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Pharmacy Professor Conducts COVID-19 Vaccine Effectiveness Research

CEDARVILLE, OHIO -- The COVID-19 vaccine has been the talk of news stations, social media, institutional policy and much more. As these conversations unfold, many people have begun asking questions about the vaccine's details and data, and one Cedarville University professor is looking for answers.

[Dr. Rocco Rotello](#), associate professor of pharmaceutical sciences, is conducting research regarding the longevity of protein production from the synthetic mRNA injected during vaccination. And why is that important? According to Rotello, the lifespan of the mRNA has implications for the duration of the immune response and, ultimately, the long-term effectiveness of the vaccine.

"I have confidence that the vaccine works, but given its emergency approval, a lot of vaccine companies conducted far less pre-clinical work," said Rotello, whose pharmaceutical background is in mouse and human antibody development. "My hope is to backfill some of the details."

The Moderna and Pfizer COVID-19 vaccines contain pieces of mRNA that encode for spike proteins, which are comprised of cells that take up the mRNA molecules. The first shot creates a memory of that protein in the body, and the second shot allows the body to develop a hyper-immune response.

"My hypothesis is that the message — the antibody protein production set into motion by the synthetic mRNA — is lasting longer than it would in a case of actual infection," Rotello said. "We're checking to see if the message is still there after certain periods of time in culture, because if it is, then our bodies continue to make spike proteins and antibodies against it. In typical infections, the mRNA message is only there for a few minutes to an hour."

When the body encounters the COVID-19 virus protein after inoculation, special cells recognize it, chop it up and present those fragments to immune cells, telling our bodies we have a foreign molecule that needs to be eliminated.

"Your body says, 'I have this foreign protein again and I need to signal my body to make antibodies to get rid of it,' but if your cells that took up the vaccine still have the synthetic mRNA message, then they're still actively making that antibody protein," explained Rotello.

Rotello refers to this phenomenon of continued mRNA messaging as bodily redundancy, and its implications could be that the COVID-19 vaccine is more effective in immunity than natural infection since the synthetic mRNA maintains the antibody production message for longer.

As he continues his research, Rotello is considering the factors of protein longevity, which include resistance to metabolism and degradation.

When the vaccine is administered to immune-like cell lines, Rotello can observe its behavior in a body-like environment, tracking subsequent protein production and duration. Rotello has contacted both Pfizer and Moderna to provide their data, but both have only looked up to two days in cell cultures.

His research will continue into this semester with help from a team of Cedarville's pharmacy students, with hopes of preliminary experiments developing in coming weeks with time points from seven to 28 days.

"These are simple, straightforward, and timely experiments," Rotello said. "Daily, we're going to further understand this outbreak."

Located in southwest Ohio, Cedarville University is an accredited, Christ-centered, Baptist institution with an enrollment of 4,715 undergraduate, graduate, and online students in more than 150 areas of study. Founded in 1887, Cedarville is one of the largest private universities in Ohio, recognized nationally for its authentic Christian community, rigorous academic programs, including the [Doctor of Pharmacy](#) program, strong graduation, and retention rates, accredited professional and health science offerings, and high student engagement ranking. For more information about the University, visit www.cedarville.edu.

Written by Heidie Raine