Study predicts threshold of viral load for passing herpes from one person to another

March 26 2014, by Mary Engel

Credit: AI-generated image (disclaimer)

(Medical Xpress)—One of the most common questions asked of doctors who treat genital herpes comes from couples in which one partner is infected with the virus and the other is not. How, they ask, can they have a relationship without passing on this sexually transmitted disease?

In an attempt to better answer that question, a new study uses mathematical models to predict viral loads below which transmission of the virus is unlikely to occur. The model suggests that a treatment or intervention that maintains genital viral load below a threshold of 10,000 copies of herpes simplex DNA would prevent most transmissions, according to the study published online Tuesday in the London-based Royal Society journal *Interface*.

Using a model—which the study's authors emphasized must be further tested—was a way to estimate a threshold when measuring viral load directly is challenging, if not impossible, due to the rapidly changing interactions between the virus and the host's immune system.

Herpes simplex virus 2 (HSV-2) expands very rapidly, from zero to tens of millions, often in 24 hours, said Dr. Joshua T. Schiffer of Fred Hutchinson Cancer Research Center's Vaccine and Infectious Disease Division, the study's the lead author. The immune system's response can be equally speedy in fighting the virus.

"Both the virus and the immune system are very effective," Schiffer said. "Most of the time, the virus is cleared quickly enough so that an infected person is not even aware that the virus is reactivating. But there's still enough time to transmit it to a partner." The study combined a model that simulated viral shedding in an infected host and a model of intercourse at random intervals to estimate viral loads at which infection was very likely to occur.

1 in 6 in U.S. infected

HSV-2 is spread through oral, vaginal or anal sex. The Centers for Disease Control estimates that one out of every six people in the United States between the ages of 14 and 49 has genital herpes, with 776,000 people newly infected each year.

Preventing transmission is critical because there is no cure for herpes. Condoms can lower—but not eliminate—the risk of transmission. Current antiviral medications can prevent or shorten outbreaks while the person is taking the drugs and can partially reduce the likelihood of transmission, but like the body's own immune response, may not bring the viral load down quickly enough to prevent transmission entirely.The lifelong infection may cause pain and sores in the genital area or anal region.. But one of the tricky things about herpes is that rapid viral expansion resulting in high viral loads can occur before a sore is visible, so even if people avoid sex during visible outbreaks they may still spread or contract the virus.

80 percent not aware they are infected

Many people have mild symptoms or none at all. More than 80 percent of those infected with HSV-2 or the herpes simplex virus 1 (which most commonly causes cold sores around the mouths and lips) are not aware that they carry the virus but can still spread the disease to sexual partners, according to the CDC.

For many people, a herpes infection is a source of embarrassment, shame or stress that can interfere with relationships.

The virus also can be passed to newborns, or cause miscarriage or early delivery. Sores can be severe in people with suppressed immune systems. And genital sores can increase the risk of transmitting or getting HIV.

In Sub-Saharan Africa, HSV-2 is one of the main drivers of HIV infection, said Dr. Anna Wald, medical director at the Virology Research Clinic at the University of Washington, a member of Fred Hutch's Vaccine and Infections Disease Division and senior author of the study. Those infected with the genital herpes virus are more than three times more likely to acquire HIV, lending urgency to the need to treat

and prevent infections, Wald said.

Wald was the lead author of a study on a new drug, called pritelivir, that may suppress viral shedding more effectively and be a potent treatment for HSV-2. The proof-of-concept study was published in January in the *New England Journal of Medicine*. Although more clinical trials will be needed, the drug holds out hope for the first new treatment of herpes in three decades.

More information: Herpes simplex virus-2 transmission probability estimates based on quantity of viral shedding, Published 26 March 2014 DOI: 10.1098/rsif.2014.0160 . *J. R. Soc. Interface* 6 June 2014 vol. 11 no. 95 20140160

"Helicase–Primase Inhibitor Pritelivir for HSV-2 Infection." Anna Wald, M.D., M.P.H., Lawrence Corey, M.D., Burkhard Timmler, M.D., Amalia Magaret, Ph.D., Terri Warren, M.N., Stephen Tyring, M.D., Ph.D., Christine Johnston, M.D., M.P.H., John Kriesel, M.D., Kenneth Fife, M.D., Ph.D., Lawrence Galitz, M.D., Susanne Stoelben, M.D., M.P.H., Meei-Li Huang, Ph.D., Stacy Selke, M.A., Hans-Peter Stobernack, D.V.M., Helga Ruebsamen-Schaeff, Ph.D., and Alexander Birkmann, Ph.D. *N Engl J Med* 2014; 370:201-210January 16, 2014DOI: 10.1056/NEJMoa1301150

Provided by Fred Hutchinson Cancer Research Center