Transmission of HIV: Study spotlights virus that starts infection

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(Medical Xpress) -- When HIV is transmitted from one person to another, the virus faces a genetic "bottleneck." This means that usually during heterosexual transmission, only one virus out of a swarm of frequently mutating viruses establishes the new infection.

Now Emory Vaccine Center researchers have shown that the virus that starts an individual's new infection differs markedly from the dominant strains in his or her partner's genital tract. This suggests that the process of transmission favors some viral variants, and the bottleneck effect doesn't arise simply by chance or through what types of virus flourish better in the genital tract.

The results are published online this week in *Proceedings of the National Academy of Sciences*, Early Edition.

"If the success of the establishing virus came only by chance, most of the time it would be one of the viruses that is most abundant in the donor's genital tract. But we don't see that," says senior author Eric Hunter, PhD, professor of pathology and laboratory medicine at Emory University School of Medicine. "What we see suggests that transmission is selecting for certain viruses. The virus establishing the infection is a single variant, but that variant is different for each transmission event."

The first author of the paper is senior scientist Debrah Boeras, PhD, now at the Centers for Disease Control and Prevention. Dr. Hunter is co-director of Emory's Center for AIDS Research and a Georgia Research

Alliance Eminent Scholar. Emory co-authors include Susan Allen, MD, MPH, professor of pathology and laboratory medicine and Cynthia Derdeyn, PhD, associate professor of pathology and laboratory medicine in Emory School of Medicine. Collaborators from Los Alamos National Laboratory contributed to the paper.

Access to patient samples came through collaboration with co-investigators and volunteers at Emory's HIV research programs in Rwanda and Zambia. The researchers obtained vaginal swabs, semen, and blood samples from eight consenting heterosexual couples in Rwanda and Zambia at the time the newly infected partners were diagnosed as HIV-positive. Of the eight instances of infection, six involved female-to-male transmission.

Boeras and her colleagues determined the DNA sequences for the viruses' env gene, which encodes a protein forming the outer coat of the virus. They found that a single genetic variant in the genital tracts of the donor established an infection in the recipient.

Hunter emphasized that the paper's results are the starting point for a detailed study of the distinguishing features of viruses that initiate infection.

"There is clearly a lot of work still to do," he says. The big challenge now is to understand the features of the viruses that start an infection, and target them with microbicides or vaccines. It could help us be much smarter in how we try to protect people."

Other studies have already shown that "founder" viruses have Env proteins that are more compact and have fewer sites that can be modified with sugars, which may affect how these viruses interact with genital tissue in the uninfected partner.

This topic is the focus of current research in the Hunter laboratory, and their results could inform design of a still-elusive HIV vaccine.

More information: D.I. Boeras et al. Role of donor genital tract HIV-1 diversity in the transmission bottleneck. *PNAS* Early Edition (2011)

Provided by Emory University

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