

Researchers demonstrate how white blood cells cannibalize virus-infected cells

October 2 2006

Researchers at the Vaccine and Gene Therapy Institute (VGTI) at Oregon Health & Science University have demonstrated how certain white blood cells literally eat virus-infected cells while fighting disease at the microscopic level. The research not only helps provide a clearer understanding of the body's immune system, it also offers hope of a new method for gauging vaccine effectiveness. The research is published in the current edition of the journal *Nature Medicine*.

CD8+ T-cells are specialized white blood cells that serve an important role in the body's immune system. The cells attack and destroy disease "invaders" such as viruses in the body. Previous studies indicated that T-cells may consume parts of cells with which they interact, but this new research shows this can happen in response to a systemic viral infection.

"If you use a fluorescent dye to stain infected cells, you can literally watch T-cells consume membranes and outer surfaces of diseased cells. As they destroy and cannibalize the fluorescently labeled cells, they become labeled with the fluorescent dye themselves," explained Mark Slifka, Ph.D., a researcher in the VGTI who led the research. Slifka is also a scientist in the Division of Pathobiology and Immunology at the Oregon National Primate Research Center and holds a concurrent appointment in the Department of Molecular Microbiology and Immunology in the OHSU School of Medicine.

"While we don't fully understand why this happens, one possibility is that the T-cell consumes virus-infected cells to fuel itself in the

continued fight against an ongoing infection. It's sort of like invaders that pillage their defeated foe's supplies and then continue the fight."

The way in which Slifka and his colleague, Carol Beadling, made this discovery was quite serendipitous. The researchers were studying the interactions between virus-specific T-cells and fluorescently labeled infected cells when they noticed that the T-cells also began to glow with the fluorescent dye. Further investigation revealed that the CD8+ T-cells, often referred to as "killer" T-cells, were literally ingesting parts of the virus-infected cells that they were attacking.

Slifka and Beadling's findings follow a discovery by David Parker, Ph.D., a professor of Molecular Microbiology and Immunology in the OHSU School of Medicine. Parker and his colleague, Scott Wetzel, noted a similar behavior in CD4+ T-cells, often called "helper" T-cells, which are less aggressive T-cells but also an important aspect of the immune system.

"Another interesting finding for our lab is that in some ways, T-cells can be picky eaters," explained Slifka. "Although they will destroy almost any infected cell, they prefer to eat certain types of cells but not others. For instance, we noted that CD8+ T-cells consumed other white blood cells such as infected B-cells, but they were not fond of eating infected fibroblasts, a type of cell found in connective tissue. They're sort of like a 5-year-old who loves to eat cookies, but refuses to eat their brussels sprouts."

The researchers believe that these findings may be useful as a method for determining a vaccine's effectiveness during the process of immunization. Measuring the levels at which CD8+ T-cells respond to and consume a candidate vaccine could likely determine whether that vaccine is effective in educating the body's immune system as to what diseases to look for.

Source: Oregon Health & Science University

Citation: Researchers demonstrate how white blood cells cannibalize virus-infected cells (2006, October 2) retrieved 24 April 2024 from <https://medicalxpress.com/news/2006-10-white-blood-cells-cannibalize-virus-infected.html>

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