

# EMERGENCY RESPONSE GUIDE – EXPOSURES & SPILLS

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## 1.0 PURPOSE

This guide provides plans and procedures to support the mitigation of sudden, unplanned, or unexpected situations when working with Risk Group 2 (RG2) materials, and human blood, tissues, or bodily fluids.

## 2.0 SCOPE

The procedures in this guide cover the most common emergencies labs experience when using, handling, or storing RG2 materials, or human blood, tissues, and bodily fluids. It is the responsibility of each individual laboratory to develop emergency procedures for events that are not been covered in this guide. Procedures covered 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

### Risk groups

Group	Risk
Risk Group 1 (RG1)	Low individual and community risk
Risk Group 2 (RG2)	Moderate individual risk, low community risk
Risk Group 3 (RG3)	High individual risk, low community risk
Risk Group 4 (RG4)	High individual and community risk



## **3.0 REPORTING INCIDENTS**

As with all emergencies, incidents should be reported as soon as it is safe to do so. Any worker who has been exposed to a material, whether directly (cut, needle stick, splash, etc.) or indirectly (spill, potential inhalation, etc.) must report the incident to their direct supervisor. The University of Waterloo's health services department or a health professional (nurse or physician) should assess the exposed person as soon as possible.

The supervisor should also inform the biosafety officer of the potential exposure. Use the University's incident and investigation reports (available on the Safety Office website) for reporting incidents.

## **4.0 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.

### **4.1 ANIMAL BITES/SCRATCHES**

1. Allow the wound to bleed freely.
2. Wash well with soap and water.
3. Report immediately to Health Services and have someone escort you in case of fainting.
4. If Health Services is not open, seek medical attention, have the health care provider contact Health Services' on-call physician (519-888-4096), and follow directions given.
5. Health Services will provide counselling regarding potential exposure or infection. Follow up testing will be offered if the exposure is found to have the potential to transmit disease-causing agents.

### **4.2 NEEDLE STICK INJURIES**

1. Allow the wound to bleed freely.
2. Wash well with soap and water.
3. Report immediately to Health Services and have someone escort you in case of fainting.
4. If Health Services is not open, seek medical attention, have the health care provider contact Health Services' on-call physician (519-888-4096), and follow directions given.
5. Health Services will provide counselling regarding potential exposure or infection. Follow up testing will be offered if the exposure is found to have the potential to transmit disease-causing agents.

### **4.3 SPLASHES TO EYES AND MUOCUS MEMBRANES**

1. Wash well with water. Rinse eyes for 15 minutes.
2. Report immediately to Health Services and have someone escort you in case of fainting.

3. If Health Services is not open, seek medical attention, have the health care provider contact Health Services' on-call physician (519-888-4096), and follow directions given.
4. Report the incident to Health Services and file an incident report as soon as possible.
5. Health Services will provide counselling regarding potential exposure or infection. Follow up testing will be offered if the exposure is found to have the potential to transmit disease-causing agents.

#### **4.4 SPLASHES TO INTACT SKIN**

1. Wash well with soap and water.
2. Report the incident to Health Services and file an incident report as soon as possible.

### **5.0 SPILLS**

#### **5.1 DEFINITIONS**

##### **Small or Minor Spills**

A small or minor spill is one that involves either:

- The release of RG1 organisms without splashing or agitation.
- The release of RG2 organisms in volumes of 250 mL or less.

##### **Large or Major Spill**

A large or major spill is one that involves any of the following:

- The release of RG2 organisms through splashing or aerosols.
- The spill of RG2 organisms in a volume in excess of 250 mL.
- The assistance of another individual.

##### **Sterilization**

A process that eliminates all living microorganisms, including bacterial spores.

##### **Disinfection**

A less lethal process than sterilization that eliminates most forms of living microorganisms. 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, all affect the effectiveness of the disinfection process.

##### **Decontamination**

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.

#### **5.2 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 have not been trained on how to clean it up.**

### **5.3 SPILLS IN A BIOSAFETY CABINET (BSC)**

#### **Spill only on working surface**

1. Leave the cabinet running to prevent the escape of contaminants from the cabinet.
2. Cover the spill with paper towels and gently flood the surface with your 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 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 need to disinfect and remove your gloves inside the cabinet and 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 your lab coat and gloves on 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 spill, you may want to wear disposable arm covers or a back-closing gown.
5. After the allotted contact time, remove the disinfectant soaked paper towels and place in an autoclave bag. Ensure that the disposal container and your arm movements are all located inside the BSC (as much as possible). 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 broken or sharp materials 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 with the disinfectant on all the interior cabinet surfaces and any remaining equipment or supplies located inside the BSC. Alternatively, place the supplies in 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 a bleach solution was 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 from the spill area with tongs or forceps and place them into an approved sharps container.
3. Using a decontaminating solution appropriate for the agent involved, flood the top work surface tray. If using a Class II BSC, flood the drain pans and catch basins below the work surface. Let sit for appropriate contact time.
4. Drain the liquid in the tray into the drain pan and remove the 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. Dispose of the spent decontaminant through the Safety Office.
7. Dispose of PPE in a biohazard bin and wash hands thoroughly.
8. If bleach solution was used on stainless steel, rinse all surfaces well with water. You can also re-wipe with 70% alcohol.
9. Let the cabinet run for at least 10 minutes after clean-up.

## **5.4 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 to the tubes, buckets, rotor and inner surfaces of the centrifuge.
6. **If you are alone and unable to clean up the spill, contact your supervisor.**
7. Remove any sharp debris with forceps, tweezers, or tongs and place in a 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 the plastic bag in a biohazard waste container.
9. Carefully remove rotors and buckets; place them 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.
11. Use more paper towel soaked with disinfectant to clean the inside of the centrifuge. If bleach solution is used, wash the equipment thoroughly with tap water after disinfection. Place all used paper towel into a sealable plastic bag. Discard the sealed, plastic bag into a biohazard waste container.
12. 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.
13. Dispose spent disinfectant down the sink with running water.
14. 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.
15. Notify your supervisor, and report the spill and successful clean up.
16. Fill out an incident report form.



Always use forceps/tweezers to remove glass or plastic particles.



Clean and disinfect unit lid.

## **5.5 BIOHAZARD SPILLS OUTSIDE OF A BIOSAFETY CABINET**

1. Assess the area for the severity of the incident. For example, ask yourself:
  - 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 deter 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 the exposure is reported to your supervisor as soon as possible.
4. 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 back closing gowns.
  - c. If the incident involves a potential exposure of blood, body fluids, or 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 a N100 or HEPA filtered respirator is required for the spill kit. These require fit testing and a consult with the Safety Office ext. 33587.

5. 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.
6. 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.
7. 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 but not directly by hand. Place in a sharps container for autoclaving.
  - b. Using a disposable dustpan 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 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.

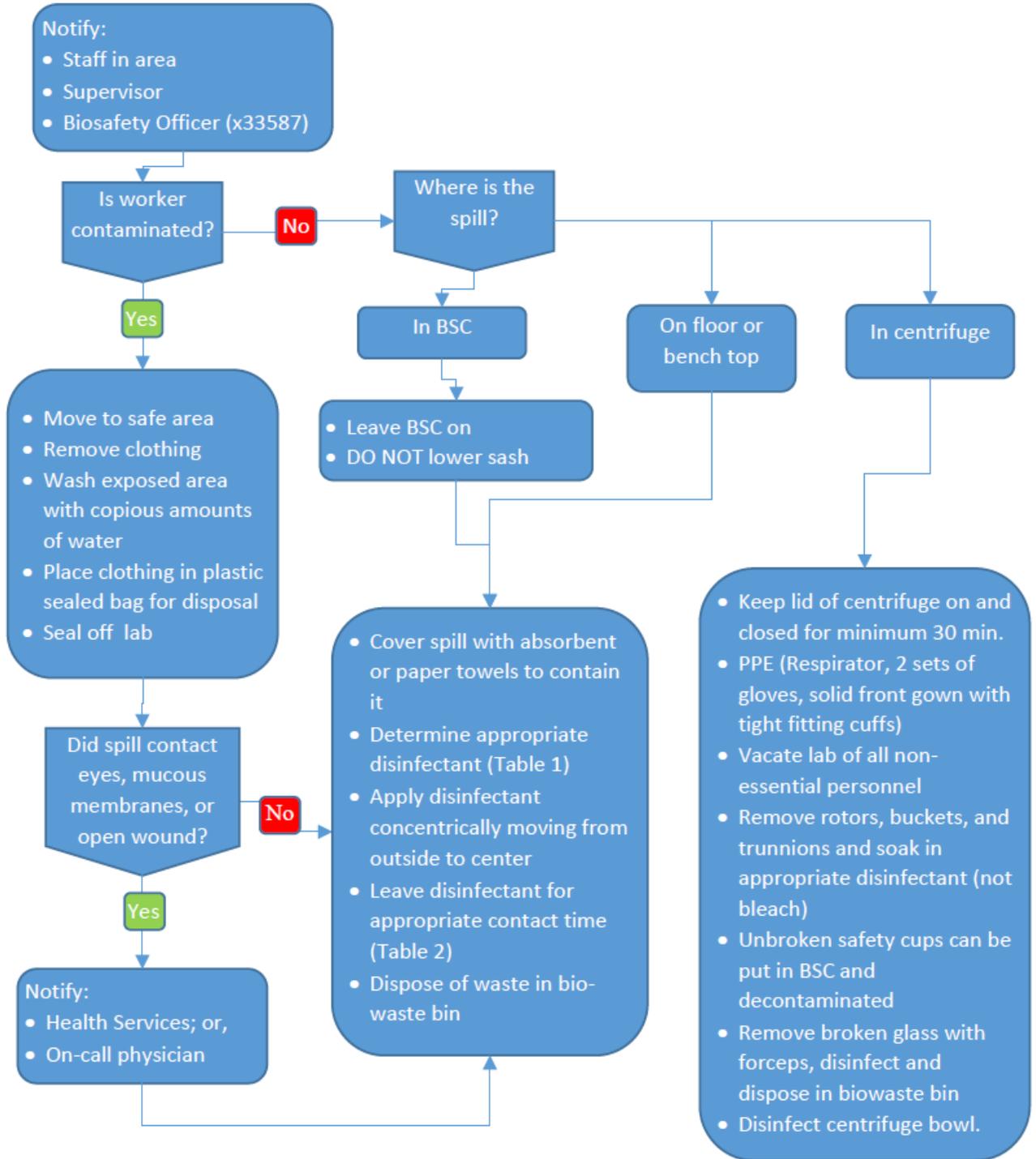
It is important that you report the incident to your supervisor and the biosafety officer. The biosafety officer will request an incident report and incident investigation be completed. Written records of such incidents must be maintained, and the results of incident investigations should be used for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

**Make arrangements to restock items used in the spill kit.**

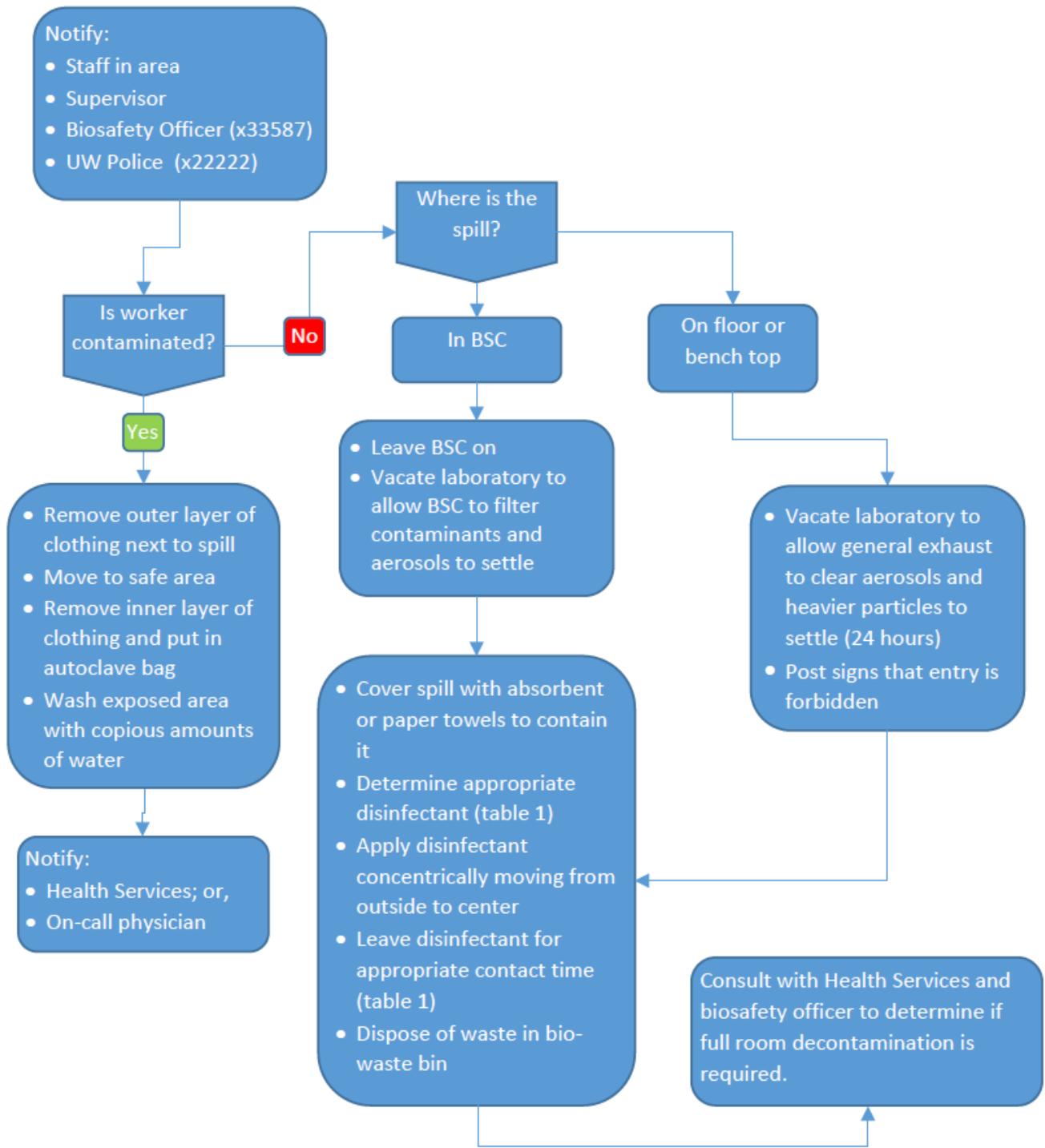
See Appendix 1, figures 1 and 2 for an outline of the the spills procedures to be used should a spill occur on a surface, in a Biosafety Cabinet or in a centrifuge. Plans for other specific spill scenarios should be developed by each lab where deemed necessary.

# APPENDIX 1: SPILLS PROCEDURAL FLOWCHARTS

## SMALL SPILL PROCESS MAP



# LARGE SPILL PROCESS MAP



## APPENDIX 2: DISINFECTION

When choosing a chemical disinfectant, many factors should be taken into consideration. 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 summarize this information and the [Canadian Biosafety Standards](#) provide more guidance. It is up to you to understand which disinfectant is appropriate for the work you are performing. Always determine your disinfection needs prior to beginning your work.

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

Susceptibility	Microorganism	Disinfectants reported to be effective
Extremely resistant	Prions	Unusually resistant to chemical disinfectants. High concentrations of sodium hypochlorite (NaOCl) or heated strong solutions of sodium hydroxide (NaOH)
Highly resistant	Protozoal oocysts	Ammonium hydroxide, halogens (high concentrations), halogenated phenols.
	Bacterial endospores	Some acids, aldehydes, halogens (high concentrations), peroxygen compounds.
Resistant	Mycobacteria	Alcohols, aldehydes, some alkalis, halogens, some peroxygen compounds, some phenols.
	Non-enveloped viruses	Aldehydes, halogens, peroxygen compounds.
Susceptible	Fungal spores	Some alcohols, aldehydes, biguanides, halogens, peroxygen compounds, some phenols.
	Gram-negative bacteria	Alcohols, aldehydes, alkalis, biguanides, halogens, peroxygen compounds, some phenols, some quaternary ammonium compounds (QACs).
	Gram-positive bacteria	
	Enveloped viruses	
Highly susceptible	Mycoplasma	Acids, alcohols, aldehydes, alkalis, biguanides, halogens, peroxygen compounds, phenols, QACs.

**Table 2: Chemical disinfectants and their effectiveness.**

Chemical Disinfectant	Commonly Available Form	Effective Against							Contact Time
		Bacteria			Viruses		Fungi		
		Veg	Mycobacteria	Spores	Enveloped	Non-enveloped	Fungi	Fungal Spores	
Chlorine	Liquid, powder and tablet	+	+	+	+	+	+	+	Generally short; longer for bacterial spores (≥ 30 min)
Iodine	Aqueous solutions, tinctures and iodophores	+	L	L	+	L	+	L	Generally short for vegetative bacteria and enveloped viruses; contact time for other organisms is product-specific
Alcohol	Ethyl or isopropyl alcohol; 70% in water is most effective	+	+	-	+	L	+	-	Generally short for vegetative bacteria and enveloped viruses; longer for fungi and mycobacteria
Phenolics	Wide variety; generally used as substituted phenols in combination with detergents	+	V	-	+	-	V	-	
Quaternary ammonium compounds	Wide variety available with built-in detergent action	+	-	-	+	-	+	-	
Glutaraldehyde	2% acidic solution supplied with a bicarbonate compound	+	+	+	+	+	+	+	≥ 20 min required for non-enveloped viruses and mycobacteria; >3 hours required for bacterial spores
Formaldehyde	Available as solid paraformaldehyde and liquid formalin	+	+	+	+	+	+	+	
Hydrogen peroxide	Accelerated formulations and 30% solutions in water	+	+	+	+	+	+	+	When using 6% H2O2, short contact time for all viruses, vegetative bacteria, fungi, mycobacteria, and some bacterial spores. Higher concentrations and longer contact times required for sporicidal activity.
Chlorhexidine	4% solution of chlorhexidine gluconate in a detergent base and concentrated alcohol-based solutions	+/ L*	-	-	+	-	L	-	