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Antibodies help protect monkeys from HIV-like virus, scientists show

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Using a monkey model of AIDS, scientists have identified a vaccine-generated immune-system response that correlates with protection against infection by the monkey version of HIV, called simian immunodeficiency virus (SIV). The researchers found that neutralizing antibodies generated by immunization were associated with protection against SIV infection. This finding marks an important step toward understanding how an effective HIV vaccine could work, according to scientists who led the study at the National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health.

Scientists administered the SIV vaccine to half of the 129 monkeys in this study and a placebo vaccine to the other half. The scientists then gave each monkey up to 12 doses of one of two forms of SIV through rectal injection to simulate sexual exposure to the virus. The vaccine regimen did not protect the monkeys that received one form of SIV, but it reduced the rate of infection by 50 percent in the monkeys that received the other form of the virus.

To learn how the vaccine worked, the study team examined a variety of immune responses and certain genetic factors in the monkeys that the vaccine protected. The scientists found that SIV neutralizing antibodies and the activation of white blood cells known as helper CD4+ T cells correlated with the protective effect. Also, monkeys that expressed two copies of a gene known to help limit SIV replication were better protected by the vaccine than monkeys that did not, demonstrating that genetic factors can contribute to protection.

This study provides evidence that neutralizing antibodies are an important part of the immune response needed to prevent HIV infection. The ability of the vaccine regimen to protect monkeys from SIV infection is comparable to the results seen in the RV144 trial with 16,000 adult volunteers in Thailand; RV144 was the first HIV vaccine study to demonstrate a modest protective effect, reducing the rate of HIV infection by 31 percent. The new research also provides an animal model to better understand the immune basis for vaccine protection against lentiviruses, a subclass of viruses that includes HIV and SIV. This knowledge will help guide strategies for the future development of AIDS vaccines.

The SIV vaccine regimen used in this study was similar to an HIV vaccine regimen currently being tested in humans in the NIAID-funded clinical trial known as HVTN 505. Both vaccine regimens consist of priming with a vaccine made from DNA that encodes immunodeficiency virus proteins, followed by boosting with an inactivated cold virus (adenovirus) that contains immunodeficiency virus proteins.

More information: L Letvin et al. Immune and genetic correlates of vaccine protection against mucosal infection by SIV in monkeys. Science Translational Medicine DOI: 10.1126/scitranslmed.3002351 (2011).

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