

Vaccines are effective against most SARS-CoV-2 variants, says study

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Two of the commonly used coronavirus vaccines provide protection against multiple variants of the virus that causes COVID-19, including the highly infectious Delta variant, a new Yale study has found.

The findings, published Oct. 11 in the journal *Nature*, also show that those infected with the virus prior to vaccination exhibit a more robust immune response to all variants than those who were uninfected and fully vaccinated.

The results come as an increase in so-called "breakthrough" infections caused by the Delta variant among vaccinated individuals continues to raise questions about whether the vaccines offer broad protection against newly arising variants.

According to the researchers, the Moderna and Pfizer-BioNTech vaccines do bolster the immune system's response to infection.

"Vaccines induce high levels of antibodies against Delta and most variants," said Akiko Iwasaki, the Waldemar Von Zedtwitz Professor of Immunobiology and co-corresponding author of the paper. "And two shots are better than one."

In addition, the results suggest that booster shots can be effective in warding off SARS-CoV-2, the authors say.

For the study, a research team led by Iwasaki and two co-corresponding authors—Nathan Grubaugh, associate professor of epidemiology at Yale, and Saad Omer, director of the Yale Institute for Global Health—collected blood samples from 40 healthcare workers in the Yale New Haven Health System between November, 2020 and January, 2021 before they had received vaccinations. In the following weeks, they periodically took additional samples after the volunteers received their first and second doses of the Moderna or Pfizer-BioNTech mRNA vaccines.

The researchers then exposed the volunteers' blood samples to 16 different SARS-COV-2 variants, including the Delta variant, the most

predominate strain circulating in the United States, and then measured antibody and T cell response to each of the variants. (None of the volunteers were exposed to the virus.)

The researchers found evidence of enhanced immune system response in all blood samples, although the strength of response varied by variant and by individual. The [immune system](#) response to the Delta variant in the blood of all volunteers was generally robust—and even stronger in samples collected after the individuals' second shots.

The breakthrough cases attributed to the Delta variant are unlikely to arise from a failure of vaccines, Iwasaki said. Rather, they likely stem from the extremely infectious nature of the Delta variant, which can overcome the immune defense, she said.

Other studies have also shown that vaccinated individuals tend to have less severe infections.

"The Delta variant is more infectious than earlier variants," Grubaugh added. "The high transmissibility of the [variant](#), not its escape from our vaccine-induced immune response, best explains infections among the vaccinated."

The researchers also divided healthcare volunteers into two groups: Those who had been infected by COVID-19 prior to vaccination and those who had not. The immune response of those infected prior to vaccination was more robust than for those who never been infected.

"Recovering from an initial infection is like getting a first vaccine shot," Iwasaki said.

A booster shot among those vaccinated could have a similar effect, increasing presence of antibodies and T cells that protect against

infections, she said.

Yale's Carolina Lucas, Chantal Vogels, and Inci Yildirim are co-lead authors of the study.

More information: Carolina Lucas et al, Impact of circulating SARS-CoV-2 variants on mRNA vaccine-induced immunity, *Nature* (2021).

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