

# Risk Assessment

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Most exposures involve a one-way transmission of body fluid from the source to the exposed person; this guideline is prepared based on this premise. However, situations occasionally arise where both people involved in an incident could have been exposed to each other's fluids (for example, biting incidents, sexual exposures or physical alterations) in which case it is prudent to assess both individuals from the perspective of both being the exposed and the source.

The risk from occupational and community exposures is assessed in the same manner and the same recommendations for management can be applied. The actual risk from exposures outside the healthcare setting for needle-stick injuries is usually significantly less than in the health care setting (Centers for Disease Control and Prevention, 2010); however, some other non-occupational exposures may be of similar or higher risk as some occupational exposures.

To date it appears no one has become infected with human immunodeficiency virus (HIV) from an abandoned needle in Canada, the United States or Europe. The primary route of HIV transmission in Saskatchewan is from sharing needles and other equipment related to illicit drug use, and from unprotected high-risk sexual activity.

**HIV PEP should start as soon as possible, preferably within 2 hours of the exposure. It is unlikely to be of benefit if more than 72 hours post-exposure**  
(US Centers for Disease Control and Prevention, 2005)

**Table 2.1 Risk Estimates of HIV, hepatitis B virus (HBV), hepatitis C virus (HCV) Transmission after Exposure to Infected Blood**

INFECTED BLOOD	HIV	HBV	HCV
Risk of transmission after <u>percutaneous</u> exposure	0.3% (3 in 1000)	6-30% (6-30 in 100)	3-10% (3-10 in 100)
Risk of transmission after <u>mucocutaneous</u> exposure	0.1% (1 in 1000)		

(U.S. Centers for Disease Control and Prevention, 2003)

The [Exposure Incident Report Form \(Appendix 3\)](#) must be completed. It includes all required information in considering the risk of transmission of HIV, HBV or HCV.

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## Risk of HIV Transmission

Conducting an objective and thorough risk assessment is the key to making a recommendation for HIV post-exposure prophylaxis (PEP). The risk of transmission is calculated based on the:

- exposure fluid;
- type of exposure;
- likelihood the source is infected.

An exposure can be defined as a percutaneous injury (e.g., needlestick or cut with a sharp object) or contact of mucous membrane or non-intact skin (e.g., exposed skin that is chapped, abraded, or afflicted with dermatitis) with blood, saliva, tissue, or other body fluids that are potentially infectious. Exposure incidents might place the exposed person at risk for HIV, HBV, or HCV infection, and therefore should be evaluated immediately by a qualified health-care professional (U.S. Centers for Disease Control and Prevention, 2001).

## Risk by Fluid Type

Determine if a percutaneous, mucosal, or non-intact skin exposure to a potentially infectious body fluid poses a risk for HIV, HBV, or HCV transmission ([Table 2.2](#)).

**Table 2.2 Fluids and tissues capable of transmitting blood borne pathogens**

FLUID	HIV	HBV	HCV
Lab specimens containing concentrated HIV, HBV or HCV	Yes	Yes	Yes
Blood, serum, plasma or other biological fluids visibly contaminated with blood	Yes	Yes	Yes
Pleural, amniotic, pericardial, peritoneal, synovial and cerebrospinal fluids	Yes	Yes	Yes
Semen, vaginal secretions	Yes	Yes	Yes
Saliva	No, unless contaminated with blood	Yes	No, unless contaminated with blood
Breast milk	Yes	Biologically plausible, particularly if nipples are cracked or bleeding or if mother is HBeAg positive	Biologically plausible, particularly if nipples are cracked or bleeding
Organ and tissue transplants	Yes	Yes	Yes
Screened donated blood & manufactured blood products	Minimal risk in Canada	Minimal risk in Canada	Minimal risk in Canada

Source: U.S. Centers for Disease Control and Prevention, 2001.

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Although HBV and HIV have been found in secretions such as tears, vomitus, feces and urine, epidemiological studies have not implicated these substances in the transmission of HBV and HIV infections. The risk of transmission increases if these secretions have been contaminated with blood.

## Risk by Type of Exposure

The type of exposure ([Table 2.3](#)) and risk estimates based on exposures with an HIV infected source ([Table 2.4](#)) should be considered prior to recommending HIV PEP (New York State Department of Health AIDS Institute, 2010).

**Table 2.3 Consideration of HIV PEP according to Type of Exposure<sup>a</sup>**

<b>Types of Exposures When HIV PEP Should Be Recommended</b> (higher-risk exposures)	<ul style="list-style-type: none"> <li>• Receptive and insertive vaginal or anal intercourse<sup>b</sup></li> <li>• Needle sharing<sup>b</sup></li> <li>• Injuries with exposure to blood or other potentially infected fluids (including needlesticks with a hollow-bore needle, human bites, accidents) from a source known to be HIV-infected or has known risk factors</li> </ul>
<b>Lower-Risk Exposures That Require Case-by-Case Evaluation for HIV PEP</b>  (lower-risk exposures: assess for factors that increase risk before recommending initiation of HIV PEP)	<ul style="list-style-type: none"> <li>• Oral-vaginal contact (receptive and insertive)</li> <li>• Oral-anal contact (receptive and insertive)</li> <li>• Receptive penile-oral contact with or without ejaculation</li> <li>• Insertive penile-oral contact with or without ejaculation</li> <li>• Injuries with exposure to blood or other potentially infected fluids (including needlesticks with a hollow-bore needle, human bites, accidents) from a source whose HIV status is unknown</li> </ul> <p><b>Factors that increase risk:</b></p> <ul style="list-style-type: none"> <li>• Source person is known to be HIV-infected with high viral load</li> <li>• An oral mucosa that is not intact (e.g., oral lesions, gingivitis, wounds)</li> <li>• Blood exposure – it is important to note that blood exposure can be minimal and therefore not recognized by the exposed person. If the exposed person reports frank blood exposure, PEP would be indicated</li> <li>• Presence of genital ulcer disease or other STIs</li> </ul>
<b>Types of Exposures That Do Not Warrant HIV PEP</b>  (no risk)	<ul style="list-style-type: none"> <li>• Kissing<sup>c</sup></li> <li>• Oral-to-oral contact without mucosal damage (mouth-to-mouth resuscitation)</li> <li>• Human bites not involving blood</li> <li>• Exposure to solid-bore needles or sharps not in recent contact with blood<sup>d</sup></li> <li>• Mutual masturbation without skin breakdown or blood exposure</li> <li>• Found needle in community, no visible blood</li> </ul>
<p><sup>a</sup> Table 2.4 provides risk calculations for specific risk behaviours.</p> <p><sup>b</sup> With a source known to be HIV-infected or HIV status is unknown.</p> <p><sup>c</sup> There is no risk associated with close-mouthed kissing. There is a remote risk associated with open-mouthed kissing if there are sores or bleeding gums and blood is exchanged.</p> <p><sup>d</sup> Examples of solid-bore needles include tattoo needles and lancets used by diabetics to measure blood sugar levels.</p>	

Source: Adapted from New York State Department of Health AIDS Institute, 2013.

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The risk of HIV prophylactic medications usually exceeds the risk of an individual becoming infected from an abandoned needle.

These guidelines do not recommend prophylaxis for needlesticks from an abandoned needle outside the health care setting when there is no history of the origin of the needle or the time of its abandonment.

BC Center of Excellence in HIV/AIDS, 2010

**Table 2.4 Estimated Per-Act Probability of Acquiring HIV from a Known HIV-Infected Source by Exposure Act**

Type of Exposure	Estimated Risk	Reference
<b>Parenteral</b>		
Blood Transfusion	90% (9 in 10)	Patel, et al (2014)
Needle-sharing during injection drug use	0.63% (63 in 10000)	
Percutaneous (needlestick)	0.23% (23 in 10 000)	
<b>Sexual</b>		
Receptive anal intercourse	1.4% (7 in 5000)	Patel, et al (2014)
Receptive penile-vaginal intercourse	0.08% (8 in 10000)	Patel, et al (2014)
Insertive anal intercourse	0.11% (11 in 10000)	Patel, et al (2014)
Insertive penile-vaginal intercourse	0.04% (4 in 10000)	Patel, et al (2014)
Receptive oral intercourse	Low <sup>a</sup>	Varghese, et al. (2002) Page-Shafer, et al. (2002)
Insertive oral intercourse	Low <sup>a</sup>	Varghese, et al. (2002)
<b>Other<sup>b</sup></b>		
Biting	Negligible	Pretty, et al. (1999)
Spitting	Negligible	
Throwing body fluids (including semen or saliva)	Negligible	
Sharing sex toys	Negligible	

<sup>a</sup> HIV transmission through oral sex has been documented, but rare. Accurate estimates of risk are not available. It is prudent to recommend HIV PEP for receptive oral sex with ejaculation, although discussion about the low risk should occur. Refer to Table 5.1 for further consideration.

<sup>b</sup> HIV transmission through these exposure routes is technically possible but extremely unlikely and cases are not well documented. Increased risk occurs when the activity involved exposure to blood

Source: New York State Department of Health AIDS Institute, 2013. AIDS (2014)

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Factors known to further increase transmission of HIV infection should be included in the risk assessment. These include:

- trauma at the site of the exposure (for example, sexual assault);
- presence of genital ulcer disease and/or other sexually transmitted infections (STIs) in the exposed person;
- high plasma viral load in the HIV-infected partner or source (i.e., in seroconversion illness or late stage AIDS disease) (New York State Department of Health AIDS Institute, 2013);
- exposure to the blood/infectious body fluids from a source with advanced HIV disease;
- exposure to a source with concomitant hepatitis C.

Other factors that may enhance transmission include (Cardo et al., 1997; New York State Department of Health AIDS Institute, 2013):

- cervical ectopy;
- lack of circumcision;
- deep injury;
- visible blood on the device in enough volume to transmit virus; however, risk through exposure to dried blood on discarded needles is extremely low;
- direct injection into a vein or artery;
- terminal illness in the source patient.

## **Risk Assessment of Source**

The New York State Department of Health AIDS Institute (2010) and The Ontario Network of Sexual Assault/Domestic Violence Treatment Centres have identified that sources with the following risks may be at increased risk of HIV infection:

- hepatitis C positive;
- sexually transmitted disease, particularly ulcerative diseases;
- men who have sex with men;
- from a country with an HIV prevalence rate greater than 5%;
- sex with known or suspected HIV positive people;
- history of multiple sexual partners;
- history of sharing needles;
- history of trading sex for money or drugs;
- prior convictions for sexual assault;
- has been in prison.

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The details in the previous tables only represent an average risk and risk may be higher in the presence of other risk factors:

- high viral load in the source (i.e., in seroconversion illness or late stage AIDS disease);
- visible blood on the device and/or device was previously in a source's artery or vein;
- depth of wound;
- volume of blood;
- gauge of needle in needlestick injuries.

The source, if available, should be tested and or interviewed to provide the most appropriate care to the exposed. The source **must** provide informed consent regarding use and disclosure of information prior to conducting the interview or obtaining specimens for testing. Refer to [Appendix 15 – Collection Use and Disclosure of Information](#) and [Appendix 16 – Consent for Source Patient Testing Following a Blood/Body Fluid Exposure](#).

**Table 2.5 Recommendations for Source Based on HIV Status**

<b>Unknown HIV Status</b>	<ul style="list-style-type: none"><li>• Obtain risk history and HIV test.</li><li>• Consider evaluation and testing for other STIs, including hepatitis B and hepatitis C.</li></ul>
<b>Known Positive HIV Status</b>	<ul style="list-style-type: none"><li>• Obtain history of antiretroviral medications, recent viral load, CD4 cell count, and date of results.</li><li>• Consider drawing HIV viral load, CD4 cell count and resistance testing.</li><li>• Consider evaluation and testing for other STIs, including hepatitis B and hepatitis C.</li></ul>

**Table 2.6 Considerations for Exposed Based on Source Status**

<b>Known HIV Positive</b>	<ul style="list-style-type: none"><li>• HIV PEP should be offered to exposed person based on the assessment of the risk carried by the exposure. See <a href="#">Tables 2.3</a> and <a href="#">2.4</a>.</li></ul>
<b>Known HIV Negative</b>	<ul style="list-style-type: none"><li>• Consideration should be given to when the source's negative test was and history of risk factors since their last HIV test; history of a prior negative test may not indicate no risk for the exposed.</li><li>• Consider HIV Point of Care (POC) test if source available.</li></ul>

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<b>Unknown &amp; Available for Interview and/or Testing</b>	<ul style="list-style-type: none"><li>• Further investigation, including source testing for various blood borne pathogens. HIV PEP may be initiated before receipt of test results if exposure (based on source and type of exposure) is considered high-risk.</li><li>• HIV POC test should be considered where available for testing the source. See below for more information.</li><li>• If HIV POC test comes back negative this is very reassuring, however consider the source's risk factors during the <a href="#">window period</a>.</li></ul>
<b>Unknown &amp; Unavailable for Interview and/or Testing</b>	<ul style="list-style-type: none"><li>• Emphasis should be placed on the type of exposure, as well as ascertainment of possible risk factors in source.</li></ul>
<b>Refused Testing</b>	<ul style="list-style-type: none"><li>• Carefully consider the reasons for refusal. If there is no reason to suspect the source is in a high-risk group and the refusal is based on factors other than fear of disclosure, consider a low-risk source. It is not appropriate to consider all persons who refuse testing as positive.</li></ul>

When results for the source are available, the health care provider who requested the testing should immediately notify the provider responsible for care of the exposed person. The exposed person is entitled to know if the full course of prophylaxis is required or not, but details regarding the source should NOT be provided to the exposed person.

## Window Period Considerations

In HIV testing, the window period refers to the time between a person becoming infected and when laboratory tests can detect HIV infection. The window period varies based on the test that is completed; progress in HIV testing technologies continues to result in tests with shorter window periods (BC Centre for Disease Control, 2010).

In addition to test results, the risks that the individual has engaged in during the window period should be considered. There is an extremely low probability that an individual would test negative during the 3 month window period **AND** be involved in an exposure at the same time. Regardless, the possibility of a false negative test result during the window period should be considered in persons with ongoing risk factors. See [Risk Assessment of Source](#) and [Appendix 14 – Source Patient Risk Assessment](#).

A summary of window periods based on the HIV test used provides context to the reliability of the test results:

- antibody/antigen (4<sup>th</sup> generation test) has window period of approximately 2 weeks;
- antibody test (3<sup>rd</sup> generation) has a window period of approximately 3-4 weeks;

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- point of care test has a window period of approximately 1 month (personal communication, Dr. Greg Horsman, October 2012);
- greater than 99% of individuals will have seroconverted by 3 months as detected by the Western blot.

Because window periods vary with the test, a negative test result at 3 months is deemed to be negative and no further testing is required.

## Considerations Based on Saskatchewan Data

Prevalence of HIV information for Saskatchewan is not included in these guidelines. The World Health Organization (2007) has identified the following as challenges and cautions using prevalence data to make recommendations for HIV PEP due to:

- lack of reliable prevalence data;
- pockets of high prevalence within low-prevalence settings;
- differences in prevalence between exposed individuals and source subgroups;
- change of prevalence among various demographic groups over time;
- the possibility that HIV PEP may be denied to someone exposed to a known source of HIV infection.

## Additional Considerations Prior to Initiating HIV PEP

One must weigh the risks of becoming infected with HIV (which are frequently extremely low) against the risk of taking antiretroviral therapy (which can be significant). Human immunodeficiency virus PEP should not be initiated if the risk/benefit ratio is unfavourable. Refer to [Section 3 – Antiretroviral Therapy \(ART\) for HIV Post-Exposure Prophylaxis \(HIV PEP\)](#) for details about HIV PEP medications to assist conducting the risk/benefit ratio.

Once the risk assessment is completed, refer to the appropriate section of this guideline that addresses the exposure setting ([Section 4 – Occupational](#) and [Section 5 – Non-occupational \(Community\)](#), [Section 5a – Sexual Exposures](#) and [5b – Lifestyle](#)). [Section 3](#) outlines information on medications for HIV PEP which is the same for all settings.

## HIV Tests

Standard HIV tests routinely have a turn-around time from 2-3 days up to 2 weeks.

When managing an exposure, timely results of source tests can inform the decision for necessary management of the exposed.



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An HIV POC test can provide more timely results and should be considered where available for the source and/or the exposed. “Patients must be informed that parallel [standard HIV] testing will be performed to confirm the results of all reactive (positive) and indeterminate point of care rapid tests” (Saskatchewan Ministry of Health, 2012, p. 9). Refer to the Guidelines for the Use of Point of Care (POC) Test Kits in Saskatchewan.<sup>6</sup>

## Source:

Human immunodeficiency virus POC test should be considered on the source when they are available and their HIV status is unknown. If an HIV POC test is done and the result is:

- reactive (preliminary positive): prophylaxis is recommended based on the exposure until confirmatory test results are available;
- invalid or indeterminate: if the source has risk factors and the exposure is high-risk, prophylaxis should be strongly considered until confirmatory testing is completed;
- non-reactive: in most cases this result indicates a true negative. However, if the source has engaged in risk behaviour in the 1 month prior to the POC test and the exposure is high-risk, the [window period](#) should be considered in determining the appropriate treatment of the exposed.

## Exposed:

Human immunodeficiency virus testing of exposed persons is recommended to avoid unnecessary HIV PEP in individuals already infected with HIV and to expedite referral for treatment. Circumstances for which an HIV POC test should be considered for the exposed person include:

- **Single or episodic exposure with a background of unprotected chronic exposure**
  - an individual who has regular, ongoing consensual unprotected sex with an HIV positive partner and presents with another type of exposure such as sharing of needles for injecting drugs or has been sexually assaulted.
- **Chronic exposure without taking precautions or inconsistent use of precautions**
  - intravenous drug users repeatedly sharing needles/works with individuals whose HIV status is known or unknown.
  - sexual assault by an intimate partner with whom a person is also having ongoing unprotected consensual sex.
  - domestic abuse.

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<sup>6</sup> <http://www.saskatchewan.ca/government/health-care-administration-and-provider-resources/treatment-procedures-and-guidelines/blood-and-blood-borne-illness/hiv-information-for-health-care-providers>

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If the test result of the exposed person is reactive, HIV PEP is not required, but the individual should be referred for appropriate follow-up by an infectious disease Specialist.

Considering all the info gathered from the risk assessment of the fluid, of the exposure and of the source, as well as the results of the HIV POC test of the source and/or exposed, determine if HIV prophylaxis is indicated or not. Refer to the appropriate section of this guideline that addresses the exposure setting ([Section 4 – Occupational](#) and [Section 5 – Non-Occupational \(Community\)](#) including [5a – Sexual Exposures](#) and [5b – Lifestyle](#)) for further guidance. [Section 3](#) outlines information on medications for HIV PEP which is the same for all settings.

## Risk of Hepatitis B Transmission

For percutaneous and mucosal exposure to blood, several factors should be considered when making a decision to provide prophylaxis with hepatitis B vaccine and/or immune globulin (HBIG), including the predicted serostatus of the source, the exposed hepatitis B immunization status and vaccine response. Refer to [Appendix 8 – Management of Potential Exposures to Hepatitis B](#).

Community needlestick injury exposures (when the source is unknown) are low-risk and should be managed with hepatitis B vaccine only as per [\(b\) Management of Individuals with Percutaneous or Mucosal Exposure to an Uninfected or Low-Risk Source](#) in Appendix 8.

[Table 2.1](#) demonstrates that HBV is transmitted more efficiently than HIV. When the source is known, the following risk factors should be assessed:

- multiple sexual partners;
- type of sexual contact (anal intercourse carries a higher risk than vaginal intercourse which is higher risk than oral-anal); oral-genital and/or oral-oral contact do not appear to influence the risk of becoming infected with HBV;
- the presence of other sexually transmitted infections;
- if the source is from an endemic country;<sup>7</sup>
- high HBV DNA levels or HBe antigen positivity in the source.

Exposed individuals, including sexual assault victims should be managed with hepatitis B vaccine and/or HBIG as outlined in [Appendix 8 – \(a\) Management of Individuals with Percutaneous or Mucosal Exposure to an Infected or High-Risk Source](#).

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<sup>7</sup> <http://wwwnc.cdc.gov/travel/yellowbook/2012/chapter-3-infectious-diseases-related-to-travel/hepatitis-b.htm>.

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## **Risk of Hepatitis C Transmission**

While HCV is transmitted more efficiently than HIV by the parenteral route, transmission through sexual contact is much less efficient than either HBV or HIV. Persons with multiple partners and those with STIs are at increased risk of acquisition.

HIV co-infection seems to increase the rate of HCV transmission, while individuals without detectable HCV RNA appear to be at extremely low or near zero risk of transmitting HCV.

Currently, there is no effective post-exposure prophylaxis against HCV. Refer to [Appendix 9 – Management of Potential Exposures to Hepatitis C](#).