



UNIVERSITI TUN HUSSEIN ONN MALAYSIA
STANDARD OPERATING PROCEDURE
SAFE OPERATION OF BIOLOGICAL SAFETY CABINETS

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Purpose:

To provide guidelines for safe operation of a biological safety cabinet (BSC) use in university laboratories and to ensure adequate containment of biological materials. In UTHM, the most common type of BSC use is a Class II BSC. Class II BSC provide a microbe-free work environment essential for cell culture and handling of infectious organisms. All users are required to be familiar with the procedures below before operating a BSC.

Definitions:

A biological safety cabinet (BSC) is a piece of equipment designed to protect the operator, the laboratory environment and work materials from exposure to infectious aerosols and splashes that may be generated when manipulating substances containing infectious agents, such as viruses, bacteria and primary tissue cultures, or any other bio-hazardous material.

A BSC should contain a High Efficiency Particulate Air (HEPA) Filter. This is a type of filter that traps 99.97% of particles of 0.3 μm in diameter and 99.99% of particles of greater or smaller size, thus capturing all infectious agents and ensuring only microbe-free air is exhausted from the cabinet or directed to the work surface.

Laminar flow/clean benches are devices that look similar to a biosafety cabinet, but only protect the product from contamination. These devices direct air towards the operator and should never be used for handling infectious, toxic or sensitizing materials.

A biosafety cabinet certification involves performance and safety tests that are conducted annually by an outside contractor to ensure that the cabinet is working according to the NSF-49 Safety Standard.

Roles and Responsibilities:

Principal Investigator - The Principal Investigator (PI) is responsible for ensuring personnel under their supervision are trained on the safe and proper use of the BSC and that correct procedures are followed.

Designated Person - The PI may designate a member of the lab (lab technician or science officer) to oversee the correct operation and maintenance of the BSC. This person shall:

- Periodically inspect the BSC to ensure its operational performance.
- Coordinate yearly BSC certification by the certified vendor. The dates of the most recent certification must be posted on the front of the BSC.
- Make any necessary arrangements for repairs and annual certification of the BSC.
- Report to PI unsafe practices by BSC users.
- Label the BSC when it is not operating correctly.

BSC Users

- BSC users must receive proper training from their PI on the safe and proper use of the BSC prior to use.
- BSC users must follow correct procedures.
- BSC users shall report any injuries, accidents or spills to their PI.
- BSCs users shall report any defects or malfunctions of the BSC to their PI or the designated person.

BSC Operation Procedures

Prior to Operation

- Read the Safety Data Sheets (SDS) for materials being used in a BSC. Note any precautions regarding the use of the chemical or microorganisms in the BSC.
- Lift the sash to the recommended height.
- Turn on the BSC fan 10 minutes before beginning work to allow adequate air filtration.
- Turn on the UV light.
- Check the air intake and exhaust grilles for obstructions, and check the pressure gauge reading indicating HEPA filter load. If you do not know the acceptable reading for the cabinet, ask the certifier or consult your manufacturer's manual.
- If the cabinet is equipped with an alarm, test the alarm and switch it to the "ON" position.
- Confirm inward airflow by holding a piece of tissue at the middle of the edge of the viewing panel and ensuring it is drawn in. Make sure the BSC is clear without any object that could obstruct the air flow.
- Decontaminate the cabinet surface and surface-decontaminate all materials to be placed inside the BSC (refer to the Cleaning and Disinfection section).
- Bulky items, such as waste containers and suction collection flasks, should be placed to one side of the interior of the cabinet.
- Keep the work area of the BSC free of unnecessary equipment or supplies. Clutter inside the BSC may impede proper airflow and the level of protection provided. Consider using wire racks or shelving to increase airflow around front and rear grills.
- Wear eye protection, a lab coat, closed-toe shoes and disposable gloves to protect yourself as well as your samples from contamination.

- Respirators may be required for some procedures. The nature of the Personal Protective Equipment (PPE) worn may vary according to the findings obtained from the biological risk assessment.

Operation

- Active work should flow from clean to contaminated areas across the work surface.
- Arms should be moved in and out slowly, perpendicular to the front opening to minimize disruption of the air curtain and laminar flow.
- Work as far to the back as possible, but within comfortable reach.
- Always use mechanical pipetting aids. Mouth pipetting is not allowed.
- Heat sources such as Bunsen burners are strictly prohibited inside the BSCs as they significantly disrupt the laminar flow of air.
- To sterilize bacteriological loops, micro-burners or electric “furnaces” may be used.
- Do not work in a BSC while a warning light or alarm is signaling.
- Locate liquid waste traps inside cabinet and use an in-line HEPA filter to protect the vacuum line. If traps must be located on the floor, place them in a secondary container (such as a durable plastic tray or box) to prevent breakage.

Cleaning and Disinfection

- When work is completed, all equipment and supplies from the BSC should be decontaminated and removed from the cabinet.
- The interior surfaces should also be wiped with an appropriate disinfectant that would kill any microorganisms that could be found in the cabinet. Corrosive chemicals such as bleach should be avoided, but if used, should be followed with a wipe down of sterile water or 70% ethanol.
- Allow the cabinet to run for 10 minutes.

Use of UV Light in a Biosafety Cabinet

If UV lights are used, they must be tested yearly to ensure that the appropriate wavelength for decontamination is emitted (254nm). Please note that dust particles on the light and on the surface of the biosafety cabinet will inhibit decontamination. If not used properly, UV light can also cause serious eye and skin injury. We recommend that biosafety cabinets be disinfected with the appropriate disinfectant (i.e., 10% bleach or 70% ethanol), instead of using a UV light.

Spills

In the event of a spill within a BSC, follow these steps:

1. Alert the other laboratory employees.
2. Leave the cabinet turned on.
3. While wearing gloves, spray or wipe cabinet walls, work surfaces and equipment with disinfectant equivalent to 1:10 bleach solution. If necessary, flood the work surface, as well as drain-pans and catch basins below the work surface, with disinfectant for a contact time of at least 20 minutes.
4. Report the spill to the laboratory’s PI, who will report the spill to the University’s Biosafety Officer from Biosafety Unit of OSHE Office if a select agent or toxin is involved.

5. Soak up disinfectant and spill with paper towels. Drain catch basin into a container. Lift front exhaust grill and tray and wipe all surfaces. Ensure that no paper towels or solid debris are blown into the area beneath the grill.
6. Autoclave all clean-up materials before disposal in the biohazard waste container.
7. Wash hands and any exposed surfaces thoroughly after the clean-up procedure.

Other Considerations

- All repairs to the BSC must be performed by a qualified technician. Any malfunction of the BSC must be reported and repaired before the BSC is used again.
- The BSC should be positioned in an isolated corner to minimize disruption of the air intake arising from traffic around the biosafety cabinet or drafts from doors, windows and/or air conditioning.
- The BSC must be certified by an NSF/ANSI Standard 49 qualified technician.
- The BSC must be decontaminated before filter changes and before being moved. The most common decontamination method is by fumigation with formaldehyde gas. BSC decontamination may only be performed by a certified contractor.
- Contact UTHM's Biosafety Officer from Biosafety Unit of OSHE Office if you have any questions.

Biosafety Cabinet Annual Certification

All biosafety cabinets at the University must be certified annually by an authorized contractor. The certifications follow the NSF-49 Safety Standard for biosafety cabinets. The contractor will test down flow and inflow velocities, air flow patterns, the HEPA filter and perform a cabinet leak test to ensure that the BSC is working properly.

Guidelines for when a Biosafety Cabinet certification must be performed:

1. Before initial use
2. After moving a BSC from one location to another
3. After replacement of high efficiency particulate air (HEPA) filter(s)
4. At least annually

References:

1. SOP of Winthrop University, Department of Chemistry, Physics and Geology.
2. SOP of Arizona State University.