



Fundamentals of Working Safely in a Biological Safety Cabinet (BSC): Factors Affecting BSC Airflow

Airflow in a biological safety cabinet, or BSC, can be interrupted, altered, and changed by many different factors. These interruptions can lead to potential exposures and/or product contamination.

This is a smoke generator. It is used to demonstrate how airflow is affected by operations inside and around a BSC. But first, let's look at what proper airflow looks like.

For proper containment, air is drawn into the cabinet at the opening and then down into the front grille. Together, the sash and inward-flowing air provide an air "curtain" or barrier that is intended to keep cabinet air and room air separate from one another.

To protect the work product, the cabinet's downward air is cleaned by a high efficiency filter within the cabinet.

Upon reaching the work surface, roughly half of the downflow air moves toward the front grille, and the other half moves toward the back grille.

The physical location of the BSC can affect the airflow as well. Placing a BSC too close to a doorway can cause air to be drawn out of the BSC when the door is opened.

Placing a BSC too close to an HVAC supply vent can also interfere with BSC containment.

Proper sash height is critical because when the sash is kept at the proper height, the appropriate inward airflow can be maintained. The proper sash height is designated in the BSC operation manual and should be clearly indicated on the BSC. The performance of the BSC at the declared sash height is actually part of the cabinet certification process.

If the sash is too low, inward air velocity will increase at the opening, which can cause turbulence and potential contamination inside the cabinet.

If the sash is set too high, an alarm will sound. This indicates the inward air velocity may slow down to a point that it cannot provide and maintain containment at the sash opening.

This could cause contaminated air to leak out of the cabinet or room air to enter the BSC opening, mix with the downflow air, and potentially contaminate the work product.

Even when the sash height is correct, the air barrier at the opening is fragile (approximately 100 ft/min or 1 mph). It can be easily disrupted. Something as simple as the way you withdraw your



arms or a person walking too close to the cabinet can pull air and potential contaminants out of the cabinet and into the breathing zone of the person working in the BSC.

One common mistake is overloading the inside of the BSC with too much equipment and/or supplies

Or covering the front or rear grilles.

Another way to disrupt airflow is by using a flame inside the cabinet. This is not a good idea for two reasons:

- 1) The heat from the flame can cause air currents inside the BSC and interfere with proper airflow, and
- 2) Flames are a fire hazard and can damage the HEPA filter.

For these reasons, flames should not be used inside a BSC.

Link to video job aid: <https://reach.cdc.gov/jobaid/fundamentals-working-safely-biological-safety-cabinet-bsc-factors-affecting-bsc-airflow>