UNITY HEALTH TORONTO

Caring hearts. Leading minds.

Title:	**Biological Safety Cabinet Guidelines**		
Document Type:	Procedure	Document #:	UHT0001955
Program:	Research Facilities	Effective Date:	January 01, 2015
Executive Sponsor:	Vice President, Research and Innovation	Last Reviewed:	October 3, 2022
Owner/Lead:	Director - Research Facilities, Research Biosafety Officer	Last Revised:	October 3, 2022
Approval Body:	Director - Research Facilities	Review Cycle:	3 year
Applicable Sites:	☐ **Unity Health** ☐ **Providence** ☐ **St. Joseph's** ☒ **St. Michael's**		
Keyword(s):	Biosafety, containment		

1.0 PURPOSE

A Biological Safety Cabinet (BSC) with proper maintenance and in conjunction with good laboratory practices, can provide an effective primary containment for human pathogens. At Keenan Research Centre for Biomedical Sciences (KRCBS), BSCs are used for work likely to create a bioaerosol and involving high concentrations or large quantities of infectious or hazardous material. This procedure will detail the practices in place to work safely and maintain optimum containment in a BSC.

2.0 PROCEDURE

Start-up procedure for BSC-

- Turn on the BSC by holding the 'ON' button for 5 sec.
- Turn on the fluorescent light (bulb symbol button in front) and cabinet blower by raising the front sash of the BSC to the designated height. Once the performance indicator lights to turn green allow the unit to run for 5 minutes to purge the BSC.
- Check the air intake and exhaust grilles for obstructions. Confirm inward airflow by holding a tissue at the middle of the edge of the viewing panel and ensuring that it is drawn inward.
- Disinfect the interior surfaces with a suitable, noncorrosive disinfectant e.g. 70% Ethanol or 10% Virox (Accelerated Hydrogen Peroxide).
- Assemble all materials required for the procedure and load them into the cabinet; do not obstruct the air grills or opening; segregate "clean" items from "dirty" items.

Work procedure

- Don protective clothing and gloves and insert arms into BSC at a 90-degree angle (perpendicular to the air-flow). Use arm supports if available.
- Perform operations towards the middle of the cabinet at least 6 inches from sash.
- Avoid movement of materials or excessive movement of hands and arms through the front access opening during use; when you do enter or exit the cabinet, do so at a 90-degree angle; allow the cabinet to establish laminar flow for 10 seconds before resuming work.
- Segregate contaminated material towards the rear of the cabinet; do not discard materials in containers outside of the cabinet.
- Do not work with open flames inside the cabinet.
- Before using a vacuum line, ensure that there is fresh concentrated bleach in the collection flask and the vacuum tubing has been decontaminated with 70% ethanol.
- Clean up spills as soon as they occur. Disinfection should be with 70% ethanol. Do not use bleach as this will damage the work surfaces of the BSC. If necessary, remove and disinfect the grill and remember to clean under it.
- If the spill was relatively large or contained concentrated infectious material, then allow the cabinet to sit undisturbed for at least 5 minutes for bioaerosols to clear before beginning cleanup.
- While you wait remove and disinfect or appropriately dispose of contaminated personal protective equipment (PPE). Don fresh PPE and proceed with spill cleanup. Remember to allow appropriate contact time for the disinfectant (around 15 minutes).

Upon completion of the work

- Allow the cabinet to run for 5 minutes with no activity.
- Close or cover open containers before removing them from the cabinet.
- Surface-disinfect objects in contact with contaminated material before removal from the cabinet.
- Remove contaminated gloves and dispose of them as appropriate; wash hands.
- Don clean gloves disinfect the interior surfaces of cabinet with 70% ethanol; periodically remove the grills and interior working surfaces of the BSC and disinfect the area beneath it (including the catch pan).

- Turn off the fluorescent light and cabinet blower by returning sash to designated lower height when appropriate (some cabinets must be left on at all times; if you are unsure, check with your cabinet certifier, safety officer or building maintenance personnel).
- Use of the germicidal UV light is not recommended. Recent new guidelines have been published that show that UV decontamination has serious limitations. In particular:
    - -the risk of exposure to workers
    - -the lack of penetration power
    - -the sharp decline in decontamination associated with an aging lamp -the mounting evidence that long term (read overnight) UV exposure causes damage to plastic and rubber.

BSC Maintenance and certification

- When used for biosafety containment level 2, biological safety cabinet performance must be tested and certified:
    - upon initial installation in the laboratory
    - annually thereafter
    - when moved from one area to another within the same room, or from one room to another
    - whenever maintenance is carried out on internal parts, and
    - whenever filters are changed

Maintenance and certification must be performed by accredited technicians. Please contact the Research Specialist for approved companies. Maintenance certificates must be preserved and be available for inspection. Certification of the equipment used to certify the BSC should also be available for review.

Emergency Spill Procedure within the BSC

- Leave the BSC turned on.
- Move slowly but deliberately within and around the cabinet to prevent disruption of air flow.
- Remove contaminated gloves and discard within the cabinet.
- Remove lab coat if it has been contaminated and bag. Contaminated lab coats should be autoclaved before being returned to stores (B2 CC) for laundering.
- Don fresh gloves and a new lab coat and mask. Use forceps to pick up any broken glass or sharps and place them in a sharps container.

- Cover the spill with absorbent paper. Allow liquid to be absorbed. Dispose of in a yellow biohazard bag.
- Pour 10% Virox (or 70% ethanol) over the area of the spill, beginning at the edge of the spill towards the middle using a gentle flooding action. If you suspect that infectious material is in the catch tray, pour disinfectant through the grills.
- Allow for a contact time of 30 minutes. Absorb the liquid and dispose of in a yellow biohazard bag.
- Items that cannot be disposed must be wiped down thoroughly with an appropriate disinfectant inside the cabinet.
- Wipe the inside of the cabinet with a disinfectant and let the BSC run for 10 minutes before resuming your work.

Emergency BSC Failure

- Immediately stop all work and close all containers within the cabinet.
- Close the sash and wait for 30 minutes for aerosols to settle.
- After 30 minutes, disinfect the exterior of all items in the hood before removing from the BSC.
- Inform your supervisor, the Research Specialist about the incident. In case of the loss of containment, please report the incident to the hospital's tracking system.

DEFINITIONS

1. **Biological Safety Cabinet (BSC)-** A BSC is an enclosed, ventilated laboratory workspace for safely working with materials contaminated with (or potentially contaminated with) pathogens or where there is the possibility of producing bio-aerosols. All exhaust air is HEPA-filtered as it exits the biosafety cabinet, removing harmful bacteria and viruses. Several different types of BSCs exist, differentiated by the degree of biocontainment required. At KRCBS, all BSCs are type A2, defined as A BSC that has a minimum inflow air velocity of 100 ft/min. The filtered makeup air is divided equally over the work surface at about two to six inches above the work surface. The exhaust is drawn at the bottom of the cabinet, where it rises to the top. 70% of the air re-circulates through the supply HEPA filter and the other 30% is exhausted through the exhaust HEPA filter. Type A2 BSC is not safe for work with hazardous chemicals except when ducted, usually with a "thimble" or canopy hood to avoid disturbing internal airflow.

2. **HEPA filter**- High-Efficiency Particulate Air or HEPA is a type of air filter which can remove up to 99.7% of airborne contaminates of 0.3 microns, the size of particle most difficult to filter. They are composed of a mat of randomly arranged fibers typically composed of fiberglass. Particles stick to the filter by one of the following mechanisms: 1. Impact: Large particles are unable to maneuver through the filter and become embedded between two filter fibers 2. Interception: As air passes through the filter, medium-sized particles bounce off the fibers of the HEPA filter. Every time the particle changes direction, it loses some energy, and it eventually just settles by clinging to a filter fiber 3. Diffusion: occurs in a HEPA filter when the gas molecules smaller than 0.1 microns collide and are delayed in passing through the filter.

   HEPA filters do not filter out gasses or odors and thus are of no use when handling volatile chemicals.

3.0 REFERENCES

Public Health Agency of Canada (PHAC), Canadian Biosafety Standards and Guidelines, 2nd Edition, 2015.

Canadian Food Inspection Agency (CFIA) Veterinary Standards for Animal Facilities.

National Sanitation Foundation (NSF) Standard No. 49-2002 for the design, manufacture and testing of BSCs (NSF-49)

https://learn.kaiterra.com/en/air-academy/how-hepa-filters-work

Version	Approval/Sub-approval body	Approval date
01	Director, Research Facilities	October 3, 2022
02		
03		