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

Angela Messmer-Blust
University of Massachusetts Medical School

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

First, the basics! The nucleus of your cells houses all of the instructions (DNA) to make the molecules (proteins) that allow your cells to function. However, the factories that make proteins (ribosomes) are outside of the nucleus (cytoplasm)! To get the information where it needs to go, cells copy pieces of the DNA (transcription) into messenger RNA molecules (mRNA, get it?), which leave the nucleus to find the ribosomes and make proteins (translation). Scientists call this process the Central Dogma. The coronavirus is different than your cells, it is made of proteins and genetic information, but not in the form of DNA! Scroll on to find out why that is important!

How coronavirus hijacks your cells

1. The proteins covering coronavirus (spike proteins) attack proteins on the outside of cells (cell receptors), like a lock and key, allowing the virus to enter the cell.
2. Upon entry, the virus sheds its protein coat, releasing the RNA genome in the cell’s cytoplasm. The cell’s ribosomes can’t tell the difference between the virus mRNA and cell mRNA, so it makes a viral protein (polymerase) necessary to make copies of the virus.
3. The polymerase protein makes copies of the RNA genome and mRNA instructions to make more viral proteins.
4. The viral mRNA copies are kept in the nucleus along with viral components, like nucleocapsid, membrane, and spike protein.
5. The cell’s ribosomes keep producing lots of spike, nucleocapsid, membrane, and envelope viral proteins.
6. The newly-made coronaviruses exit the cell to go on and infect more cells, repeating this same process over and over.
7. The nature, fully assembled new virus is ready to exit the cell.
8. All of the pieces of the coronavirus are now assembled.
9. The cell has made all the pieces necessary to make more virus particles.

How mRNA vaccines work

1. The mRNA vaccine contains the instructions for only the spike protein; no other pieces of the viral genome are included.
2. The mRNA vaccine is the vaccine to enter the cell and find ribosomes.
3. The mRNA is the vaccine delivering the instructions to make the coronavirus spike protein.
4. Once made, the antibodies wait for the opportunity to attack the spike and keep you infected with the coronavirus in the future.

Dispelling common myths about mRNA vaccines

The vaccine was developed quickly, isn’t it safe?
Scientists have been developing and using mRNA vaccine technology for decades. Approval processes were not changed for these vaccines. Because the groundwork had already been laid, scientists were able to remove mRNA information from a different virus and gives us mRNA-specific mRNA for the spike protein. All new vaccines and medications require 3 phases of human trials.

Will the mRNA vaccine change my DNA? No, mRNA vaccines cannot change your DNA. Why? Because mRNA is not the code, it is the protein! The Central Dogma says mRNA in the vaccine cannot and will never enter the nucleus, where your DNA is stored. The DNA in the cytoplasm. The spike protein is made, proteins at the membrane, and cannot be saved for later.

Does the vaccine affect fertility? No, there are no data to support this myth falsely claiming that a vaccine made from the vaccine may affect the placenta. There is no evidence that COVID-19 vaccine (whether mRNA or vaccine-produced) affect fertility. In fact, during the Pfizer vaccine trial, 32 women conceived 10 in the vaccine and 11 in the placebo group). Although protective antibodies might be passed to the baby, the mRNA cannot because it is destroyed too quickly.