Researchers advance COVID-19 antibody knowledge

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Researchers at the University of Tennessee Health Science Center working with colleagues at MD Anderson Cancer Center in Houston have found that some antibodies to SARS-CoV-2, the virus that causes

COVID-19, are more protective than others, when it comes to reinfection.

This information, discovered from the joint study and published online in the Journal of Clinical Investigation's *JCI Insight*, has implications for the overall understanding of the virus and whether infection actually does trigger immunity, according to Michael Whitt, Ph.D., associate dean of the Office of Medical Education in the UTHSC College of Medicine, chair of the Department of Medical Education, and a professor and former chair of the Department of Microbiology, Immunology, and Biochemistry. Dr. Whitt is one of the principal investigators on the antibody study, which is ongoing at UTHSC.

Dr. Whitt and his laboratory team, which includes three fourth-year medical students and two Master of Medical Laboratory Science students, used an assay or test procedure developed in his lab roughly 25 years ago to study the infection mechanism of Ebolavirus. They applied that assay to study infection of and immunity generated against SARS-CoV-2. Dr. Whitt was contacted by researchers at MD Anderson to use his assay to test for the presence of neutralizing antibodies in samples from 134 hospitalized COVID patients and 464 healthy individuals obtained between June 2017 and June 2020.

"We ended up running samples for them (MD Anderson), and those data are presented in the paper," Dr. Whitt said. "Companies have developed assays to show whether people have SARS-CoV-2 antibodies, but these assays only provide a yes or no answer. So why is our work important? We can determine the amount of neutralizing antibody present in the blood, and neutralizing antibodies are the ones that can prevent the individual from becoming infected. If you have an antibody to an internal component of the virus, then that means you have been infected, but those antibodies won't prevent infection.

"Neutralizing antibodies are directed to the spike (S) protein, which is responsible for the binding of the virus to receptors on a host cell and for entry of the virus into the cell," Dr. Whitt explained. "However, not all antibodies to the S protein have neutralizing activity, so it is only a subset of antibodies to the S protein that can prevent infection. One of the questions we wanted to address is, do all people who have had the disease, COVID-19, generate neutralizing antibodies? That answer is clearly, no. The other question is, for those who do produce neutralizing antibodies, how much do they make?"

Further research will help answer questions about immunity. This is vital to plans for reopening the community.

"What we don't know is how much neutralizing antibody is needed to prevent infection or reinfection," Dr. Whitt said. "Just because you have detectable antibodies doesn't mean that you're protected from infection."

As a medical educator, Dr. Whitt said he is proud that the research in his lab has included students. "I think that speaks to the academic and training opportunities here at UTHSC," he said.

Along with Dr. Whitt, researchers in the Department of Microbiology, Immunology, and Biochemistry at UTHSC are working on ways to test the general population in Memphis for the SARS-CoV-2 antibody. Professor Maria Gomes-Solecki, DVM, and her team have developed and are vetting a prototype ELISA (enzyme-linked immunosorbent assay), a blood test that could be used to mass-test antibodies in the community that would signal individual exposure.

Colleen Jonsson, Ph.D., professor and the Van Vleet Chair of Excellence in Virology and director of the Regional Biocontainment Laboratory at UTHSC, is leading the efforts with live SARS-CoV-2 to identify neutralizing antibodies and therapeutics to treat COVID-19. Dr. Jonsson

is the lead investigator on a protocol to perform testing of the general population in Memphis for the SARS-CoV-2 antibodies.

More information: Kathleen M. McAndrews et al, Heterogeneous antibodies against SARS-CoV-2 spike receptor binding domain and nucleocapsid with implications for COVID-19 immunity, *JCI Insight* (2020). DOI: 10.1172/jci.insight.142386