



BIOLOGICAL DECONTAMINATION OF LABORATORY EQUIPMENT

Scope

This SOP describes decontamination of laboratory equipment that has been used with biological agents, including recombinant/synthetic nucleic acids. Surface decontamination methods described in this document are appropriate and required for laboratory equipment used with or exposed to biological materials prior to the equipment's relocation, decommissioning/disposal, or transport for authorized repair.

Any equipment authorized for use with radioactive material (RAM) **MUST** be decontaminated/decommissioned by EHS Radiation Safety staff prior to relocation, repair, or disposal. This shall occur **prior to** final biological decontamination. Please contact the EHS Assistant Radiation Safety Officer for additional guidance.

References

The content of this SOP is based on the following:

- *Biosafety in Microbiological and Biomedical Laboratories (BMBL)*, 5th ed. U.S. Dept. of Health and Human Services (CDC and NIH), 2009.
- NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules, U.S. Dept. of Health and Human Services (NIH), April 2019.

Supplemental EHS SOPs

The following EHS SOPs provide additional guidance relative to certain aspects of this SOP:

- Chemical Disinfectants for Biohazardous Materials
- Biosafety Cabinets
- Autoclave Operation and Use
- Personal Protective Equipment for Chemical Exposures

Means of Decontamination

Use of UV light as a sole means of equipment decontamination is **NOT** sufficient or acceptable. Decontamination must be achieved with an appropriate EPA registered chemical disinfectant known to be effective against the agent(s) in use. When using chlorine-based

disinfectants on stainless steel surfaces, follow disinfectant treatment with a wipe down with water to remove chlorine residues, followed by either a 70% ethanol or 70% isopropanol solution.

In addition to standard laboratory attire, proper PPE to be used when decontaminating laboratory equipment are: *chemical resistant gloves, eye protection, and lab coat*. It is always advisable to be familiar with hazards associated with chemical disinfectants, which may be found on the product label and Safety Data Sheet.

Specific Laboratory Equipment Decontamination

A) Biosafety Cabinet (BSC):

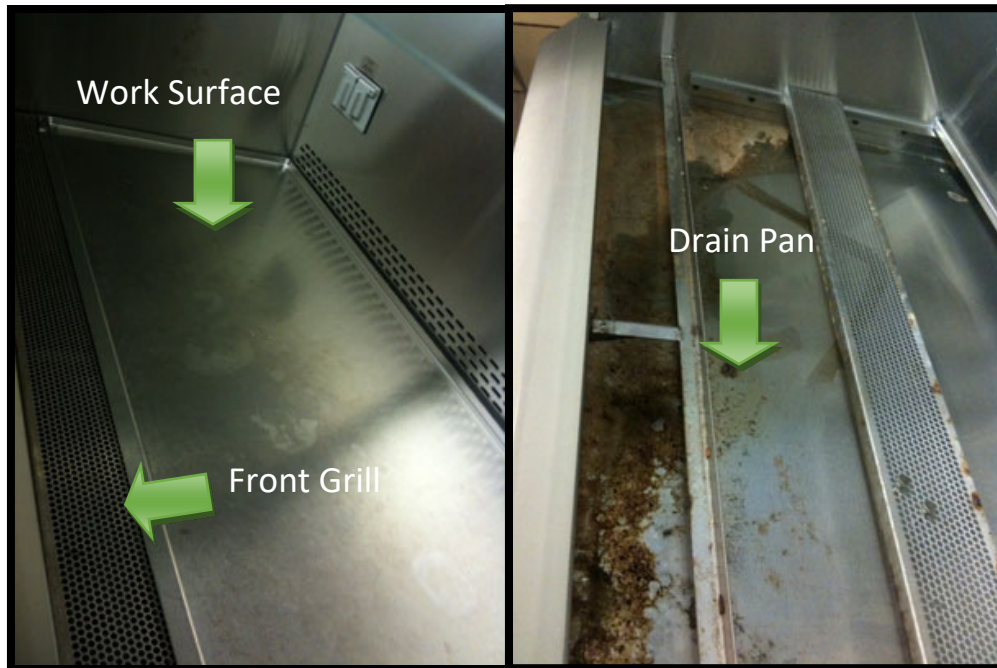
Following chemical surface disinfection, biological safety cabinets used with human pathogens, including zoonotics, must undergo gaseous disinfection prior to relocation, decommissioning/disposal, or repair. Gaseous decontamination is also required for cabinets in which other human derived materials (i.e., human tissue, cell lines) have been manipulated. Gaseous decontamination must be performed by an authorized BSC technician or BSM staff, and shall not be attempted by laboratory workers. If gaseous decontamination is indicated based on use of the biosafety cabinet, contact BSM to schedule decontamination.



Surface decontamination alone is sufficient for BSCs that have been used with biological agents that are *not* human pathogens.

Recommended chemical decontamination procedure

1. With the cabinet blower on, surface decontaminate and remove all materials, reagents, and waste containers from the cabinet and either store or discard properly.
2. Clean up any spills which may have resulted from removal of materials from the BSC and discard properly.
3. Make sure the plenum drain valve (located underneath the front of the cabinet) is closed, and spray disinfectant into the front grill of the cabinet. Liberally apply disinfectant to the work surface, side walls, back wall, and inside of sash. **DO NOT** spray the ceiling of the cabinet workspace as the HEPA filter could be damaged by the disinfectant. Allow disinfectant to remain on the surfaces for at least 10 minutes or as recommended on the disinfectant product label.
4. Raise the workspace grill and work surface (it should lift up in some manner) and liberally apply the disinfectant to the underside and all surfaces beneath. You may need something or someone to hold the work surface up while you spray disinfectant. Allow disinfectant to sit for at least 10 minutes, or as recommended on the disinfectant product label.



5. Following use of a chlorine-based disinfectant, wipe down **all** surfaces (including **underneath** the workspace and grill) with water, followed by 70% ethanol or 70% isopropanol (v/v, diluted in water) to remove any residue left by the disinfectant. This will help prevent subsequent corrosion of cabinet surfaces.
6. After decontaminated surfaces have dried, replace the workplace grill, close the sash, and turn off the blower.
7. For relocation, repair or decommissioning, also wipe down all external surfaces of the biosafety cabinet with an appropriate disinfectant, allowing sufficient contact time.



Important: If being sent for repair or being decommissioned/discarded, be sure to remove any biohazard stickers after decontamination.



DO NOT use the BSC once it has been decontaminated for relocation, repair, or decommissioning. Place a sign on the equipment indicating date of decontamination. (See **Appendix A** for a sample sign)



When the BSC is moved to the new laboratory, it **must be recertified** by an appropriately trained service technician prior to use.

B) Incubator

1. Remove all materials from the incubator and either store or discard appropriately.

2. Turn off incubator power supply and unplug from the source outlet.
3. Clean up any spills which may have resulted from material removal and discard appropriately.
4. Remove any modular shelving and liberally apply disinfectant to top, bottom, and sides of shelves. Allow disinfectant to remain on the surfaces for at least 10 minutes or as recommended on the disinfectant product label.
5. You may also autoclave the shelves if compatible with exposure to autoclave temperatures of $\geq 121^{\circ}\text{C}$.
6. Liberally apply disinfectant to all surfaces inside the incubator, including the inside of the door and gaskets. Allow sufficient contact time for disinfectant (at least 10 minutes or as recommended on disinfectant label).
7. Following use of a chlorine-based disinfectant, wipe down metal surfaces (including shelving) with water, then 70% ethanol or 70% isopropanol (v/v, diluted in water) to remove any residue left by the disinfectant. This will help prevent subsequent corrosion of surfaces.



Important: If being sent for repair or being decommissioned/discarded, be sure to remove any biohazard stickers after decontamination.



DO NOT use the incubator once it has been decontaminated for relocation, repair, or decommissioning. Place a sign on the equipment indicating date of decontamination. (See **Appendix A** for a sample sign) If necessary, tape the door shut to prevent opening during transport.

C) Growth Chamber

1. Remove all materials from the growth chamber and either store or discard properly.
2. Turn off power supply and unplug from source outlet if possible.
3. Clean up any spills or residual organic material with soap and water and discard properly.
 - a. Remove any modular shelving and liberally apply disinfectant to top, bottom, and sides of shelves. Allow disinfectant to remain on the surfaces for at least 10 minutes or as recommended on disinfectant label. Alternatively, the shelves could be autoclaved at $\geq 121^{\circ}\text{C}$ if they will tolerate heat treatment.
4. Liberally apply disinfectant to all surfaces inside the chamber, including the inside of the door and gaskets.
5. Following use of a chlorine-based disinfectant, wipe down all metal surfaces (including shelving) with water, then 70% ethanol or 70% isopropanol (v/v, diluted in water) to remove any residue left by the disinfectant. This will help prevent subsequent corrosion of surfaces.
6. Replace the shelving inside the unit, and close the door.

- If chamber light bulbs require replacement, dispose of used bulbs via EHS.



Important: If being sent for repair or being decommissioned/discarded, be sure to remove any biohazard stickers after decontamination.



DO NOT use the growth chamber once it has been decontaminated for relocation, repair, or decommissioning. Place a sign on the equipment indicating date of decontamination. (See **Appendix A** for a sample sign)

D) Refrigerators/Freezers

For relocation of refrigerators/freezers, you have two decontamination options. If the refrigerator or freezer is being sent for repair, decommissioned/discarded, or sent to UNL inventory, you **must use** Option 2.

Option 1: Relocate the equipment without removing samples and defrosting the refrigerator/freezer. Follow these steps if you choose this option:

- Clean and decontaminate all external surfaces with an appropriate disinfectant, allowing for sufficient contact time as recommended by the manufacturer of the disinfectant.
- Once decontaminated, place signage on the equipment indicating that it is “**out of service.**” (See Appendix A for a sample sign)
- Seal the refrigerator/freezer using shrink wrap, tape, etc., so it cannot be opened.
- Just prior to relocating the equipment, power off (if necessary) and unplug the equipment from the outlet.
- Once relocated to its new location, remove any shrink wrap, and plug the refrigerator/freezer in to an outlet. Turn on the power and ensure operating temperature is achieved.
- Check for any damaged materials and clean as needed.

Option 2: Remove samples from the refrigerator/freezer and defrost entirely prior to relocation. This option requires internal as well as external surface decontamination. Follow these steps if you choose this option:

Plan for 2 days of freezer downtime during this process.

- Remove all materials from the refrigerator or freezer and either store or discard properly.
- Turn off power supply and unplug from source outlet. Unplug the freezer in the morning. This allows you to monitor runoff throughout the day.

- i. Never use sharp objects to chip at the ice. Freezer walls are easily punctured by sharp objects, allowing coolant to escape and resulting in expensive repairs or replacement costs.
 - ii. Never allow liquid to run directly onto floors creating a slip hazard, or down any floor drain. If the unit is thawed outside, do not let runoff reach the storm sewer drain.
3. Establish a wick and reservoir system to manage the melting ice:
 - i. Place a piece of bench paper (paper side down, plastic side up) inside the freezer, on the lower level and lead it into a large autoclave pan.
 - ii. Surround the freezer and autoclave pan with paper towels or bench paper.
 - iii. Manage contaminated ice and liquid by collecting it and add 1 part bleach to 9 parts melted ice and liquids.
 - iv. Allow 20 minutes of contact time before pouring the melted ice down the drain.
4. Clean up any spills or residual organic material with soap and water and discard properly.
5. Remove any modular shelving and liberally apply disinfectant to top, bottom, and sides of shelves. Allow disinfectant to remain on the surfaces for at least 10 minutes or as recommended on The disinfectant product label.
6. Liberally apply disinfectant to all surfaces inside the refrigerator/freezer, including the inside of the door and gaskets.
7. Following use of a chlorine-based disinfectant, wipe down all metal surfaces (including shelving) with water, then 70% ethanol or 70% isopropanol (v/v, diluted in water) to remove any residue left by the disinfectant. This will help prevent subsequent corrosion of surfaces.
8. Replace the shelving inside the unit, and close the door.



Important: If being sent for repair or being decommissioned/discarded, be sure to remove any biohazard stickers after decontamination.



DO NOT use the refrigerator/freezer once it has been decontaminated for relocation, repair, or decommissioning. Place a sign on the equipment indicating date of decontamination. (See **Appendix A** for a sample sign)

E) Portable/tabletop autoclaves

These units are often self-contained, providing steam from a water reservoir within the unit. Prior to transport, verify the water reservoir is completely empty and any residual water or spilled material is removed from the chamber.



Important: If being sent for repair or being decommissioned/discarded, be sure to remove any biohazard stickers after decontamination.



DO NOT use the autoclave once it has been decontaminated for relocation, repair, or decommissioning. Place a sign on the equipment indicating date of decontamination. (See **Appendix A** for a sample sign)

F) Bioreactors/Fermenters

This specialized equipment is designed for complete disassembly after use and is often sterilized by autoclaving. Please consult the equipment user's manual for disassembly and decontamination instructions.



Important: If being sent for repair or being decommissioned/discarded, be sure to remove any biohazard stickers after decontamination.



DO NOT use the bioreactor/fermenter once it has been decontaminated for relocation, repair, or decommissioning. Place a sign on the equipment indicating date of decontamination. (See **Appendix A** for a sample sign)

G) Centrifuges

1. Turn off power supply and unplug from source outlet.
2. Clean up any spills or residual organic material with soap and water and discard properly. Using tongs or forceps, place broken glass in a biohazard sharps container.
3. Remove any rotors and baskets/buckets and liberally apply disinfectant on all surfaces of the rotor and baskets/buckets. Allow disinfectant to remain on the surfaces for the time recommended by the manufacturer. If rotor is not removable, apply disinfectant in place and be sure to wipe the underside of the rotor if possible.

Note: *Some centrifuge rotors and buckets can be autoclaved. Consult the equipment user's manual for additional guidance.*

4. Liberally apply disinfectant to all surfaces inside the centrifuge, including the inside of the lid and gaskets.
5. Wipe down the exterior of the centrifuge with disinfectant.
6. Following use of a chlorine-based disinfectant, wipe down all metal surfaces (including rotors) with water, then 70% ethanol or 70% isopropanol (v/v, diluted in water) to remove any residue left by the disinfectant. This will help prevent subsequent corrosion of surfaces.
7. If the centrifuge is equipped with a vacuum pump and HEPA filter, contact EHS for assistance in determining if decontamination of the tubing and pump is necessary.

8. Replace the rotor in the centrifuge, and close the lid. *If the unit is being discarded or sent for repair, do not put the rotor back into the centrifuge.*



Important: If being sent for repair or being decommissioned/discarded, be sure to remove any biohazard stickers after decontamination.



DO NOT use the centrifuge once it has been decontaminated for relocation, repair, or decommissioning. Place a sign on the equipment indicating date of decontamination. (See **Appendix A** for a sample sign)

H) Miscellaneous equipment (shaker/rocker platforms, vortex mixers, etc.)

Consult the equipment user's manual for proper disassembly. Exposed surfaces can be decontaminated as listed:

1. Unplug the unit from the power supply.
2. Liberally apply appropriate disinfectant to surfaces and allow sufficient contact time as recommended by the manufacturer.
3. Following use of a chlorine-based disinfectant, wipe down all metal surfaces with water, then 70% ethanol or isopropanol to remove any residue.



Important: If being sent for repair or being decommissioned/discarded, be sure to remove any biohazard stickers after decontamination.



DO NOT use the equipment once it has been decontaminated for relocation, repair, or decommissioning. Place a sign on the equipment indicating date of decontamination. (See **Appendix A** for a sample sign)



Appendix A

Signage for Equipment Decontamination

Out of Service

The equipment listed below has been decontaminated and should not be used until further notice.

Equipment Description: <i>(Include serial or ID numbers if known)</i>		
Location <i>(Bldg., Room #)</i>		
It is scheduled to be:	<input type="checkbox"/>	Relocated
	<input type="checkbox"/>	Repaired
	<input type="checkbox"/>	Decommissioned/Inventory
	<input type="checkbox"/>	Discarded
Biological Agents Used in/with or Stored in Equipment:		
Disinfectant Used:	Date of Decontamination:	Decontamination Completed By:
	Contact Phone #	
Principal Investigator:		
Signature		Date: