Prior COVID-19 infection linked to robust, accelerated immune response after first vaccine dose

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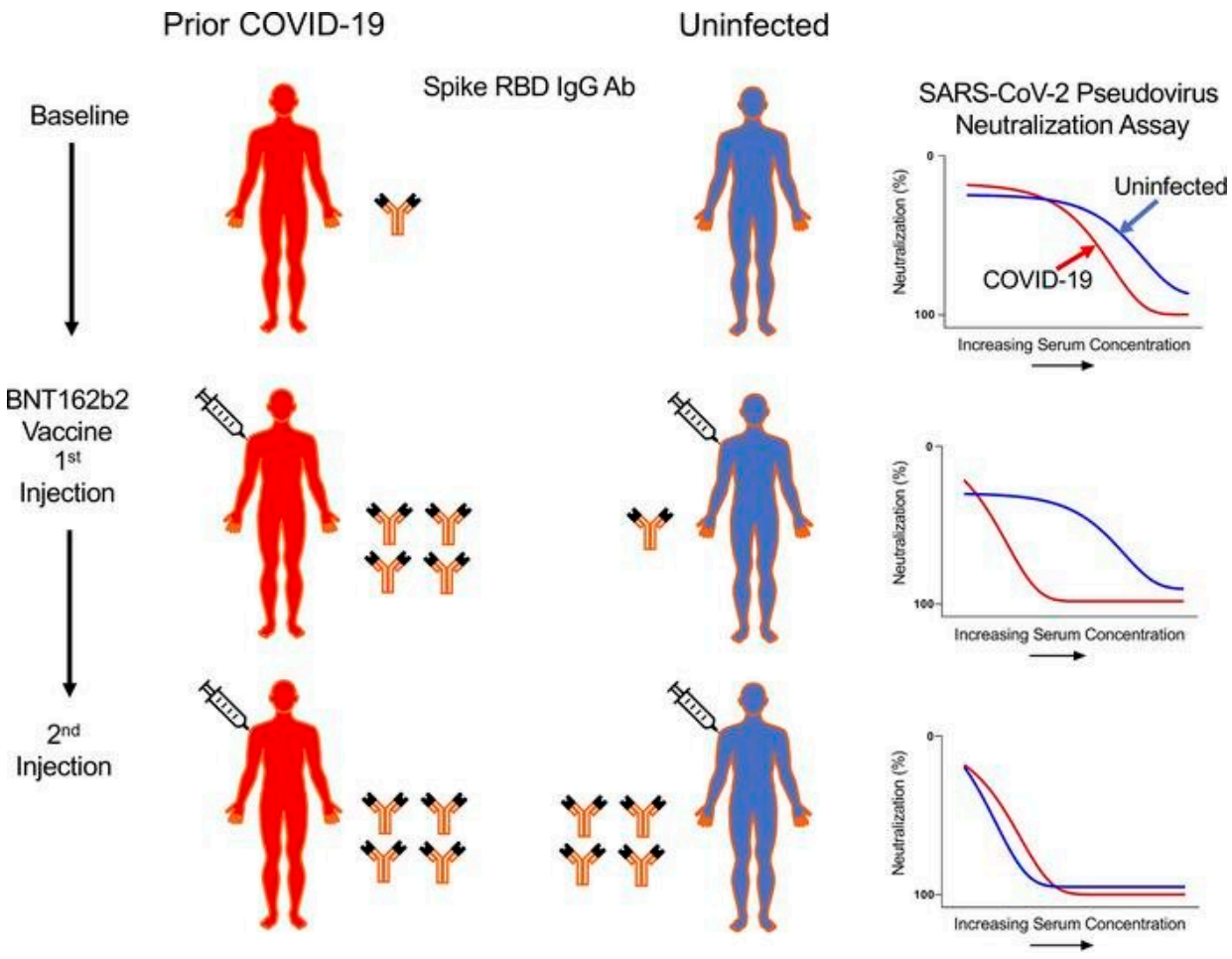

Graphical abstract. Credit: *JCI Insight* (2022). DOI: 10.1172/jci.insight.155889

Since March 2020, the SARS-CoV-2 virus, the cause of coronavirus disease 2019 (COVID-19), has infected more than 460 million people worldwide. The vast majority of people who recover from infection demonstrate long-lasting immune memory of the virus. Little is known, however, about how this immune memory alters responses to SARS-CoV-2 mRNA vaccines, despite possible impacts on public health guidelines for vaccination.

Now, in recent research published in the journal *JCI Insight*, scientists at the Lewis Katz School of Medicine at Temple University show that responses to the Pfizer-BioNTech BNT162b2 mRNA vaccine differ significantly in individuals based on whether or not they were previously infected with SARS-CoV-2. Notably, those who had COVID before vaccination experienced rapid antibody production after the first vaccine dose, with little or no increase after the second dose. The opposite pattern was observed in infection-naive individuals.

"Our study shows that the presence of immune memory induced by prior infection alters the way in which individuals respond to SARS-CoV-2 mRNA vaccination," explained Steven G. Kelsen, MD, Professor in the Department of Thoracic Medicine and Surgery at the Lewis Katz School of Medicine, and first author on the new report. "The lack of response after the second vaccine dose in previously infected individuals is especially relevant, because it could mean that some people may require only one dose or could potentially skip the booster shot."

Dr. Kelsen and Temple colleagues carried out the study in health care workers, some having previously tested positive for SARS-CoV-2 infection and others never having been infected. In both groups, the researchers measured levels of neutralizing antibodies in blood samples taken at three different time points, including before vaccination and after each vaccine dose. They also performed qualitative assessment for local reactions and systemic symptoms, such as fever, headache, and

fatigue, associated with vaccination.

While levels of neutralizing antibodies reached their maximum in some people with prior COVID illness after the first vaccine dose, individuals with no history of infection exhibited massive responses after the second dose. But those high levels also plummeted quickly, and for the COVID group, despite the lack of response to a second dose, individuals overall had longer-lasting immunity. Prior infection, however, was also linked to more frequent and longer-lasting adverse reactions to the vaccine.

"Previous studies had similarly reported long-lasting immunity and strong immune reactions in COVID patients," Dr. Kelsen said. "We now provide new information on how prior infection interacts with vaccination in terms of measurable immune response and how individuals react to mRNA vaccines based on infection history."

In future work, Dr. Kelsen and collaborators plan to modify their neutralizing antibody assay to detect Omicron and other SARS-CoV-2 variants. "We also are interested in understanding how long protection from a booster dose of the vaccine lasts," he said.

More information: Steven G. Kelsen et al, SARS-CoV-2 BNT162b2 vaccine–induced humoral response and reactogenicity in individuals with prior COVID-19 disease, *JCI Insight* (2022). DOI: 10.1172/jci.insight.155889

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