Environmental Health and Safety

Decontamination of Biological Safety Cabinets

There are three classes of biological safety cabinets: Class I, II and III. A Class I cabinet protects the operator and the environment while a Class II cabinet additionally protects the materials in the cabinet from laboratory air contamination because all of the air in the cabinet is sterile having passed through a HEPA (high efficiency particulate air/absolute) filter. A Class III cabinet is glove box that is entirely enclosed with all manipulations inside the cabinet performed using gas tight gloves affixed to the front of the cabinet.

Cabinets are sometimes mistakenly called “hoods”. The term hood refers to a fume hood or local exhaust hood.

What is decontamination?

Decontamination is the planned deactivation of viable or active biological agents such as viruses, bacteria, fungi and other microbial agents. Decontamination agents can be liquid, vapor or gases. Decontamination is conducted before persons are allowed to come into contact with the surfaces or when the cabinet is being repaired and technicians need access to the interior of the cabinet to repair the blower or replace HEPA filters.

There are two types of decontamination: surface and surface + interior or total decon. Surface decontamination is the process of applying usually liquid disinfectant to all of the accessible surfaces of the cabinet. Usually this refers to the interior surfaces, but following a release of airborne pathogens in the laboratory may also include the exterior surfaces of the cabinet.

Surface + interior decontamination or total decontamination

In this process, a disinfectant vapor or gas is introduced into the sealed interior of the cabinet and allowed adequate contact time to provide a 6 log reduction of biological agents on the surface as well as in the filter. There are three substances used to the decontaminate cabinets, although only two are approved by NSF and documented in NSF49 Biosafety Cabinetry Certification. Formaldehyde gas and chlorine dioxide gas are generated and introduced into the cabinet where all surfaces including the filter media comes into contact with high concentration of the gas. The cycle time for formaldehyde is 9-15 hours while chlorine dioxide is 3-4 hours. The concentration of formaldehyde required in 8-10,000 ppm while the concentration of chlorine dioxide is 1800 ppm.

Because of the high toxicity hazard to humans from these concentrations, gaseous decontamination is conducted by trained individuals with training and experience in performing successful decontamination projects. The cabinet must be gas-tight throughout the exposure period and then the gas is safely exhausted to the out of doors or trapped in scrubber units which scrub the gas from the air and deactivate the gas.

An alternative method using vaporized hydrogen peroxide has been studied but not yet approved by the NSF. It must be demonstrated effective for the agent most difficult to deactivate within the biosafety cabinet and HEPA filter.

Confirmation

Decontamination is confirmed through the use of chemical indicator strips which document the concentration of the chemical. In addition, biological indicator tubers containing live bacteria are placed in the cabinet and then incubated to confirm that the kill is effective.

Note: The exterior of the cabinet must be decontaminated with an effective disinfectant for the microbial agents used since the gas disinfectant is trapped inside the cabinet and the external surfaces remain potentially contaminated.

Contact Tufts EHS prior to moving the cabinet, opening up the interior of the cabinet, replacing the blowers or filters so that a contractor can be scheduled to perform the decontamination procedure safely and effectively.