HIV transmission

FACT SHEET

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Summary

Only five bodily fluids contain enough HIV to transmit the virus: blood, semen (including pre-cum), rectal fluid, vaginal fluid and breast milk. HIV can only be transmitted when virus in one of these fluids gets into the bloodstream of an HIV-negative person, either through broken skin or by passing through the mucous membranes (the "wet" tissues of the body).

This fact sheet describes how HIV transmission happens through: sexual activity; sharing/reusing needles or other equipment used to inject drugs, or for tattooing or piercing; and during pregnancy, childbirth and infant feeding.

What is necessary for HIV transmission to occur?

For HIV transmission to occur there are three necessary components: a fluid, a route and an activity or event. Sufficient virus in a fluid containing HIV needs to get into the body of an HIV-negative person. This can happen only through a limited number of activities.

The amount of virus in the blood and other bodily fluids of a person with HIV is known as the viral load. It is measured as the number of copies of the virus per millilitre of blood (copies/ml). Most viral load tests used in Canada cannot detect HIV in the blood if there are fewer than 40 to 50 copies/ml, though some newer tests can detect as few as 20 copies/ml. People who have a lower concentration of the virus than these thresholds are said to have an undetectable viral load. When a person takes HIV treatment consistently, their viral load can become undetectable within about three to six months. Having an undetectable viral load greatly lowers or eliminates the chance of passing HIV. A person with HIV will have a higher viral load right after contracting the virus, which can be reduced to the undetectable level if they take effective treatment.

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Canada's source for HIV and hepatitis C information

Fluid	There needs to be a fluid that contains enough HIV to cause infection. The lower the viral load, the lower the chance of passing HIV. When the viral load is undetectable it significantly reduces the chance of passing the virus. Only five bodily fluids can contain enough HIV to transmit the virus: • blood • semen (including pre-cum) • rectal fluid • vaginal fluid • breast milk
Route	HIV can only be passed when virus in one of the five fluids gets into the body of an HIV-negative person through one of the following routes: • a mucous membrane (the wet linings of the body), such as the opening of the penis, the foreskin, the vagina or the rectum; or • a break in the skin, such as when someone shares needles used to inject drugs or someone has a needlestick injury.
Activity	There needs to be an activity or event that brings the fluid and route together for HIV transmission to occur. The activities/events that can potentially transmit HIV are: • unprotected sexual activity (such as anal or vaginal sex, giving oral sex and sharing sex toys) • sharing/reusing needles or other equipment used to inject drugs or used for tattooing or piercing, and accidental needlestick injury • pregnancy, childbirth and infant feeding (for transmission to a fetus or infant)

What happens once HIV gets into the body?

Once HIV gets into the body, it needs to infect immune cells and make copies of itself (replicate) to cause a permanent infection.

HIV cannot replicate on its own – it needs to take over cells within the body to replicate. To do this it targets specific immune cells called CD4 T cells as well as other immune cells. HIV enters and takes control of the cell and starts to replicate. New copies of the virus are released into the blood that can then infect more immune cells.

If the virus can replicate for one to three days without being stopped, it can then spread to other parts of the body and establish a permanent infection. The body's immune system defences are sometimes able to defeat HIV before it spreads and causes a permanent infection. Taking pre-exposure prophylaxis (PrEP) or post-exposure prophylaxis (PEP) can also stop HIV from replicating and being able to establish a permanent infection.

About two-thirds of people newly infected with HIV experience symptoms of acute infection such as fever, chills, a rash, muscle aches, sore throat, swollen lymph nodes, fatigue, night sweats and mouth ulcers, which may last from a few days to a few weeks.

How is HIV passed through sex?

HIV can be passed during sex in a sexual fluid (i.e., semen/pre-cum, vaginal or rectal fluid) or blood, if present. For transmission to occur, one of these fluids, containing enough HIV, must come in contact with a mucous membrane (the wet linings of the body) of an HIV-negative person, such as the opening of the penis, the foreskin, the vagina, the cervix or the rectum. When this happens, the virus must overcome the body's natural defences before it can establish a permanent infection.

There are many natural defences that can stop HIV transmission from occurring. The mucous membranes are made up of epithelial cells that are tightly joined together, providing a partially protective barrier against HIV and other germs. This epithelial cell layer can be a single layer (for example, in the rectum) or it can be multiple

layers thick (for example, in the vagina). The more epithelial cell layers there are, the more difficult it is for HIV to cross into the body. HIV can pass through the cell layer(s) on its own, but damage to the mucous membrane can make it easier for HIV to enter the body. Additionally, mucus that covers and moistens the mucous membrane can trap HIV and help prevent it from crossing the epithelial cell layer. Finally, if HIV crosses the epithelial cell layer, the body's immune cells will fight the virus and try to clear it from the body.

The types of sex that a person participates in affect their risk of HIV transmission. The sex acts that have the highest risk for HIV transmission are anal sex and vaginal sex. Receptive anal sex (where an HIV-negative person receives a penis into their anus) carries the highest risk of HIV transmission. Research suggests the risk may be 10 to 20 times higher than that for vaginal sex or insertive anal sex (where an HIV-negative person inserts their penis into an anus). This is partly because the epithelial cell layer lining the rectum is only one layer thick, making it more susceptible to tearing and inflammation, which can facilitate HIV transmission. In contrast, the epithelial cell layers in the vagina and penis are several layers thick.

Studies suggest that *receptive* vaginal sex is approximately two times riskier than *insertive* vaginal sex. This is partly because the vagina and cervix have a larger surface area than the urethra and foreskin of the penis, and the sexual fluids remain in contact with the vagina for a longer time, providing more opportunity for HIV to cross the mucous membrane in the receptive partner.

Some types of oral sex have a very low risk of HIV transmission and some have no risk. For people giving oral sex, HIV transmission can happen through sores or cuts in the mouth or through the mucous membranes of the mouth and throat. There is a very small chance of an HIV-negative person getting HIV from *giving* fellatio (a blow job) if the person with HIV ejaculates (cums) in their mouth. There is almost no chance of getting HIV from giving someone fellatio when the person does not ejaculate, or from giving cunnilingus (eating someone out). There is no chance of an HIV-negative person getting HIV from *receiving* any type of oral sex.

Certain biological factors can increase a person's risk of getting HIV if they are exposed to the virus through sex. Viral load (the amount of HIV present in the blood and bodily fluids) is the most important factor. A high amount of HIV in a sexual fluid can greatly increase the risk of HIV transmission. On the other hand, a low viral load can dramatically lower the risk. When a person with HIV takes successful treatment, so their viral load is undetectable, they can't transmit HIV through sex.

The two other main factors are damage and inflammation of the mucous membrane tissues. Damage or trauma to the genital, rectal or oral mucous membranes of an HIV-negative person makes it easier for HIV to cross into their body. Inflammation can increase the amount of immune cells in the mucous membrane; HIV can infect these cells and use them to make additional copies of itself. Both damage and inflammation can be caused by sexually transmitted infections (STIs) and friction during sex.

It's important to note that when a highly effective HIV prevention strategy (for example, condoms, pre-exposure prophylaxis [PrEP], or taking HIV treatment to maintain an undetectable viral load) is used consistently and correctly, the risk for sexual HIV transmission ranges from zero to very low.

How is HIV passed through needles and other drug use or body work equipment?

HIV can be passed through blood that remains in used needles or other drug injection equipment, even if the amount of blood is so small it can't be seen. When a used needle containing blood with HIV breaks the skin of another person, HIV can get directly into their bloodstream. Once inside the bloodstream it can then cause a permanent infection. In the same way, HIV can be passed on by reusing unsterilized equipment for tattooing or piercing and through accidental needlestick injuries.

Sharing needles or other equipment used to inject drugs is the most common way that HIV is transmitted through broken skin. When a person injects drugs, blood can get into the needle/syringe or on other equipment they are using to inject or prepare their drugs. When someone uses a

needle/syringe (or other equipment such as cookers, filters, and the solution used to cook drugs) that has already been used by another person, there is a possibility that blood containing HIV is present. When a person prepares and injects drugs using shared equipment, blood that may contain HIV can directly enter their bloodstream through the broken skin. This is an efficient mode of transmission because the immune cells are the only natural defence against this type of HIV transmission. A larger amount of residual blood in the needle/syringe or other equipment and a higher amount of HIV in the blood can both increase the risk of injection-related HIV transmission.

When needles or other equipment are reused for tattooing or piercing (or any other purpose), there is a risk of passing HIV, because the needle or equipment might contain traces of blood that remains after a previous use. Most professional settings use infection control procedures to ensure all equipment is new or properly sterilized. A person can also get HIV if their skin is accidentally pierced with a used needle (known as a needlestick injury). This most commonly happens in healthcare settings.

It's important to note that when a highly effective HIV prevention strategy (for example, new needles and other equipment, or PrEP) is used consistently and correctly, the risk for HIV transmission ranges from zero to very low.

How is HIV passed during pregnancy and childbirth?

HIV can be passed from a parent to their child (known as perinatal HIV transmission) during pregnancy, labour and delivery. Most babies who get HIV through perinatal transmission acquire it during labour and delivery, when they are exposed to blood and vaginal fluid as they pass through the birth canal. Additionally, HIV in the parent's blood can pass to a fetus through the placenta during pregnancy.

Without HIV treatment, there is a 15% to 30% chance that a baby born to a person living with HIV will acquire HIV during pregnancy or delivery. Taking HIV treatment to maintain an undetectable viral load is the best way to prevent passing HIV to a baby. In fact, research has shown that if a pregnant person starts HIV treatment before pregnancy and maintains an undetectable viral load throughout pregnancy and delivery, they do not transmit HIV to their baby. When treatment is started after conception and taken for the remainder of the pregnancy and delivery there is a low risk of HIV transmission. A short course of HIV medications is also given to the infant immediately after birth to help prevent HIV transmission. Recommendations such as initiation of lifelong HIV treatment as soon as possible after diagnosis for all people living with HIV and the offer of an HIV test during pregnancy (which helps to find pregnant people who don't know they have HIV) have made perinatal transmission extremely uncommon in Canada.

How can HIV be passed through infant feeding?

HIV can be passed to an infant through breast milk, and HIV has also reportedly been passed to young children through food that was prechewed by a parent or caregiver who has HIV.

We know that breast milk can contain high levels of HIV but we don't perfectly understand how HIV transmission happens through breastfeeding (sometimes called chestfeeding for trans people). Transmission of HIV through breastfeeding is thought to occur when HIV in breast milk enters an infant's body through the mucous membranes that line the back of the baby's throat and gut. Newborn babies are vulnerable to getting HIV in this way because of the frequency of their exposure to HIV in their parent's breast milk and the fact that their immune systems and their bodies are still underdeveloped.

There is a 5% to 20% chance that a baby will get HIV through breastfeeding if the lactating parent is not on successful HIV treatment. In addition, there is still a small chance of transmission even with an undetectable viral load.

Feeding an infant prechewed food (also called premastication) has been reported as a possible route of HIV transmission in only three cases where young children acquired HIV after being born HIV negative. Although none were breastfed, all three were fed food that had been prechewed by a parent or caregiver with HIV (whose HIV

treatment status and viral loads were not reported). Oral bleeding was reportedly present in two of these cases, which may have increased the risk of transmission.

To eliminate the risk of postnatal HIV transmission, parents with HIV in Canada are currently advised not to breastfeed (but rather to use formula exclusively) and not to feed their infants prechewed food. There are many programs across Canada that provide free formula for babies of people with HIV. However, experts also recommend that people who are on successful HIV treatment who have a strong desire to breastfeed should receive clinical support to do so as safely as possible.

How is HIV *not* transmitted?

HIV is not transmitted by saliva, tears, sweat, urine or feces. HIV does not survive well outside the human body. It cannot be transmitted through casual contact with a person who has HIV, or through objects such as toilet seats, doorknobs or dishes used by a person who has HIV.

In the past, some people got HIV after receiving a blood transfusion or organ or tissue transplant. However, Canada implemented HIV screening for all blood and tissue donations in 1985.

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Disclaimer

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

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