47-2020-10904 | Targeting Neutrophils as a Therapy for Severe COVID-19 Infection

Granot Zvika, HUJI, School of Medicine - IMRIC, Developmental Biology and Cancer Research

COVID-19 is a new, highly infectious virus that infects the respiratory system. Severe COVID-19 infection is associated with respiratory failure which may be lethal. One of the major causes for lethal respiratory failure in critically ill COVID-19 patients, is Acute Respiratory Distress Syndrome (ARDS). ARDS is a rapidly deteriorating condition where components of the immune system react excessively and cause severe lung tissue damage. While it is clear that the COVID-19 virus is capable of initiating the ARDS cascade, this pathology is propagated by neutrophils, the most abundant subset of white blood cells. After the viral replication triggers hyper inflammatory conditions and a cytokines storm, an influx of activated neutrophils is the next step in this deleterious process.

Neutrophils, an abundant type of white blood cell in the immune system, are primarily involved in protecting the host from microbial infections and inflammatory processes. However, under extreme conditions, such as COVID-19 -induced ARDS, they play a deleterious role and cause life threatening damage to the lungs. Moreover, a study published this month shows that refractory COVID-19 patients in Wuhan, China (the epicenter of the COVID-19 outbreak) present with a significant increase in neutrophil numbers compared with recovering COVID-19 patients. This observation, together with the established role neutrophils play in ARDS, highlights neutrophils as a potential therapeutic target in complicated severe COVID-19 cases.

Over the past several years, Profs. Granot and Fridlender have been developing a neutrophil-specific drug delivery platform. The specificity of this platform provides an opportunity to deliver potentially toxic drugs to neutrophils with minimal effect on other cells in the body. Using several mouse models of disease, they have proved that this platform may be used to modulate neutrophil function in vivo. As neutrophils appear to be an attractive target in treating severe COVID-19 cases, they will study the possibility of utilizing this platform as a potential therapy for severe COVID19 patients.

This therapy will have two complementary arms: A. they will use this platform to deliver a toxic molecule to neutrophils and reduce their number without harming other components of the immune system; and B. they will deliver specific inhibitors that will limit the extent of neutrophil-induced tissue damage. To test the therapeutic potential of targeting neutrophils in this context, they will use mouse models of ARDS and mouse models of coronavirus infection. They will assess how limiting neutrophil numbers, limiting neutrophil activity, or limiting both, improves survival. Profs. Granot and Fridlender have already successfully adjusted the neutrophil-specific drug delivery platform to human neutrophils. This suggests that if their experiments in mice are successful, they could be rapidly translated into a life-saving therapy.

Patent Status

Contact for more information:

Keren-Or Amar
VP, Business Development, Healthcare

Yissum Research Development Company of the Hebrew University of Jerusalem
Hi-Tech Park, Edmond J. Safra Campus, Givat-Ram, Jerusalem
P.O. Box 39135, Jerusalem 91390 Israel
Telephone: 972-2-658-6688, Fax: 972-2-658-6689