



FACTSHEET

Sexually Transmitted Infections and HIV Transmission

This is one of a series of fact sheets about the biology of HIV transmission. The fact sheets review specific biological factors that make it more or less likely that HIV can be sexually transmitted.

What are the most common sexually transmitted infections?

Some of the most common sexually transmitted infections (STIs) are chlamydia, gonorrhea, syphilis, genital herpes and HPV, a virus that can cause genital warts or cervical and rectal cancer.

Does having an STI increase the risk of HIV transmission?

Having an STI increases the risk of HIV transmission regardless of whether it is the HIV-positive partner or the HIV-negative partner who has the STI.

It is a good idea for anyone having sex to get tested regularly and treated for STIs if necessary.

How does having an STI increase the risk of transmitting HIV?

An HIV-positive person who is co-infected with an STI has a higher chance of transmitting HIV to their partner(s).

Most STIs cause an increase in the HIV viral load in semen, vaginal fluid or anal fluid, depending on the location of the STI. As this increase only happens in the area where the STI is located, it may have no effect on a person's blood viral load; however, it can still have a direct impact on how infectious someone is.

In one study, men with urethritis (inflammation of the urethra in the penis caused by STIs) had a semen viral load eight times higher than those without urethritis. The semen viral load was ten times lower in the men after they were treated for urethritis compared to the level before treatment.

The reasons for the increase in viral load include:

- The presence of an STI brings more immune cells, including CD4+ cells, to the area to fight the infection. If the CD4+ cells are infected with HIV, they end up producing more viruses instead of fighting off the STI. This can increase the viral load in that area.

- Some STIs (herpes or gonorrhea, for example) produce proteins that improve HIV's ability to make copies of itself. Again, this can increase the viral load in fluids where the STI is present, without changing the blood viral load.

How does having an STI increase the risk of HIV infection?

An HIV-negative person who has an STI is more open to HIV infection for several reasons:

- STIs cause the mucous membrane (the moist tissues in the mouth, penis, vagina, and rectum) to become inflamed (see the fact sheet on HIV Transmission: an Overview). When these tissues are inflamed, the immune system becomes activated to fight the infection. Activated immune cells, specifically CD4+ cells, are easier for HIV to infect. It is also easier for HIV to pass into the bloodstream when inflammation is present.
- When the immune system responds to an infection, more immune cells, including CD4+ cells, are brought to the infected area. This makes it more likely that HIV will find a cell to infect.
- Some STIs, such as herpes and syphilis, can cause open sores or lesions, which provide entry points into the body for HIV.

Is someone who is HIV-positive more at risk for infection with another STI?

Although HIV only infects certain kinds of immune cells, it affects and weakens the entire immune system. This means that it is easier for someone who is HIV-positive to become infected with another STI.

Having a weakened immune system means that any infection is likely to be worse. This means more breakouts, more severe symptoms, longer treatment and other complications.

How do sexually transmitted infections affect HIV transmission?

Genital herpes

Genital herpes is caused by the herpes simplex-2 virus (HSV-2), a common virus that infects as many as 20–30% of adult Canadians. Rates are much higher for women, men who have sex with men and also people who are HIV-positive.

There is no cure for herpes and, once infected, HSV-2 establishes a life-long infection that tends to flare up from time to time.

Herpes is spread through sexual contact with someone who has HSV-2.

Oral herpes (usually caused by HSV-1) is much more common than genital herpes, and it is also possible to get an HSV-1 infection on your genitals through oral sex.

How does herpes affect HIV transmission?

Being infected with HSV-2 has been shown to make you two to eight times more susceptible to HIV, depending on the frequency and severity of outbreaks.

A herpes outbreak causes genital ulcers, or sores, making it easier for HIV (and other infections) to enter the body.

A herpes ulcer also tends to cause inflammation (see the fact sheet on HIV Transmission: an Overview), which brings cells (including CD4+ cells) to the

area. This provides more target cells for HIV to infect.

Being co-infected with HSV-2 and HIV increases the risk of passing HIV to your partner(s) by as much as five times. Even in the absence of HSV-2 symptoms you are still more likely to transmit HIV than someone who is not infected with HSV-2.

Infected CD4+ cells rush to the herpes sores, where they come in contact with HSV proteins. These proteins increase the speed at which infected cells make more copies of HIV. This raises the HIV viral load in the genital or anal fluids in the infected area.

If you are co-infected with HSV-2 and HIV, you may have more frequent and more severe herpes outbreaks.

It is important to note that if you are infected with HSV-2, you are able to spread HSV-2 even when you have no sores or symptoms of an outbreak.

Gonorrhea

Gonorrhea is caused by the bacteria *Neisseria gonorrhoeae*.

Gonorrhea is primarily transmitted through sexual contact involving the anus, penis, vagina, mouth or throat. Ejaculation and production of pre-cum does not have to occur to transmit gonorrhea.

One reason for the high prevalence of gonorrhea is that in many men and most women infection does not produce symptoms. This means people are often unaware that they are infected and are infectious to their sexual partner(s).

The best way for sexually active individuals to prevent infecting others is

to get tested regularly and not to have sex while infected with gonorrhea. If you have unprotected oral sex, it is important also to get tested for gonorrhea in your throat.

The best way to avoid getting infected with gonorrhea is to always use proper protection, such as a female or male condom with lubrication (lube) for vaginal or anal sex and a flavoured condom or dental dam for oral sex.

How does gonorrhea affect HIV transmission?

If you are HIV-positive and also infected with gonorrhea, the HIV viral load in your genital or anal fluids will be up to 10 times higher. This means you would be much more likely to transmit HIV to your sexual partner(s).

Alternatively, someone who is HIV-negative who has gonorrhea may be five times more susceptible to HIV than someone who is not infected with gonorrhea.

Chlamydia

Chlamydia is the most common bacterial sexually transmitted infection in Canada and probably the world. It is caused by *Chlamydia trachomatis*.

Chlamydia can be transmitted through vaginal, anal or oral sex. Many people infected with chlamydia will have no symptoms; however, even people with no symptoms are still able to transmit chlamydia to their sexual partner(s).

If left untreated, chlamydia infection can cause serious complications in women (pelvic inflammatory disorder and sterility) and men (urethral scarring and sterility).

How does chlamydia affect HIV transmission?

Chlamydia infection causes a great deal of inflammation at the site of infection. As already mentioned, inflammation recruits immune cells (targets of HIV) to the site of infection. Therefore, it increases the vulnerability of an HIV-negative person, and the infectiousness of an HIV-positive person.

An HIV-negative person who is infected with chlamydia is three times more likely to become infected with HIV through sexual contact than someone who is not infected with chlamydia.

Studies have shown that HIV-positive men with an untreated chlamydia infection have at least five times more HIV in their semen than they do after they receive chlamydia treatment.

Syphilis

Syphilis is caused by the bacteria *Treponema pallidum*.

Syphilis is transmitted primarily through sexual contact, usually when there is a syphilis sore or “chancre” present. Chancres usually appear on the external genitals, vagina and/or the anus. It is sometimes possible to transmit syphilis when no chancres are present.

People are often unaware when they have syphilis. Chancres—small, painless, round and firm sores—are one of the early symptoms, but people often don’t notice them.

How does syphilis affect HIV transmission?

In early syphilis, genital chancres result in inflammation and breaks in the skin, providing an easy route for HIV to get into the body.

An HIV-negative person infected with syphilis is between two and five times more likely to be infected with HIV.

Syphilis infection in people living with HIV has been shown to increase the HIV viral load in genital or anal fluids, making a person up to five times more infectious.

In addition, HIV-positive people seem to develop more advanced stages of syphilis with more severe symptoms than HIV-negative people. The infection can also be harder to treat.

Key points

Having a sexually transmitted infection can increase your risk of HIV infection and transmission.

This is true whether you have open sores or breaks in the skin (as with syphilis and herpes) or not (as with chlamydia and gonorrhea). Where there are breaks in the skin, HIV can enter and exit the bloodstream more easily.

Even when there are no sores, STIs can cause biological changes, such as swelling of tissue (inflammation), which makes it easier to transmit and acquire HIV through sexual contact.

It is important to get tested regularly as STIs often have no symptoms, and you may be at greater risk of being infected with or transmitting HIV to your sexual partner(s).

Other fact sheets in the series are:

- HIV Transmission: an Overview;
- Women and the Biology of HIV Transmission;
- HAART and HIV Transmission.

Credits

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Recommended reading

STIs

Basil Donovan. Sexually transmissible infections other than HIV. *Lancet* 2004;363: 545–556.

A review article highlighting the most prevalent common sexually transmitted infections. A great read for people who want to know about what's out there and what symptoms to look for along with some information on treatment options.

Cohen MS, Hoffman IF, Royce RA, Kazembe P, Dyer JR, Daly CC, et al. Reduction of concentration of HIV-1 in semen after treatment of urethritis: implications for prevention of sexual transmission of HIV-1. AIDSCAP Malawi Research Group. *Lancet* 1997; 349 (9069): 1868–1873.

This is one of the earliest studies linking increased infectiousness of HIV-positive men to sexually transmitted infections (STI). This study found that men with inflammation of the urethra (urethritis), had 10-times as much HIV in their semen compared to after they received treatment for their urethritis. No change in blood HIV RNA was observed in participants throughout the study.

Genital herpes

Kaul R, Kimani J, Nagelkerke NJ, Fonck K, Ngugi EN, Keli F, et al.; Kibera HIV Study Group. Monthly Antibiotic Chemoprophylaxis and incidence of Sexually Transmitted Infections and HIV-1 infection in Kenyan Sex workers. *Journal of the American Medical Association* 2004;291:2555–2562.

The initial study was to look at the impact of providing monthly antibiotic treatment for bacterial STIs on HIV acquisition in a cohort of female sex workers in Kenya. The study expanded to include HSV-2 and found that HSV-2 infected female sex workers were up to 6-fold more likely to get infected with HIV compared to their HSV-2 negative counterparts. It also documented that HIV acquisition was higher in female sex workers who had a bacterial sexually transmitted infection within three months before the start of the study.

Schacker T, Ryncard AJ, Goddard J, Diem K, Shaughnessy M, Corey L. Frequent Recovery of HIV-1 from Genital Herpes Simplex Virus lesions in HIV-1-infected men. *Journal of the American Medical Association* 1998;280:61–66.

A study looking at the ability and frequency of recovery of HIV-1 from lesions of HSV-2 and the potential implications as they relate to HIV transmission.

Syphilis

Fenton K, Breban R, Vardavas R, Okano J, Martin T, Aral S, Blower S. Infectious syphilis in high-income settings in the 21st century. *Lancet Infectious Diseases* 2008;8(4):244–253.

A review providing an outline of the current state of syphilis in developed high-income countries. A look into social and biological aspects responsible for the recent resurgence of syphilis.

Zetola NM, Klausne JD. Syphilis and HIV infection: an update. *Clinical Infectious Disease* 2007;44:1222–1228.

This publication provides an overview of the interaction between HIV and syphilis.

Additional resource

The Canadian AIDS Society's HIV Transmission—Guidelines for assessing risk: a resource for educators, counsellors and health care professionals (2005) is available from the CATIE Ordering Centre (<http://orders.catie.ca>).

Disclaimer

Decisions about particular medical treatments should always be made in consultation with a qualified medical practitioner knowledgeable about HIV-related illness and the treatments in question.

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