Single-Shot COVID-19 Vaccine Produces Immune Response Against Variants

The immune response to the single-shot Johnson & Johnson vaccine remained robust against variants of SARS-CoV-2.

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To date, three vaccines against SARS-CoV-2—the virus that causes COVID-19—have received emergency authorization for use in the U.S. All showed excellent protection against severe or critical disease in the clinical trials that led to their approval.

However, these vaccines were developed early in the pandemic, before the virus mutated to produce the variants now found around the world. Some variants seem to be able to partially escape the immune response in people previously infected with the virus.

Scientists haven't been sure if the current COVID-19 vaccines work as well against these variants. Early data for these vaccines have been promising. For example, the clinical trial testing the Ad26.COV2.S vaccine, by Janssen/Johnson & Johnson, showed that it protected people in Brazil and South Africa during times when new variants dominated.

Researchers led by Dr. Dan Barouch from Beth Israel Deaconess Medical Center wanted to examine the immune response to SARS-Cov-2 variants after vaccination with Ad26.COV2.S. The team looked at blood samples from 20 volunteers. Participants had received either Ad26.COV2.S at various doses and schedules or a placebo vaccine.

The researchers tested antibodies and immune cells from samples taken 57 days after vaccination. They tested activity against the original strain of SARS-Cov-2 as well as several variants. These included the alpha, beta, and gamma variants, and another first isolated in California.

The study was funded in part by NIH's National Institute of Allergy and Infectious Diseases (NIAID). Results were published on June 9, 2021, in Nature.

As expected, no neutralizing immune responses—those able to stop infection—were seen in people who received placebo shots. Among those who received Ad26.COV2.S, the team found

neutralizing antibodies against the variants. However, there was a reduction in antibodies that could neutralize the variants compared with the original virus. For example, the team saw a 3-fold reduction in antibodies that could recognize and bind to the gamma variant. They found a 5-fold reduction in those targeting the beta variant.

Importantly, other immune-system responses against the variants were similar to those against the original virus. These included the production of non-neutralizing antibodies, which can help immune cells recognize an invading pathogen. Different types of T cells, which help recognize and kill pathogens, responded similarly against the variants compared with the original virus.

The different types of immune responses to the vaccine may account for the protection against variants seen in South Africa and Brazil during earlier studies.

“Although the mechanistic correlates of protection for COVID-19 are not yet known, the vaccine’s robust protective efficacy in these regions raises the possibility that non-neutralizing antibodies and/or T cell responses may also contribute to protection,” Barouch says. “Alternatively, it is possible that low levels of neutralizing antibodies are sufficient for protection against COVID-19.”

Further research will be needed to better understand what immune system components are needed to protect against disease. Newer variants, such as the delta variant—which now accounts for about 10% of cases in the U.S.—will also need to be tested. The longer the pandemic continues, the more variants will emerge and circulate around the world.

Editor’s note: This study did not look at vaccine response in people exposed to the newer SARS-CoV-2 delta variant (B.1.617.2) , a more transmissible variant that is now circulating worldwide. However, Johnson & Johnson announced this week that the vaccine does induce “strong neutralizing antibody activity” against this variant.

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