Biological Safety Cabinets

Mindfulness Minute: Incorporate safety into your workflow by considering the equipment you use to protect yourself from hazards.

*A biological safety cabinet (BSC) is an engineering control device that employs HEPA (high-efficiency particulate air) filters to remove hazardous particles, including infectious agents, from an airstream. Most BSCs used at UTK are designed to protect laboratory workers as well as research materials from biological and particulate contaminants (see **Figure 1**). It is important to remember that HEPA filters do not remove chemical vapors. Volatile hazardous chemicals are not to be used in a BSC unless it has been specifically designed to exhaust vapors (contact EHS at ehs_labsafety@utk.edu for assistance with risk assessments).*

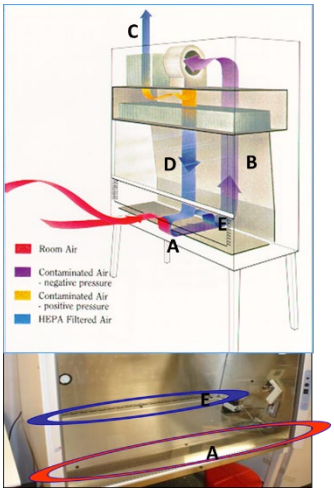

Figure 1. Air Flow within a Class II (Type A2) Biosafety Cabinet

BSCs offer protection by drawing the air in at the face opening and immediately drawing the air through the front grille (A) and under the work surface. The air is then blown through the rear air plenum (B) to the top of the cabinet where it is divided into two chambers by the motor. 30% of the air is exhausted out of the cabinet (C) through a HEPA filter into the laboratory room. The remaining 70% of the air is directed through another HEPA filter down onto the work surface (D) in a laminar flow directional air pattern. Approximately 6 inches from the work surface, the airstream splits to either the front grille or back grille (E). This filtering process repeats itself while the BSC motor continues to run, preventing contaminating particles from either entering or leaving the cabinet. Most BSCs at UTK operate in this manner.

Follow this list of dos and don'ts to ensure worker protection:

- **Do** work in BSCs that have been certified by a professional field certifier within a calendar year.
- **Do** work with the sash at the correct height.
- **Do** decontaminate work surfaces prior to procedures.
- **Do** minimize disturbances to airflow.
- **Do** wear appropriate PPE to prevent skin contamination.
- **Do** work at least 4 inches inside front grille.
- **Do** practice aseptic technique by working "clean to dirty."
- **Do** keep all wastes *within* the BSC while in use.
- **Do** appropriately disinfect surfaces after each use.
- **Don't** confuse BSCs with fume hoods or laminar flow (clean benches). They all function differently.
- **Don't** use a BSC if any alarms are activated.
- **Don't** obstruct the front or rear grilles or overload the BSC with too much equipment.
- **Don't** work with your head inside a BSC.
- **Don't** rely on germicidal ultraviolet (UV) lights for disinfection.
- **Don't** work in the BSC with the UV light is on.
- **Don't** work with volatile, toxic, or flammable chemicals in the BSC without EHS approval.
- **Don't** collect wastes outside of the BSC.
- **Don't** use an open flame/Bunsen burner in a BSC.

References:

CDC training video: https://www.cdc.gov/labtraining/training-courses/biological-safety-cabinets.html

NIH training video: https://www.youtube.com/watch?v=96-aZLom340

ESCO Global training video: https://www.youtube.com/watch?v=4NTRWQR5sg8