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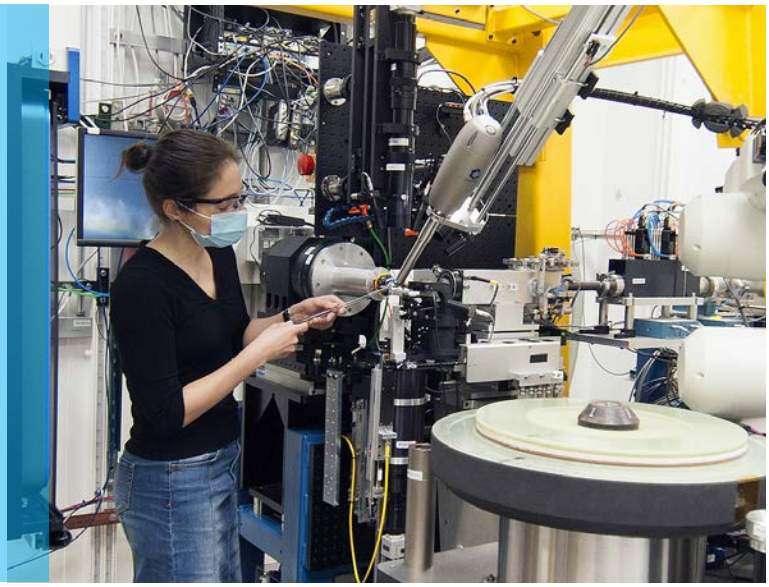
FIGHTING COVID WITH THE ADVANCED PHOTON SOURCE



Karolina Michalska, a structural biologist at the Structural Biology Center, in the 19-ID research station.

From the outset of the COVID-19 pandemic, researchers using the U.S. Department of Energy's Advanced Photon Source (APS) at Argonne National Laboratory have been studying the SARS-CoV-2 virus that causes COVID-19.

As of fall 2021, scientists using ultra-bright x-rays from the APS have published 53 papers about the SARS-CoV-2 virus, with more on the way (scan the QR code below for a list of COVID-19-related publications and highlights). Here are a few examples of recent discoveries.

• A study at the APS provided structural details of how the drug masitinib (which has undergone clinical trials for human conditions but has not yet received approval to treat humans) works. Because the drug may be effective against many types of coronaviruses and picornaviruses due to the way it inhibits replication, it may be effective against COVID-19 variants.

• Researchers using the APS determined protein structures that will help develop small-molecule drugs designed to stop the spread of COVID-19 by inhibiting a critical enzyme's ability to set viral replication in motion.

• Using the APS to study the naturally occurring human antibodies created in response to SARS-CoV-2 helped researchers discover how different antibodies bind to the SARS-CoV-2 virus, and identified clues to ways of optimizing antibodies so that they are more effective at targeting the virus, on the way to developing new therapies that can prevent and treat COVID-19 infections.

• Researchers developed a potential COVID-19 antibody therapy using antibodies from llamas by immunizing llamas with prefusion-stabilized coronavirus spikes and isolating the resulting single-domain antibodies, or VHHs. Using the APS, the researchers determined the crystal structures of the isolated VHHs in complex with viral agents and revealed their mechanisms of neutralization, adding to the growing research highlighting VHHs as desirable therapeutic candidates for viral respiratory diseases.

Groups operating x-ray facilities at the APS supporting SARS-CoV-2 research: the Structural Biology Center, the Life Sciences Collaborative Access Team (CAT), the Lilly Research Laboratories CAT, the National Institute of General Medical Sciences and National Cancer Institute facility, the Northeastern CAT, and the Industrial Macromolecular Crystallography Association CAT.

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