

Using Biological Safety Cabinets

Biological safety cabinets (BSCs) are among the most effective primary containment devices used in laboratories working with infectious agents. They act as primary barriers to prevent the escape of biological aerosols into the laboratory environment. This is an important function, because most laboratory techniques (e.g., pipetting, vortexing, sonicating) are known to produce inadvertent aerosols that can be readily inhaled by the laboratory worker.

HEPA Filters

High Efficiency Particulate Air (HEPA) filters are present in all classes of BSCs. A HEPA filter removes only particulates (including microorganisms), not vapors or gasses, from the air. Depending on its quality, a HEPA filter is able to trap 99.97% of particles equal to and greater than 0.3 micron.

BSC Protection

BSCs are designed, in varying degrees, for:

- Personnel Protection: Protect personnel from harmful agents inside the BSC
- Product Protection: Protect the work, product, experiment, or procedure performed in the BSC from contaminants in the laboratory environment or from cross contamination inside the cabinet
- Environmental Protection: Protect the environment from contaminants contained in the BSC

A comprehensive description of BSC types, performance characteristics, and applications can be found in the publication *Primary Containment for Biohazards: Selection, Installation and Use of Biological Safety Cabinets* available online at: <http://www.cdc.gov/od/ohs/biosfty/bsc/bsc.htm>.

Before selecting a cabinet, potential users must evaluate their program and match specific requirements with the appropriate equipment. The Biological Safety Section can assist researchers with these evaluations.

Policies for BSC Use Certification Requirement

It is required that BSCs are tested and certified on site:

- At the time of installation
- At least annually thereafter
- At any time the BSC is moved

Contact DRS to be added to the monthly certification schedule. Note that there is a cost associated with certification, which varies depending on the type of equipment being certified. Call or e-mail DRS for more information.

Chemicals in a BSC

BSCs should not be used in place of a chemical fume hood. Volatile or toxic chemicals should not be used in unducted Class II Type A cabinets since vapor build-up inside the cabinet presents a fire or explosion hazard. In addition, this type of cabinet recirculates air to the cabinet work space and exhausts into the room, potentially exposing the operator and other room occupants to toxic chemical vapors via the air flow. Biotoxins should also be manipulated in a chemical fume hood, see:

<http://www.drs.illinois.edu/bss/factsheets/biotoxins.aspx>.



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Gas connections, gas burners and alcohol lamps in the BSC

Gas connections to a BSC are not permitted without a DRS approved, written **justification for specialized, limited duration work. Note that routine "flaming" is not considered adequate justification.**

Open flames in BSCs:

- Create turbulence in the airflow, compromising protection of both the worker and the work
- Present a potential fire or explosion hazard, especially when using a gas burner in conjunction with ethanol
- Cause excessive heat build-up, which may damage HEPA filters and compromise the cabinet's integrity
- May inactivate the manufacturers warranty

Ultraviolet (UV) lamp usage

UV lamps are not required or recommended in BSCs. There is a potential for exposure to UV radiation above recommended limits if working in or near a BSC with a UV light in use. In addition, the germicidal activity of UV lights is limited by a number of factors, many of which are difficult to control. These include the ability of the light to penetrate the cabinet air flow, relative humidity levels >70%, ambient temperature <770 F and > 800 F, cleanliness of the bulb, and age of the bulb (should be measured every 6 months for intensity).

Use of Cabinet Planning

- Thoroughly understand procedures and equipment required before beginning work.
- Arrange for minimal disruptions, such as room traffic or entry into the room, while the cabinet is in use.

Start-Up

- Turn off UV light if in use. Ensure that the sash is set in the correct operating position.
- Turn on fluorescent light and cabinet blower.
- Check the return air grilles for obstructions, and note the pressure gauge reading.
- Allow the cabinet to operate unobstructed for at least fifteen minutes.
- Wash hands and arms thoroughly with soap.
- Wear a long sleeved lab coat with knit cuffs and over-the-cuff gloves.

Surface Decontamination – before work

- Wipe down the interior surfaces of the cabinet with 10% bleach, followed in 5 to 10 minutes with 70% ethanol to prevent pitting of the stainless steel, and allow to dry.



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Loading Materials and Equipment

- Only load the materials required for the procedure. Do not overload the cabinet.
- Do not obstruct the front, side, or rear return air grilles.
- Large objects should not be placed close together. After loading the cabinet, wait two to three minutes to purge airborne contaminants from the work area.

Work Techniques

- Keep all materials at least four inches inside the sash, and perform all contaminated operations as far to the rear of the work area as possible.
- Segregate all clean and contaminated materials in the work area and arrange materials to minimize the movement of contaminated materials into clean areas.
- Keep all discarded, contaminated material to the rear of the cabinet.
- Avoid moving materials or excessive motion of the operator's hands and arms through the front access opening during use.
- Open flames SHOULD NOT be used.
- Use proper aseptic technique.
- Avoid using techniques or procedures that disrupt the air flow pattern of the cabinet.
- If there is a spill or splatter during use, all objects in the cabinet should be surface decontaminated before removal. Thoroughly disinfect the working area of the cabinet WHILE IT IS STILL IN OPERATION. This will prevent the release of contaminants from the cabinet.

Final Purging

- Upon completion of work, the cabinet should be allowed to operate for three to five minutes undisturbed, to purge airborne contaminants from the work area.

Unloading Materials and Equipment

- Disposable contaminated objects, including gloves, should be placed in disposal pans or autoclave bags inside the BSC after use.
- Reusable objects in contact with contaminated material should be surface decontaminated before removal from the cabinet.
- All open trays or containers should be covered before being removed from the cabinet.

Surface Decontamination – after work

- Wipe down the interior surfaces of the cabinet with 10% bleach, followed in 5 to 10 minutes with 70% ethanol to prevent pitting of the stainless steel, and allow to dry.

Shutdown (Optional)

- Turn off the fluorescent light and cabinet blower, if desired.



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Questions?

Contact the Division of Research Safety, Biological Safety Section (333-2755 or [via e-mail at bss@illinois.edu](mailto:bss@illinois.edu)) or visit our web site: <http://www.drs.illinois.edu/bss/>.

Other Biosafety Fact Sheets are available from the Biological Safety Section at our web site: <http://www.drs.illinois.edu/bss/factsheets>.

