

Appendix A Biological Safety Cabinets

Biological Safety Cabinets and other primary containment devices are an essential component of conducting biological research. As a primary safety barrier, the effectiveness of the BSC is limited by the

techniques employed by the researcher (e.g. good microbiological techniques), an understanding of how

the cabinet functions, and the location of the biological safety cabinet within the facility. As a general

rule, keep biosafety cabinets away from doors, high traffic areas and supply diffusers. The Biosafety

Officer can provide consultation and guidance on the selection, operation and use that meet your specific research needs.

A Class II, A2 Biosafety Cabinet is recommended and the most common type of BSC in use, as it is appropriate for most biohazardous work applications. Class II BSC provide personnel protection from

biohazardous materials using HEPA filtered air prior to release into the room, in addition to providing

product protection (to maintain sterility). Information on specific classes and types of Biosafety Cabinets can be found at

<https://www.cdc.gov/labs/pdf/CDCBiosafetyMicrobiologicalBiomedicalLaboratories-2009-P.PDF>

For most applications, it is not necessary to connect a Class II A2 BSC to the building ventilation system. Class II A2 cabinets are designed to be “convertible” units and can be connected to the ventilation system using a thimble connection designed with an air gap. This is recommended only in

certain situations that merit connection to the HVAC system.

Biological Safety Cabinets must be certified annually and whenever moved; they must be decontaminated (chlorine dioxide gas or hydrogen peroxide vapor) before being moved. BSCs are certified (and decontaminated) by an outside contractor at the expense of the Principal Investigator. The

Biosafety Officer will provide a list of designated, NSF-certified vendors from which to choose.

Laboratory staff is responsible for coordinating BSC certification service directly with the vendor.

Instructions on the proper use of the Biological Safety Cabinet (BSC)

- Biosafety cabinets are designed to run 24 hours a day, and for frequent work with BSL-2 agents in the BSC, it is recommended that blowers remain on at all times.

- If it is necessary to turn off the blower, allow sufficient time to purge airborne contaminants from the work area (Centers for Disease Control and the Public Health Agency of Canada recommend a minimum of 5 minutes before and 5 minutes after work, taking into account sufficient time for settling of aerosols).

- Minimize other activities in the room (e.g., rapid movement, open/closing room doors, etc.) to avoid disrupting the cabinet air barrier.

- Laboratory coats are worn buttoned over street clothing; gloves are worn to provide hand protection.
- Before beginning work, the investigator must adjust the stool height so that his/her face is above the front opening.
- Plastic-backed absorbent toweling can be placed on the work surface (but not on the front or rear grille openings). This toweling facilitates routine cleanup and reduces splatter and aerosol formation during an overt spill.
- Closure of the drain valve under the work surface must be done prior to beginning work so that all contaminated materials are contained within the cabinet should a large spill occur.
- Place necessary materials in the BSC before beginning work. This serves to minimize the number of arm-movement disruptions across the air barrier of the cabinet. All materials must be placed as far back in the cabinet as practical, toward the rear edge of the work surface and away from the front grille of the cabinet.
- The front grille must not be blocked with research notes, discarded plastic wrappers, pipeting devices, etc.
- Aspirator suction flasks must contain an appropriate disinfectant, and a High Efficiency Particulate Air (HEPA) in-line filter. This combination will provide protection to the central building vacuum system or vacuum pump, as well as to the personnel who service this equipment. Inactivation of aspirated materials can be accomplished by placing sufficient chemical decontamination solution such as bleach, into the flask to kill the microorganisms as they are collected. Once inactivation occurs, liquid materials can be disposed of as noninfectious waste.
- Horizontal pipette discard trays containing an autoclave bag or an appropriate chemical disinfectant should be used within the cabinet. Upright pipette collection containers placed on the floor outside the cabinet or autoclave-safe biohazard collection bags taped to the outside of the cabinet should not be used. The frequent inward/outward movement needed to place objects in these containers is disruptive to the integrity of the cabinet air barrier and can compromise both personnel and product protection.
- All operations should be performed on the work surface at least four (4) inches from the inside edge of the front grille.
- Active work should flow from the clean to contaminated area across the work surface. Bulky items such as biohazard bags, discard pipette trays and suction collection flasks must be placed to one side of the interior of the cabinet.
- Use of glass Pasteur pipettes is discouraged. Glass pipettes should be replaced with safer alternatives (i.e., plastic) as recommended by the U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Institutes of Health in Biosafety in Microbiological and Biomedical Laboratories, 5th Edition Fifth Edition and by The World Health Organization Biosafety Manual. Contact EHS Biosafety for more information on safer alternatives.
- Open flames (i.e., Bunsen burners) are rarely necessary in the near microbe-free environment of a biological safety cabinet and are an artifact left over from usage of A1 cabinets (e.g., provided only personnel, not product protection) several decades ago. An open flame creates turbulence that disrupts the pattern of HEPA-filtered air supplied to the work surface. When deemed absolutely necessary, touch-plate micro-burners equipped with a pilot light to provide a flame on demand may be used. Internal cabinet air disturbance and heat buildup will be minimized. The burner must be turned off when work is completed. Micro-incinerators (electric) are the best alternative for use in the BSC.

□ Use of ultraviolet light (UV) in the BSC is strongly discouraged. UV bulbs in the BSC must be cleaned and monitored regularly, as dust and debris inhibit effectiveness as well as gradual degradation of the UV bulb over time and should never be used as a primary or sole means of disinfecting the unit. Therefore, chemical surface disinfection must be the primary means of decontaminating the BSC.

□ Clean Up: Upon completion of work, the final surface decontamination of the cabinet must include a wipe-down of the interior surfaces. Investigators must remove their gloves and gowns in a manner to prevent contamination of unprotected skin and aerosol generation and wash their hands as the final step in safe microbiological practice. Investigators must determine the appropriate method of decontaminating materials that will be removed from the BSC at the conclusion of the work.

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