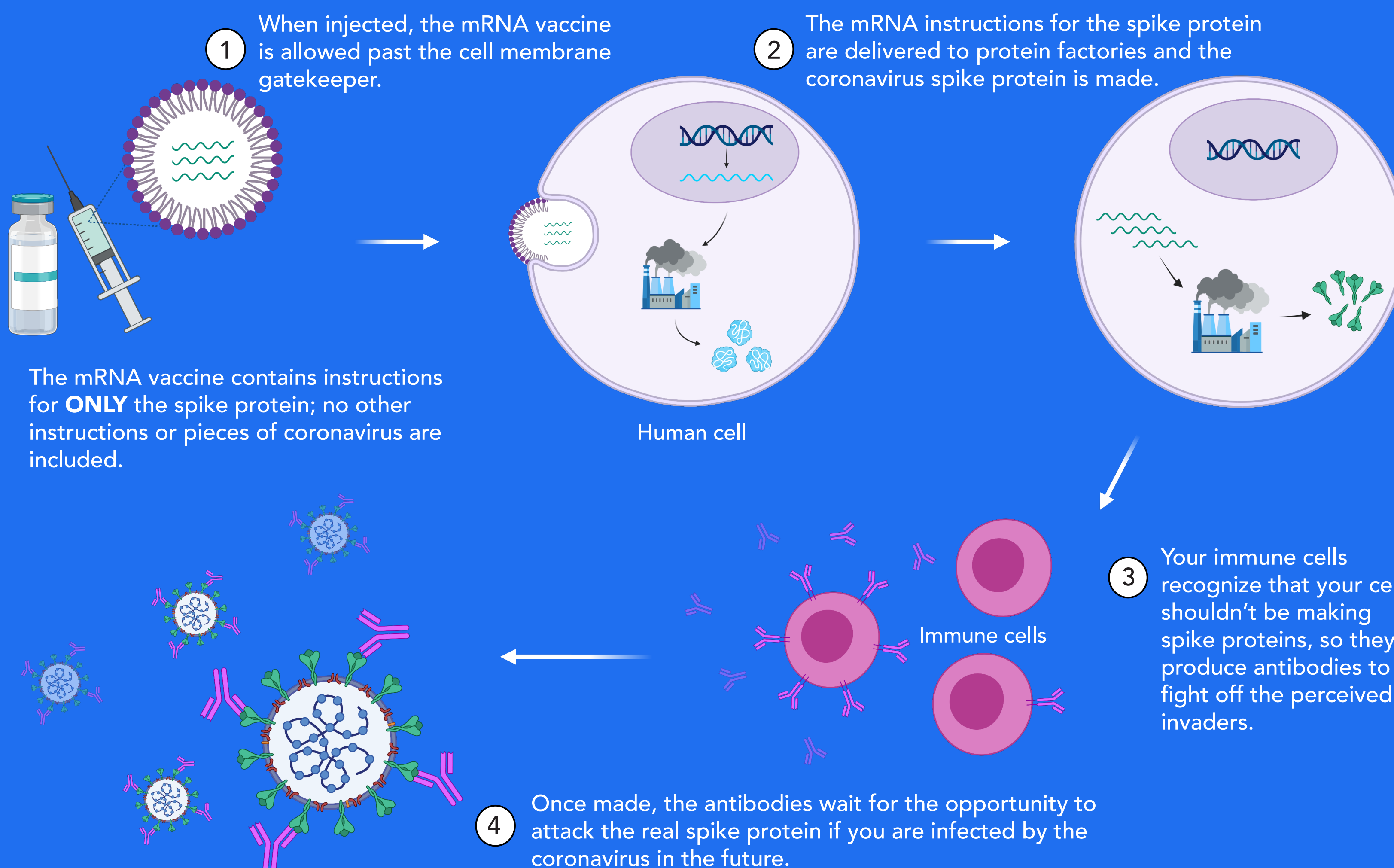
The virus spike protein attaches to a cell protein in the cell membrane. Like a key opening a lock, the virus is allowed to pass the cell membrane gatekeeper.

Unlike cells, the virus doesn't have DNA recipes for its proteins; it has RNA recipes! The cell protein factories can't tell the difference between cell and virus RNA recipes, so virus proteins are made.

The newly made coronavirus exits the cell membrane and then finds more cells to infect, repeating this process over and over.

When the cell has made all of the pieces needed to make more virus, the virus assembles.

What happens when you get the mRNA vaccine



The mRNA vaccine contains instructions for **ONLY** the spike protein; no other instructions or pieces of coronavirus are included.

Human cell

Immune cells

Frequently Asked Questions

The vaccine was developed quickly, is it safe?



Yes! Scientists have been developing, using, and perfecting mRNA vaccines for decades. Because the technology had been studied so thoroughly, scientists were able to switch out the mRNA information from a different virus and add in the mRNA information for the coronavirus spike protein when it became clear that COVID-19 was dangerous. All new vaccines, including the Moderna and Pfizer coronavirus vaccines, require 3 phases of human trials. Approval processes were not changed for these vaccines.

Will the mRNA vaccine change my DNA?



No, mRNA vaccines can't change your DNA. Why? Because the mRNA from the vaccine cannot and never will enter the nucleus, where your DNA is housed! Unlike cell mRNAs that are created in the nucleus and then exit to the cytoplasm, the mRNA from the vaccine is delivered directly to the cytoplasm and remains there. After being used to make spike protein, the vaccine mRNAs are destroyed and cannot be saved for later.

Does the vaccine contain harmful chemicals?



No, none of the four ingredients in the vaccine are harmful and each have a specific job. The mRNA recipe is the information for the cell's protein factories to make spike protein, causing the immune system to generate antibodies. The mRNA is dissolved in a salty solution called a buffer, which keeps the pH stable so it matches the pH in our bodies. To get into our cells, the mRNA is in a protective coat of fatty molecules, called lipids. Finally, there is also some sugar in the vaccine, which keeps the lipids from sticking together too much when the vaccine is stored at extremely cold temperatures. There are **NO** virus particles, eggs, microchips, or human cells or tissues in the vaccine!

Does the vaccine affect fertility?



No, there are no data to support the myth falsely claiming that antibodies made from the vaccine attack the placenta. There is no evidence that COVID-19 antibodies (naturally occurring or vaccine-produced) affect fertility. In fact, during the Pfizer vaccine trial, 23 women conceived (12 in the vaccine and 11 in the non-vaccine group). Although protective antibodies might be passed from pregnant mother to the baby, the mRNA cannot because it is destroyed too quickly.