Laboratory Equipment Safety: Biosafety Cabinets

What's at Stake?

Consider the following incident…

Recently, a researcher left a lit Bunsen burner inside a BSC, closed the sash and walked away. The type of biological safety cabinet she was using recirculates about 70% of the air with 30% of the air going out of the exhaust. When the sash is closed there is no bypass to allow fresh air into the cabinet. Thus, no exhaust was leaving the cabinet. Heat within the BSC built up quickly. The situation was discovered only after the flame had burned for a few minutes. The BSC was hot to the touch on the outside. Fortunately, the hazard was caught, and appropriate measures taken, otherwise a fire could have engulfed the lab.

What's the Danger?

A biosafety cabinet (BSC) is simply an enclosed, ventilated laboratory workspace for safely working with materials contaminated with (or potentially contaminated with) pathogens requiring a defined biosafety level. Because of this, any dangers associated with a BSC come from the equipment and supplies within the cabinet at the time. In general, hazards include:

- Fire
- Puncture wounds
- Pathological contamination
- Chemical inhalation

How to Protect Yourself

Before using the BSC

- Prepare a written checklist of materials necessary for a

particular activity and place only necessary materials in the BSC before beginning work.
- Turn off any overhead room germicidal ultraviolet light (UV) and any BSC UV lights.
- Confirm that the BSC is currently certified for use and confirm that the BSC is operating properly prior to beginning work by checking airflow gauges.
- Adjust the stool height so that armpits are level with the bottom of the view screen or sash.

During use of the BSC

- In addition to the following considerations, always use appropriate PPE when working in BSCs.

Airflow considerations

- Do not use equipment or store supplies inside the BSC that may disrupt the protective BSC airflow pattern.
- Move arms in and out of the cabinet slowly, perpendicular to the face opening, to limit disruption of the air curtain.
- Manipulation of materials inside the cabinet should be delayed for 1 minute after placing hands/arms inside the cabinet to allow the air to stabilize and to "air sweep" arms.
- Do not rest arms on front grille (unless the BSC is specifically equipped with features that permit this action) because doing so allows room air to flow directly into the work area rather than being drawn through the front grille. Instead, work with both arms raised slightly.
- Fire/Flame considerations:
    - Open flames should be avoided because they create turbulence that disrupts the pattern of air supplied to the work surface.
    - All flames must be turned off before disinfectants are used.
- Pathological considerations:
    - Do not work with open containers of infectious or hazardous materials in front of large equipment.
    - Use the aseptic techniques to reduce splatter and

aerosol generation – opened bottles or tubes should not be held in a vertical position.

- Immediately following the use of infectious agents in the BSC, decontaminate surfaces and the BSC contents. Do **not** allow any potential contamination on the interior surfaces to remain until the end of the work shift as this will reduce the efficiency of decontamination procedures.

After use of BSC

- Before removing any supplies/equipment, surface decontaminate all items that will be brought out of the BSC.
- After removal of these items, the interior walls and the interior surface of the window should be wiped with 70 percent ethanol.
- At the end of the workday, surface decontaminate the BSC with 70 percent ethanol or diluted bleach.

Final Word

Properly maintained biosafety cabinets, when used in conjunction with good microbiological techniques, provide an effective containment system for safe manipulation of moderate- and high-risk infectious agents. BSCs protect laboratory workers and the immediate lab environment from infectious aerosols generated within the cabinet.