

Biological Spills, Contamination, Potential Infection

Laboratory accidents that may result in infection arise primarily from needlesticks or other cuts; hand to mouth contamination (poor lab technique, poor housekeeping or contamination through spills); failure to wear PPE resulting in splashes into the eyes or infection through breaks in the skin. Aerosolization of biological materials is another potential source of a laboratory acquired infection, especially resulting from accidents involving dropping a microbial loaded plate or growth flask; centrifuge rotor leaks; blocked syringe filters or syringe failures; and aerosolization of particles during pipetting, vortexing, centrifuging, homogenizing; or malfunction of equipment. (See Bennett, A. and Parks, S. (2006) Microbial aerosol generation during laboratory accidents and subsequent risk assessment. J. of Applied Microbiology 100 658-663 and the following [study on laboratory acquired viral infections](#).)

Researchers should be aware of the hazards of each operation within an experiment, and must follow protocols designed to minimize the potential for a laboratory accident:

- Become knowledgeable about the hazards related to the research and carefully plan each step of the experiment
- Work in a Biological Safety Cabinet; use sealed rotor cups, and take other precautions developed in consultation with the Biological Safety Office
- Wear appropriate [PPE](#) and change as needed
- Check equipment carefully before use, and use equipment as designed
- Wash hands; decontaminate surfaces
- Know how to respond to a spill or lab accident – contact [Biological Safety](#) for a spill kit

The proper procedures to deal with biological spills vary depending on the infectious agent, quantity and location of the event. However, in order to quickly clean-up a biological spill, your laboratory should keep a spill kit handy. A spill kit should include:

- Concentrated disinfectant (chlorine bleach or Lysol®).
- Packages of paper towels
- Forceps to pick up broken glass
- Household rubber gloves
- Utility gloves
- Several biohazard bags

[BSL2](#) and [BSL3](#) practices require different approaches in how to deal with a spill. Follow the procedures listed below in the event of a biological spill or contact [Biological Safety](#) for assistance.

Summary of Biological Spill Response

Hazard Type	Where	Initial Step	Minimum PPE	Clean Up
BSL-1	In a Biosafety Cabinet	Leave Cabinet On	Goggles, Heavy Gloves, Lab Coat	Spray disinfectant, let sit 20 min. Mop up with paper towels

	Outside a Biosafety Cabinet	Absorb spill and apply disinfectant		Cover spill with disinfectant from outside ring. Mop up with paper towels
BSL-2	In a Biosafety Cabinet	Leave Cabinet On	Goggles, Heavy Gloves, Lab Coat	Spray disinfectant, let sit 20 min. Mop up with paper towels
	Outside a Biosafety Cabinet	Absorb spill and apply disinfectant	Face mask (dust mask or HEPA are best), Goggles, Heavy Gloves, Lab Coat	Cover spill with disinfectant from outside ring. Mop up with paper towels
BSL-3	Anywhere	Evacuate area, call for help	Serious Accident: Notify supervisor and call 644-5374 immediately.	
Blood	Anywhere	Absorb spill and apply disinfectant	Goggles, Heavy Gloves, Lab Coat	Cover spill with disinfectant from outside of spill inward. Mop up.
Radioactive + Biological Material	Anywhere	Block off area, call Radiation Safety Office or the Biological Safety Office	Varies with radionuclide	Inactivate biological spill first, then deal with radioactivity.

Disinfection

Disinfection is an infection control practice that is widely used. The purpose of disinfection is to destroy all organisms that could pose a hazard to humans. For practical reasons, chemical disinfection is used in the clean-up of spills and to decontaminate surfaces.

Different disinfectants operate by different mechanisms, and some are more effective than others. The effectiveness of a particular disinfectant will often vary from organism to organism. For example, quaternary ammonium compounds are effective for destroying: fungi, bacteria, and lipophilic viruses, such as Human Immunodeficiency Virus (HIV), and Hepatitis B Virus (HBV); however, they are not effective for destroying spores. In addition, they are not generally effective for destroying *Mycobacterium tuberculosis* or hydrophilic viruses.

Using disinfectant products, requires strict adherence to the usage instructions on the label. Also note the concentration of certain disinfectants can greatly impact the effectiveness. In most cases, a higher concentration increases microbial killing power and decreases time necessary for disinfection.

Types of Disinfectant

Bleach solution:

Recommended by the Centers for Disease Control and Prevention (CDC), a diluted bleach solution of sodium hypochlorite (household bleach) diluted to 1:10 proportions (1 cup of bleach to 9 cups of water) is acceptable for clean-up of a contaminated surface or item. However, it may be corrosive, such as for steel equipment, and not compatible with certain environmental surfaces, such as cloth and carpet, therefore it may not be an appropriate choice for all situations. Note: **Bleach solutions should be mixed fresh, within the last day.**

Registered tuberculocidal disinfectant:

The CDC states that a U.S. Environmental Protection Agency (EPA)-registered tuberculocidal disinfectant, or EPA-registered disinfectants are effective against both HIV and HBV. A list of registered tuberculocidal disinfectant can be found on this [website](#).

Other products:

Glutaraldehyde, hydrogen peroxide (3-6%), and iodophors are also effective for destroying bloodborne pathogens. Although isopropyl alcohol and ethanol will inactivate HIV and HBV, these disinfectants evaporate rapidly so sufficient contact time may be difficult to achieve. In order to assure adequate disinfection, the recommended contact time should be at least 10 minutes.

Bloodborne Pathogens

HIV and HBV are of concern because of potential consequences associated with infection. HIV and HBV are bloodborne infectious agents. Both HIV and HBV are lipophilic viruses and therefore susceptible to a variety of disinfectants.

Spills Inside a Biological Safety Cabinet

- LEAVE THE CABINET TURNED ON.
- While wearing gloves, spray or wipe cabinet walls, work surfaces and equipment with disinfectant. If necessary, flood the work surface, as well as drain pans and catch basins below the work surface, with a disinfectant and allow at least 20 minutes contact time.
- Soak up the disinfectant and spill with paper towels.
- Drain the catch basin into a container. Lift 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.
- Autoclave all clean-up materials and protective clothing.
- Wash hands and exposed skin areas with disinfectant.
- The [Biological Safety](#) Office should be notified if the spill overflows into the interior of the cabinet. It may be necessary to do a more extensive cabinet decontamination.

Small Spills of BSL-2 Material Outside of a Safety Cabinet

- Wearing appropriate PPE such as gloves and a lab coat.
- Pick up broken glass with forceps and place in sharps container.
- Cover the spill with paper towels and apply appropriate disinfectant.
- Allow sufficient contact time with disinfectant (usually >20 minutes).
- Pick up towels and discard into biohazard waste container.

- Re-wipe the spill area with disinfectant and wash your hands with soap or hand washing disinfectant.

Large Spills of BSL-2 Material Outside of a Safety Cabinet

GET HELP! (Call 644-5374, 644-6895, or FSUPD after hours at 644-1234)

- Keep people out of the area to prevent spread of the contamination. Post sign.
- Remove any contaminated clothing and put it into a biohazard bag for decontamination later.
- Wash hands and exposed skin and inform your supervisor about the spill.
- Put on protective clothing (lab coat, gloves and, if indicated, face protection and shoe covers) and assemble clean-up materials (disinfectant, autoclavable container or bag, forceps and paper towels).
- Pick up any broken glass with forceps and dispose of it in Sharps container.
- Apply disinfectant and mix it into the spill. Take care not to over-dilute the disinfectant.
- After at least 20 minutes contact time, clean-up liquids, reapply disinfectant, allow 20 minutes contact time and wipe the spill area
- Collect all contaminated materials for decontamination and wash your hands with soap or hand washing disinfectant.

Blood Spill

If you are current in [bloodborne pathogens training](#) at FSU, perform the following steps:

- Wearing gloves and if necessary a laboratory coat or smock.
- Pick up any broken glasses or sharps with tongs or other mechanical means. DO NOT pick up broken glass or sharps while just wearing standard laboratory gloves.
- Absorb blood with paper towels.
- Using a detergent solution and clean the spill site of all visible blood.
- Wipe down the spill site with paper towels soaked in a disinfectant such as chlorine bleach, diluted 1:10.
- Discard all contaminated materials in a biohazard waste container.
- Wash your hands with soap or hand washing disinfectant.

If you are not trained or need assistance, contact EH&S at 644-5374, 644-6895, or FSUPD after hours at 644-1234.

Any BSL-3 Spill Outside of a Safety Cabinet

A [BSL3](#) spill outside a biosafety cabinet is a very serious event. As many [BSL3](#) agents are respiratory pathogens, everyone in the room is at risk of becoming infected. It is very important that everyone leaves the room and no cleanup is attempted without specialized equipment.

If the spill is outside a biosafety cabinet:

- Immediately alert all persons nearby.
- Leave the biosafety cabinet on.

- Avoid breathing vapors of the spilled material.
- Evacuate the area and close the door to the laboratory facility. Put a “DO NOT ENTER” sign on the door.
- Call the BSL3 Facility Director or [Biological Safety](#) for assistance. Be prepared to provide the identity, amount and location of the spill, as well as your location, names of those at the scene and a phone number where you can be reached (not your lab phone, since you should not remain in the lab after the spill).

Spill of Biological Radioactive Material

A biohazardous spill involving radioactive material requires emergency procedures that are different from the procedures used for either material alone. Use procedures that protect you from the radionuclide as you disinfect the biohazardous material.

- Avoid inhaling airborne material and quickly leave the room.
- Notify others to leave the affected area.
- Close door and post with warning sign.
- Remove any contaminated clothing, turn exposed areas inward and place in a biohazard bag.
- Wash any exposed skin such as with soap and tepid water or flushing for several minutes. TAKE CARE TO NOT BREAK OR DAMAGE SKIN!
- Inform your supervisor and [Radiation Safety](#) (644-8802) of the spill and monitor all exposed personnel for radiation. If assistance is needed in handling the biological material, contact the [Biological Safety](#) (644-5374).

Before any clean-up, consider the type of radionuclide, the characteristics of the biological material and the volume of the spill. Contact [Radiation Safety](#) for specific isotope clean-up procedures.

- After any exposed personnel have been attended to, you can clean-up the area.
- Assemble clean-up materials (such as disinfectant, forceps, towels, sponges and waste receptacles).
- Confirm with the Radiation/Biological Safety Officer that it is safe to enter the lab and to get assistance with clean-up and waste disposal efforts.
- Clean up the material, if you have proper [training](#) and it is safe to do so, using appropriate techniques and [Universal Precautions](#).

The waste involved in this type of clean-up is called “mixed-waste” because it contains biological infectious agents and radioactive material. Therefore, it must be labeled with a “radioactive material” tag and the “biohazard symbol” and kept separate from unmixed wastes.

Additional Information and Resources

- Decontamination methods are also discussed in the BMBL found at <http://www.cdc.gov/biosafety/publications/bmb15/>
- For information about particular disinfectants and manufacturers,

- Purdue National Biosecurity Resource Center at <http://www.biosecuritycenter.org/disinfect.php>
- Extensive CDC resources at <https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html>