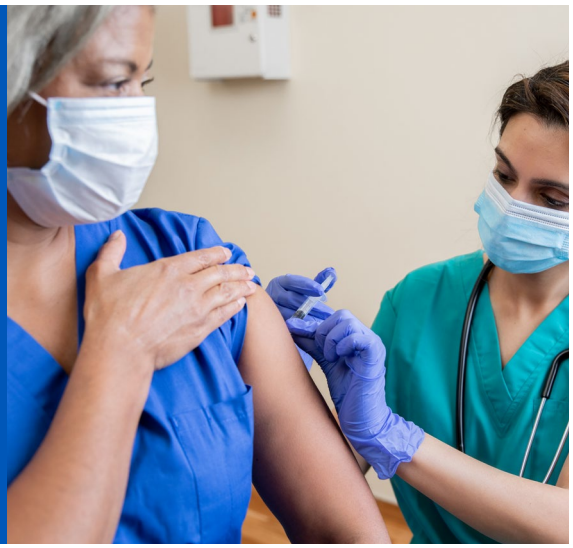
Vaccines versus acquired immunity from "natural infection" from SARS-CoV-2

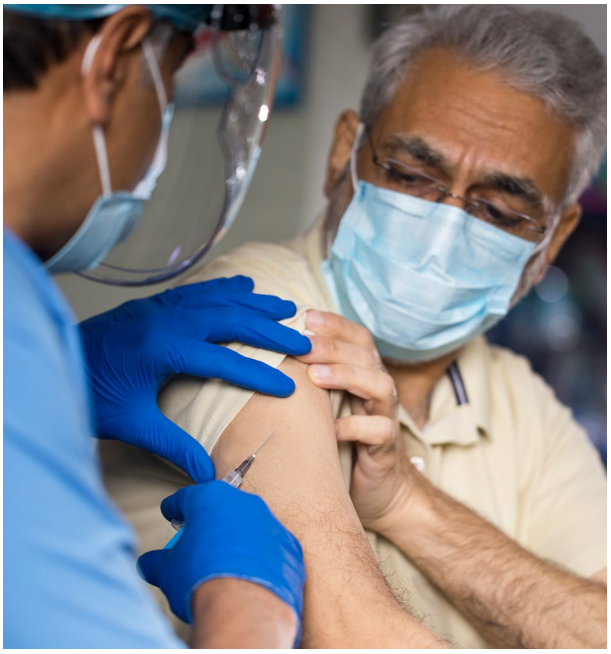


Introduction

Protection against SARS-CoV-2 – in the most basic sense - happens when the human immune system "learns" to create antibodies against the spike protein of the virus. The spike protein is the critical structure on the virus that allows it to bind to the ACE2 receptors in the body, and infect cells. If antibodies disable the spike protein, the virus can't enter the cell, and no infection happens.

One of the primary questions during this pandemic has been determining how robust any protection is, and how long it lasts. A second question relates to the level of immune protection provided by "natural infections" compared to the immunity produced by the mRNA COVID-19 vaccines. Now, a recent National Institutes of Science (NIH) study is starting to clarify these parts of the pandemic puzzle.

This study was conducted at the Fred Hutchinson Cancer Research Center in Seattle by Jesse Bloom and Allison Greaney. In a previous study, they characterized the spike protein Receptor Binding Domain (RBD) along with 3,800 single letter codon changes that could happen there and possibly alter the ability of the spike protein to bind to the ACE2 receptor.



In their most recent investigation they used samples of serum from multiple individuals – some of whom had suffered natural infections with SARS-CoV-2 – and some of whom had received two doses of the Moderna mRNA lipidnanoparticle COVID-19 vaccine. They evaluated the effect of these serum antibodies on the various alterations of the RBD as well as other locations of the spike protein.

What they found was that there are some very important differences in the type and level of protection against the virus comparing antibodies from natural infections versus those from the mRNA vaccine. First, antibodies from patients with natural infections were much less specific – often targeting areas of the spike protein that had nothing to do with binding to the ACE2 receptors. While antibodies from the mRNA vaccine were highly specific for the RBD, even across the variations of single "mutations" in the amino acid codons.

What this means is that the mRNA vaccine produced antibodies that were much better at attacking the important binding area of the spike protein than those produced by natural infections. And this specificity remained high despite the changes in the amino acid codons. These data strongly support that mRNA vaccine produced antibodies are much more likely to effectively target new mutations and variants of the SARS-CoV-2 virus than antibodies produced from a natural infection.

It is not entirely clear why the mRNA vaccine antibodies are so much more specific. The researchers suggest that it likely has to do with the way the spike proteins from the mRNA vaccine are received, presented and processed by the human immune system. This study supports the idea that immunity from the mRNA vaccines is likely superior to any immunity resulting from a naturally acquired COVID-19 infection. The findings also have implications for a longer term immunity not just to SARS-CoV-2, but to other coronavirus species.

As clinicians we need to continue to encourage and promote vaccination with the currently available mRNA vaccines in our communities. This is not only true for those who are unvaccinated, but for those incompletely vaccinated or those relying on any level of protection from past COVID-19 infections.

External References:

Antibodies elicited by mRNA-1273 vaccination bind more broadly to the receptor binding domain than do those from SARS-CoV-2 infection.
Greaney AJ, Loes AN, Gentles LE, Crawford KHD, Starr TN, Malone KD, Chu HY, Bloom JD.
Sci Transl Med. 2021 Jun 8.

COVID-19 Research (NIH)

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