Environmental Health and Safety

Certification of Biological Safety Cabinets

Class II biological safety cabinets were invented in the 1970s for the purpose of protecting the agents in use, operator and the environment from aerosols of hazardous biological agents produced during experiment procedures and accidents involving hazardous agents inside the cabinet. In order to minimize microbial contamination by unwanted agents such as mold spores, the air within the cabinet is sterile, free particulates including all viruses, bacteria, mold spores and other potential airborne biological contaminants. Hence, as long as all equipment and materials brought into the cabinet are sterile, then there is no need for flaming to ensure aseptic culture conditions including subculture of agents, cell lines and tissues.

NSF is an organization that produces national and international standards for performing specific tasks. Standard NSF/ANSI 49 is Biohazard Cabinetry Certification. This standard defines the design and operation of Class II biosafety cabinets: A1, A2, B1 and B2 subclasses.

The Biosafety Cabinet can be operated continuously 24/7 or intermittently as needed. However, if the cabinet is operated intermittently the interior will be contaminated with agents in the room air and may require disinfection before use.

In order for the cabinet to operate correctly, the airflows, airflow patterns, and HEPA filters must be tested every 12 months by qualified field technicians. The technician follows standard test procedures to ensure that the cabinet operates in the exact manner designed by the manufacturer and in compliance with NSF 49.

Note: The purpose of certification is document that the cabinet is operating correctly and has been since the last time it was tested. However, there is no guarantee that the airflow, airflow patterns or HEPA filters will not fail sometime in the 12 months following testing. Operators must consider the potential for harm should the filter fail resulting in contaminated air. If the exhaust filter fails, the air will be discharged into the room and expose all persons in the room. To avoid this, many biosafety cabinets are ducted into an exhaust system which prevents discharge into the room if the filter fails. When ducted, biosafety cabinets should have a canopy connection or “air gap” per the NSF 49 standard - 2014. Some organizations test their cabinets more frequently e.g. every 3 or 6 months rather than 12 to limit the time of exposure after the cabinet fails.

If during testing the cabinet fails, the supervisor with the assistance of Tufts EHS and/or the Biosafety Manager will evaluate the potential exposures that may have resulted from unsafe operation. In addition, the cabinet will be immediately labeled DO NOT USE and taken off-line until repairs are completed and the cabinet recertified by a qualified, experienced BSC technician.

Ultraviolet lamps: use and controversy

Most manufacturers installed ultraviolet light emitting lamps (mercury discharge) and use the UV radiation to reduce the concentration of biological agents on the irradiated surfaces. Tufts EHS does not recommend the use of UV radiation because the amount of UV radiation required for decontamination varies widely from agent to agent, because the lamp ages and loses intensity, because a thin film of dust will render the lamp ineffective and because there is some risk of overexposure to the eyes from direct and reflected UV radiation. Chemical decontamination is more reliable if the type, concentration and contact time on the surface is long enough. Note that ethanol evaporates too quickly to deactivate any microbial agents. The primary use for wiping down the interior surface with ethanol or isopropanol is to physically remove microbial agent with the wiping materials.

Cabinets must be field certified upon installation, following any repairs, and following any moves for example if the cabinet is moved from one laboratory to another.

Preparing the Cabinet for Certification

In general, the interior of the cabinet should be empty of all equipment, supplies and materials except when in actual use. Suction apparatus may remain however it cannot be allowed to prevent the technician from scanning the filter for leaks or measuring the airflow inside the cabinet. Of course, the cabinet surfaces should be disinfected prior to certification procedures. Note on condition of suction apparatus traps: The purpose of the trap is to prevent liquids from entering the vacuum system and contaminating the piping and vacuum pump. The trap should contain sufficient disinfectant to kill the bioaerosols and prevent mold growth in the disinfectant. Contact Tufts EHS for additional information on Certification or scheduling a certification.