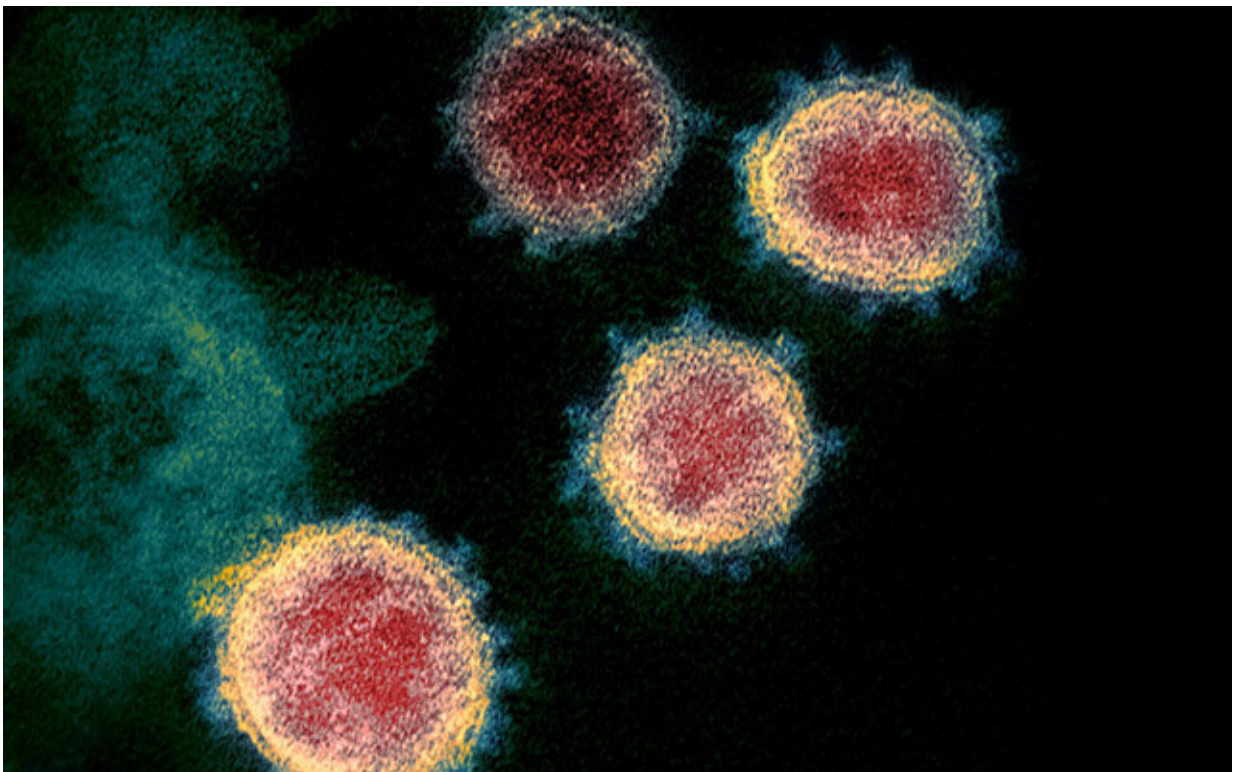


Vaccine-induced antibodies may be less effective against several new SARS-CoV-2 variants: study

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A colorized scanning electron micrograph of the SARS-CoV-2 virus. Credit: NIAID

SARS-CoV-2, the virus that causes COVID-19, has mutated throughout the pandemic. New variants of the virus have arisen throughout the

world, including variants that might possess increased ability to spread or evade the immune system. Such variants have been identified in California, Denmark, the U.K., South Africa and Brazil/Japan. Understanding how well the COVID-19 vaccines work against these variants is vital in the efforts to stop the global pandemic, and is the subject of new research from the Ragon Institute of MGH, MIT and Harvard and Massachusetts General Hospital.

In a study recently published in *Cell*, Ragon Core Member Alejandro Balazs, Ph.D., found that the neutralizing [antibodies](#) induced by the Pfizer and Moderna COVID-19 vaccines were significantly less effective against the variants first described in Brazil/Japan and South Africa. Balazs's team used their experience measuring HIV neutralizing antibodies to create similar assays for COVID-19, comparing how well the antibodies worked against the original strain versus the new variants.

"We were able to leverage the unique high-throughput capacity that was already in place and apply it to SARS-CoV-2," says Balazs, who is also an assistant professor of Medicine at Harvard Medical School and assistant investigator in the Department of Medicine at MGH. "When we tested these new strains against [vaccine](#)-induced neutralizing antibodies, we found that the three new strains first described in South Africa were 20-40 times more resistant to neutralization, and the two strains first described in Brazil and Japan were five to seven times more resistant, compared to the original SARS-CoV-2 virus."

Neutralizing antibodies, explains Balazs, work by binding tightly to the virus and blocking it from entering cells, thus preventing infection. Like a key in a lock, this binding only happens when the antibody's shape and the virus's shape are perfectly matched to each other. If the shape of the virus changes where the antibody attaches to it—in this case, in SARS-CoV-2's spike protein—then the antibody may no longer be able to recognize and neutralize the virus as well. The virus would then be

described as resistant to neutralization.

"In particular," says Wilfredo Garcia-Beltran, MD, Ph.D., a resident physician in the Department of Pathology at MGH and first author of the study, "we found that mutations in a specific part of the spike protein called the receptor binding domain were more likely to help the virus resist the neutralizing antibodies." The three South African variants, which were the most resistant, all shared three mutations in the receptor binding domain. This may contribute to their high resistance to neutralizing antibodies.

Currently, all approved COVID-19 vaccines work by teaching the body to produce an immune response, including antibodies, against the SARS-CoV-2 spike protein. While the ability of these variants to resist neutralizing antibodies is concerning, it doesn't mean the vaccines won't be effective.

"The body has other methods of immune protection besides antibodies," says Balazs. "Our findings don't necessarily mean that vaccines won't prevent COVID, only that the antibody portion of the immune response may have trouble recognizing some of these new variants."

Like all viruses, SARS-CoV-2 is expected to continue to mutate as it spreads. Understanding which mutations are most likely to allow the [virus](#) to evade vaccine-derived immunity can help researchers develop next-generation vaccines that can provide protection against new variants. It can also help researchers develop more effective preventative methods, such as broadly protective vaccines that work against a wide variety of variants, regardless of which mutations develop.

More information: *Cell* (2021). [DOI: 10.1016/j.cell.2021.03.013](https://doi.org/10.1016/j.cell.2021.03.013) , [www.cell.com/cell/fulltext/S0092-8674\(21\)00298-1](https://www.cell.com/cell/fulltext/S0092-8674(21)00298-1)

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