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Researchers discover new battleground for viruses and immune cells

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Vaccines have led to many of the world's greatest public health triumphs, but many deadly viruses, such as HIV, still elude the best efforts of scientists to develop effective vaccines against them. An improved understanding of how the immune system operates during a viral infection is critical to designing successful anti-virus vaccines. Scientists from the National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health (NIH), have added an important dimension to this knowledge.

Focusing on mouse lymph nodes—bean-shaped organs that contain a variety of immune cells and are distributed throughout the body—the researchers discovered that immune cells confront viruses just inside of the lymph node and not deep within these organs as previously thought. The study, led by Jonathan Yewdell, M.D., Ph.D., chief of the NIAID Cellular Biology Section and his NIAID colleague, Heather Hickman, Ph.D., is described in a report online in *Nature Immunology*.

The results are significant, the authors say, as they observed in detail the interaction of viruses and immune cells inside a living organism, in this case, mice. Combining expertise from disciplines such as imaging, immunology, virology and other specialties, the scientists first extracted and then purified specific T cells—killer T cells—from mice.

Killer T cells, which attack and kill infected or cancerous cells, are major weapons in the immune system arsenal. The scientists labeled the T cells with a fluorescent marker, injected them back into the mice, and

then infected the animals with vaccinia virus, the virus used to make smallpox vaccine, engineered to express a brilliantly colored protein.

Using a multiphoton microscope, a highly specialized microscope that enables scientists to peer into a living organism, the scientists could now look into the lymph nodes of the infected mice and see that the viruses had infected cells just inside the lymph node surface, triggering a swarm of T cells. These virus-specific T cells form an elaborate and dynamic communications network that activates them to divide and travel to the site of viral infection, where they kill virus-infected cells.

“A key challenge in viral vaccine research is developing strategies for immunizing against lethal viruses such as HIV that have eluded the standard vaccine approaches,” notes Dr. Yewdell. “We have contributed a page to the handbook of understanding how to rationally design vaccines to elicit a T-cell response.” According to the NIAID team, pinpointing where in the lymph node immune cells fight the virus should help efforts to design effective anti-virus vaccines.

Source: National Institute of Allergy and Infectious Diseases