Why coronavirus variants might undercut vaccine efficacy

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Beware the SARS-CoV-2 variants that are evolving rapidly around the world. If they haven’t arrived in the U.S. yet, they may soon, according to John P. Moore, PhD, professor of microbiology and immunology at the Weill Cornell Medical College in New York.

And while the vaccines now being distributed still work pretty well against the current variants, their protection may lose efficacy as variants evolve, Moore explained during a recent JAMA Network™ livestream and podcast.

Moore also contributed to a JAMA Viewpoint article, “SARS-CoV-2 Vaccines and the Growing Threat of Viral Variants.”

Two types of variants

Moore identified two types of variants: more transmissible ones—which are 30% to 50% more likely to infect people than the original strain of the SARS-CoV-2—and antibody-resistant viruses that could affect the efficacy of some vaccines.

“The two different mechanisms arise for different reasons in viral evolution and they have different implications,” he said. The most rapidly spreading variant is B.1.1.7, identified first in the United Kingdom but predicted to dominate new infections in the U.S. later this year. The antibody-resistant variants are much less frequent but may be more of a concern over time, Moore said.

Moore also said he was concerned about proposed changes in the intervals between the first and second vaccine injections. While some public health scientists, particularly in the U.K., support delaying second shots until more people are vaccinated, the delay could seriously affect how the vaccines protect against some variants.

“You are not fully protected in the interval between the first and second doses,” he said. Recent
studies in Israel indicated that protection more than doubles after the second dose and other papers show that the second dose increases neutralizing antibody levels by 20- to 50-fold.

Read more from the AMA about what doctors wish patients knew about new coronavirus variants.

**Seeking the strongest antibody response**

“If you are dealing with variants, you want the strongest possible antibody response,” he said. While vaccines presently being distributed do well against B.1.1.7, after only a single dose they may be much less able to tackle the B.1.351 variant that first emerged in South Africa.

In laboratory studies with sera from vaccine recipients obtained after one dose, the B.1.351 variant “blows right past them—it’s like it is not there,” Moore said. It's not yet known whether the variant will do the same in people, but Moore believes it’s highly likely. However, sera from people given two vaccine doses still have the capacity to impede B.1.351, although a bit less well than the original virus strain.

A weaker antibody response after a single dose may also contribute to the development of more variants, he continued. “If you have a very strong antibody response, the virus can’t replicate. If you have a weak or nonexistent antibody response, the virus doesn’t care. But if you have something in between, the virus sees the selection pressure and mutates to escape it.”

Moore said he expects more variants over time as more and more people are infected. “If you give an RNA virus to 100 million people and you give it a year, that’s a recipe for variants emerging. You will see more and more appear over time as more and more people are infected.”

The P.1 variant that originated in Brazil is similar to B.1.351 in terms of resistance to the vaccines and is also a cause for concern, he said.

**Possible solutions**

Vaccine developers are already anticipating variant issues and are working on redesigning the current vaccines to work better against B.1.351, Moore said.

“Another strategy is to give a third dose of the mRNA vaccines [Pfizer and Moderna] and a second dose of the Johnson & Johnson vaccine,” or possibly combining different types of vaccines in some sequential order to enhance immune response against the variants.
All of these approaches, however, would require clinical trial evaluations which would take months.

The AMA recognizes the critical importance of scientific integrity, transparency, and public trust in the fight to contain the global spread of COVID-19 and plan for the authorization, distribution, and administration of COVID-19 vaccines. Stay updated with the AMA on COVID-19 and vaccine development.