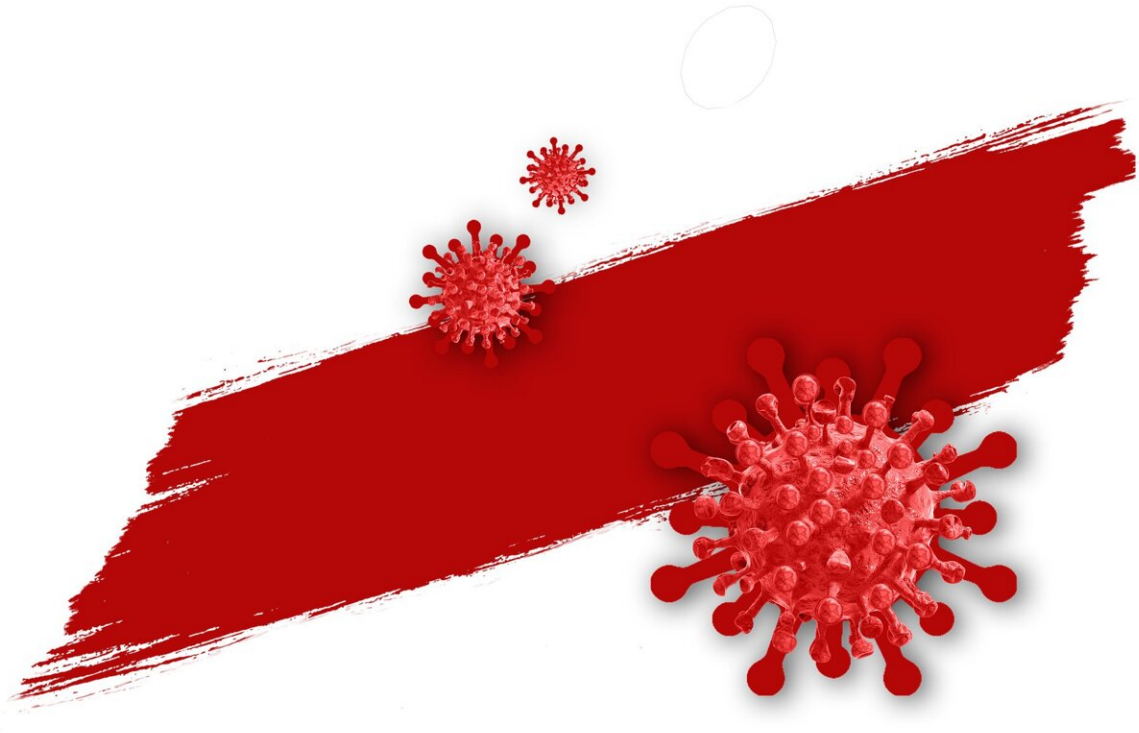
Medical Xpress

Researchers gain new insights into antibody response against viral COVID variants

January 25 2022



Credit: Pixabay/CC0 Public Domain

In the journal *Science*, researchers from Deutsches Zentrum für Neurodegenerative Erkrankungen (DZNE) and Charité–Universitätsmedizin Berlin present new findings on the immune

response against the coronavirus SARS-CoV-2. Their study is based on investigations of antibodies elicited by infection with the Beta variant of the virus. The researchers conclude that the Beta variant can confer broad immunity to multiple viral strains, which could be beneficial for protection against the currently prevalent Delta and Omicron variants, as well as against future viral variants. In their view, this aspect should be taken into account in the development of vaccination strategies.

"The Beta variant of the coronavirus shows marked differences from the wild type, the original strain of the virus. Until the emergence of the now dominating Omicron variant, it was the viral form that had evolved furthest from the wild type, against which the existing vaccines have been developed," says Dr. Momsen Reincke, a researcher at DZNE and the Department of Neurology with Experimental Neurology on Campus Charité Mitte, as well as one of the first authors of the current publication in *Science*. "We were interested in learning more about the exact antibody response to this variant—to see what conclusions can be drawn from this about the immune response to other variants. Since the coronavirus is likely to continue mutating, we were interested in whether the antibodies we found acted only against the Beta variant or had broader potential."

Antibody diversity

Antibodies are proteins that the body uses to defend itself against pathogens. The human immune system can produce an almost inexhaustible variety of them by making use of various mechanisms: in particular, by repeatedly recombining the blueprints for the components of an antibody that are stored in the genome. "The immune response to coronavirus also produces a spectrum of antibodies that bind to different areas of the pathogen," Reincke says. From an immune defense perspective, binding to the so-called spike protein is particularly effective. "In a nutshell, this is the hook that the virus uses to attach

itself to body cells so that it can then slip in. Some antibodies bind to this protein and thereby render the hook useless. These are the neutralizing antibodies. In our study, these were exactly the antibodies we looked at."

Replication in the laboratory

The findings of the Berlin scientists are based on an analysis of antibodies that they isolated from the blood of 40 individuals. All patients had been infected with the Beta variant of SARS-CoV-2. Of the approximately 300 antibodies initially surveyed, 81 bound particularly strongly to the spike protein of the coronavirus. Reincke and his colleagues unraveled the genetic blueprints of the antibodies. This enabled them to understand which genes play a role in the assembly of these antibodies and to artificially produce these immune proteins for further studies. In doing so, they benefited from a project funded by the Helmholtz Association: The "BaoBab Innovation Lab." Within the framework of BaoBab, they develop and refine technologies for the characterization and production of antibodies.

Effective against Delta and Omicron

"We tested if antibodies against the Beta variant are also effective against other virus variants. This is called cross-reactivity. Our analyses show that some of these antibodies do little against the wild type. Others, however, are very effective against the original virus strain and also against some of the variants of concern. Some of the antibodies against Beta are even effective against the currently circulating variants Delta and Omicron," says Dr. Jakob Kreye, last author of the study and a scientist at DZNE and Charité's Department of Pediatric Neurology, as well as the Department of Neurology with Experimental Neurology.

It depends on the binding site

The key to cross-reactivity is the site of the spike protein a particular antibody binds to and whether this site has changed between viral variants. "The antibodies with broad efficacy target areas of the spike protein that have remained largely the same in the previous viral variants," Kreye says. However, there are exceptions to this in the case of Omicron. "Yet we have found antibodies that work well against both Beta and Omicron and only weakly against other variants. These particular antibodies bind to sites of the spike protein that are quite similar in Beta and Omicron but not in other variants."

Protection against new variants

Cross-reactivity could prove to be an important aspect of future vaccinations: "Individual antibodies against the wild type also have broad efficacy. This has been described in the literature and is also shown by studies in our laboratory. Taking together these data and our current findings, we conclude that antibodies generated against different viral variants can complement each other and thus jointly improve the potency of the immune response against emerging variants. Largest possible diversity in the antibody response seems to make sense," says Prof. Dr. Harald Prüss, research group leader at DZNE and senior physician at the Department of Neurology with Experimental Neurology on Campus Charité Mitte.

"Simultaneous or even sequential vaccination against different variants would likely provide enhanced protection against potential further forms of the coronavirus," Kreye adds. "This approach could be relevant for the further development of vaccination strategies, because the pathogen can be expected to keep changing in the future."

More information: Momsen Reincke et al, SARS-CoV-2 Beta variant infection elicits potent lineage-specific and cross-reactive antibodies,

Science (2022). DOI: 10.1126/science.abm5835

Provided by German Center for Neurodegenerative Diseases

Citation: Researchers gain new insights into antibody response against viral COVID variants (2022, January 25) retrieved 26 April 2024 from https://medicalxpress.com/news/2022-01-gain-insights-antibody-response-viral.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.