

## EFFECTIVE USE OF BIOLOGICAL SAFETY CABINETS (BSCs)

Class II biological safety cabinets (BSCs) are primary containment devices that are designed to provide protection for the worker and the environment as well as provide a work environment free of particulate contaminants. The effectiveness of the BSC is directly dependent on the manner in which users perform their work within the BSC.

### Understanding how the cabinet works:

- The effectiveness of the BSC is a function of three separate directional airflows: inward from the room through the front grille (this air barrier provides personal protection); downward through a high efficiency particulate air (HEPA) filter onto the work surface (providing product protection); and out of the cabinet through an exhaust HEPA filter (providing environmental protection).
- Disrupting these airflow patterns reduces cabinet effectiveness. Such disruptions may be caused by rapidly moving your arms in and out of the BSC; thermal drafts from using a Bunsen burner or open flame; people walking rapidly behind you across the face of the cabinet; down-drafts from room ventilation systems; cross-drafts from open laboratory windows or doors; blockage of the front or rear grilles.
- Boxes stored on top of BSCs may block exhaust discharge from the filters; excess materials inside the cabinet will disrupt the airflow and may compromise the containment capability of the BSC. Good laboratory housekeeping reduces the chance of contamination. Remember BSCs are engineering controls and not storage cabinets!

### General suggestions:

- Wear gloves to protect your hands from the biologicals that you work with; gloves also protect tissue cultures from microbial contamination shed by your hands. Wash your hands thoroughly after working in your BSC, after replacing gloves and when leaving the laboratory.

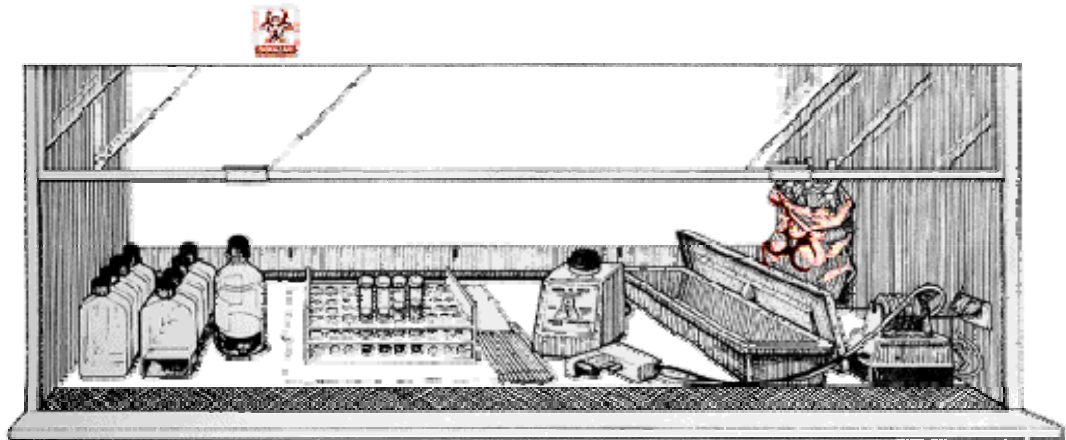
Note: Some publications recommend washing your hands with alcohol and not gloving while doing "tissue culture" work. EHS does not recommend this practice because alcohol can dry out your skin, leading to adverse dermatological conditions. Alcohol is not an EPA-approved disinfectant. Furthermore, epithelial cells, with all associated microorganisms, can slough off your hands and create contamination problems with your cultures. Hence, you should wear latex, nitrile, or equivalent gloves to protect yourself against contamination from potentially infectious materials and to protect your research material or product from contamination by your skin flora.

- A buttoned lab coat or back-closing gown will protect your street clothes; remove lab coats before leaving your laboratory.
- Please contact EHS for advice when you wish to obtain a new BSC; also contact them if you wish to move your BSC, so that arrangements can be made for cabinet decontamination and/or recertification.

- Obtain approval from Radiation Safety prior to using radioactive materials in your BSC (x5730).

### Operational suggestions:

1. Disinfect the interior surfaces of the BSC by wiping down with an appropriate EPA-approved disinfectant such as 1:10 Wescodyne, Cavicide, Dispatch or other appropriate non-corrosive decontaminant. (**Caution** 70% ethanol is not a EPA-approved disinfectant and is highly flammable -- DO NOT USE in the presence of flame or spark)
  - a. Keep the rear exhaust and the front air intake grilles clear of research objects or notebooks; arms should not rest across the front grille.
  - b. Cover the dry, disinfected work surface of the BSC with plastic-backed absorbent lab toweling to capture splatter and facilitate spill clean up; avoid covering the air intake/exhaust grilles. Replace toweling when overtly contaminated or at the end of the procedure to help assure a clean work environment.
  - c. Place all necessary items for your experiment in the BSC at this time. Keep clean items segregated from dirty items.
    1. Minimize the amount of equipment and supplies; overloading the working zone with equipment and supplies may compromise the effectiveness of your BSC.
    2. Organize your material so that dirty "contaminated" items are not passed over (cross contaminate) clean items. Work from "clean" to "dirty" areas. A good work layout of materials would position clean items, i.e., pipettes, cultures, flasks, etc. toward the front or either side of the work surface. Place your waste container and contaminated pipette trays to the rear. You should work at least six inches back from the front of the air intake grille.



- d. Assume a comfortable seating position in front of the BSC. Your chair should be adjusted to a comfortable height that promotes good ergonomic posture. When inserting your arms into the BSC remember that they are penetrating a delicate "curtain" of air. Allow the air curtain to stabilize around your arms before starting

work. Avoid making rapid, jerking arm motions. Use smooth motions that avoid disrupting the air curtain.

- e. Remember that the BSC air curtain is delicate and can only provide protection from contamination as long as it is not disrupted. The BSC is not a substitute for good microbiological practices and does not entirely provide you with protection from potentially hazardous materials or automatically prevent contamination of the experiment and materials.

## 2. Cleaning Your BSC:

When work has been completed, disinfect the exterior surfaces of potentially contaminated materials and supplies with an appropriate disinfectant prior to removing them from the BSC. Remove all materials from the interior of the BSC.

- a. Disinfect the interior BSC surfaces, including the inside of the view screen, with an appropriate disinfectant solution.

Note: The BSC blower motor should be left on continuously. This is a permissible practice. However, service life of your HEPA filters may be reduced.

- b. Examine the spill pan beneath the work surface. Clean and disinfect the spill pan at least four times per year or as necessary.

- 1. Be careful when removing interior work surfaces. They are heavy and may have sharp edges and corners. Consult your service manual or the Biosafety Officer for proper removal/maintenance procedures.
- 2. Do not clean the spill pan when a BSC blower is operating. Paper towels may be accidentally sucked into the airstream and can lodge in the blower motor and HEPA filter. Recovering paper towels can only be accomplished by decontamination and disassembly of the cabinet by the FME technician. Do not attempt retrieval yourself. Contact the Biosafety Officer, EHS (x1451) for service.

- c. Turn off the ultraviolet lamp.

- c. Discard waste materials appropriately.

- e. Remove your lab coat and gloves and then wash your hands thoroughly with a mild, antimicrobial hand soap.

## 3. While working in the BSC follow standard good microbiological practices and procedures as described in the CDC/NIH publication, Biosafety in Microbiological and Biomedical Laboratories 4<sup>th</sup> edition.

- a. Use mechanical pipetting aids. Never mouth pipette.

- b. Use horizontal pipette discard pans containing an effective disinfectant solution inside the BSC. Do not use vertical pipette discard canisters placed on the floor outside the cabinet.

- c. Waste containers including discard bags should be placed in the rear corner of the cabinet, not taped to the front of the cabinet.
  - d. If you hold open tubes and bottles as horizontal as possible inside the cabinet, it is not necessary to flame them. An open flame inside the BSC will create turbulence in the airflow and may compromise the clean environment. Open flames have been known to ignite fires in cabinets. Prolonged heat build-up may also damage the integrity of the HEPA filters.
4. Move your arms slowly to minimize disruption of the fragile air barrier when you remove items or introduce new items into the BSC.
  5. If you use a piece of equipment that creates air turbulence in the BSC (e.g., centrifuge, vortex mixer), place the equipment in the back third of the cabinet work surface; stop other work while the equipment is operating.
  6. Protect the building vacuum system from potential biohazard contamination by placing a cartridge filter (Gelman vacushield Stock #6640-1215) between the collection vessel and the vacuum shut-off valve in the cabinet. Disposable suction flasks usually have suitable built-in filters. Place disinfectant into the collection flask to decontaminate the fluids. Chemically decontaminated fluids may be poured down laboratory drains.
  7. If a spill occurs within the cabinet, allow the cabinet to run for 15 minutes before spill clean-up procedures. Wipe down the working surface with an appropriate disinfectant; wait 3-5 minutes before resuming work. If a spill occurs which runs through the grille, decontaminate the tray beneath the work surface with sufficient chemical disinfectant. This can be emptied through the tray drain into a bucket or other collection vessel. Call Biosafety for advice or assistance (x1451).
  8. Remove gloves and dispose in biohazard bag. Remove lab coat and wash hands thoroughly before leaving the lab.

<b>For Assistance</b>	<b>Contact</b>	<b>Telephone</b>
Use of the BSC/purchasing, servicing, or moving a BSC	Biosafety	x1451
Chem safety issues	Industrial Hygiene	x1451
Radiological issues/ radioactive waste pick-up	Radiation Safety	x1451