Learning to Care for Those in Harm's Way

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Study identifies new approach for developing simple-to-use, 'shelf-available' COVID treatment options

Bethesda, Md. – An array of new, simple "shelf-available" SARS-CoV-2 treatment options could soon be available in the fight against COVID thanks to a new study, "Engineered ACE2-Fc counters murine lethal SARS-CoV-2 infection through direct neutralization and Fc-effector activities," published July 13 in Science Advances.

The researchers, led by Dr. Marzena Pazgier, Professor of Medicine at USU, Infectious Disease Division of Department of Medicine, in collaboration with researchers from the National Institutes of Health (NIH), Yale University, Centre de Recherche du CHUM (CRCHUM) at Université de Montréal and Dartmouth College, used a strategy to design new therapeutics to treat SARS-CoV-2 by adopting the protein that the virus naturally uses as an entry portal to infect human cells. The protein is called the ACE2 receptor and it is found on the surface of airway cells and other tissues.

By making this protein in a soluble form (not bound to a cell) and by modifying it by attaching part of an antibody, researchers created a drug named ACE2-Fc. Because of the attached antibody portion, ACE2-Fc neutralizes the virus, and binds to cells of the immune system, signaling them to effectively eliminate the virus and infected cells. In addition, by structure-based design, the researchers identified and introduced three ACE2 mutations that significantly enhanced the activity of ACE2-Fc against most of currently known variants of SARS-CoV-2, including the Delta and Omicron variants.

The researchers believe that by using this strategy it is possible to develop inexpensive, simple-to-use, shelf-available treatment options to combat the virus, shorten recovery times and reduce the severity of any subsequent complications, while also cutting down on the need for repeated vaccinations. Additionally, these new potential treatment options could also be suitable for patients with or without cardiovascular complications.

With more than six million deaths worldwide as a result of the pandemic, there has been a significant impact on the general population and military members, dependents, veterans, and operations. Studies have also shown that about 10 percent of adults are also experiencing long-haul symptoms in the weeks after a COVID infection that can include cognitive issues, shortness of breath, activity-limiting fatigue, cough, and headaches. In this latest study, researchers sought to develop new treatment options that could prevent and treat new infections, therefore preventing long-haul symptoms, which could, ultimately, also help bypass the need for repeated vaccinations.

"Our overall goal is to save lives by developing a simple-to-use COVID-19 treatment that could be used to prevent and treat current and future outbreaks. One huge advantage of utilizing ACE2 to counter

coronaviruses is that SARS-CoV-2 and all its known mutants including Delta and the recent Omicron can be targeted and inactivated by ACE2-Fc therapeutic as they need to use ACE2 to bind and enter human cells. This means that no matter which variant of the virus infects or how much it has changed, this drug will always be able to bind to and kill it." said Dr. Pazgier, the study's lead and corresponding author.

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