Date Issued: September 2011	Page No.: 1 of 12	Document No.: SOP-Biosafety-08
Revision: 2.0	Subject: **Human Tissue, Blood or Other Body Fluid**	

1. **Purpose:**

   To outline the health risks associated with the use of human tissue, blood, or other bodily fluids in research laboratories, the methods to prevent infection and the response to incidents with these materials that can potentially transmit infection. The infectious agents of primary concern are the bloodborne pathogens (BBP), Human Immunodeficiency Virus (HIV, the virus that causes AIDS) and Hepatitis viruses B and C. However, any infectious agent of disease present in the material can be transmitted by improper handling or accidental exposure to infected material. Blood is the body fluid of highest risk and the main subject of this SOP. However all body fluids and tissues should be handled as if they have the potential to transmit disease.

   Following an incident, prompt first aid and medical treatment is important because it can prevent infection by some of the viruses for which there is no cure once an infection is established (e.g. drug therapy within two hours of the incident can prevent HIV infection).

   Potentially serious infection of a wound resulting in Tetanus (lockjaw) can be prevented by proper cleaning and up-to-date immunization (or tetanus booster or anti-tetanus immunoglobulin may be required).

   If this is an emergency, see the last three pages for an action flow chart and maps.

2. **Applicable Legislation, Standards, Guidelines**:

   Ontario Occupational Health and Safety Act

   Public Health Agency of Canada Laboratory Biosafety Guidelines

   Canadian Immunization Guide 2002 6th Edition – Updated July 2021. National Advisory Committee on Immunization, Minister of Health. Population and Public Health Branch. Immunization in Canada: Canadian Immunization Guide - Canada.ca

   Preventing transmission of bloodborne pathogens in the health care and public service sector setting. Public Health Agency of Canada. Guideline on the Prevention of Transmission of Bloodborne Viruses from Infected Healthcare Workers in Healthcare Settings - Canada.ca

3. **Definitions**

   bloodborne pathogens (BBP) : micro-organisms in blood and certain body fluids that cause disease in humans; the viruses of most concern are HIV, Hepatitis B and Hepatitis C

AIDS : acquired immune deficiency syndrome, caused by infection with HIV

HIV : Human immunodeficiency virus that causes the disease Acquired Immune Deficiency Syndrome (AIDS). HIV attacks the immune system, resulting in a chronic, progressive illness and leaving infected people vulnerable to opportunistic infections and cancers. The median time from infection to AIDS diagnosis now exceeds 10 years. **AIDS is a chronic, potentially fatal disease that requires complex and ongoing medical management.**

Hepatitis B Virus : A bloodborne virus (HBV) that causes liver inflammation (hepatitis); severity ranges from unapparent cases to fatal acute hepatic necrosis, or becomes a chronic infection; low short term case fatality rate in hospitalized patients; long term case fatality rate is 2-3% due to cancer or cirrhosis of the liver; 95% of adult infections are self limited; note prolonged survival of the virus outside the host**. HBV it is most frequently occurring bloodborne pathogen and historically has been the most frequent laboratory-associated infection. There is no cure for disease from HBV**.

Hepatitis C Virus : A bloodborne virus (HCV) severity ranges from unapparent cases in approximately 90% of infections, to rare fulminating, fatal cases. Up to 90 per cent of infected persons carry HCV indefinitely. Over the long term, they are at risk of such illnesses as profound fatigue, cirrhosis, and liver cancer. - chronic liver disease with fluctuating or persistently elevated liver enzymes is common, occurring after 50%-80% of HCV infections in adults; of those with chronic liver disease, 30%-60% may develop chronic active hepatitis and 5%-20% may develop cirrhosis; chronic infection is often not symptomatic; there appears to be an association between HCV infection and hepatocellular carcinoma; of chronically infected persons, approximately 50% will develop cirrhosis or cancer of the liver. **HCV is potentially treatable although treatment is toxic and not always successful.**

Hepatitis A Virus : The virus (HAV) causes acute hepatitis A, not a chronic infection; abrupt onset with fever, malaise, anorexia, nausea and abdominal discomfort, followed within a few days by jaundice; illness can be mild (1-2 weeks) to severely disabling (6-9 months period); transmitted by the oral-fecal route, ingestion of contaminated food (i.e., shell fish) and water; hands may play an important role in the direct as well as the indirect spread of HAV; prolonged survival of the virus outside the host; is rarely transmitted by blood because it does not become a chronic infection so it would not be present in blood of apparently healthy individuals

KGH : Kingston General Hospital

Walsh-OHS : Walsh and Associates Occupational Health Services

KGH-Emergency : Kingston General Hospital Emergency Department

Tetanus (lockjaw) : Infection by *Clostridium tetani* bacterial spores introduced into the body through a wound contaminated with soil, street dust or feces, or injected street drugs; also through lacerations, burns and trivial wounds; *C. tetani* produces a potent neurotoxin; painful muscular contractions, primarily of neck muscles, secondarily of trunk muscles; abdominal rigidity, generalized spasms; **30-90% case fatality rate**.

Universal Precautions : A set of steps to protect yourself from infectious agents in blood and body fluids

4. Disease Risks:

Bloodborne pathogens are micro-organisms that may be present in human blood and other body fluids and tissues. **The micro-organisms of most concern are the viruses HIV, Hepatitis B and Hepatitis C.** Incidents that involve breaks in the skin can allow these viruses to enter the body and cause and infection.

In addition, breaks in the skin can permit entry of other micro-organisms, in particular the **bacteria that causes tetanus,** so a tetanus booster or anti-tetanus immunoglobulin may be required. Details about the diseases that these agents cause are presented in the definitions section above. The relative risks of various types of exposures are described below (section 5).

The potential for additional pathogenic micro-organisms should be considered as part of a risk assessment for particular tissues and donor populations. For example, the intestines contain large numbers of bacteria and also may contain viruses, some of which may be pathogenic (eg. Hepatitis A). The cervix can be infected by human papilloma virus (HPV). Universal precautions should be used and immunizations that are advisable should be identified and provided to personnel (in addition to Hepatitis B).

Note that only certain established human cell lines grown under certain conditions are capable of supporting the growth of the common bloodborne viruses in culture. Thus these viruses are not a general risk for those working with human cell lines. However individuals should know whether the cell lines that they are using are infected with any of the bloodborne pathogens or other human pathogens. Take appropriate precautions and seek medical attention promptly if exposed, informing the doctor about the risk.

5. Exposure Types and Risks:

The risk of infection is related, in part, to the probability that the source material contains the infectious agent and also to the type of exposure that occurs. **It is important that you know as much as possible about the biological material that you are working with, and that you convey this information to medical personnel to assist them in decision making about**

appropriate treatment following an incident. If you know the identity of the person who was the source of the blood or other material, then this "source" person can be approached by medical personnel to request that they be tested for bloodborne pathogens. This testing could be arranged through Walsh-OHS.

Those in research laboratories work with unfixed human material from different sources, and often do not know the identity of the donor. The risk that the material contains bloodborne pathogens varies greatly. Some laboratories use samples that have been screened and found negative for HIV, Hepatitis B and Hepatitis C, making the risk that these agents are present extremely low. However it is important to know how long the time was between the negative screen and obtaining the sample, in order to determine the likelihood that the source might have changed status to infected. Other research laboratories work with fresh or frozen (unfixed) human material that has been donated by apparently normal, healthy donors. In this case the frequency of contamination of the material by bloodborne pathogens would be the same as for that particular type of biological material in the general population. **If you do not know that the sample is negative for HIV, HBV and HCV and do not know the identity of the donor, but do have a sample to which you have been exposed, then take the sample with you when you seek medical attention to determine if it can be tested for viral content.**

Some laboratories work with samples from donors known to be positive for a particular virus, the highest risk samples, or are from high risk donors (e.g. intravenous drug users, high risk sexual behaviour, recipient of blood products before 1990, or recipient of blood-derived coagulation products before 1985).

5.1 Types of Body Fluids and Risks of Transmitting Bloodborne Pathogens:

Body fluids capable of transmitting HBV, HCV, and HIV from an infected individual:

a) **Blood or any body fluid/tissue contaminated with blood**, as these are the only fluids that have been implicated in occupational infection.
b) **Semen and vaginal fluids**, as these fluids have been implicated in sexual transmission.
c) **Cerebral spinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid and amniotic fluid.** The risk of transmission of HIV from these fluids has not yet been determined.
d) **Saliva**:
    a. if HBV infected and associated with a bite that breaks the skin (with or without the presence of blood in the saliva) *or*
    b. if HIV or HCV infected and associated with a bite (with the presence of blood in the saliva)

Note: The risk of transmission from screened, donated blood, and manufactured blood products is negligible in Canada. Feces, nasal secretions, sputum, tears, urine, and vomitus are not implicated in the transmission of HBV, HCV, and HIV unless visibly contaminated with blood. However, feces can be a source of Hepatitis A from an individual infected with this virus.

5.2 Bloodborne disease cannot be contracted by casual contact with infected persons.

Types of injuries/exposures that may result in transmission of a Bloodborne Pathogen are:

a) **Percutaneous Injury:** needle-stick or cut/puncture with a sharp object.
b) **Contact with Mucous Membranes:** splash to eyes, nose or mouth.
c) Contact with Non-intact Skin: prolonged or extensive contact of exposed skin which is chapped, abraded, or afflicted with dermatitis, with blood or other infections body fluid. Includes a bite that breaks the skin.

Needle-stick contaminated with virus	Risk of Infection
Hepatitis B Virus	6-30%
Hepatitis C Virus	3-10% (approx.)
HIV	0.3-0.4%

In Canada, it is estimated that between 210,000 and 275,000 people are currently infected with Hepatitis C Virus, of whom only 30 per cent know that they have the virus. **There is no effective preventative immunization for HCV, and treatment is toxic and not always successful so Universal Precautions are extremely important to prevent infection.**

6. Prevention of Diseases Associated with Human Material:

6.1 Universal Precautions:

"Universal Precautions" is a set of steps to protect yourself from the blood and body fluids, by making the assumption that the material is infected with bloodborne pathogens. It includes:

a) engineering controls to reduce exposure to the material and to contain aerosols (eg. Biological safety cabinet when feasible, capped tubes, sealed centrifuge cups)
b) personal protective equipment including lab coat/gown, gloves and goggles, and may include a mask or face shield depending on the activity
c) thorough hand washing with detergent soap immediately upon removing gloves
d) disinfection of surfaces using the appropriate disinfectant – note that bloodborne pathogens are susceptible to many disinfectants; 1% sodium hypochlorite, 70% ethanol, 2% alkalinized glutaraldehyde, formaldehyde, but that some non-lipid enveloped viruses, such as Hepatitis A

are only moderately susceptible to 70% ethanol. A general purpose virucidal disinfectant cleaner such as PerCept/Virox may be used on stainless steel surfaces where bleach needs to be avoided. Ensure wet contact time following manufacturers recommendations; for 1% sodium hypochlorite (freshly diluted 10% bleach) wet contact for 30 seconds for cleaning; 5 minutes for disinfection; 30 minutes to decontaminate spills).

e) appropriate disposal of material in contact with blood or body fluids
f) appropriate clean-up of spills – using freshly diluted 10% bleach or other general disinfectant with activity against bloodborne pathogens; disinfect after bulk of blood removed to reduce the organic load that decreases disinfectant activity
g) limited use of sharps (i.e. substitute methods that do not require needles, use blunt forceps); use of safety-engineered sharps when feasible; no recapping of needles; correct disposal of sharps

6.2 Immunization:

a) Hepatitis B Virus – infection can be prevented by immunization prior to exposure; **even if immunized, a blood sample should be taken to check anti-Hepatitis B antibody titres immediately following an incident.**

a. Those who have the potential for exposure to human blood, body fluids, tissues or wounds from contaminated sharps in the course of their work should be immunized with Hepatitis B vaccination, which can be arranged through Walsh-OHS. This vaccine must be offered to unimmunized employees at the expense of the University or, in the case of grant and contract workers and graduate students, the Principal Investigator, when the employee's risk of HBV infection is primarily related to their work. After the initial series a booster is not generally required. 90% of people respond to immunization, and antibody titres can be checked by Walsh-OHS to ensure that an individual has responded. Those who have not responded will be offered an additional immunization series and titre check. If they still have negative titres this will be important information for them to tell medical personnel following an exposure incident.

b. Workers who are at ongoing risk of exposure to bloodborne pathogens and who are unimmunized (owing to contraindication to the vaccine) or who are non-responders to vaccine should be offered annual screening for Hbs Ag.

c. If hiring contract workers, the person doing the hiring at the University will inform the supplying agency that the agency is responsible for Hepatitis B immunization if they will be in contact with human material that could put them at risk for infection.

b) **Hepatitis A –** Is prevented by Hepatitis A immunization and good personal hygiene (gloves when dealing with fecal matter and thorough hand washing). Because HVA is not a

common virus in Canada or in most research laboratories, immunization against HVA is only recommended for Queen's staff whose duties bring them into contact with material potentially contaminated by human feces or animals that have not been screened for Hepatitis A. The duration of protection after 2 doses of vaccine is unknown, but predicted to be greater than 20 years.

c) Tetanus - can be prevented by immunization. Normally a tetanus immunization booster is given every 10 years as part of your personal physician's care. In the case of an injury, if it is more than 10 years since your last booster then one should be administered by KGH-Emergency or by Walsh-OHS.

6.3 Post-exposure prevention:

a) HIV - there is no cure or immunization for HIV infection but **infection can be prevented by taking antiviral drug therapy soon after an exposure incident, preferably within 2 hours** (called prophylactic antiviral therapy because it is intended to prevent infection, not to cure infection; also called post exposure prophylaxis (PEP for short)).

b) Hepatitis B – if not immune or if antibody titres low, infection can be prevented by immunoglobulin treatment within 48 hours of exposure.

c) Hepatitis A - prophylactic immunoglobulin if known infected individual is contacted

d) Tetanus - if more than 10 years since last booster immunization then should get a booster when wounded and/or Tetanus Immune Globulin

7. Exposed person action – *note that this action is summarized in a flow chart on the third last page of this SOP, a map to KGH-Emergency on the second last page, and is a map to Walsh-OHS on the last page of this SOP; <u>these should be posted in the laboratory</u>*

a) Immediately following the exposure:

a. Percutaneous injury or contact with non-intact skin: allow the puncture, cut or abrasion to bleed freely, and wash well with soap under running water for 5 minutes. (Use an antiseptic if available)

b. Contact with mucous membranes (eyes, nose, mouth): flush thoroughly with water for 10 to 15 minutes.

b) Notify supervisor (or safety officer if supervisor is not available) who will initiate an Employee Incident Report detailing exposure situation, the body fluid involved and the source individual, if known.

c) **If wounded and your tetanus booster was not within the last 10 years then call Walsh-OHS to arrange a booster and other follow-up or consult with your family physician.** Wounds that are large and/or have environmental contamination should be carefully cleaned and may require a booster the same day if more than 10 years since your last booster.

d) **Consider the infectious potential of the source material and the nature of the contact.**

a. If you have had contact with material that is **from a source screened negative for HIV, HBV and HCV** then you may delay seeking medical attention, if your tetanus booster is up to date. If contact was **only a few drops of unscreened fluid on intact healthy skin for a moment**, then follow-up may also be delayed. However, call Walsh-OHS as soon as feasible, explain the situation and determine when you should be seen for assessment, baseline blood work and counseling. You should normally be seen within 72 hours of the incident.

b. If the material is **from an unscreened source (i.e. has not been certified negative for HIV, HBV and HCV) and the contact is mucosal, associated with a wound (e.g. contaminated needle-stick or scalpel), on chapped skin, or a large volume or prolonged contact on intact skin then immediately following first aid, go to KGH-Emergency**. You are not advised to go to the Walsh-OHS clinic because you will need to see a physician immediately and this is not possible every day in Kingston. **To expedite treatment,** inform the triage nurse in the Emergency Department that you have been involved in an occupational incident with potentially infected human material, how long it has already been since the incident, and that you are concerned that **if antiretroviral drugs are to be given to prevent HIV infection then to be most effective therapy should be started as soon as possible, preferably within two hours of the incident.** Blood samples will be taken to determine baseline levels to indicate immunity or infection by bloodborne pathogens. You will be counseled about what things you should do and should not do during the period that you will be followed medically.
    i. KGH-Emergency should send a report to Walsh-OHS as well as to your family physician. Walsh-OHS will follow-up with you.

e) After initial treatment at KGH, the injured worker should see Walsh-OHS for medical follow-up. If a worker prefers to see their family physician for medical follow-up then they should inform Walsh-OHS and the Biosafety Officer.

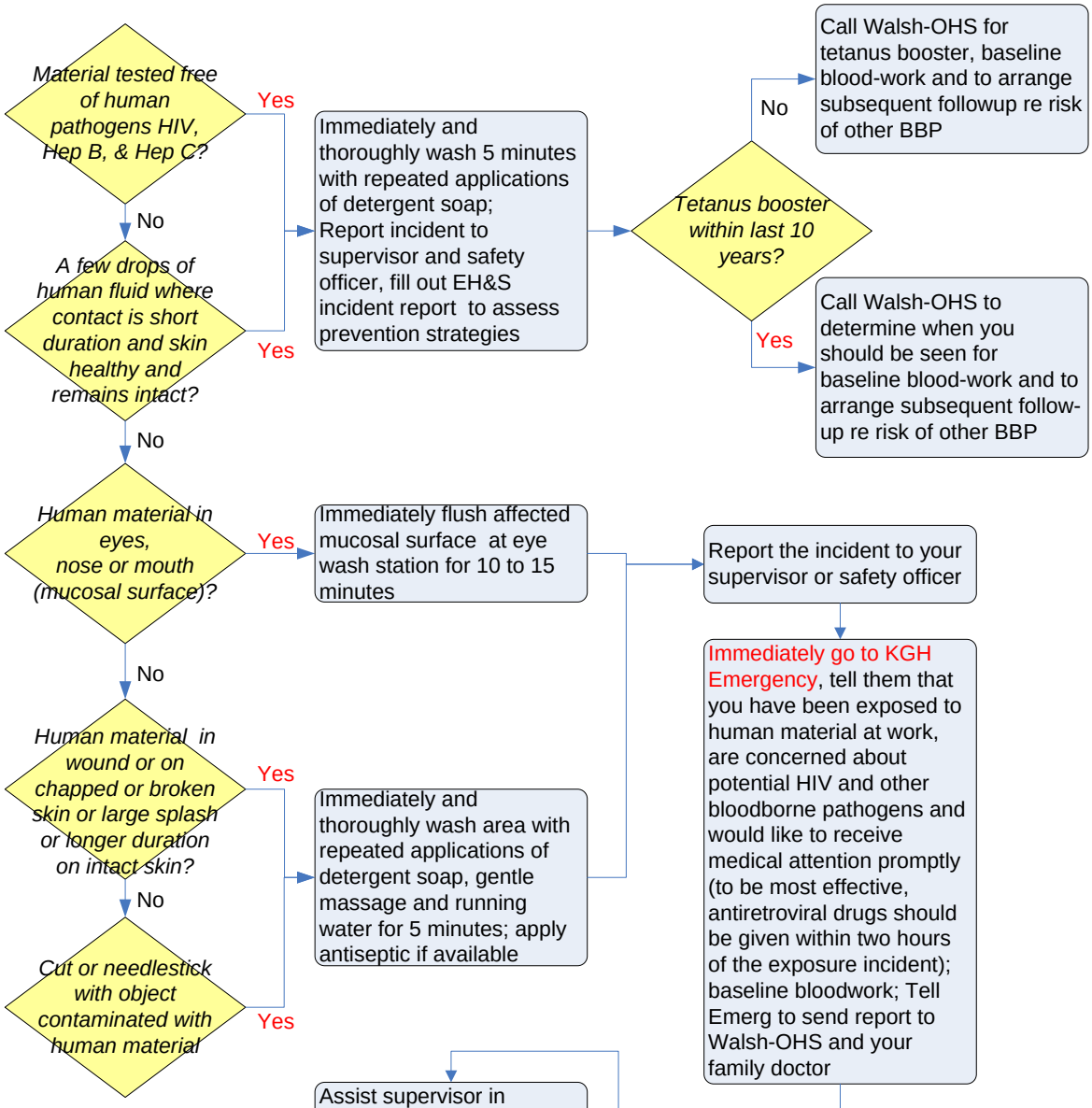
8. **Supervisor action:**
   a) Ensure that the worker has had appropriate first aid and then that they are assessed by KGH-Emergency immediately or by Walsh-OHS as appropriate.

b) Assess the nature of the injury/exposure, identify the source individual or material, and initiate the Employee Incident Report which should be sent to Queen's Department of Environmental Health and Safety within 24 hours.
c) Facilitate testing of source individual or material, and communicate with medical personnel as required.
d) Assess the incident for measures that may have prevented the exposure. Note these on the Employee Incident Report and take follow-up action to prevent a similar incident in the future eg. change practice, modify environment, education. Queen's Department of Environmental Health and Safety will follow-up with the exposed person.

Information and Enquires:
Safety Technician (ext. 32591, Natalie.roy@queensu.ca)

Revision History:
1.0 April 2010: Initial Release
2.0 September 2011: Change information re Occupational Health provider

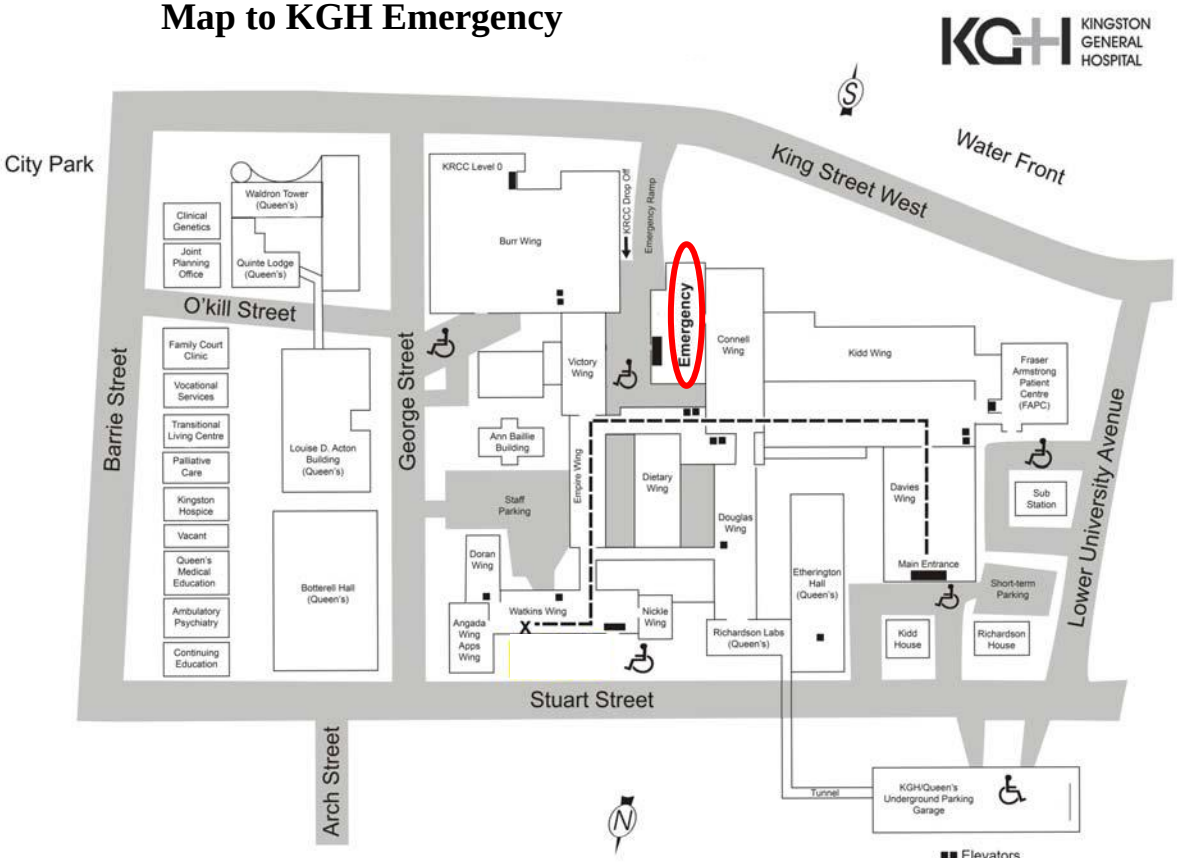
First Aid and Medical Response for Human Tissue, Blood or Other Body Fluid Exposures



Types of Human Material requiring response: blood or any body fluid or tissue contaminated with blood; the following fluids - semen and vaginal, cerebral spinal, synovial, pleural, peritoneal pericardial, and saliva

A more detailed explanation can be found in the text of the Queen's SOP-Biosafety-08 Human Blood, Tissue or Other Body Fluid Exposures

Map to KGH Emergency



Walsh and Associates Occupational Health Services

For urgent matters call the Belleville office at 613-966-4114. Otherwise, to make an appointment, call the Kingston office at 613-546-4646. Messages will be monitored daily on weekdays and your call returned.

Map to Walsh and Associates Occupational Health Services Clinic
120 Clarence Street
Kingston, ON