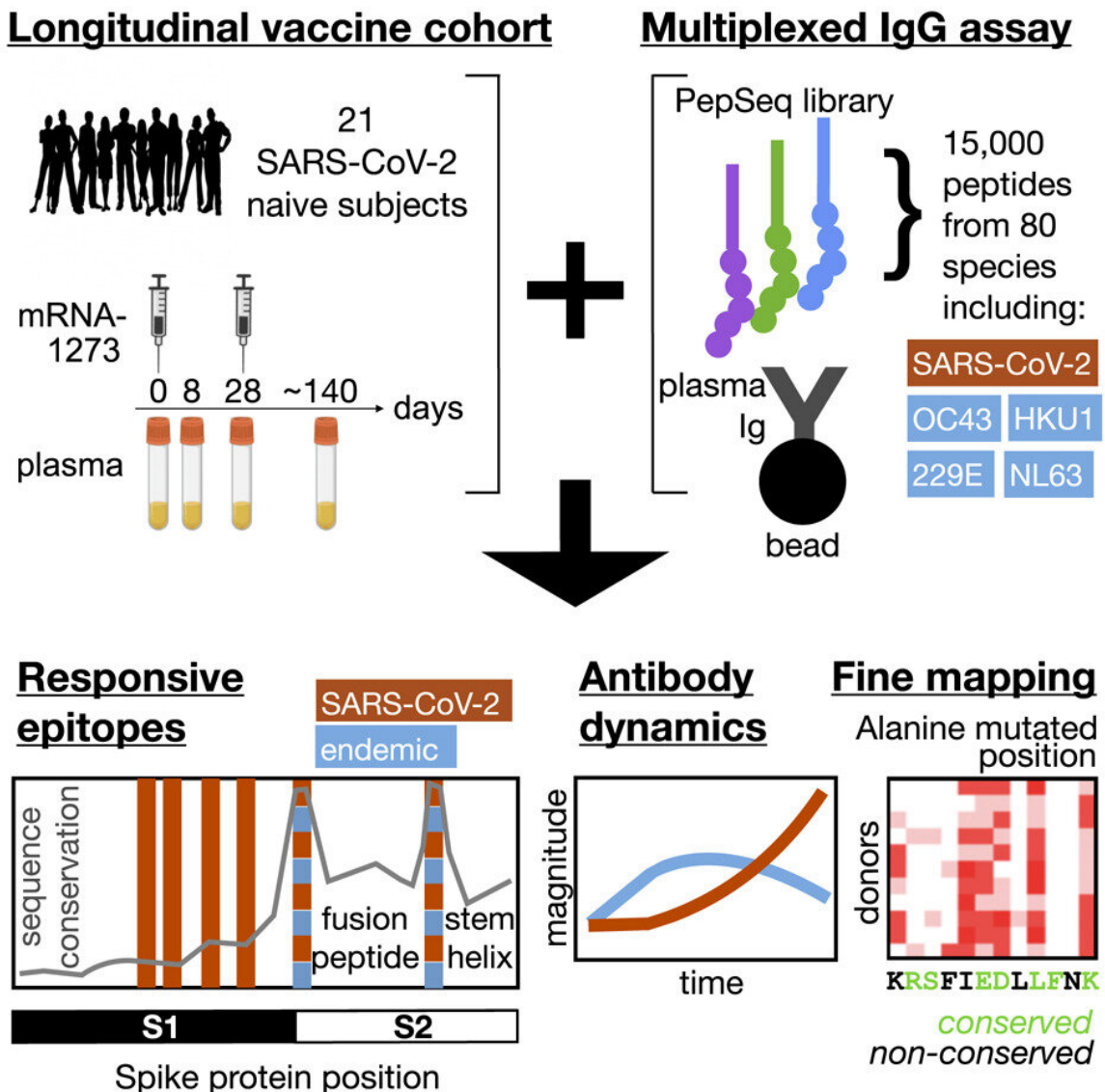


COVID-19 vaccination activates antibodies targeting parts of virus spike protein shared between coronaviruses

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Graphical abstract. Credit: *Cell Reports* (2022). DOI: 10.1016/j.celrep.2022.111022

Could the SARS-CoV-2 vaccine reawaken previous antibody responses and point the way to a universal coronavirus vaccine? A new analysis of the antibody response to a COVID-19 vaccine suggests the immune system's history with other coronaviruses, including those behind the common cold, shapes the patient's response, according to a study published today in *Cell Reports*.

Led by scientists at the Translational Genomics Research Institute (TGen), part of City of Hope, and Northern Arizona University (NAU), a research team found that the vaccine generates antibodies that target regions of the SARS-CoV-2 spike protein that are unique to the [new virus](#), while also targeting regions of the protein that are shared or conserved among many coronaviruses.

What's more, the antibody response to these different coronaviruses appears to follow different paths. Over the course of 140 days following vaccination, the response to common cold coronaviruses started early but diminished over time. The response to SARS-CoV-2 continued to get stronger and stronger over time.

"The findings could help fine-tune the design of future vaccines or new monoclonal antibody treatments, perhaps leading to a universal coronavirus vaccine," said John Altin, Ph.D., senior author and assistant professor in TGen's Pathogen Genomics and Integrated Cancer Genomics Divisions.

"Even if the response to the conserved regions is just a small part of the vaccine's overall protection, it may be a response that could be leveraged in future vaccines against future variants of the COVID-19 virus," he added.

Altin and colleagues are now looking more closely at the antibodies that target the two conserved regions they identified in their study to determine whether these are broadly neutralizing antibodies that generate immunity extending to new variants of the virus.

Using a technology called PepSeq developed by Altin and co-author Jason Ladner, Ph.D., an assistant professor at NAU's Pathogen and Microbiome Institute, allowed the researchers to carefully map antibody responses and track them serially over 140 days in 21 people who received the Moderna SARS-CoV-2 vaccine. The technology matches individual peptides (the building blocks of proteins) with unique DNA tags. The tags allow scientists to pinpoint which peptides are being targeted by antibodies.

Before technologies like PepSeq, researchers had to measure the response of antibodies against one protein target at a time.

"PepSeq allows us to perform up to hundreds of thousands of measurements of antibodies against different parts of virus proteins all at the same time from the same sample," Ladner said.

PepSeq also helps scientists precisely map the antibody response to specific regions of a protein. This allowed Ladner, Altin and their colleagues to track the differences in antibody response between divergent and conserved regions of the SARS-CoV-2 Spike [protein](#).

"Our theory is that there is actually memory from previous common cold coronavirus encounters, and when you get the vaccine for SARS-CoV-2,

the [vaccine](#) reawakens some of those memories. Then you see this early response which is basically just a rapid memory response to what you've already seen," Altin said. "With time, the [immune system](#) can reshape those responses more in the direction of the pandemic [virus](#)."

Before COVID-19, Ladner and Altin were using PepSeq to get a closer look at the full range of viruses that infect humans. The powerful technology offers a way to "understand something about the viruses that a person has been exposed to in the past and the immune response to those infections," Ladner said.

For instance, Ladner and his colleagues are looking at whether some [chronic diseases](#), such as type 1 diabetes and celiac disease, might have some of their roots in different viral exposures. They also use the technology to look for different rates of infection between different populations, to see how this exposure history might be related to health disparities between those populations.

More information: Evan A. Elko et al, COVID-19 vaccination elicits an evolving, cross-reactive antibody response to epitopes conserved with endemic coronavirus spike proteins, *Cell Reports* (2022). [DOI: 10.1016/j.celrep.2022.111022](https://doi.org/10.1016/j.celrep.2022.111022)

Provided by Northern Arizona University

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