Anti-HIV Molecule May Lead to Vaccine and Long-Acting Treatment

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A new molecule effectively blocked a simian version of HIV from attaching to immune cells, and may work as both a long-acting treatment and a vaccine for HIV in humans, The New York Times reports. Publishing their findings in the journal Nature, researchers injected a new genetic therapy into four monkeys infected with SIV (HIV's simian cousin). Then they exposed the animals to SIV six times in increasing doses over a 34-week period, doing the same with four untreated, SIV-positive control monkeys.

HIV—or SIV, in the case of primates—makes initial contact with a CD4 immune cell by latching onto the CD4 receptor on the cell's surface. This in turn exposes the CCR5 receptor, which the virus latches onto before ultimately infecting the cell. (HIV may latch onto the CXCR4 receptor rather than the CCR5, but that tends to occur later in the course of someone's infection.)

To develop the therapy, the researchers took a molecule with antibody-like properties that latches onto the CD4 receptor and connected it with a short protein fragment that attaches to the adjacent CCR5 receptor. Next, they fashioned genetic instructions for the manufacture of this fused molecule, which they named eCD4-Ig, and put that code into a benign virus that was designed to integrate the instructions into human cells. The idea is to get the human body to produce the SIV-fighting molecule indefinitely. The molecule is meant to work by attaching to the CD4 and CCR5 receptors in a claw-like shape, thus blocking the virus from connecting to the immune cell, thwarting its attempts at infection from the first step.

None of the monkeys treated with eCD4-Ig contracted SIV during the study, while all of those who went untreated became SIV positive. Additionally, the eCD4-Ig persisted in the monkey's bodies through the 40 weeks of the study at levels the scientists deemed protective against the virus.

"Our molecule appears to be the most potent and broadest inhibitor of HIV entry so far described in a preclinical study," study lead Michael Farzan, PhD, a professor in the department of infectious diseases at the Scripps Research Institute in Jupiter, Florida, said in a press release. "If one could inject either eCD4-Ig or our gene therapy tool into people with HIV infection, it might control HIV for extended periods in the absence of antiretroviral drugs. Further research will help illuminate the promise of these approaches."

Indeed, eCD4-Ig protected against a wider array of viral strains in laboratory study than any of the

anti-HIV broadly neutralizing antibodies researchers have been studying—most can only combat one or two—and with a much simpler method. Additionally, the molecule proved more effective against fighting the virus than any of those antibodies.

The researchers who developed eCD4-Ig are now studying the molecule as a potential treatment for monkeys infected with HIV-like viruses.

“This innovative research holds promise for moving us toward two important goals: achieving long-term protection from HIV infection, and putting HIV into sustained remission in chronically infected people,” Anthony S. Fauci, MD, director of the National Institute of Allergy and Infectious Diseases, which is part of the National Institutes of Health, said in the same press release. The NIAID was the primary funder of the research.

To read the study abstract, click here.

To read the New York Times story, click here.

To read the press release, click here.

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