

How SARS-CoV-2 Might Cause Dangerous Inflammation in Children

Study findings could help shed light on how MIS-C and other autoimmune diseases develop after viral infections.

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Children infected with SARS-CoV-2, the virus that causes COVID-19, can develop a rare, life-threatening complication called multisystem inflammatory syndrome in children (MIS-C). In MIS-C, aberrant immune responses cause inflammation throughout the body. But it's not clear how SARS-CoV-2 infection leads to MIS-C.

To gain more insight, a team of researchers led by Drs. Aaron Bodansky, Mark Anderson and Joseph DeRisi at the University of California San Francisco compared blood samples from almost 200 children with MIS-C to 45 control children without MIS-C. All had recent SARS-CoV-2 infections. Results of the study, which was partially funded by NIH, [appeared in Nature on August 7, 2024](#).

The team looked at whether the two groups had different antibodies targeting human proteins. They found that MIS-C patients had antibodies to a distinct set of proteins. One of these was SNX8, which is found at high levels within immune cells. SNX8 is involved in a virus defense pathway that has been implicated in MIS-C. Almost all the antibodies against SNX8 from MIS-C patients recognized the same structural feature on the protein.

The researchers also examined antibody responses to SARS-CoV-2 proteins. They found that MIS-C patients produced a lot more antibodies that targeted a specific site on the viral nucleocapsid protein. This site closely resembles the site on the SNX8 protein that the patients' antibodies recognized. Because of this molecular mimicry, the same antibodies targeting the viral nucleocapsid may be recognizing the body's SNX8 protein.

As antibodies can't access proteins inside of cells, the team then looked for T cells that reacted to SNX8. They found them in MIS-C patients but not in controls. These T cells recognized both the site on SNX8 and the site on the nucleocapsid protein that the antibodies recognized.

The findings provide a plausible mechanism by which SARS-CoV-2 infection can, in rare cases, lead to MIS-C. First, the immune system reacts to a specific site on the viral nucleocapsid protein. Then, because this site so closely resembles part of SNX8, the immune system begins to mistakenly target the body's own SNX8 protein.

Viral infections are also believed to trigger other autoimmune diseases, such as type 1 diabetes and multiple sclerosis. The findings could help in understanding and eventually treating these conditions as well.

“We hope this kind of approach can help break new ground in understanding similar diseases of immune dysregulation that have stumped us for decades,” Bodansky says.

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