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1. OBJECTIVE

The purpose of this SOP is to outline the procedures of cleaning up biological spills. It will provide guidance on how to handle possible emergencies that may arise in any biosafety level 2 (BSL-2) laboratory of Department of Medicine working with biological hazards.

2. SCOPE

This SOP is applicable to all trained staff and students handling biological agents.

3. RESPONSIBILITY AND ACCOUNTABILITY

- 3.1 It is the responsibility of the Principal Investigators to ensure all staff and students in their laboratory are properly trained to respond safely to biohazardous material accidents and spills, safe use of biological agents in their laboratory, assess the accident/incident and the course of action required to control the accident/incident effectively.
- 3.2 It is the responsibility of all laboratory staff and students performing this procedure to acquire sufficient knowledge in biological safety, aware of potential hazards, understand this SOP and its contents, and obtain necessary training to carry out this procedure safely.

4. POTENTIAL HAZARDS

Laboratories in the Department of Medicine operate under BSL-2 containment where experiments involving agents of potential hazard to laboratory workers and the environment are conducted.

It is important to be aware that there may be potential risks in handling and processing biological materials (especially those of human), microorganisms such as bacteria and viruses (e.g. Hepatitis A, B and C virus, HIV), recombinant DNA, tissue culture and oncogenic viral systems and other human pathogens that are blood-borne, etc. All spills involving biological material and agents should therefore be treated as potentially infectious.

5. BIOLOGICAL SPILL KIT

A basic biological spill kit should include:

Personal Protective Equipment

- Safety goggles
- N95 masks (The list of responders with their N95 fit-tested relevant sizes is documented in the kit.)
- Disposable laboratory gown
- Disposable Gloves (latex or nitrile)

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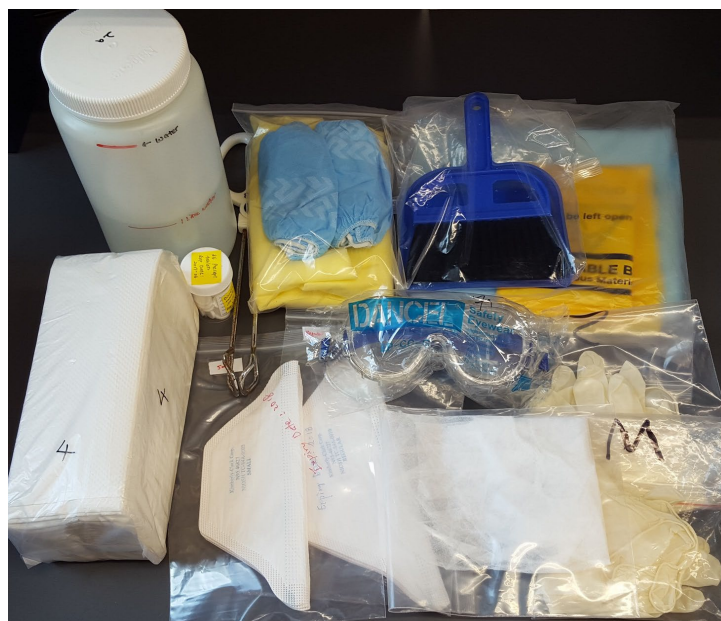
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- Shoe covers
 - Disposable head covers (optional)
- Materials:
- Disinfectant appropriate for the infectious agent(s) handled in the laboratory
 - Bottle for making dilutions of disinfectant
 - Absorbent materials and Paper towels
 - Forceps or tongs for handling the spill clean up materials and/or sharps
 - Dust pan with broom
 - Sharps bin (available for use and within reach)
 - Biohazard bags
 - Biohazard spill alert notice
 - Biological spill response procedure and emergency contact numbers
 - Name list of staff who are test fitted for N95 masks

Spill kits shall be easily accessible to responders and free from obstructions.
Spill kits shall be maintained, checked and replenished regularly.



Biological Spill Alert Notice



Biological Spill Kit

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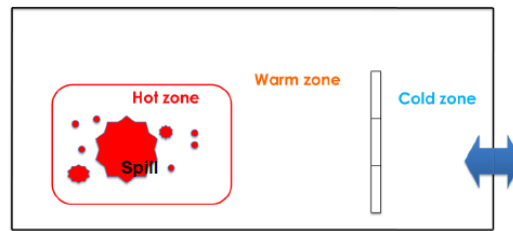
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6. SPILL RESPONSE PROCEDURES (WORK IN BUDDY SYSTEM)

The degree of risk due to a spill depends on the volume of materials spilled, the nature of the material spilled, the concentration of organisms in the material spilled, the hazard of the organisms spilled, the route of infection of the organisms, the diseases caused by the organisms as well as the location of the spill.

6.1 Spill Response Guidelines

- a. Occupants in the area shall be alerted and evacuated when required e.g. BSL2 spills.
- b. Access shall be restricted to the spill area.
- c. A sign alerting others of the spill shall be posted at the entrance to the spill area.
- d. Aerosols shall be allowed to settle for at least 30 minutes prior to start of spill cleanup.
- e. Area of the spill shall be demarcated into 3 zones: hot, warm and cold.




- f. Liquid disinfectant should not be sprayed onto spills to minimize aerosol generation.
- g. Any potentially contaminated stationary, furniture or equipment shall be wiped down with an appropriate disinfectant.
- h. The laboratory shall be cleared for re-entry based on the laboratory's spill response procedure.
- i. PPE, equipment and waste used/ collected after a biological spill clean-up shall be treated as biohazardous and disposed.

In addition to the above general spill response guidelines, the following shall also be considered under specific situations in BSL2 laboratories.

6.2 General Spill Clean-up Procedure (Outside Biosafety Cabinet)


- a. Hold your breath and evacuate the room immediately.
- b. Notify others (including PI/supervisor) to stay out of the spill area.
- c. Remove any contaminated clothing and place in a double biohazard waste disposal bag.
- d. Post a "biological spill alert notice" to prevent access to the spill area.
- e. Identify any specific biological agent and assess degree of contamination and action required.
- f. Wait 30 minutes for aerosol to settle.
- g. Put on protective personnel equipment in the correct order: Gloves (inner layer) → Hair net (optional) → N95 mask → Safety goggles → Disposable lab gown → Gloves (outer layer) → Shoe covers.
- h. Prepare disinfectant according to manufacturer's instructions.
- i. Cover the spill with paper towels, gently pour the disinfectant over the absorbent materials working from outer edge of the spill to its centre. Avoid splashes.

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- j. Allow a 30 minutes contact time before wiping up the spill, working from the edges into the centre. Use a dustpan and/or forceps to pick up broken pieces of glass if any, and discard in a sharps bin.
- k. Repeat Steps i and j
- l. Perform a final cleaning with water by wiping down the entire spill area.
- m. Remove protective personnel equipment in the correct order: Shoe covers → Gloves (outer layer) → Disposable lab gown (inside out) → Safety goggles (handle by head band) → N95 mask (handle by straps) → Hair net (optional) → Gloves (inner layer).
- n. Dispose all clean-up materials in a double biohazard waste bag.
- o. Notify PI/supervisor after clean-up.
- p. Report the incident to OSHE via the NUS Accident/Incident Reporting System (AIRS).
- q. Replenish Biological Spill Kit contents.

6.3 Spill Inside a Biosafety Cabinet

- a. Leave the cabinet switched on to prevent contaminant aerosols from escaping.
- b. Immediately notify others in the laboratory (including PI/supervisor) that there is a biological spill inside a biosafety cabinet.
- c. Remove outer layer of gloves and any contaminated clothing. Place them in a double biohazardous waste bag inside the BSC.
- d. Post a “biological spill alert notice” to prevent access to the spill area.
- e. Put on protective personnel equipment in the correct order: Gloves (inner layer) → Disposable lab gown → Gloves (outer layer) → Shoe covers.
- f. Prepare disinfectant according to manufacturer’s instructions.
- g. If the spill is on the work surface area, cover the spill with paper towels. Pour disinfectant from the edge of the spill toward the centre. If necessary, flood the work surface, as well as drain pans and catch basins below the work surface with disinfectant.
- h. Allow a 30 minutes contact time before wiping up the spill, working from the edges into the centre.
- i. If the spill reaches the front exhaust grille and under pan, then these shall also be decontaminated. Drain catch basin into a container. Lift the front exhaust grill and tray and wipe all surfaces. Ensure that no paper towels or solid debris are blown into the area beneath the grill. Use a dustpan and/or forceps to pick up broken pieces of glass if any, and discard in a sharps bin.
- j. Repeat Steps g and h.
- k. Perform a final cleaning with water by wiping down the entire spill area.
- l. Allow BSC to run for at least 10 minutes (with UV on if available) before resuming work.
- m. Remove protective personnel equipment in the correct order: Shoe covers → Gloves (outer layer) → Disposable lab gown (inside out) → Gloves (inner layer).
- n. Dispose all clean-up materials in a double biohazard waste bag.
- o. Notify PI/supervisor after clean-up.
- p. Report the incident to OSHE via the NUS Accident/Incident Management System (AIMS).
- q. Replenish Biological Spill Kit contents.
- r. If the entire interior of the BSC needs disinfection, contact the contracted certification vendor.

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6.4 Spill Inside a Centrifuge


- a. Turn off the centrifuge immediately if you hear a tube break. Do not open the centrifuge lid for 30 minutes to allow aerosols to settle. If you discover broken tubes after the centrifuge has stopped, close the lid and wait 30 minutes.
- b. Notify others (including PI/supervisor) that there is a biological spill inside a centrifuge.
- c. Prevent access to the laboratory by posting a “biological spill alert notice”.
- d. Put on protective personnel equipment in the correct order: Gloves (inner layer) → Hair net (optional) → N95 mask → Safety goggles → Disposable lab gown → Gloves (outer layer) → Shoe covers.
- e. If the spill occurred in a sealed bucket, remove rotors and buckets to the nearest biosafety cabinet for cleanup. Open and disinfect inside the biological safety cabinet.
- f. Apply disinfectant to all contaminated surfaces within the chamber taking care to minimize splashing. Allow 30 minutes contact time before cleaning up the chamber.
- g. Use forceps to remove all pieces of broken glass. Place all broken glass inside a puncture-resistant biohazard sharps container
- h. Repeat Steps f.
- i. Perform a final cleaning with water by wiping down the entire spill area.
- j. Remove protective personnel equipment in the correct order: Shoe covers → Gloves (outer layer) → Disposable lab gown (inside out) → Safety goggles → N95 mask → Hair net (optional) → Gloves (inner layer).
- k. Dispose all clean-up materials in a double biohazard waste bag.
- l. Report the incident to OSHE via the NUS Accident/Incident Management System (AIMS).
- m. Replenish Biological Spill Kit contents.

7. TRAINING

All individuals handling biological spill are required to complete the relevant safety training: Biosafety for BSL-2 Laboratories (OSHBIO08), Safe Handling of Human Tissue and Fluids (OSHBIO03) and Biological Spills and Emergency Response (OSHBIO05) via LumiNUS.

8. WASTE DISPOSAL

Materials used in biological spill clean-up must be disposed of as biohazardous waste and collected by the licensed waste collector. Label PI name, laboratory location and contact number on the bag.

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9. ACCIDENTS AND INCIDENTS REPORTING

Accidents resulting in injuries or spill incidents must be reported to the PI, laboratory supervisor and safety lead immediately after first aid is applied.


Seek medical attention when necessary at the University Health Centre (UHC) for a medical assessment or proceed to the Accident & Emergency units of National University Hospital after office hours.

All incidents or accidents have to be notified to OSHE within 24 hours via the online NUS Accident and Incident Management System (AIMS)

@https://inetapps.nus.edu.sg/osh/portal/eServices/ehs360_aims.html

10. REFERENCE

NUS Laboratory Biorisk Management Manual (NUS/OSHE/M/01)

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11. APPENDIX

Dilution instructions - PRESEPT® Hard Surface Disinfectant Tablets

Disinfection of	Required concentration of available chlorine	Dilution Rates			Additional instructions
		0.5g tablets	2.5g tablets	5.0g tablets	
Blood spillage [‡]	10,000 ppm	18 tablets in 0.5 litre water	7 tablets in 1.0 litre water	9 tablets in 2.5 litres water	Pour over blood. Using gloves, wipe up with disinfectant-saturated disposable cloth.
Pipette jars [‡]	2,500 ppm	9 tablets in 1.0 litre water	9 tablets in 5.0 litres water	9 tablets in 10 litres water	Drop tablets into water-filled pipette jar. Discard daily. [‡]
General laboratory/ environmental use [‡]	1,000 ppm	4 tablets in 1.0 litre water	4 tablets in 5.0 litres water	3.5 tablets in 10.0 litres water	Wipe down surfaces with disinfectant-saturated disposable cloth.
Glassware, rubber and plastic tubing	140 ppm	1 tablet in 2.0 litres water	1 tablet in 10 litres water	1 tablet in 20 litres water	Immerse for 1 hour before washing.
Soiled linen	140 ppm	1 tablet in 2.0 litres water	1 tablet in 10 litres water	1 tablet in 20 litres water	Immerse for 1 hour before washing.
Work surfaces, cupboards, floors, etc.	140 ppm	1 tablet in 2.0 litres water	1 tablet in 10 litres water	1 tablet in 20 litres water	Immerse for 1 hour before washing.

[‡]Howie Code requirements for laboratory use. †A 1% compatible detergent should also be added.

12. REVISION HISTORY

Date Revised	Version No.	Author	Summary of Revisions
16-03-2016	001	Wang Juling / Yeo Soh Bee	
18-10-2016	002	Wang Juling / Yeo Soh Bee	Section 9: Revised Accident and Incident Reporting System (AIRS) to Accident and Incident Management System (AIMS) Section 12: Appendix “Biological Spill Clean-up Procedure” by YLL SoM Safety Committee is added
15-04-2019	003	Wang Juling / Yeo Soh Bee	Section 6.1: Added Spill Response Guidelines Section 7: Replaced Biological Safety with Biosafety for BSL-2 Laboratories”
15-04-2022	004	Adeline Chow/ Wang Juling	Section 5: Updated Biological Spill Kit Section 6: Updated Spill Response Procedures Section 7: Updated Training portal - LumiNUS

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13. APPENDIX

BIOLOGICAL SPILL CLEAN-UP PROCEDURE

SPILL EVALUATION

(Risk assessment by Principal Investigator & lab personnel)

MINOR SPILL

Spill volume manageable
&
Poses no immediate danger to personnel

**RESTRICT ACCESS
TO CLEAN-UP AREA**

CLEAN-UP PROCEDURE

Prior to re-entering laboratory

- Allow aerosols to settle for 30 mins
- Turn off all flames (if used)
- Prepare clean-up materials & disinfectant
- Wear Personal Protective Equipment (PPE)

Upon entering laboratory

- Trace splatters
- Lay appropriate absorbents over the spill, from periphery to centre
- Apply disinfectant over absorbents, from periphery to centre
- Allow at least 20 mins contact time
- Pick up sharps & dispose in a sharps bin
- Pick up treated absorbents with tongs & dispose them in double yellow biohazard bag
- Clean treated area with disinfectant/water
- Remove & dispose PPE into biohazard bag
- Label the waste bag
- Wash hands

MAJOR SPILL

Spill volume NOT manageable
OR
Poses potential risk to personnel

LAB EVACUATION

**RESTRICT ALL
LAB ENTRY POINTS**

IMMEDIATE RESPONSE

- Call SCDF (995) and Campus Security (6874 1616)
- Activate fire alarm for building evacuation

REPORT

Report lab accident/incident to
AIMS (OSHE) within 24hrs
https://inetapps.nus.edu.sg/osh/portal/eServices/ehs360_aims.html