



BIOLOGICAL DECONTAMINATION OF LABORATORY EQUIPMENT

Scope

This SOP describes decontamination, which is the process of removing or neutralizing contaminants, of certain laboratory equipment that has been used with biological agents, including recombinant/synthetic nucleic acids. Surface decontamination methods described in this document must use agent-specific decontamination chemicals to reduce microbial contamination of materials or surfaces to an acceptably safe level prior to the equipment's relocation, decommissioning/disposal, or transport for authorized repair.

NOTE: 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 Radiation Safety Officer for additional guidance.

References

The content of this SOP is based on the following:

- *Biosafety in Microbiological and Biomedical Laboratories (BMBL)*, Centers for Disease Control and National Institutes of Health.
- *NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules (NIH Guidelines)*, National Institutes of Health.
- *Infection Control CDC Disinfection and Sterilization Guideline for Healthcare Facilities*

Supplemental EHS Safe Operating Procedures

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

Chemical Based Means of Decontamination

Decontamination must be achieved with an appropriate EPA registered chemical disinfectant known to be effective against the specific agent(s) used. Classes of chemical disinfectants include **alcohols** (like ethanol with a bactericidal concentration of 70% for ethanol solutions in water); **aldehydes** (like formaldehyde and glutaraldehyde); **halogens and iodophors** (like iodine); **oxidizing agents** (like hydrogen peroxide and peracetic acid); **phenolic compounds**; **quaternary ammonium compounds**; and **chlorine and chlorine-based compounds** (like sodium hypochlorite).

NOTE: Chlorine and chlorine-based compounds pit stainless steel equipment like biosafety cabinets, water baths, incubators and autoclaves. 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 (v/v, diluted in water) solution.

In addition to standard laboratory attire, proper personal protective equipment (PPE) to be used when employing chemical decontaminating methods are the correct gloves for the chemical disinfectant used, eye protection, and lab coat. PPE guidance can be found on the product label and Safety Data Sheet.

Specific Laboratory Equipment Decontamination

A) Biological Safety Cabinet (BSC) Chemical Decontamination (non-spill):

Materials Needed:

- Swiffer sweeper or equivalent
- Wypall X60 style paper towels
- Pathogen specific disinfectant(s)
- Gloves
- Autoclave indicator tape
- Biohazard autoclave bags
- Marker

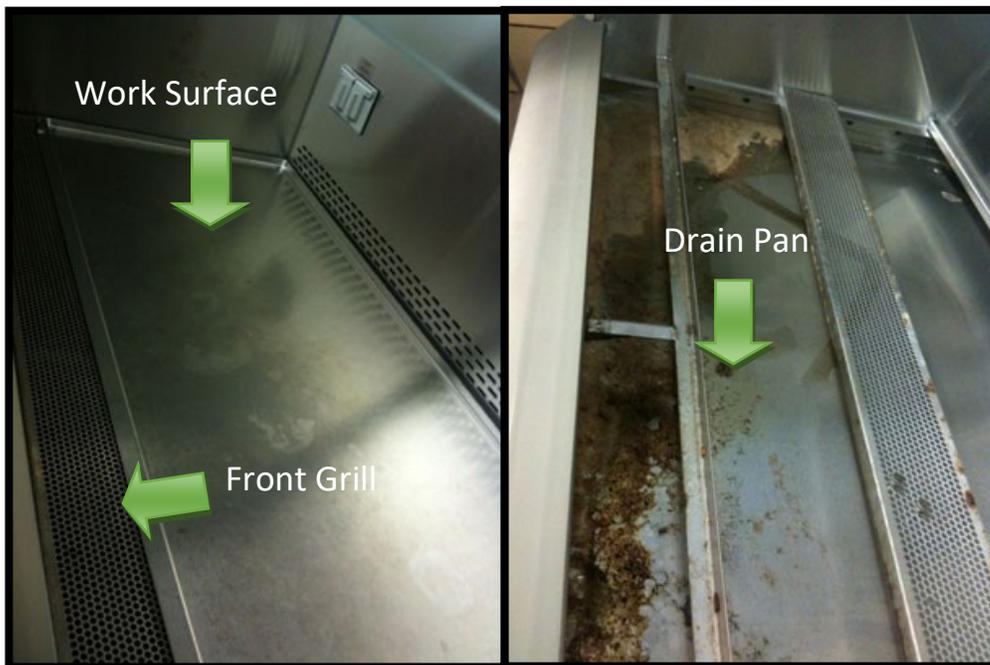
Procedure:

1. With the cabinet blower on, liberally **pour** pathogen-specific disinfectant down the front grill/air vent of the cabinet and let it sit (have the proper contact time) while cleaning the work area of the cabinet.



- a. Note: Place autoclavable waste bag(s) in the biosafety cabinet to collect all waste during this decontamination procedure.
2. Using pathogen specific disinfectant and thick paper towels (Wypall™ towels work well), wipe down any material inside the biosafety cabinet, provide proper contact time, and then remove materials from the cabinet.
3. Using a Swiffer™ sweeper and thick paper towel(s) (Wypall™ towels work really well), attach the towel to the Swiffer™, liberally apply disinfectant to the towel, and wipe down the side walls, back wall, and work surface.
 - a. Use your gloved hand and a paper towel to also wipe the inside of the sash.
 - b. **DO NOT** spray the ceiling of the cabinet workspace as the HEPA filter could be damaged by the disinfectant.
 - c. Allow disinfectant to remain on the surfaces for the proper contact time as indicated on the bottle or product label
4. Summon an individual (lab mate or biosafety staff) to help with the rest of the cleanup process.
 - a. As a team:
 - i. Slightly raise the workspace grill and work surface (it should lift up in some manner).
 1. You may need someone to hold the work surface up while you move the front grill/air vent onto the work surface to disinfect.
 2. Wipe each piece with a generous amount of pathogen-specific disinfectant and allow proper contact time before removing the piece from the cabinet.
 - ii. For the work surface area, (this will take both people) both individuals will hold the work area up and you work together to clean the stainless steel of the underside of the work area. Give the work surface the full contact time with the disinfectant and then together remove the work surface from the cabinet and set aside.
 - iii. **Using a Swiffer™ sweeper, or equivalent**, clean the drain pan/ undercarriage of the BSC. This part may take a while depending on how often your cabinet is regularly cleaned.

1. DO NOT USE YOUR HANDS as sharps ARE present!
 2. Use forceps to place sharp objects in a sharps container.
 3. Have a person not already assisting to help by providing new paper towels, as necessary.
 4. Replace gloves (or outer pair of gloves if double gloved) accordingly.
- iv. Wipe down the biohazard waste bags with pathogen specific disinfectant, seal the bag and remove from the BSC.
- v. Wipe down the BSC parts with 70% ethanol and place the parts back into the BSC.



5. Wipe down all external surfaces of the biosafety cabinet (work surface, front grill, drain pan) with an appropriate disinfectant for relocation, repair or decommissioning.

Following chemical *surface* disinfection, biological safety cabinets must undergo *gaseous* decontamination (hydrogen peroxide, chlorine dioxide gas, or formaldehyde) prior to relocation, decommissioning/disposal, or repair due to the internal properties of the equipment (plenum, blower, motor, HEPA filters) not getting surface decontaminated. Gaseous decontamination must be performed by an authorized BSC certified technician

or University of Nebraska-Lincoln Building Systems Maintenance (BSM) BSC trained staff member. Work with the Building Maintenance Reporter (BMR) in your building to schedule gaseous decontamination.



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/ Environmental/ Growth Chamber decontamination

Procedure:

1. Remove all biological/ liquid materials from the incubator and either store or discard appropriately.
2. Turn off incubator power supply and unplug from the source outlet.
3. Properly clean up any spills which may have resulted from material removal and discard appropriately.
4. Liberally apply agent-specific disinfectant to a thick paper towel (Wypall 60 works well) and disinfect the top, bottom, and sides of shelves. Allow disinfectant to remain on the surfaces for the proper contact time 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 agent-specific disinfectant to a thick paper towel and wipe all surfaces inside the incubator, including the inside of the door and gaskets. Allow sufficient contact time for disinfectant (as recommended on disinfectant label).

Note: You may want to wipe down the metal surfaces (including shelving) with water or 70% ethanol or 70% isopropanol (v/v, diluted in water) to remove any residue left by the disinfectant.

7. Wipe down all external surfaces with an appropriate disinfectant for relocation, repair or decommissioning.



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) 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 the University of Nebraska-Lincoln 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:

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



NOTE: Plan for 2 days of freezer downtime during this process.

1. Remove all materials from the refrigerator or freezer and either store or discard properly.
2. 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, 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. Do not thaw the unit outside of the lab.
3. Establish a wick and reservoir system to manage the melting ice:
 - i. Place a large autoclave or thick garbage bag 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, industrial towels, or bench paper.
 - iii. Collect ice and contaminated liquid by collecting it in the autoclave pans and add 1 part bleach to 9 parts liquid.
 - iv. Allow 20 minutes of contact time before pouring the melted liquid down the drain.
4. Disinfect any spills or residual organic material, provide proper contact time and autoclave/ discard properly.
5. Disinfect shelving. Allow disinfectant to remain on the surfaces for the contact time located on the disinfectant product label.
6. Liberally apply agent-specific disinfectant to thick paper towels and wipe all surfaces inside the refrigerator/freezer, including the inside of the door and gaskets.
7. Following use of the agent-specific disinfectant, wipe down all metal surfaces (including shelving) with water or 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.

9. Wipe down all external surfaces, including the floor with an agent-specific disinfectant for relocation, repair or decommissioning.



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)

D) 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. Wipe down all external surfaces, including the floor with an agent specific disinfectant for relocation, repair or decommissioning.



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 the date of external decontamination. (See **Appendix A** for a sample sign)

E) 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)

F) Centrifuges

1. Turn off power supply and unplug it from the source outlet.
2. Remove any rotors and baskets/buckets and disinfectant all surfaces of the rotor, baskets/buckets/ lids. Allow disinfectant to remain on the surfaces for the time recommended by the manufacturer. If the 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.*
3. Liberally apply agent-specific disinfectant to all surfaces inside the centrifuge, including the inside of the lid and gaskets.
4. Wipe down the exterior of the centrifuge with disinfectant.
5. Following use and contact time of agent-specific disinfectant, a wipe down of all metal surfaces (including rotors) with water or 70% ethanol or 70% isopropanol (v/v, diluted in water) may be needed to remove any residue left by the disinfectant. This will help prevent subsequent corrosion or stickiness of surfaces.
6. 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.
7. 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)

G) Miscellaneous equipment (shaker/rocker, water bath, vortexers/sonicators, 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 agent-specific disinfectant to a thick paper towel, wipe down the surfaces and allow sufficient contact time as recommended by the manufacturer.
3. Following use and contact time of agent-specific disinfectant, it is recommended to wipe down all metal surfaces with water or 70% ethanol or 70% 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 Undergoing Decontamination

Print and affix to equipment

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	
Disinfectant Used:	Date of Decontamination:	Decontamination Completed By:
	Contact Phone #	
Principal Investigator:		
Signature		Date: