Biological Hazards / Blood Borne Pathogens Training

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Overview

Why are we here?

So that the TAs and Dons are informed of the risks when handling body fluid (required by law)

Knowledge is Power! The more you know, the less risk of exposure
Overview

- Part I: Biological Hazards, Infection & Transmission
- Part II: Blood Borne Pathogens
- Part III: Sharps and Biohazardous Waste Handling
- Part IV: Precautions, Spill and Exposure Response
What Are Biological Hazards?

Biological hazards (biohazards) are biological agents that can cause disease in humans, plants, animals.

Pathogenic microorganisms are biohazards

Bacteria, Fungi, Viruses, Parasites, (Toxins)

- Pathogens can be found in:
  - Blood (Bloodborne pathogens)
  - Body fluids/secretions:
    - saliva, mucous
    - vomit, fecal matter, urine
    - semen, vaginal secretions
How Are Biological Hazards Transmitted?

- **Direct Contact**
  - person to person exposure
    - (e.g., blood, mucus, vomit, secretions through open wounds etc.)

- **Indirect Contact**
  - surface to person exposure
    - (e.g. person touching contaminated surface/object)

- **Airborne Route**
  - inhalation of aerosols that an infected person coughs or sneezes into the air

- **Injection/Inoculation**
  - contaminated sharp objects
  - infected animal/insect to person
    - (e.g. Malaria, West Nile, Rabies, Lyme disease)
Infection

- An infection occurs when a host is colonized by a pathogen/germ
- The infecting organism uses its host’s resources to reproduce resulting in disease.

- Four things must happen for this to occur:
  1. Pathogens are present
  2. Pathogens get into the body
  3. Enough pathogens are present
  4. The host’s natural defenses are ‘weak’
What is My Risk of Infection?!?!?!

- Difficult to assess what the true risk of exposure is as there are many factors to consider.....
  - Is anything about the person’s health status known?
  - What is my immune status?
  - What is present and how much?

- The good news is that we can practice good hygiene practices to prevent ourselves and others from being exposed. (Part IV)
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What is a Bloodborne Pathogen?

Microorganisms that are present in human blood and can cause disease in humans

- HIV
- Hepatitis B
- Hepatitis C
- Viral Hemorrhagic Fevers
  - (hantavirus, ebola)
- (Malaria)
- (West Nile Virus)

Prevalent in North America
How are Bloodborne Pathogens Transmitted?

In a Laboratory Setting, Bloodborne Pathogens Are Transmitted via:

- **Direct Contact with infected blood:**
  - with broken or damaged skin (open sores)
  - With mucous membranes (eyes, mouth, rectal, vaginal)

- **Injection/Inoculation**
  - Needlestick injuries: An accidental puncture by a sharp object, such as a needle, broken glass, or other "sharps", contaminated with the pathogen.
Human Immunodeficiency Virus

What is HIV?

- HIV is a virus that infects and kills the vital cells of the immune system
- HIV causes Acquired Immune Deficiency Syndrome (AIDS), a fatal disease with no cure
- AIDS is characterized by symptoms and infections caused by the destruction of the immune system
- Opportunistic infections and cancers are able to thrive. Patients succumb to various pathogenic microorganisms
Hepatitis

What is Hepatitis?

- Hepatitis is the medical term for inflammation of the liver

- Many infected people do not have any symptoms

- The minority of people who do get symptoms display:
  - Flu like symptoms (fever, fatigue, muscle and joint aches, loss of appetite, nausea, headaches, vomiting)
  - Jaundice (yellowing of the skin or whites of the eyes)

- Hepatitis B&C produce long term effects: damage and scarring of the liver, kidney dysfunction, lowered life expectancy
Hepatitis

What are the different types of hepatitis viruses?

- There are five hepatitis viruses: A, B, C, D, and E

- Hepatitis A, B, and C are the common causes of liver inflammation in North America

- **Hepatitis A:**
  - Transmitted via fecal-oral route
  - No long term consequences

- **Hepatitis B and C:**
  - Blood borne pathogens
  - Can be chronically infected and a carrier for life
  - Hep B is the most reported laboratory acquired infection
Hepatitis

“There are about 3,000 reported cases of each hepatitis A and hepatitis B in Canada each year. Since many infected people have no symptoms, however, we can assume the true rate of infection is higher than this.”

- Ministry of Health and Long-Term Care

“The rates of Hepatitis B infection have been reported to be several times greater in laboratory staff than the general population and is one of the most frequently reported laboratory acquired infection.”

- Public Health Agency of Canada
Hepatitis – Treatment?

- No cure for Hepatitis A & B
  - There are no safe drugs that can eliminate these viruses.
    - Although there are some developments in this area, the only option is to wait for the infection to run its course.

- Only prevention through vaccination (immunoprophylaxis)
Hepatitis – Prevention

- Immunoprophylaxis involves 2 steps:
  
1. Screening for Hepatitis A & B antibodies
   - Performed by blood test
   - If negative for antibodies, vaccine may be given

2. Series of Vaccine injections:
   - Injections required at 0, 1, 6 months
   - Vaccines names:
     - Hep A: Havrix, Vaqta
     - Hep B: Recomivax nb, Engerix- B
     - Hep A/B combination: Twinrix
Pathogens in Other Body Fluids

- Saliva:
  - *Common cold viruses (coronavirus, rhinovirus)*
  - *Influenza*
  - *Herpes simplex 1*

- Vomit
  - *Salmonella, E.coli, Leptospira, Yersinia*

- Urine:
  - *Salmonella, E.coli, Leptospira, Yersinia*

- Fecal Matter:
  - *Hepatitis A*
  - Viruses causing stomach gastroenteritis (*rotaviruses, noroviruses, adenoviruses*)
  - *Salmonella, E. coli*
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Sharps

- Examples:

- Key points when using sharps:
  - Wear gloves for all manipulations with needles and syringes
  - Do not forcefully expel a stream of fluid into an open vial
  - Use plastic disposable syringes/lancets instead of reusable glass
  - Use safety needles as much as possible
  - Avoid quick and unnecessary movements of the hand holding the sharp
  - Never reuse sharps between participants
If You Find Sharps:

- Treat all sharps as being contaminated
  - Avoid direct handling: Wear gloves and use tongs or dustpan and broom to pick up sharps.
  - *Warning:* Gloves do not protect against punctures or cuts!

- For needles, pick up by the blunt end (e.g. the plastic fitting where it is fixed onto a syringe) If there is more than one, pick them up one at a time.

- **DO NOT** bend or recap contaminated needles and other sharps.

- Carefully transfer to a puncture-proof container.

- Remove gloves and dispose of appropriately.

- Wash hands thoroughly with soap and water.
Sharps Disposal

- All sharps must be placed disposed in a labeled puncture-proof container for disposal as biomedical waste

- Researchers: Puncture proof containers are available from Science Stores

- Staff: Puncture proof containers are provided by Housing (clean up) or Health Education and Promotion Centre (individual use)

- Discard syringes immediately into a sharps container

- DO NOT discard syringes into garbage or biohazard bag

- Never refill sharps container above the fill line
Biohazardous Waste Disposal

- Sharps and human body tissue and fluids (excluding urine) are considered regulated waste.

- Regulated waste must be placed in stericycle yellow bags and boxes.
  - Available from Science Stores – ask for assistance.

- Label waste with:
  - PI name
  - Room number
  - Contact number

- Sharps containers should be placed in a box in of the biohazardous waste room of Farquharson Life Sciences.
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Exposure Precautions

- Universal Precautions

\[ Treat \text{ all blood/body fluids as if they are infectious } \]

1. Wear protective clothing and gloves when administering first aid, during experiment, or during cleanup
2. Wash hands regularly and properly
3. Follow proper disposal procedures
4. Safe sharps handling and disposal
Personal Protective Equipment (PPE)

- Wear personal protective equipment where contamination of the body and street clothing is possible:
  - During experiments
  - During clean up of biological spills
  - When biological spills are likely occur
PPE- Protective Clothing

- Lab coats, tyvex suits, aprons, gowns, etc.
- Prevents contamination of street clothes and body areas
- Can be disposable
PPE- Gloves

Wear gloves as a skin barrier

- Not a substitute for hand washing
- Never reuse disposable gloves
- Remove contaminated gloves properly
Hand protection: glove removal

(1) Pinch glove near your wrist and pull slowly towards your fingers. Turn the glove inside out while pulling.

(2) Continue holding glove with one hand while removing the other hand from the glove.

(3) Slide finger from glove-free hand under other glove. Slide approximately half of your finger under the glove.

(4) Rotate your finger $\sim 180^\circ$, and pull glove outwards towards your fingertips. Turn the glove inside out while pulling.

(5) Holding the glove by the uncontaminated surface, transfer to waste bin.
Handwashing

- Hand washing is the single most important procedure for preventing the spread of biological contamination
  - At least 30 seconds
    - (sing happy birthday - TWICE)
  - Lather and scrub past wrists (or further if needed)
Handwashing

Handwashing with soap and water

1. Remove jewellery and wet hands and wrists with warm water.
2. Use 1 or 2 squirts of liquid or foam soap.
3. Lather soap and scrub hands well, palm to palm.
4. Scrub in between and around fingers.
5. Scrub back of each hand with palm of other hand.
6. Scrub fingertips of each hand in opposite palm.
7. Scrub each thumb clasped in opposite hand.
8. Scrub each wrist clasped in opposite hand.
9. Rinse thoroughly under running water.
11. Turn off water using same paper towel.

Handwashing vs. Hand Sanitizing

- In a lab setting it is better to hand wash since sinks are available
- Hand sanitizers must be at least 60% alcohol-based to show equivalent efficacy as hand washing
- Hand sanitizer efficacy is exponential to the amount used – squirt twice!
- Hand sanitizing is not effective if hands are visibly soiled – must hand wash
Spill Clean-up Procedure

- Cleanup of such biological materials may be a result of an accident or due to poor hygiene practices.

- Incidents that involve urine, feces, vomit, or blood body fluids may contain infectious materials, and must be handled following universal precautions. It is important to clean and then sanitize surfaces after a spill.

- Clean spills at your comfort level.

- When unsure contact your supervisor.
Spill Kit Equipment Recommendations

- Create a spill kit for quick and easy clean up:
  - Caution sign
  - **Personal Protective Equipment (PPE)**
    - Gloves
    - Safety Goggles
    - Protective clothing e.g. plastic apron
    - Mask (e.g. N95)
  - Absorbent Material (MegaSorb)
  - Disinfectant solution
    - e.g. household bleach (5% fresh solution) or ED Disinfectant
  - Dust Pan/Broom
  - Garbage container/bag
Safe Handling of Bleach

- Refer to Material Safety Data Sheet
- Avoid contact with eyes, skin, clothing
- Wear safety glasses, rubber or nitrile gloves
- For disinfection: 10% household bleach for 30 minutes

**DO NOT MIX WITH OTHER CHEMICALS**
- Strong oxidizing agent
- INCOMPATIBLE WITH:
  - Other household chemicals such as toilet bowl cleaners, rust removers, vinegar, acids, ammonia-containing products to produce extremely hazardous chlorine gases
Spill Response

1. Put on appropriate personal protective equipment.
2. Post a “spill cleanup in progress” sign, to warn others.
3. Cover the spill with an absorbent (e.g. paper towels)
4. Gently pour* disinfectant (e.g. 10% bleach solution) around and over the spill.
5. Allow appropriate contact time (e.g. 30 minutes for 10% bleach) to destroy potential pathogens.
6. Sweep/collect waste material onto dustpan or dispose directly into a garbage bag for regular waste disposal. Treated liquid waste can be poured into the sanitary sewer system.
7. Sanitize area by reapplying disinfectant to the spill area after initial cleaning**
8. Do final wipe down with water to remove residual disinfectant.

** Care should be taken to avoid splashing or generating aerosols during clean up
Spill Response - absorbing surface (carpet, upholstery etc…)

1. Put on appropriate personal protective equipment.
2. Post a “spill cleanup in progress” sign, to warn others.
3. Gently pour disinfectant solution onto the absorbed spill site.
4. Allow appropriate contact time to destroy potential pathogens.
5. If solid waste, remove as much as possible into waste bag/container.
6. Blot up what is possible with a dry cloth. Do not rub.
7. Apply soap/water or appropriate carpet spotter to remove visible staining.
   (NOTE: MUST BE COMPATIBLE WITH DISINFECTANT!!)
8. Place all cleaned up waste into a garbage bag for regular waste disposal.
Post Spill Response

- Don’t forget to post-spill cleanup!

  - Clean used equipment (e.g. dustpan and broom) with disinfectant.

  - Discarding soiled equipment is best.

- Wash hands thoroughly.
Exposure Response- Immediate

- **MAJOR or LIFE-THREATENING INJURIES SEEK MEDICAL ATTENTION IMMEDIATELY:**
  - Call 911 and Campus Security x33333
  - First Aiders can administer first aid

- **CLOTHING:**
  - Remove contaminated clothing and prepare for disinfecting
  - Place contaminated clothing in autoclave bags for autoclaving or in chemical disinfectant bath for appropriate disinfection time
Exposure Response- Immediate

- **SKIN:**
  - Wash the exposed surface with soap and water
  - For cuts to skin, allow to bleed freely if safe to do so
  - After rinsing the wound apply a skin antiseptic and cover using a dressing or bandage

- **EYES/NOSE/MOUTH:**
  - Flush thoroughly with water (~15 minutes)
What should I do if I become exposed?

- Report to your supervisor.
  - **If working (eg TA duties):** supervisor must fill out the Supervisor’s Accident Investigation Report (SAIR)
  - **If doing research student duties:** Get supervisor to fill out a faculty student accident report form

- If you feel you had a possible exposure to biohazards:
  - Seek medical attention immediately. Inform physician of possible exposure.
  - MUST contact Biosafety Officer (x55491 or x44745)
    - Can get advice from Occupational Medical Doctor
Thanks for being safe!!

Please visit us at:
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