

Spill Procedures

Planning for spills

All spills of biohazardous materials do not represent the same risk to personnel and the environment, making each spill somewhat unique.

Factors other than volume that must be considered in spill risk assessment include:

- Location
- Nature
- Volatility and viscosity of spilled material
- Other properties of material
- Nature of affected surfaces
- Complicating materials
- Susceptibility of spilled material to neutralization/disinfection



a- Chemical Spill

The cleanup of a chemical spill should only be done by knowledgeable and experienced personnel. The first line of action to have safe environment in the laboratories is to minimize and contain chemical spills which may occur at any time. Sometimes, even a small spill of chemical can cause much harm to the public health. All chemical spills irrespective whether it is a major or minor spill must be officially reported to the chairman of the Department. A chemical spill is considered serious and urgent to care for if it causes injuries, fire, breathing problems, airborne contaminants, or requires an extended cleaning effort.

Most manufacturers of laboratory chemicals issue charts describing methods for dealing with spills. Appropriate charts should be displayed in a prominent position in the laboratory.

The following equipment should also be provided:

1. Chemical spill kits
2. Protective clothing, e.g. heavy-duty rubber gloves, overshoes or rubber boots, respirators.
3. Scoops and dustpans
4. Forceps for picking up broken glass
5. Mops, cloths, and paper towels
6. Buckets

7. Soda ash (sodium carbonate, Na_2CO_3) or sodium bicarbonate (NaHCO_3) for neutralizing acids and corrosive chemicals.

8. Sand (to cover alkali spills)

9. Non-flammable detergent.

The most occurring chemical spills are:

- Inorganic acids or bases

Small amounts: use neutralizing agent as soda or an adsorbent like vermiculite, dry sand or towels.

Large amounts: flush with large amounts of water if water does not pose any danger like reacting violently with other chemicals which might occur in the area of the spill. Make sure that the floors must be dry after the cleanup process is over.

-Volatile materials

With fully functional hood equipped with appropriate filters, allow the spill to evaporate

-Solids

If the spilled solid is not dangerous and does not pose any threat to the health, the spill should be swept and placed in the proper chemical waste container for appropriate treatments.

High power vacuum cleaner with appropriate filter must be used to clean up the solid toxic spill. If the solid spill has caused staining, always give priority to the manufacturer's stain removal guideline if available.

-Mercury spills

Due to its severe effect to public health, special care must be taken when dealing with mercury spills. Mercury can get into the body through inhaling its vapor or getting absorbed through the skin. The use of mercury must be kept to the minimum. Mercury spills must be covered completely with adsorbent and properly and fully cleaned. Mercury spill kits are available in all chemistry labs. Protecting clothing, gloves, and breathing devices must be used when with mercury spills.

Since students breaking Mercury Thermometers is one of the main reasons of Mercury spills in laboratories, we need special precautions when cleaning up broken mercury thermometers:

- Remove students from the area.
- Clean up the spill promptly to avoid accumulation on surfaces and evaporation causing inhalation. Because of the very small amount of mercury involved (less than 0.5 ml), it is usually not necessary to use a respirator in these cases. Use a mercury absorption sponge to collect the liquid beads from your Mercury clean-up kit. Wash the affected area with a detergent soap and allow to air dry before it is safe to reuse the area.
- Do not touch the liquid mercury with your hand and do not flush down the drain nor use a broom or vacuum to clean up mercury.

The following actions should be taken in the event of a significant chemical spill:

- Minor Chemical Spill

1. Alert people in immediate area of spill. All electrical and gas supplies must be turned off.
2. Wear protective equipment, including safety goggles, gloves, and long-sleeve lab coat.
3. If there is chemical exposure to others, respond as quickly as possible in administering First Aid.
4. Avoid breathing vapours from spill (wear appropriate breathing apparatus or protection).

5. Confine spill to small area.
6. Use appropriate kit to neutralize and absorb inorganic acids and bases. Collect residue, place in container, and dispose as chemical waste.
7. Clean spill area with water.
8. Review area when decontamination is complete. Check surrounding areas.
9. Report incident.



- Major Chemical Spill



Protect yourself and, if safe to do –

1. Attend to injured or contaminated persons and remove them from exposure.
2. Alert people in the laboratory to evacuate (use Break glass alarm if needed)
3. If spilled material is flammable, turn off ignition and heat sources.
4. Call Security
5. Cordon of the immediate area and close doors to affected area.
6. Have person knowledgeable of incident and laboratory assist emergency personnel.
7. Report incident

Chemical Spill on Body

1. Flood exposed area with running water from faucet or safety shower for at least 5 minutes.
2. Remove contaminated clothing at once.
3. Make sure chemical has not accumulated in shoes.
4. Obtain medical attention, if necessary.
5. Report incident.

b- Spill Clean Up of Biological Agents

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.

As part of the biosafety program, Laboratory has a spill response kit with appropriate personal protective clothing and clean up materials located in the laboratory and is available for use at all times. Spill kits should include absorbent material appropriate to contain the spill and reduce aerosols.

All biological spills must be attended to immediately. The approach that take will depend on the risk group of the biological material, the volume and location of the spill.



Biological Spill Kit

A basic biological spill kit should include:

Personal Protective Equipment Materials: Appropriate disinfectant , bottle for making dilutions of disinfectant , paper towels or other suitable absorbent materials , forceps or tongs , sharps container for broken glass or needle, dust pan with broom , yellow biohazard trash bags , biohazard spill alert notice , biological spill response procedure and emergency contact numbers.



1- General Spills Clean-up Procedure (outside of biological safety cabinet)

• Small spill of Risk group 1 or 2 material (< 100mls)

1. Alert people in immediate area of spill.
2. At a minimum, wear disposable gloves and face protection.
3. Cover spill with paper towel or other absorbent material.
4. Carefully pour a freshly prepared 1:10 dilution of household bleach (or other effective disinfectant) around the edges of the spill and then into the spill. Avoid splashing.
5. Allow a 20-minute contact period for bleach (or as indicated as effective time for different disinfectant). If broken glass is present, use forceps to remove and place glass in sharps collection container.
6. Use paper towels to wipe up the spill, working from the outer edges into the center.
7. Clean spill area again as indicated in steps 4 and 5.
8. Depending on the size and concentration of the spill, a third disinfection (steps 4 and 5) may be warranted.
9. Discard disinfected disposal materials. Items that do not contain large amounts of bleach may autoclaved according to the Medical Waste Management Policy before disposal.

• Spill Involving Concentrated Microorganisms Required BSL 3 Containment (e.g. Mycobacterium tuberculosis, (TB) cultures)

Attend to injured or contaminated persons and remove them from exposure. Alert people in the area to evacuate. Close doors to affected area; do not enter area for at least one hour. Have a person knowledgeable of the incident and area assist in proper cleanup.

Wearing gowns, gloves, respirator, and shoe covers, clean up spills as indicated for biohazard spill clean-up.

• Large spill of Risk group 1 material (> 100mls)

1. Get help if required.
2. Clean up procedure is the same as for small risk group 1 spills only on a larger scale.
3. Notify the lab manager or supervisor that there has been a spill.

• Large spill of Risk group 2 material (> 100mls)

1. Get Help.
2. Contact the lab manager immediately.
3. Keep people out of the area
4. If the spill is potentially infectious the area must be vacated for 30 minutes to allow aerosols to settle before the clean- up procedure can commence.
5. Follow the instructions inside the Biohazard Spill kit.
6. Remove and decontaminate any PPE (including lab coats) according to laboratory protocols.
7. Report the incident.

2- Spill in a Biological Safety Cabinet

1. Ensure that the cabinet is on and continues to operate during the clean-up procedure
2. Put on PPE
3. Remove any sharp objects with forceps
4. Cover the spill with absorbent material and dispose of in the biological waste bin
5. All surfaces must be decontaminated. Cover the affected area with suitable disinfectant (e.g. 1:10 dilute of sodium hypochlorite) and leave for the appropriate contact time (e.g. 30 minutes).

6. Ensure that the surfaces below the work area are also treated.
7. After decontamination thoroughly rinse the surface to remove any remaining bleach because it can corrode stainless steel.
8. Items in the BSC at the time of the spill must be thoroughly cleaned with 70% ethanol prior to removal from the BSC and/or bagged for removal and autoclaved.
9. Wipe the inside of the cabinet with 70% ethanol and allow BSC to run for 10 minutes prior to resuming work.
10. Remove and decontaminate any PPE (including lab coats) according to laboratory protocols.
11. Report incident.

3- Spill in a centrifuge

A biological spill in a centrifuge has the potential for creating aerosols. As soon as the operator becomes aware of a spill immediate action is required.

1. Turn off centrifuge. Do not open the centrifuge for 30 minutes to allow the aerosols to disperse and settle; place a note warning other not to open it.
2. Allow 30 minutes settling time before cleaning up procedures commence.
3. Put on PPE. Remove all debris.
4. Place contaminated equipment in leak proof bag and if possible, transfer to Biological Safety cabinet for disinfection
5. Disinfect (1:10 dilute of sodium hypochlorite) the interior of the centrifuge and the head (or cups).
6. All debris must be collected, bagged, autoclaved, and disposed of appropriately
7. Remove and decontaminate any PPE (including lab coats) according to laboratory protocols.
8. Report spill.

4- Biological Spill on Body

1. Remove contaminated clothing.
2. Vigorously wash exposed area with soap and water for 1 minute.
3. Obtain medical attention, if necessary.
4. Report incident

5- Hazardous Material Splashed in Eye

1. Immediately rinse eyeball and inner surface of eyelid with water continuously for 15 minutes.
2. Forcibly hold eye open to ensure effective wash behind eyelids.
3. Obtain medical attention.
4. Report incident.

6- Minor Cuts and Puncture Wounds

1. Vigorously wash injury with soap and water for several minutes.
2. Obtain medical attention.
3. Report incident.

Reference:

Flayyih MT, AL-Hmoud N D, Belbaisi A, & Al-Sanouri T.(2020). Training and educational materials on biosafety and biosecurity. The biological risk management

handbook. Produced by Iraqi ministry of higher education and scientific research and ministry of health.

<https://www.bing.com/videos/riverview/relatedvideo?q=Mercury%20spills%20%20%2020ABSA&mid=F77C363F14399F844039F77C363F14399F844039&ajaxhist=0>

<https://www.bing.com/videos/riverview/relatedvideo?q=Mercury%20spills%20%20%2020ABSA&mid=F77C363F14399F844039F77C363F14399F844039&ajaxhist=0>

<https://www.bing.com/videos/riverview/relatedvideo?&q=Major+Chemical+Spill&&mid=5111C7B498EA12B4C6CF5111C7B498EA12B4C6CF&&FORM=VRDGAR>

<https://www.bing.com/videos/riverview/relatedvideo?&q=Biological+Spill+on++EYES&&mid=544F5552275068122823544F5552275068122823&&FORM=VRDGAR>

Prepared by Assist Prof. Dr. Zainab Khudhur Ahmad