Risks of Transmission

This info sheet summarizes the current scientific consensus on risk of transmission of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) as a result of an occupational exposure.

This is one of a series of seven info sheets on Occupational Exposure to HBV, HCV, or HIV.

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Significant Exposures

Occupational exposures are only considered *significant* if there is a potential for infection. Some exposures (such as contact with clothing) are not significant because there is no potential for infection.

Significant exposure to HBV, HCV, or HIV occurs when a type of body fluid capable of transmitting the virus comes into contact with:

- tissue under the skin (eg, through a needle stick or a cut). This is called a *percutaneous* exposure.
- mucous membranes (eg, through a splash to the eyes, nose, or mouth) This is called a *mucocutaneous* exposure.
- non-intact skin (eg, when the skin is chapped, scraped, or afflicted with dermatitis).

Contact with intact skin is not a significant exposure, but the larger the area of skin exposed and the longer the time of contact, the more important it is to verify that the skin is intact.

Infectious Fluids

The types of body fluids capable of transmitting HBV, HCV, or HIV include:

- blood, serum, plasma, and all biologic fluids visibly contaminated with blood;
- laboratory specimens, samples, or cultures that contain concentrated HBV, HCV, or HIV;
- organ and tissue transplants;
- pleural, amniotic, pericardial, peritoneal, synovial, and cerebrospinal fluids;
- uterine/vaginal secretions or semen (unlikely to transmit HCV); and
- saliva (saliva alone transmits only HBV; if saliva is contaminated by blood it may also transmit HCV and HIV).

HBV, HCV, and HIV are not transmitted by feces, nasal secretions, sputum, tears, urine, and vomit unless they are visibly contaminated by blood.

Risk of Infection after Exposure

HBV: People who have received hepatitis B vaccine and have developed immunity to the virus are at virtually no risk of infection. For an unvaccinated person, the risk from a single percutaneous exposure to HBV-infected blood ranges from 6 to 30 percent and depends on the serological status of the source person.

HCV: The risk of infection from a single percutaneous exposure to HCV-infected blood is estimated to be 1.8 percent. The risk of infection from an exposure to mucous membranes or non-intact skin is unknown, but is believed to be very small.

HIV: The risk of infection from a single percutaneous exposure to HIV-infected blood is estimated to be

0.3 percent (1 in 300). The rate of transmission from a mucocutaneous exposure is estimated to be, on average, 0.1 percent. The rate of transmission from an exposure to the skin is estimated to be less than 0.1 percent. There have been no documented cases of HIV infection due to an exposure involving a small amount of blood on intact skin.

Risk Factors

Several factors influence the risk of infection from a single significant exposure. These include:

- the virus involved (HBV and HCV are more infectious than HIV);
- the type of exposure (a deep injury is more risky than a splash to the eyes);
- the amount of blood involved in the exposure (more blood is associated with more risk);
- the amount of virus in the source person's blood at the time of exposure (more virus is associated with more risk).

The probability of infection from an exposure varies in proportion to the prevalence of the virus in the population. The British Columbia Centre for Excellence in HIV/AIDS estimates that the probability of HIV seroconversion in British Columbia after a single percutaneous needle exposure is 0.3 percent if the source person is HIV-positive (the rate is probably lower if the person is taking antiretroviral drugs); 0.12 percent if the source person uses injection drugs; 0.06 percent if the source person is a man who has sex with men; and lower still if the source person does not have any risk factors.

The risk of incurring a significant exposure is greater among certain professions and with certain activities. In health-care settings the majority of exposures are due to needle sticks, and nurses incur the most exposures. Among health-care providers, operating room nurses, surgical residents, and surgeons have high rates of exposure. The risk of incurring a significant exposure is smaller outside health-care settings.

There is limited information on risk factors among firefighters, ambulance attendants, police, and correctional staff. A summary of five studies of HCV infection among emergency responders (firefighters, emergency medical technicians, and paramedics) in selected locations in the US, conducted between 1991 and 2000, found that the rate of infection was not greater among first responders than in the general population. HCV infection among emergency responders was associated not with occupational factors but rather with non-occupational factors. A study of occupational exposure to HIV among police officers in Denver, Colorado, concluded that while the police officers rarely had percutaneous or mucocutaneous exposures to blood, when they did, the risk of exposure to HIV-infected blood was quite high.

Surveillance of Exposures

There are a number of surveillance programs of occupational exposures in health-care settings. The Canadian Needle Stick Surveillance Network reported 599 exposures in twelve sites from April to September 2000. Of these, 514 were percutaneous exposures and 85 mucocutaneous exposures. The percutaneous exposures included 406 needle sticks, 42 other sticks, 44 cuts, 15 scratches, and seven bites that broke the skin. There are two surveillance programs of occupational exposures among health-care workers in the US: the National Surveillance System for Hospital Health Care Workers maintained by the CDC, and the Exposure Prevention Information Network coordinated by the International Health Care Worker Safety Center at the University of Virginia.

There is limited information on occupational exposures in other settings.

Documented Cases of Occupational Transmission of HIV

To date, there have been two probable cases of occupational transmission of HIV involving laboratory workers in Canada, and one definite case involving a health-care provider. There have been no documented cases of occupational transmission of HIV involving firefighters, ambulance attendants, police, and correctional staff in Canada.

The information in this series of info sheets is based on a report prepared by Theodore de Bruyn for the Canadian HIV/AIDS Legal Network: *Testing of Persons Believed to be the Source of an Accidental Occupational Exposure to HBV, HCV, or HIV: A Backgrounder*. Additional reading for each of the info sheets can be found in info sheet 7. Copies of the report and series of info sheets are available on the Legal Network's website at www.aidslaw.ca/Maincontent/issues/testing.htm or through the Canadian HIV/AIDS Clearinghouse (tel: 1-877-999-7740; fax: 613 725-9826; email: aids/sida@cpha.ca). Reproduction of the info sheets is encouraged, but copies may not be sold, and the Canadian HIV/AIDS Legal Network must be cited as the source of this information. For further information, contact the Network (tel: 514 397-6828; email: info@aidslaw.ca). Ce feuillet d'information est également disponible en français.

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Management of Exposure

This info sheet reviews routine procedures to prevent occupational exposures and to respond to an exposure.

This is one of a series of seven info sheets on Occupational Exposure to HBV, HCV, or HIV.

1. Risks of Transmission
2. Management of Exposure
3. Post-exposure Prophylaxis
4. Testing for Infection
5. Information from the Source Person
6. Calls for Compulsory Testing of Source Persons
7. Readings and Resources

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Comprehensive Management of Exposure

A comprehensive program to manage occupational exposure to infectious diseases should include:

- policies and procedures developed for a specific sector (eg, various health-care settings, emergency responders, police);
- appropriate personal protective equipment, engineering controls, protective practices, and disinfectants;
- ongoing education and training of workers and of staff responsible to act in the event of an occupational exposure;
- a pre-exposure program;
- a post-exposure program; and
- partnership with public health.

Pre-exposure Programs

Prevention should be the first goal in managing occupational exposure to infectious diseases. Prevention can eliminate or reduce the risk of infection, the need for post-exposure prevention and treatment, the adverse effects of treatment, and anxiety and stress. Prevention is all the more important when pre-exposure immunization is available (as with hepatitis B vaccination) or when post-exposure treatment is not available (as with hepatitis C).

A pre-exposure program should include:

- standards, education, and training regarding information on infectious diseases, methods of transmission, assessment of risk of exposure, definition of significant exposure, disinfection and decontamination procedures, and the use of personal protective equipment, engineering controls, and protective practices;
- an immunization program;
- screening for airborne infections such as tuberculosis if there is a risk of exposure;
- protocols for managing bloodborne pathogens;
- employee input in testing protective equipment and developing protective practices;
- respect for confidentiality of individuals as required by law; and
- respect for the right to work in compliance with occupational health and safety legislation.

Post-exposure Programs

Post-exposure programs are key to a timely and effective response to an occupational exposure. They should include:

- standards and protocols for responding to exposures, including provisions for immediate post-exposure activities (first aid, disinfection, reporting, and referral), assessing the exposure, counseling the exposed worker, referral for

medical care and post-exposure prophylaxis, testing and follow-up for the exposed worker, and obtaining information from the source person;
- selection of designated personnel and training in their roles (first point of referral for exposed worker, assessment of exposure, administration of post-exposure prophylaxis, liaison with source person, liaison with public health);
- established systems for timely and knowledgeable delivery of medical care, counseling, and follow-up; and
- education and training of staff in the protocols, personnel, and systems involved in responding to exposures.

Room for Improvement

Research studies suggest that the prevention and management of occupational exposure could be improved, both in health-care settings and in community settings. Studies in Canada, the United States, and Europe have found evidence of unsafe practices in disposing of needles, failure to use routine precautions, continuing rates of injury, delays in administering post-exposure prophylaxis, and insufficient expertise in assessing exposures and recommending post-exposure prophylaxis.

Anecdotal reports identify numerous factors that contribute to occupational exposures, particularly needle sticks, in health-care settings: unsafe procedures in re-capping needles or in placing needles in sharps containers; sharps containers being out of easy and safe reach from the point of care; needles left in bedding or on surfaces; inadequate training in safe practices, especially among students; fatigue due to long shifts and burnout; an organizational environment and system that does not encourage and foster occupational safety; and a lack of a sense of personal or professional worth.

Prevention of occupational exposures requires an integrated system of personal protective equipment, engineering controls, workplace practices, education and training, surveillance, and risk-reduction programs. The importance of engaging management and staff in consultation, review, training, and support cannot be over-emphasized. Workers need to be involved in assessing accidents or near-accidents, suggesting solutions, implementing and evaluating solutions, and fostering ongoing training in engineering controls and protective practices.

Health Canada has made a series of recommendations about reducing the risks of occupational exposure to bloodborne pathogens in the workplace. They include recommendations on risk reduction in the workplace, immunization, engineering safeguards, personal protective equipment, hygiene and sanitation, education of workers, quality assurance, firefighters and emergency medical services, and law enforcement and correctional facility officers. It is incumbent on employers and employees to review these recommendations, determine if they are being implemented in a *regular and sustained* fashion, and remedy any lapses in policy, practice, or training.

In health-care settings particular attention should be given to reducing the incidence of needle sticks. These account for the majority of percutaneous exposures. Needle-less systems and needles with safety features are currently available, and could contribute to reducing the incidence of needle sticks. In the United States health-care facilities under the federal Occupational Safety and Health Administration are now required by law to use such systems and devices.

In emergency response settings particular attention should be given to implementing and enhancing pre- and post-exposure programs. For instance, the 1995 guidelines for establishing a notification protocol for emergency responders, which provides for trained and knowledgeable designated personnel and clear and established systems for response and notification, have proved to be effective in improving the management of occupational exposures among firefighters. However, not all jurisdictions in Canada have adopted the protocol.

The information in this series of info sheets is based on a report prepared by Theodore de Bruyn for the Canadian HIV/AIDS Legal Network: *Testing of Persons Believed to be the Source of an Accidental Occupational Exposure to HBV, HCV, or HIV: A Backgrounder*. Additional reading for each of the info sheets can be found in info sheet 7. Copies of the report and series of info sheets are available on the Legal Network's website at www.aidslaw.ca/Maincontent/issues/testing.htm or through the Canadian HIV/AIDS Clearinghouse (tel: 1-877-999-7740; fax: 613 725-9826; email: aids/sida@cpha.ca). Reproduction of the info sheets is encouraged, but copies may not be sold, and the Canadian HIV/AIDS Legal Network must be cited as the source of this information. For further information, contact the Network (tel: 514 397-6828; email: info@aidslaw.ca). Ce feuillet d'information est également disponible en français.

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Post-exposure Prophylaxis

This info sheet provides information on treatment to prevent infection after an occupational exposure (post-exposure prophylaxis or PEP).

This is one of a series of seven info sheets on Occupational Exposure to HBV, HCV, or HIV.

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Available Treatment

Treatment to prevent infection after an occupational exposure (post-exposure prophylaxis or PEP) is available for HBV and HIV, but not HCV.

HBV

HBV PEP consists of treatment with hepatitis B immune globulin (HBIG) and hepatitis B vaccine, depending on the exposed worker's susceptibility or immunity to HBV infection. HBIG should be administered within 48 hours (US guidelines recommend preferably within 24 hours). The efficacy of HBIG as PEP decreases with time and is unknown after seven days.

HIV

HIV PEP consists of treatment with two or three antiretroviral drugs for four weeks. Zidovudine (AZT) and lamivudine (3TC) – both nucleoside reverse transcriptase inhibitors – are often prescribed, but it is increasingly common to add a third drug (a protease inhibitor or non-nucleoside reverse transcriptase inhibitor), because a combination of three drugs has greater antiretroviral activity and is less likely to result in drug resistance. However, it is sometimes necessary to reduce the number of drugs taken or to replace one drug with another because of side effects, adverse events, and drug resistance.

PEP with antiretroviral drugs should begin as soon as possible after the exposure, preferably within one to two hours. Treatment may still be considered at later intervals because of the potential benefits of early treatment of acute HIV infection, should seroconversion occur. The traditional duration of treatment is four weeks.

It is virtually impossible to obtain evidence of the effectiveness of PEP in humans through a randomized controlled clinical trial, since the rate of transmission is low and it would be difficult to obtain a sufficient sample size of workers with documented occupational HIV exposure. However, there is strong *indirect* evidence of effectiveness. An international case-control study of health-care workers exposed to HIV found that the odds of HIV infection among those who took AZT was reduced by approximately 81 percent. A substantial number of studies have demonstrated that antiretroviral treatment is effective in preventing HIV transmission from infected mothers to their children. Studies of PEP in animals have found that treatment administered within 24 to 36 hours of infection was effective in preventing transmission, whereas infection occurred in some animals when treatment was administered within 48 to 72 hours. Some studies in animals have also found that infection occurred when PEP was given for less than 28 days, but other studies have found that shorter courses of treatment have been effective in preventing transmission.

Risk Assessment for HIV PEP

The decision to recommend HIV PEP, and the number of drugs in the treatment, depend on the assessment of the risk incurred in the exposure. The guidelines of the BC Centre for Excellence in HIV/AIDS, which are representative of the current consensus, are as follows:

Higher risk of transmission: Treatment with three drugs is recommended strongly when the exposure involves an infectious body fluid, a source person who is HIV-positive or has recently engaged in high-risk behaviours, a percutaneous exposure or a major mucotaneous or non-intact skin exposure (ie, more than a few drops of blood and/or duration of exposure of several minutes or more).

Moderate risk of transmission: Treatment with two drugs is recommended when the exposure involves an infectious body fluid, a source person who is HIV-positive or has recently engaged in high-risk behaviours, but the injury is unlikely to result in transmission, such as a minor mucotaneous or non-intact skin exposure (ie, less than three drops for a duration of a minute or two) or bites where there is blood in the mouth of the biter and a bleeding wound in the skin of the person bitten.

Negligible risk of transmission: Treatment with drugs is not recommended but counseling is offered to explain the negligible risk of transmission and to reassure the worker when the exposure involves a source person known or presumed to be HIV-negative or an injury not known to transmit HIV or a body fluid not known to transmit HIV.

As more becomes known about HIV PEP, however, changes are being made to risk assessment and recommended treatment. For instance, the BC Centre for Excellence in HIV/AIDS is reconsidering treatment with two drugs in cases of moderate risk and may eliminate the category altogether.

Side Effects and Adverse Events

There are side effects and serious adverse events associated with HIV PEP. A US registry of health-care workers receiving PEP found that among those for whom data were available at week six, 76 percent reported some symptoms or adverse events. The most frequently cited symptoms were nausea, malaise or fatigue, headache, vomiting, diarrhea, and myalgias or arthralgias. Serious adverse events include nephrolithiasis, severe rash, toxic hepatitis, cholecystitis, hemolysis, and epidermolysis bullosa. Most side effects and adverse events resolve when treatment is stopped.

Side effects and adverse events due to PEP result in significant time off work. They are also one of the main reasons for not completing the full course of PEP (the other reason is finding out that the source person tested negative for HIV).

When the risk of HIV infection is low, there is reason to be conservative in prescribing HIV PEP. However, when the risk of HIV infection is high, the benefits of HIV PEP (prevention of a debilitating and fatal disease) outweigh the harms (side effects and adverse events, most of which resolve after the treatment is finished).

Counseling and Follow-up

For the exposed worker, dealing with anxiety about the possibility of infection and taking precautions to prevent transmission to others are, along with the side effects and adverse effects of PEP, the main burdens of coping with an occupational exposure. These often have an impact not only on the worker, but also on the family or the intimates of the worker. Counseling is an essential component of care for the worker. It helps to reduce anxiety, ensure adequate treatment and follow-up, promote adherence to PEP, and reduce the risk of transmission to others.

To be sure that they are not infected, workers exposed to HBV should be re-tested at six months; workers exposed to HCV at three months and six months; and workers exposed to HIV at six weeks, three months, and six months. It is important to follow exposed workers for all their tests, which should be provided in one location. In fact, however, many exposed workers are lost in follow-up.

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Testing for Infection

This info sheet provides information on current testing technologies and their capabilities in detecting HBV, HCV, and HIV. For information on the relevance of HIV test results for post-exposure counseling, treatment, and follow-up, see info sheet 5 (on information from the source person).

This is one of a series of seven info sheets on Occupational Exposure to HBV, HCV, or HIV.

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Types of Tests

Several types of tests are used to determine whether a person has been exposed to or infected by HBV, HCV, or HIV. There are tests that detect the presence of antibodies to the virus or antibodies to a particle of the virus (antigens). There are tests that detect the presence of antigens in the blood (such as the test for the HIV p24 antigen). There are tests, called nucleic acid tests (NAT), that detect the presence of genetic material (RNA or DNA) of HBV, HCV, and HIV in the blood. In addition, in the case of hepatitis B and C, there are tests that measure the levels of alanine aminotransferase (ALS) and aspartate aminotransferase (AST), which are liver enzymes. Higher-than-normal levels of these enzymes can be a sign of changes in the function of the liver.

The Window Period

All viral infections begin with a window period in which the virus is present in the body but antibodies to the virus are not present in blood or cannot be detected with confidence using current tests.

There are two phases to the window period. In the first phase virus is not present in blood or cannot be detected by any of the existing tests. In the second phase virus is present in blood and can be detected by nucleic acid tests and antigen tests.

It is not possible to rule out infection until the window period is over (when antibodies are present in the blood). The length of the window period varies from person to person. In most people, seroconversion to HCV and HIV occurs within six months. In some people, it occurs later, nine months after exposure to HCV and up to a year after exposure to HIV. (Approximately five percent of persons infected with HIV develop HIV antibodies after six months). Therefore, to be sure that they are not infected, workers exposed to HBV should be re-tested at six months; workers exposed to HCV at three months and six months; and workers exposed to HIV at six weeks, three months, and six months (some protocols recommend testing for HIV after one year).

Screening Tests and Supplemental/Confirmatory Tests

The standard diagnostic testing process for HCV and HIV consists of a screening test (an enzyme immunoassay or EIA) and a supplemental or confirmatory test for antibodies to the virus. Although nucleic acid tests and antigen tests can detect infection earlier than antibody tests, they are not used as standard diagnostic tests because of cost, the complexity of the technique, problems in assuring reliable and standard results, and problems associated

with false negative and false positive results. All diagnostic testing must be accompanied by appropriate pre- and post-test counseling, including information about, among other things, the window period and the possibility of false test results.

HCV

Screening tests for HCV detect anti-HCV in ≥ 97 percent of infected people, but do not distinguish between acute, chronic, or resolved infection. The tests yield a high proportion of false positive results when used in populations with low prevalence of HCV infection. A person is considered positive for anti-HCV if the result of the screening EIA and the supplemental test are positive. Persons with a negative EIA result or a positive EIA and a negative supplemental test are considered uninfected, unless other evidence exists to indicate HCV infection.

HIV

With the EIA for HIV, the likelihood of missing antibody is low, and the probability that a negative result is a true result is very high. However, a positive reaction to the EIA may be caused not by antibodies to HIV but by factors acting like antibodies to HIV (a false positive result). Therefore a more specific confirmatory test is required. While repeatedly positive EIA results are considered highly suggestive of infection, a positive confirmatory test (Western blot or other approved test) is required for a definite diagnosis of HIV infection.

HIV p24 antigen and HIV RNA tests have been used to provide an early indication, prior to detection of HIV antibodies, of HIV infection after an occupational exposure. However, these tests cannot be relied upon for a definite diagnosis of HIV infection. A study of persons in the early stage of HIV infection who tested negative for HIV antibodies found that HIV p24 antigen tests detected approximately 90 percent of infections before HIV antibodies were detected. (There were some false negative results but no false positive results with the p24 antigen tests.) HIV RNA tests detected 100 percent of infections (there were no false negative results), but included some false positive results. It is important to note that these findings cannot be applied to later stages of HIV disease, since the level of virus in the blood drops after the initial stage of infection, and tests that detect virus in the blood may produce false negative results. This is particularly likely in persons receiving antiretroviral drugs, which can reduce the amount of virus in the blood to undetectable levels.

Rapid and Expedited HIV Tests

Standard screening and confirmatory HIV tests take time to complete, partly because samples are batched to reduce the costs of testing. However, some jurisdictions in Canada provide for expedited laboratory processing of tests (24 to 48 hours) in the event of an occupational exposure. It is usually recommended that the laboratory be notified in advance by telephone to ensure that the processing is expedited, particularly on weekends.

Rapid point-of-care HIV tests can reduce the time to obtain results. These tests are approved for use by health-care providers at the point of care. The tests use an EIA that is an equivalent of the EIAs used in laboratories to test blood specimens, but they can produce a result in less time (from a few minutes to two hours). If the result is negative, no further testing is required. If the result is positive or equivocal, a blood sample for further testing is obtained with appropriate counseling, an EIA is applied in a laboratory and, if the result is positive, a confirmatory test is applied.

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Information from the Source Person

This info sheet describes the value of information from the person who is the source of an occupational exposure to the exposed worker, and the processes that should be used to obtain such information.

This is one of a series of seven info sheets on Occupational Exposure to HBV, HCV, or HIV.

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Helpful Information from the Source Person

Information about the serological status (results of tests for viral infection), risk factors, and medical history of the source person can relieve uncertainty as to whether there was in fact an exposure to HBV, HCV, or HIV, and can contribute to decisions about post-exposure prophylaxis (PEP), testing, and follow-up for the exposed worker.

If the test results of the source person are negative and there are no risk factors, the exposed worker may be reasonably certain that there was not a significant exposure, be relieved of anxiety, and forego PEP.

If the test results of the source person are positive *or* if the results are negative but there are risk factors (indicating that the test may have been taken in the window period), the exposed worker would have to take steps to prevent further transmission, consider PEP (depending on the nature of the exposure), and be tested at a later time. *One cannot conclude that the exposed worker was infected on the basis of a positive test result from the source person, or that the exposed worker was not infected on the basis of a negative test result from the source person when risk factors are present*.

If the source person is known to be HIV-positive and is receiving medical care, information about the source person's disease status and treatment may be useful in designing or modifying PEP for the exposed worker. This information includes the source person's stage of infection (ie, asymptomatic or AIDS), CD4+ T-cell count, results of viral load testing (tests that measure the quantity of virus in the blood), and current and previous antiretroviral therapy. It is important to determine if the source person has developed resistance to any antiretroviral drugs, since these drugs may then be excluded from the post-exposure prophylaxis for the exposed worker or may be complemented with drugs to which the source person has no known resistance.

Guidelines for Obtaining Information

In 1995 Health Canada convened a national conference that reached a consensus on guidelines for a protocol to notify emergency responders (firefighters, ambulance attendants, and police) when they may have been exposed to an infectious disease (airborne or bloodborne). The protocol includes procedures that facilitate the voluntary testing of source persons with informed consent and appropriate counseling. The protocol stipulates that:

- personal information about the source person cannot be released without that person's consent;

- if testing the source person is recommended, the source person's informed consent must be obtained;
- the process of obtaining informed consent and testing the source person must include appropriate pre- and post-test counseling;
- the request for testing should be made to the source person by a person designated to perform this function by the health-care facility, public health authority, or other policymakers, not by the exposed worker;
- the type of information that may be provided to the exposed worker should be specified in a way that addresses the source person's right to privacy and confidentiality with respect to health information (eg, the exposed worker will be informed of the serological status, but not the identity, of the source person).

Ethical Practice of Voluntary, Informed Consent

Respect for personal autonomy is a fundamental principle of biomedical ethics. It is the basis for ethical rules and practices that require voluntary informed consent for medical procedures, that respect the individual's right to privacy, and that protect the confidentiality of personal medical information.

A recent Canadian study of the experience of being tested for HIV confirms the importance of respect for personal autonomy, privacy, and confidentiality in the testing process. Test recipients universally valued confidentiality and preferred anonymity, although this was not often their experience.

The Canadian Medical Association, the Canadian Nurses Association, and the Canadian Association of Nurses in AIDS Care have recently published or updated policies on occupational exposure to HIV or bloodborne pathogens. They maintain that compulsory testing or testing without informed consent is unethical and unjustified. Voluntary testing with informed consent and appropriate pre- and post-test counseling continues to be the norm for source persons and exposed workers in health-care settings.

Consent Is Almost Always Given

Most source persons agree to be tested and permit relevant information to be provided to the exposed worker, when they are approached in a sensitive manner and the importance of the information is explained. The rate of refusal in selected health centres across Canada is estimated to range from 0.1 percent to 0.5 percent. Studies in health-care centres in Virginia, Maryland, and Calgary reported refusal rates from 0.5 percent to 6 percent. A study among police officers in Denver found that of 34 identified source persons, 32 (or 94 percent) agreed to be tested for HIV.

Timing

Because PEP for HIV should ideally be started within two hours of exposure, the exposed worker should not wait to find out about the source person's serological status before starting treatment, if treatment is recommended. If it is later established that the source person was not infected and had no risk factors, the exposed worker can then discontinue PEP.

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Calls for Compulsory Testing of Source Persons

This info sheet provides information on recent proposals for compulsory testing of persons who are the source of an occupational exposure, and weighs the harms of such proposals against their presumed benefits.

This is one of a series of seven info sheets on Occupational Exposure to HBV, HCV, or HIV.

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Canadian Strategy on HIV/AIDS

Calls for Compulsory Testing

In 1999, Chuck Strahl, Member of Parliament for Fraser Valley, sponsored a private member's bill, Bill C-244 (the *Blood Samples Act*) that would authorize court-ordered testing of a source person where there are reasonable grounds to believe that a health-care worker, firefighter, volunteer, peace officer, security officer, or good Samaritan coming to the aid of that person may have been infected with HBV, HCV, or HIV. Failure to comply with a court order could result in a prison sentence of up to six months for the source person. The bill was re-introduced in the 37th Parliament as Bill C-217.

Bill C-217 has received strong support from the Canadian Police Association and qualified support from the International Association of Fire Fighters' Canadian Office. It has not been supported by the Canadian Nurses Association, the Canadian Association of Nurses in AIDS Care, or the Canadian Medical Association.

An Infringement of Ethical Principles and Legal Rights

Compulsory testing of a source person and disclosure of the results of the test would be an infringement of the person's personal autonomy. Respect for personal autonomy is a fundamental principle of biomedical ethics. It is the basis for ethical rules and practices that require voluntary informed consent for medical procedures, respect the individual's right to privacy, and protect the confidentiality of personal medical information.

The Supreme Court of Canada has repeatedly affirmed that a person cannot be subjected to medical procedures without their consent. Bill C-217 violates this legal doctrine, as well as the principle of personal autonomy, by mandating serological testing of the source person; by permitting disclosure of the results of the test; and by requiring that the source person be informed of the test results.

Bill C-217 also arguably infringes several rights and freedoms guaranteed by the *Canadian Charter of Rights and Freedoms*. These include the right to "life, liberty and security of the person and the right not to be deprived thereof except in accordance with principles of fundamental justice" (section 7), and the right to be "secure against unreasonable search or seizure" (section 8).

A Justifiable Infringement?

The right of autonomy, and the rules and practices based on it, are not absolute. They may be infringed if there is sufficient justification based on other ethical principles. However, the justification must be substantial and the terms of the infringement must be carefully circumscribed.

The Supreme Court of Canada has set out the requirements for justifying legislation that infringes Charter rights: (1) the objective must be sufficiently important to warrant overriding a constitutionally protected right or freedom; (2) the measures must be fair and not arbitrary, carefully designed to achieve the objective, and rationally connected to it; (3) the measures should impair the Charter right at little as possible; and (4) there must be proportionality between the effects of the limiting measure and the objective – the more severe the infringement of the right, the more important the objective must be.

Requiring a person to be tested for HBV, HCV, or HIV is more than a minimal impairment of Charter rights. The seriousness of the impairment is compounded by possible imprisonment for refusal to be tested and the lack of confidentiality protections for those subjected to testing.

Benefits versus Harms

Benefits to the exposed worker

If the test results of the source person are negative and there are no risk factors, the exposed person may be reasonably certain that there was not a significant exposure, be relieved of anxiety, and forego PEP.

If the test results of the source person are positive *or* if the results are negative but there are risk factors, the exposed person would have to take steps to prevent further transmission, consider PEP (depending on the nature of the exposure), and re-test at a later time.

One cannot conclude that the exposed worker was infected on the basis of a positive test result from the source person, or that the exposed worker was not infected on the basis of a negative test result from the source person when risk factors are present.

Harms to the source person

The benefits to the exposed worker must be weighed against the harms of compulsory testing. The person required to be tested suffers harms to bodily and psychological integrity, an infringement of personal privacy, and a loss of confidentiality. If the results of the tests are positive, the person may experience stigmatization, fear of the course of the illness, fear of leaving loved ones, and suicidal thoughts. In addition, compulsory testing may cause the person tested to distrust those whose role it is to assist – thereby damaging, for instance, the therapeutic relationship that is necessary for good care.

Is Compulsory Testing Necessary, Feasible, or Appropriate?

PEP should not be necessary for occupational exposure to HBV (preventative vaccination is available), and is not available for exposure to HCV. It is available for exposure to HIV, but should ideally be started within two hours of the exposure.

Most source persons agree to be tested and permit relevant information to be provided to the exposed worker (see info sheet 5).

A compulsory testing procedure, which involves obtaining a judicial warrant, would not produce information in time to contribute to decisions to start HIV PEP. The information would only be used in decisions to stop prophylaxis, should the results of the test be negative and no risk factors be present.

Most accidental occupational exposures to bloodborne pathogens are not associated with suspected or demonstrated criminal activity. It is not appropriate to have recourse to the *Criminal Code* to compel source persons to be tested in such circumstances.

Practical Alternatives

The concerns and fears that workers may have about HIV and other viral infections deserve consideration. The consequences of an accidental occupational exposure – anxiety about possible infection, side effects of PEP, stresses on personal relations, stigma, time lost from work – are significant.

More could and should be done to prevent accidental occupational exposure, support workers, and obtain voluntary consent for testing from source persons *without* having recourse to compulsory testing of source persons. Studies have found evidence of unsafe practices in disposing of needles, failure to use routine precautions, continuing rates of injury, delays in administering PEP, and insufficient expertise in assessing exposures and recommending PEP.

The information in this series of info sheets is based on a report prepared by Theodore de Bruyn for the Canadian HIV/AIDS Legal Network: *Testing of Persons Believed to be the Source of an Accidental Occupational Exposure to HBV, HCV, or HIV: A Backgrounder*. Additional reading for each of the info sheets can be found in info sheet 7. Copies of the report and series of info sheets are available on the Legal Network's website at www.aidslaw.ca/Maincontent/issues/testing.htm or through the Canadian HIV/AIDS Clearinghouse (tel: 1-877-999-7740; fax: 613 725-9826; email: aids/sida@cpha.ca). Reproduction of the info sheets is encouraged, but copies may not be sold, and the Canadian HIV/AIDS Legal Network must be cited as the source of this information. For further information, contact the Network (tel: 514 397-6828; email: info@aidslaw.ca). Ce feuillet d'information est également disponible en français.

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Readings and Resources

This info sheet provides information on guidelines, research, and other resources related to occupational exposure to hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV).

This is one of a series of seven info sheets on Occupational Exposure to HBV, HCV, or HIV.

1. Risks of Transmission
2. Management of Exposure
3. Post-exposure Prophylaxis
4. Testing for Infection
5. Information from the Source Person
6. Calls for Compulsory Testing of Source Persons
7. Readings and Resources

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Easy-to-read Materials

The following items are not listed in alphabetical order, but rather in order of priority.

Centers for Disease Control and Prevention. Exposure to Blood: What Health-Care Workers Need to Know, 1999. Frequently asked questions and answers on occupational exposure. Available at www.cdc.gov/ncidod/hip/blood/hiv.htm.

Lamy O. Tout ce que vous voulez savoir sur les expositions professionnelles au VIH. *L'Infirmière du Québec* 1999; 7(2): 28-32. A short article on the management of occupational exposure to HIV in health-care settings.

Canadian Association of Nurses in AIDS Care. Accidental Exposure to HIV: Self Care. April 1998. A handy card that provides instructions on what to do in the event of an exposure.

Storch J. Exposure to body fluids. *Canadian Nurse* 2000; 96(6): 35-36. A brief description of the process of ethical reflection in the event of an exposure.

Canadian HIV/AIDS Legal Network. Info Sheets on HIV Testing. Information on many issues associated with HIV testing, including consent, access to testing, anonymous testing, counseling, rapid point-of-care testing, home testing, testing of patients, health-care workers, and prisoners, HIV testing and pregnancy, confidentiality, and partner notification. Available at www.aidslaw.ca/Maincontent/infosheets.htm#isoht.

Hepatitis C Society of Canada. Hep C – the Basics. Hep C – in Depth. Information about hepatitis C. Available at www.hepatitiscsociety.com/help/helpmenu.htm.

Guidelines on Managing Exposures

1. Health Canada

Health Canada. An integrated protocol to manage health care workers exposed to bloodborne pathogens. *Canada Communicable Disease Report* 1997; 23 (Suppl 23S2): 1-14. A guide to the management of occupational exposure to HBV, HCV, and HIV. Available at www.hc-sc.gc.ca/hpb/lcdc/publicat/pathogns/index.html.

Health Canada. A national consensus on guidelines for establishment of a post-exposure notification protocol for emergency responders. *Canada Communicable Disease Report* 1995; 21(19): 169-175. Guidelines for the management of occupational exposures among emergency responders. Available at www.hc-sc.gc.ca/hpb/lcdc/publicat/ccdr/95pdf/cdr2119e.pdf.

Health Canada. Prevention and control of hepatitis C: guidelines and recommendations. *Canada Communicable Disease Report* 1995; 21(Suppl 21S2). Includes information on occupational exposure and on testing. Available at www.hc-sc.gc.ca/pphb-dgspsp/dpg_e.html#infection.

Health Canada. Preventing the transmission of bloodborne pathogens in health care and public service settings. *Canada Communicable Disease Report* 1997; 23(Suppl 23S3). Detailed information on the prevention of occupational transmission of HBV, HCV, and HIV. Available at www.hc-sc.gc.ca/pphb-dgspsp/dpg_e.html#infection.

Health Canada. Routine practices and additional precautions for preventing the transmission of infection in health care: Revision of isolation and precaution techniques. *Canada Communicable Disease Report* 1999; 25(Suppl 25S4). Comprehensive guidelines for preventing transmission of infectious diseases in health-care settings. Available at www.hc-sc.gc.ca/pphb-dgspsp/dpg_e.html#infection.

2. Provinces

British Columbia Centre for Excellence in HIV/AIDS. Therapeutic Guidelines. Section 7: Management of Accidental Exposure to HIV. Detailed guidelines on HIV post-exposure prophylaxis. Available at http://cfeweb.hivnet.ubc.ca/CfE.html

Manitoba Health. Integrated Post-Exposure Protocol: Guidelines for Managing Exposures to Blood/Body Fluids. October 2000.

Ministère de la Santé et des Services Sociaux. Recommendations visant la prise en charge des travailleurs exposés au sang et aux autres liquides biologiques. Québec: Ministère de la Santé et des Services Sociaux – Direction des communications, 1999.

Ontario Ministry of Health. Preventing and Assessing Occupational Exposures to Selected Communicable Diseases: An Information Manual for Designated Officers. November 1994.

Saskatchewan Technical Subcommittee on HIV/AIDS. Guidelines for the Prevention of Hepatitis B, Hepatitis C, HIV and other Bloodborne Pathogens in Work-Related Exposures. September 1997.

3. United States

Centers for Disease Control and Prevention. Public health service guidelines for the management of health-care worker exposures to HIV and recommendations for postexposure prophylaxis. *Morbidity and Mortality Weekly Report* 1998; 47(RR-7): 1-33. A frequently cited document on the management of occupational exposure to HIV. Available at www.cdc.gov/mmwr/preview/mmwrhtml/00052722.htm.

Centers for Disease Control and Prevention. Recommendations for prevention and control of hepatitis C virus (HCV) infection and HCV-related chronic disease. *Morbidity and Mortality Weekly Report* 1998; 47(RR-19): 1-39.
Available at www.cdc.gov/mmwr/mmwr_wk.html.

International Health Care Worker Safety Center, University of Virginia. Exposure Prevention Information Network (EPINet). Information available at www.med.virginia.edu/epinet.

U.S. Department of Labor, Occupational Safety and Health Administration. The website lists many guidelines and resources for health-care workers and emergency responders: www.osha-slc.gov/SLTC/bloodbornepathogens/index.html.

4. United Kingdom

UK Health Departments. HIV Post-Exposure Prophylaxis: Guidance from the UK Chief Medical Officers' Expert Advisory Group on AIDS. July 2000.

HIV Testing

Canadian Medical Association. *Counselling Guidelines for HIV Testing*. Ottawa: The Association, 1995. Authoritative guidelines that clarify the standard of care expected of physicians when conducting HIV testing. Available at www.cma.ca/cpgs/hiv/prelim.htm.

Centers for Disease Control and Prevention. Revised Guidelines for HIV Counseling, Testing, and Referral. Draft. October 17, 2000. Revised draft US guidelines, with information on the range of available HIV testing technologies.
Available at www.cdc.gov/hiv/frn/hivctr.pdf.

Elliott R, Jürgens R. *Rapid HIV Screening at the Point of Care: Legal and Ethical Questions*. Montréal: Canadian HIV/AIDS Legal Network, 2000. Examines legal and ethics issues raised by rapid HIV tests. Available at www.aidslaw.ca/Maincontent/issues/testing.htm.

Health Canada. Point-of-care HIV testing using simple/rapid HIV test kits: guidance for health-care professionals. *Canada Communicable Disease Report* 2000; 26(7): 49-59. Guidelines on the use of rapid HIV tests, including information on the steps needed to confirm an HIV diagnosis, are available at www.hc-sc.gc.ca/hpb/lcdc/publicat/ccdr/00vol26/dr2607e.html.

Joint United Nations Programme on HIV/AIDS. *UNAIDS Policy on HIV Testing and Counselling*. Geneva: UNAIDS, August 1997. A concise statement of UNAIDS' policy. Available at www.unaids.org/publications/documents/index.html.

Jürgens R. *HIV Testing and Confidentiality: Final Report.* Canadian HIV/AIDS Legal Network and Canadian AIDS Society, 1998. Comprehensive discussion of HIV testing and confidentiality in a wide range of circumstances and populations. Available at www.aidslaw.ca/Maincontent/issues/testing.htm.

Myers T et al. The HIV Test Experience: An Analysis of Test Providers' and Test Recipients' Descriptions and Critical Appraisals of the HIV Antibody Test Experience. Toronto: HIV Social, Behavioural and Epidemiological Studies Unit, Faculty of Medicine, University of Toronto, 1998. Investigates the pre- and post-test experience with a view to improving practices, procedures, and training. For a summary, see Canadian HIV/AIDS Policy & Law Newsletter 1999; 4(4): 25-28; available at www.aidslaw.ca/Maincontent/otherdocs/Newsletter/summer99/testing.htm.

Bill C-217 (formerly Bill C-244)

House of Commons of Canada. Bill C-217. Available at www.parl.gc.ca/37/1/parlbus/chambus/house/bills/private/C-217/C-217_1/C-217_cover-E.html.

Elliott R. Reform MP proposes compulsory testing. *Canadian HIV/AIDS Policy & Law Newsletter* 2000; 5(2/3): 25-27. A critique of Bill C-217 in light of Canadian case law. Available at www.aidslaw.ca/Maincontent/otherdocs/Newsletter/spring00/testing.htm#1.

Positions of Professional Associations

Canadian Medical Association. CMA Policy: Acquired Immunodeficiency Syndrome. 11 December 2000.
Available at www.cma.ca/inside/policybase.

Canadian Medical Association. CMA Policy: HIV Infection in the Workplace (Update 2000). 11 December 2000.
Available at www.cma.ca/inside/policybase.

Canadian Nurses Association. Position Statement on Blood-Borne Pathogens. November 2000.

Canadian Police Association. Brief to the Standing Committee on Justice and Human Rights, Regarding Bill C-244. 14 June 2000. Available at www.cpa-acp.ca/legislation/briefs/c-244.htm.

International Association of Fire Fighters. Bill C-217, *The Blood Samples Act*: The Right to Know.
Available at www.iaff.org/politics/ca/issues/facts.html.

Professional Codes of Ethics

Canadian Medical Association. Code of Ethics of the Canadian Medical Association. 15 October 1996. Available at www.cma.ca/inside/policybase/1996/10-15.htm.

Canadian Nurses Association. *Code of Ethics for Registered Nurses.* Ottawa: Canadian Nurses Association, 1997.

Selected Scientific Literature

Busch MP, Kleinman SH. Nucleic acid amplification testing and disease transmission. In: Nucleic acid amplification testing of blood donors for transfusion-transmitted infectious diseases. Report of the Interorganizational Task Force on Nucleic Acid Amplification Testing of Blood Donors. *Transfusion* 2000; 40(2): 143-159. Discusses the ability of different testing technologies to detect HBV, HCV, and HIV infection during the window period.

Busch MP, Satten GA. Time course of viremia and antibody seroconversion following human immunodeficiency virus exposure. *American Journal of Medicine* 1997; 102 (5B): 116-124. Reviews information about the level of virus and the presence of antibodies during the initial period of HIV infection.

Cardo DM et al. A case-control study of HIV seroconversion in health care workers after percutaneous exposure. *New England Journal of Medicine* 1997; 337(21): 1485-1490. The only study to document risk factors in occupational transmission of HIV. An earlier report was published as: Case-control study of HIV seroconversion in health-care workers after percutaneous exposure to HIV-infected blood – France, United Kingdom, and

United States, January 1988-August 1994. *Morbidity and Mortality Weekly Report* 1995; 44(50): 929-933.

Daar ES et al. Diagnosis of primary HIV-1 infection. *Annals of Internal Medicine* 2001; 134(1): 25-29. Studies the ability of HIV p24 antigen tests and HIV RNA tests to detect HIV infection before antibodies are detected.

Henderson DK. HIV Postexposure prophylaxis in the 21st century. *Emerging Infectious Diseases* 2001; 7(2): 254-258. An excellent review of current state of knowledge regarding HIV post-exposure prophylaxis. Available at www.cdc.gov/ncidod/eid/.

Hoffman RE et al. Occupational exposure to human immunodeficiency virus (HIV)-infected blood in Denver, Colorado, police officers. *American Journal of Epidemiology* 1994; 139(9): 910-917. One of the few studies of occupational exposure to HIV among police.

Human immunodeficiency virus (HIV) postexposure management of healthcare workers. *American Journal of Medicine* 1997; 102 (5B): 1-126. A special issue devoted to HIV post-exposure prophylaxis. Some of the information is dated; consult Henderson above.

Moloughney, BW. Transmission and postexposure management of bloodborne virus infections in the health care setting: Where are we now? *Canadian Medical Association Journal* 2001; 165(4): 445-51. A recent Canadian overview of occupational exposure in health-care settings. Available at www.cma.ca/cmaj/vol-165/issue-4/issue-4.htm.

Puro V, Ippolito G. Antiretroviral post-exposure prophylaxis. 6th Conference on Retroviruses and Opportunistic Infections 1999 (abstract no. 212). Provides data from an Italian registry of HIV post-exposure prophylaxis. Available on AIDSLINE.

Roome AJ et al. Hepatitis C virus infection among firefighters, emergency medical technicians, and paramedics – selected locations, United States, 1991-2000. *Morbidity and Mortality Weekly Report* 2000; 49(29): 660-665. A recent study of risk factors associated with HCV infection among emergency responders. Available at www.cdc.gov/mmwr/index2000.htm.

Solomon L et al. Occupational exposure and voluntary human immunodeficiency virus testing: a survey of Maryland hospitals. *Infection Control and Hospital Epidemiology* 1999; 20(6): 430-432. A survey of number of exposures and percentage of source persons who agree to be tested.

Wang SA et al. Experience of healthcare workers taking postexposure prophylaxis after occupational HIV exposures: findings of the HIV postexposure prophylaxis registry. *Infection Control and Hospital Epidemiology* 2000; 21(12): 780-785. Provides information on rates of discontinuation, side effects, and adverse events associated with HIV post-exposure prophylaxis from 1996 to 1999.

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