Researchers discover a pathway to turn off immune system cells

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University of Minnesota researchers have discovered a new way to turn genes off in human T cells, a type of white blood cell that helps the immune system fight infections.

Turning off genes, through a process known as mRNA decay, is important for regulating the body's immune response after fighting infection. This research could lead to development of new drugs that turn off the immune system in patients with autoimmune diseases – such as rheumatoid arthritis and lupus. It could also prevent cancer cells from dividing.

Researchers used a novel approach that combines molecular biology and computational analysis to identify mRNA sequence responsible for turning off T cells. The research is published in the February 1 issue of *Molecular Cell*.

"Although this study analyzed T cells, this pathway is present in all human cells," said Paul Bohjanen, M.D., Ph.D., co-director of the Center for Infectious Diseases and Microbiology Translational Research (CIDMTR) and principal investigator of the study. "Knowledge from this study can be applied to help researchers better understand other types of cells and how they function."

During an infection, T cells turn on and divide to help clear the infection from the body. After the infection is cleared, the cells need to turn off so the body can return to a stable condition. If the cells do not turn off,

however, they can cause damage to the body and can potentially develop into cancer cells.

This research is important because to date, understanding the mechanisms that turn off cells has not been very well understood.

Researchers measured the rate of mRNA decay for each of the approximately 6,000 genes in human T cells. That information was then analyzed by George Karypis, Ph.D., associate professor of computer science, and his colleagues at the Minnesota Supercomputing Institute, using complex computer programs to identify a sequence present in mRNA that was destroyed rapidly in the cell. Bohjanen and his colleagues performed molecular biology experiments to confirm that this sequence targets mRNA for destruction and was responsible for turning off genes in activated T cells.

“This discovery would not have been possible without the interdisciplinary collaboration between molecular biologists and computer scientists,” Bohjanen said. The collaboration between Bohjanen and Karypis was facilitated by Irina Vlasova, M.D., Ph.D., research associate in Bohjanen’s molecular biology laboratory, who received training in computational biology through a Minnesota Supercomputing Institute fellowship.

Source: University of Minnesota