Emergency Response Guide

Exposures and Spills

Borwankar, Dhananjai
UNIVERSITY OF WATERLOO
SECOND EDITION – APRIL 4TH, 2017
Introduction:
This guide provides plans and procedures to help mitigate sudden unplanned or unexpected situations when working with risk group 2 materials, and human blood, tissue and bodily fluids.

Purpose:
The purpose of this guide is to provide a plan for the mitigation of emergency situations involving the handling, use and storage of risk group 2 materials, human blood, tissues, or bodily fluids.

Scope:
The procedures in this guide are ones that span the most common emergency situations for labs using, handling, or storing risk group 2 materials, human blood, tissues, or bodily fluids. It is the responsibility of each individual laboratory to develop emergency procedures for events that have not been covered in this guide.

The following procedures are found in this guide:

*Exposures*
- Animal bites and scratches
- Needle stick injuries
- Splashes to eyes and mucous membranes
- Splashes to intact skin

*Spills*
- Small spills
- Large spills

Incident Reporting:
As with all emergency situations, incidents should be reported as soon as it is safe to do so. Any worker who has had an exposure to a material, whether directly (cut, needle stick, splash, etc...) or indirectly (spill, potential inhalation) must report the incident to their direct supervisor. The exposed person should be assessed by the University of Waterloo’s health services department or a health professional (nurse or physician) without delay. The supervisor should also inform the biosafety officer of the potential exposure.

The following reports are used for incident reporting:
- Incident Report
- Investigation Report
Exposures:
Exposures to pathogens, toxins and other disease carrying agents can occur in a variety of ways. This procedure outlines the processes you should follow should you be exposed to materials that have the potential to cause infection.

Animal bites/scratches
1. Allow the wound to bleed freely.
2. Wash well with soap and water.
4. If Health Services is not open, seek medical attention, have health care provider contact Health Services’ on call physician (519-888-4096) and follow directions given.
5. Counselling shall be provided regarding potential exposure or infection by Health Services, and follow-up testing shall be offered if the exposure is found to have potential to transmit disease causing agents.

Needle Stick injuries
1. Allow the wound to bleed freely.
2. Wash well with soap and water.
4. If Health Services is not open, seek medical attention, have health care provider contact Health Services’ on call physician (519-888-4096) and follow directions given.
5. Counselling shall be provided regarding potential exposure or infection by Health Services, and follow-up testing shall be offered if the exposure is found to have potential to transmit any disease causing agents.

Splashes to eyes and mucous membranes
1. Wash well with water. Eyes rinse for 15 minutes.
3. If Health Services is not open, seek medical attention, have health care provider contact Health Services’ on call physician (519-888-4096) and follow directions given.
4. As soon as possible report to Health Services and file an incident report.
5. Counselling shall be provided regarding potential exposure or infection by Health Services, and follow-up testing shall be offered if the exposure is found to have potential to transmit any disease causing agents.

Splashes to intact skin
1. Wash well with soap and water.
2. As soon as possible report to Health Services and file an incident report.
Spills:

Definitions

**Small or Minor Spills**: a small or minor spill is one that involves:

- the release of a risk group (RG1) organisms without splashing or agitation; or,
- the release of a RG2 organism in volumes of 250 mL or less.

**Large or Major Spill**: a large or major spill is one that involves:

- the release of an RG2 organisms with splashing or aerosolization,
- the spill of an RG2 organism in a volume in excess of 250 mL; or,
- or the assistance of another individual

**Sterilization**: Sterilization is a process that completely eliminates all living microorganisms, including bacterial spores.

**Disinfection**: Disinfection is a less lethal process than sterilization that eliminates most forms of living microorganisms. The effectiveness of the disinfection process is affected by a number of factors, including the nature and quantity of microorganisms, the amount of organic matter present, the type and state of items being disinfected, and the temperature.

**Decontamination**: Decontamination is the process by which materials and surfaces are rendered safe to handle and reasonably free of microorganisms or toxins. The primary objective of decontamination is to protect containment zone personnel and the community from exposure to pathogens that may cause disease. Depending on the situation, decontamination may require disinfection or sterilization.

General Guidelines

Most spills involving biological agents can and will be handled by trained laboratory personnel under the direct supervision of a Principal Investigator. All Laboratory staff must be trained in the lab’s spill clean-up procedure and know the location of the spill kits.

Never clean-up a spill if you haven’t been trained on how to clean it up.

Spills in a Biosafety Cabinet

1. Leave the cabinet running to prevent the escape of contaminants from the cabinet.

   **Spill just on working surface**

2. Cover the spill with paper towels and gently flood the surface with your chosen disinfectant. If you are working in the cabinet you should already have this available. Start at the outside and move to the center. Be careful not to generate any splashes or aerosols.

3. Let the disinfectant stand on the spill undisturbed for a minimum of 20 minutes (base this on the contact time of disinfectant used). Close sash and leave undisturbed. If you need to leave the area during this time you will need to disinfect and remove your gloves inside the cabinet. Then remove your lab coat and any other protective equipment and carefully wash your hands.
4. When you return to clean up the decontaminated area, put on your lab coat and gloves again and make sure you have an autoclave bag available in the BSC. A double pair of clean gloves or extra pair of clean gloves inside the BSC may be needed. Depending on the size and type of spill you may also want to put on disposable arm covers or a back closing gown.

5. After the allotted contact time remove the disinfectant soaked paper towels into an autoclave bag. As much as possible, ensure that the disposal container and your arm movements are all located inside the BSC. Use tongs for this if available. It is a good practice to touch the towels as little as possible.

6. Use forceps to pick up any broken or sharp material and place them into an approved sharps container.

7. When all the absorbent material is packaged, remove your outer gloves and dispose of them in an autoclave bag.

8. Spray or wipe all the interior cabinet surfaces and any remaining equipment and supplies which are located inside the BSC with disinfectant. Alternately package the supplies to an autoclave bag located inside the cabinet. Close the bags and then surface disinfect them before removing them from the BSC for autoclaving.

9. If bleach solution has been used on stainless steel, rinse all surfaces really well with water. You can also re-wipe with 70% alcohol.

10. Dispose of PPE and wash hands thoroughly.

11. Let the cabinet run for at least 10 minutes after clean-up.

**Spill has permeated the front or rear grills and catch basin**

1. Ensure drain valve under BSC is closed

2. Remove sharp contaminated objects with tongs or forceps from spill area and discard in puncture proof biohazard bin

3. Flood the top work surface tray, and if a Class II biological safety cabinet, the drain pans and catch basins below the work surface, with a decontaminating solution which is appropriate for the agent involved. Let sit for appropriate contact time.

4. Drain the liquid in the tray into the drain pan and remove top front and rear grills. Wipe grills down (all sides) with a sponge or cloth soaked in decontamination liquid.
5. Place a drain pan or sealable container below the BSC underneath the drain valve. Remove the drain valve and drain the decontamination liquid.

6. Re-wipe all surfaces with disinfectant, including the underside of the work surface before replacing it. The spent decontaminate should be disposed thorough the safety office.

7. Dispose of PPE in a biohazard bin and wash hands thoroughly.

8. If bleach solution has been used on stainless steel, rinse all surfaces really well with water. You can also re-wipe with 70% alcohol.

9. Let the cabinet run for at least 10 minutes after clean-up.

Biohazard Spills in a Centrifuge

Always check the manufacturer's instructions for cleaning and disinfecting your unit.

1. When you become aware of a spill in a centrifuge, inform any nearby occupants that a spill and likely tube breakage has occurred inside the centrifuge.

2. Post a Biohazard Spill sign ON the centrifuge.

3. Ensure the lid remains closed; do not disturb the centrifuge for 30 minutes after the rotor has stopped to allow aerosols to settle. Recruit trained co-workers for spill cleanup during this time.

4. Open centrifuge carefully to avoid disturbing the contents which may be up against the lid.

5. Assess the extent of the spill and damage of the tubes, buckets, rotor and inner surfaces of the centrifuge.

6. IF YOU ARE ALONE AND NOT ABLE TO CLEAN UP THE SPILL; contact your supervisor.

7. Remove any sharp debris with forceps, tweezers or tongs and place in sealable secondary container (e.g.; plastic bottle with sealable lid). Place the entire bottle into the biohazard waste container.

8. Remove any debris using forceps, tweezers or tongs and place in a sealable plastic bag. Seal and discard plastic bag in a biohazard waste container.

9. Carefully remove rotors and buckets, and place in a sealable plastic bag on a cart. Seal the bag and move it to a nearby BSC for further cleaning.

10. Mist the inside of the centrifuge with disinfectant. Take steps to inactivate any contamination on surfaces before touching the surfaces.
12. Use more paper towel soaked with disinfectant to clean the inside of the centrifuge. If bleach solution is used, you must wash the equipment thoroughly with tap water after disinfection. Bleach solutions corrode parts of the equipment. All used paper towel goes into a sealable plastic bag. Discard sealed plastic bag in a biohazard waste container.

13. Working in the biosafety cabinet, soak all the removable parts in the disinfectant for the recommended contact time, rinse thoroughly, dry and spray out of the BSC. Wash with soap and water. Return to the centrifuge.

14. Dispose spent disinfectant down the sink with running water.
   • Place all other waste (e.g. wet paper towels) in a sealable plastic bag. Discard sealed plastic bag in a biohazard waste container.
   • Ensure all reusable items used in the cleanup (forceps, dustpans, etc.) are soaked in disinfectant for the recommended contact time, rinse thoroughly. Wash with soap and water. Lay out to dry.
   • Notify your supervisor, and report the spill and successful clean-up.
   • Fill out an Incident Report Form.

Biohazard Spills Outside of a Biosafety Cabinet

1. **Assess the area for the severity of the incident. For example, ask yourself the following questions:**
   a. How pathogenic is the organism involved?
   b. What volume and concentration of biological material is involved?
   c. Do I have the experience to do this clean-up myself?

2. **Ensure your own personal safety and tell other people in the vicinity.**
   a. Clear the area of all non-essential personnel and ask for help if necessary.
   b. For major spills, wait 30 minutes before re-entering the area to allow dissipation of aerosols created by the spill.
   c. If available and safe, have someone set up signs or tape off the area to avoid people from entering the spill zone.
3. **As soon as possible, deal with personal or co-worker injuries or potential injuries.**
   a. Assess the area for personnel contamination. Remove any contaminated items and put them in an autoclave bag.
   b. Initiate first aid if required: Wash the exposed area well with gentle soap and water.
   c. Encourage bleeding if the exposure includes a sharps injury, or puncture and repeat washing. For eye exposures flush eyes for 15 minutes in eye wash. Seek medical attention.
   d. If the incident involves a potential exposure of human blood, body fluids or cell lines due to broken, cut, punctured or non-intact skin, initiate the post exposure protocol and ensure that you seek medical attention within two hours.
   e. Ensure that the exposure is reported to your supervisor as soon as possible.

3. **Ensure you are wearing adequate PPE for the clean-up.**
   a. Double gloves, lab coat, close-toed shoes, and covered legs is minimum.
   b. For major spills: Consider protection from shoe covers, arm guards, face protection/shield and/or back closing gowns.
   c. If the incident involves a potential exposure of blood, body fluids, cell lines ensure adequate skin coverage and wear a full face shield. Refer to SWP BBF.
   d. For respiratory transmitted organisms, the PI should determine whether an N100 or HEPA filtered respirator is required for the spill kit. These require fit testing and a consult with the Safety Office ext. 33587.

4. **Attend to the spill**
   a. Contain the spill with absorbent material from your spill kit. For example gently cover the spill with paper towels or absorbent. Determine the extent of the splashed area and cover it all with paper towels as well.
   b. Gently pour disinfectant on the absorbent paper starting at the outside and moving to the center.
   c. For very large spills, an alternate method is to soak towels in disinfectant and gently lay them on the spilled area.
   d. Let stand 30 minutes to allow an adequate contact time.

5. **While waiting, to avoid contaminating yourself:**
   a. Remove your outer layer of gloves and then all contaminated clothing and PPE and place them in an autoclave bag for later autoclaving.
   b. Remove the inner pair of gloves and carefully wash your hands with soap and water.

6. **Replace any removed PPE and prepare to clean-up the decontaminated spill.**
   a. Pick up contaminated broken glassware with a brush and dustpan, tongs or forceps; not directly by hand. Place in a sharps container for autoclaving.
   b. Using a disposable dust pan and squeegee or tongs, transfer all materials soaked in disinfectant into a new separate autoclave bag. The 5 gallon pail can be used as a support for this bag. Chemically disinfected material does not need to be autoclaved but is still considered chemical waste.
c. Reapply disinfectant to the spill area after the initial clean-up. Wait for the required time and then clean-up again.
d. Disinfect/decontaminate the surface of any items or equipment in the vicinity of the spill that may have been exposed.
e. When finished, secure the lid on the 5 gallon pail. Label the container appropriately with a chemical waste tag, place it in a secure location and arrange for disposal through the Environmental Safety Facility at ext. 35755
f. Carefully remove all PPE. Place in a different bag for autoclaving or if applicable, carefully surface disinfect. Lab coats used for spill clean up must be autoclaved before laundering.
g. Thoroughly wash your hands.

It is important that you report the incident to your supervisor and the biosafety officer. The biosafety officer will request an incident report and incident investigation be completed. Written records of such incidents must be maintained, and the results of incident investigations should be used for continuing education.

Make arrangements to restock items used in the spill kit.

See Appendix 1, figures 1 and 2 for an outline of the spills procedures to be used should a spill occur on a surface, in a Biosafety Cabinet or in a centrifuge. Plans for other specific spill scenarios should be developed by each lab where deemed necessary.
Appendix 2: Spills Procedural Flowcharts

**Figure 1: Small Spill process flow.**

- **Notify:**
  - Staff in area
  - Supervisor
  - Biosafety Officer (x33587)

- **Is worker contaminated?**
  - Yes
    - Move to safe area
    - Remove clothing
    - Wash exposed area with copious amounts of water
    - Place clothing in plastic sealed bag for disposal
    - Seal off lab
  - No

- **Where is the spill?**

  - **In BSC**
    - Cover spill with absorbent or paper towels to contain it
    - Determine appropriate disinfectant (Table 1)
    - Apply disinfectant concentrically moving from outside to center
    - Leave disinfectant for appropriate contact time (Table 2)
    - Dispose of waste in bio-waste bin

  - **On floor or bench top**
    - Leave BSC on
    - **DO NOT** lower sash

  - **In centrifuge**
    - Keep lid of centrifuge on and closed for minimum 30 min.
    - PPE (Respirator, 2 sets of gloves, solid front gown with tight fitting cuffs)
    - Vacate lab of all non-essential personnel
    - Remove rotors, buckets, and trunnions and soak in appropriate disinfectant (not bleach)
    - Unbroken safety cups can be put in BSC and decontaminated
    - Remove broken glass with forceps, disinfect and dispose in bio-waste bin
    - Disinfect centrifuge bowl.

- **Did spill contact eyes, mucous membranes, or open wound?**
  - No
  - Yes
    - Notify:
      - Health Services; or,
      - On-call physician
Figure 2: Large spill process flow.
Appendix 1: Disinfection

When choosing a chemical disinfectant many factors should be taken into consideration. These are all outlined in the Canadian Biosafety Standards. This document outlines the properties of various chemical disinfectants and when each can be used.

The following factors all play a role in determining which disinfectant you should use for your work:

- Organic Load
- Concentration of disinfectant
- Contact time
- Temperature
- Relative humidity
- pH
- Stability and Storage

Tables 1 and 2 in this appendices summarize this information, and the following link provides more specific guidance. It is up to you to understand which disinfectant is appropriate for the work you are performing. Please consider determining your disinfection needs prior to beginning your work.

The following link will provide detailed information for you to review:

Table 1: Microorganisms ranked according to relative susceptibility to chemical disinfectants. Adapted from the Canadian Biosafety Standards 2015.

<table>
<thead>
<tr>
<th>Susceptibility</th>
<th>Microorganism</th>
<th>Disinfectants reported to be effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely resistant</td>
<td>Prions</td>
<td>Unusually resistant to chemical disinfectants. High concentrations of sodium hypochlorite (NaOCl) or heated strong solutions of sodium hydroxide (NaOH)</td>
</tr>
<tr>
<td>Highly resistant</td>
<td>Protozoal oocysts</td>
<td>Ammonium hydroxide, halogens (high concentrations), halogenated phenols.</td>
</tr>
<tr>
<td></td>
<td>Bacterial endospores</td>
<td>Some acids, aldehydes, halogens (high concentrations), peroxygen compounds.</td>
</tr>
<tr>
<td>Resistant</td>
<td>Mycobacteria</td>
<td>Alcohols, aldehydes, some alkalis, halogens, some peroxygen compounds, some phenols.</td>
</tr>
<tr>
<td></td>
<td>Non-enveloped viruses</td>
<td>Aldehydes, halogens, peroxygen compounds.</td>
</tr>
<tr>
<td>Susceptible</td>
<td>Fungal spores</td>
<td>Some alcohols, aldehydes, biguanides, halogens, peroxygen compounds, some phenols.</td>
</tr>
<tr>
<td></td>
<td>Gram-negative bacteria</td>
<td>Alcohols, aldehydes, alkalis, biguanides, halogens, peroxygen compounds, some phenols, some quaternary ammonium compounds (QACs).</td>
</tr>
<tr>
<td></td>
<td>Gram-positive bacteria</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enveloped viruses</td>
<td></td>
</tr>
<tr>
<td>Highly susceptible</td>
<td>Mycoplasma</td>
<td>Acids, alcohols, aldehydes, alkalis, biguanides, halogens, peroxygen compounds, phenols, QACs.</td>
</tr>
</tbody>
</table>
Table 2: Characteristics of various chemical disinfectants. Adapted from the Canadian Biosafety Standards 2015.

<table>
<thead>
<tr>
<th>Chemical Disinfectant</th>
<th>Commonly Available Form</th>
<th>Effective Against</th>
<th>Contact Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Bacteria</td>
<td>Viruses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Veg.</td>
<td>Myco-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bacteria</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Liquid, powder and tablet</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Iodine</td>
<td>Aqueous solutions, tinctures and iodophores</td>
<td>+</td>
<td>L</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Ethyl or isopropyl alcohol; 70% in water is most effective</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Phenolics</td>
<td>Wide variety; generally used as substituted phenols in combination with detergents</td>
<td>+</td>
<td>V</td>
</tr>
<tr>
<td>Quaternary ammonium compounds</td>
<td>Wide variety available with built-in detergent action</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Glutaraldehyde</td>
<td>2% acidic solution supplied with a bicarbonate compound</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>Available as solid paraformaldehyde and liquid formalin</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>Accelerated formulations and 30% solutions in water</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Chlorhexidine</td>
<td>4% solution of chlorhexidine gluconate in a detergent base and concentrated alcohol-based solutions</td>
<td>+/L</td>
<td>–</td>
</tr>
</tbody>
</table>