SB016 Safe Use of Biological Safety Cabinets

Biological safety cabinets (BSCs) are among the most effective as well as the most commonly used primary containment devices in laboratories working with infectious agents. They are used 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. A BSC is designed to supplement, rather than substitute for, accepted contamination control and/or safety procedures. The capability of the BSC to provide personnel, work, and environmental protection is dependent on the ability of the laboratory worker to use the cabinet properly and the adequate functioning of the BSC itself.

HEPA Filters

A High Efficiency Particulate Air (HEPA) filter is the heart of the BSC. HEPA filters are present in all classes of BSCs. Filters are made of boron silicate microfibers formed into a flat sheet by a process similar to papermaking. The flat sheets are pleated to increase the overall surface area of the filter. Pleats are separated by aluminum baffles that direct the airflow in the filter. 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 greater than, equal to and less than 0.3 micron. The life of HEPA filters varies greatly with the hours of operation, the cleanliness of the laboratory, and the nature of the work being done. With typical usage, however, HEPA filters commonly last from three to five years before replacement is needed.

BSC Functions and Classes

BSCs are designed and manufactured, 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

The selection of a BSC is based on the potential hazard of the agent used in the experiment, the potential of the laboratory technique to produce aerosols, and the need to protect the experiment from airborne contamination. There are three general types of BSCs available. A comprehensive description of performance characteristics and applications for each class of BSC can be found in the Centers for Disease Control and Prevention (CDC) publication entitled Primary Containment for Biohazards: Selection, Installation and Use of Biological Safety Cabinets. The publication is available online at: http://www.cdc.gov/od/ohs/biosfty/bsc/bsc.htm

Certification Requirements

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

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

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 cuff s and over-the-cuff gloves.

Surface Decontamination – before work

- Wipe down the interior surfaces of the cabinet with 70% ethanol, or a suitable disinfectant, and allow to dry.

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 fat to the rear of the work area as possible.
- Segregate all clean and contaminated materials in the work area.
- 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 70% ethanol, or a suitable disinfectant, and allow to dry.
- Periodically remove the work surface and wipe down the area beneath it.

Shutdown (Optional)

- Turn off the fluorescent light and cabinet blower, if desired, and turn on the UV light if appropriate.