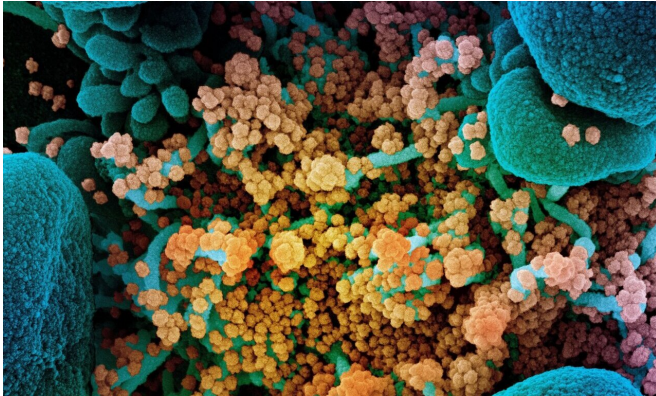


# Prior SARS-CoV-2 infection rescues B and T cell responses to variants after first vaccine

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Colorized scanning electron micrograph of a dying cell (blue) heavily infected with SARS-CoV-2 (yellow), the virus that causes COVID-19. Credit: NIAID Integrated Research Facility, Fort Detrick, Maryland.

A single dose of vaccine boosts protection against SARS-CoV-2 coronavirus variants, but only in those with previous COVID-19, a study has found.

In those who have not previously been infected and have so far only received one dose of vaccine the [immune response](#) to variants of concern may be insufficient.

The findings, published today in the journal *Science* and led by researchers at Imperial College London, Queen Mary University of London and University College London, looked at immune responses in UK healthcare workers at Barts and Royal Free hospitals following their first dose of the Pfizer/BioNTech vaccine.

They found that people who had previously had mild or asymptomatic infection had significantly enhanced protection against the Kent and South Africa variants, after a single dose of the mRNA vaccine. In those without prior COVID-19, the immune response was less strong after a first

dose, potentially leaving them at risk from variants.

Professor Rosemary Boyton, Professor of Immunology and Respiratory Medicine at Imperial College London, who led the research, said: "Our findings show that people who have had their first dose of vaccine, and who have not previously been infected with SARS-CoV-2, are not fully protected against the circulating variants of concern. This study highlights the importance of getting second doses of the vaccine rolled out to protect the population."

Blood samples were analyzed for the presence and levels of immunity against the original strain of SARS-CoV-2, as well as the Kent (B.1.1.7) and South Africa (B.1.351) variants of concern. Along with antibodies—the Y-shaped proteins which stick to the virus and help block or neutralize the threat—the researchers also focused on two types of white blood cell: B-cells, which 'remember' the virus; and T cells, which help B cell memory and recognize and destroy cells infected with coronavirus.

They found that after a first dose of vaccine, prior infection was associated with a boosted T cell, B cell and neutralizing antibody response, which could provide effective protection against SARS-CoV-2, as well as the Kent and South Africa variants.

However, in people without previous SARS-CoV-2 infection, a single vaccine dose resulted in lower levels of neutralizing antibodies against SARS-CoV-2 and the variants, potentially leaving them vulnerable to infection and highlighting the importance of the second vaccine dose.

The team looked at two variants of concern, however, they think it possible that the findings will apply to other variants in circulation, such as the Brazil (P.1) and India (B.1.617 and B.1.618) variants.

It remains unclear precisely how much protection is offered by T cells. Interestingly, the mutations in the Kent and South Africa variants here resulted in T cell immunity which could be reduced, enhanced or unchanged compared to the original strain, depending on genetic differences between people.

Professor Boyton commented: "Our data show that natural infection alone may not provide sufficient immunity against the variants. Boosting with a single vaccine dose in people with prior infection probably does. As new variants continue to emerge, it is important to fast track global rollout of vaccines to reduce transmission of the virus and remove the opportunities for new variants to arise."

Professor Danny Altmann, Professor of Immunology at Imperial, commented: "At a time of generally improving outlook in those countries with substantial vaccine rollout programs, this study reminds us of the need to be vigilant about the threat of the variants. Most vaccinated people in the UK have received just one dose. While we know this offers remarkable protection against the original virus, our data suggest this leaves people susceptible to variants of concern."

Professor Áine McKnight, of Queen Mary University of London, said: "Our study offers reassurance and a warning. We show that current vaccines offer some protection against variants of concern. However, people who have received only the first course of a double dose [vaccine](#) show a more muted immune response. We must ensure that the global vaccination program is fully implemented. Current events in India make painfully clear the cost of complacency."

Professor James Moon, of University College London and Barts, said: "These results represent collaborative science at its best between hospitals, universities and public bodies providing important timely results to inform policy and strategy."

**More information:** 'Prior SARS-CoV-2 infection rescues B and T cell responses to variants after first vaccine dose' by Reynolds, C.J. et al. *Science*. [DOI: 10.1126/science.abh1282](https://doi.org/10.1126/science.abh1282)

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