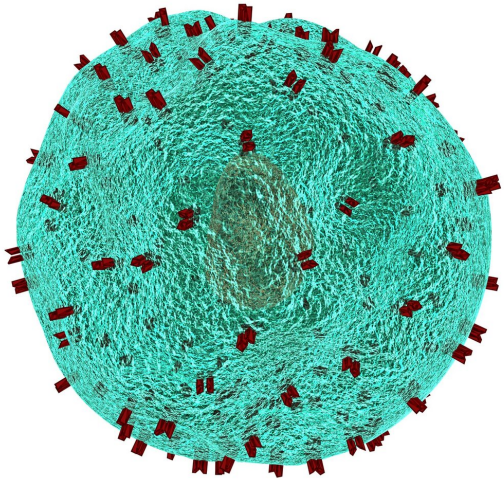
Cells sacrifice themselves to boost immune response to viruses

1 October 2020, by Mark Michaud



Credit: CC0 Public Domain

Whether flu or coronavirus, it can take several days for the body to ramp up an effective response to a viral infection. New research appearing in the journal *Nature Immunology* describes how different cells in the immune system work together, communicate, and—in the case of cells called neutrophils—bring about their own death to help fight off infections. The findings could have important implications for the development of vaccines and anti-viral therapies.

"The immune system consists of several different types of cells, all acting in coordination," said Minsoo Kim, Ph.D., a professor of Microbiology and Immunology at the University of Rochester Medical Center (URMC) and senior author of the study. "These findings show that cells called neutrophils play an important altruistic role that benefits other immune cells by providing key resources for their survival and, in the process, enhancing the body's immune response against a virus."

Neutrophils are a key component of the innate immune system, the part of the body's defenses that is always switched on and alert for bacterial and viral invaders. The vast majority of white cells circulating in blood are neutrophils and, as a result, these cells are the first on the scene to respond to an infection.

However, neutrophils are not fully equipped to eliminate a viral threat by themselves. Instead, when the respiratory tract is infected with a virus like influenza or COVID-19, a large number of neutrophils rush to the infection site and release chemical signals. This triggers the production of specialized T cells, which are part of the body's adaptive immune system, which is activated to produce a more direct response to specific infections. Once mobilized in sufficient quantities, a process that typically takes several days, these T cells target and ultimately destroy the infected cells.

The new study, which was conducted in mice infected with the flu virus, shows that in addition to jump-starting the adaptive immune response, neutrophils have one more important mission that requires that they sacrifice themselves. As T cells arrive at the infection site, the neutrophils initiate a process called apoptosis, or controlled death, which releases large quantities of a molecule called epidermal growth factor (EGF). EGF provides T cells with the extra boost in energy necessary to finish the job.

"This study represents an important paradigm shift and shows that the adaptive immune system doesn't generate a successful response without instruction and help from the innate immune system," said Kim. "The findings reveal, for the first time, how different immune cells work together, and even sacrifice themselves, to accomplish the same

goal of protecting the host from the viral infection."

Kim and his colleagues point out that this new understanding of how the immune system functions opens the door to potential new methods to intervene and optimize the collaboration between different immune cells during viral infection. These efforts could ultimately lead to more effective vaccines and anti-viral therapies for respiratory infections like the flu and coronavirus.

More information: Kihong Lim et al, In situ neutrophil efferocytosis shapes T cell immunity to influenza infection, *Nature Immunology* (2020). DOI: 10.1038/s41590-020-0746-x

Provided by University of Rochester Medical Center