Procedure for the safe use of a biosafety cabinet type II

Introduction

A biosafety cabinet type II (BSC) is a biosafety cabinet that if used properly will protect the employee, environment, and the material being used. A sterile downflow (laminar airflow) is created inside the cabinet. The air is extracted at the front and rear of the workbench. Extra air is drawn in through the working opening, thereby creating an air curtain. The recirculating air passes through a HEPA filter. The air that is exhausted at the top also passes through a HEPA filter. A HEPA filter removes more than 99.97% of particles with a diameter greater than 0.3 micrometers from the air.

A BSC is compulsory for work with microorganisms of containment level 2 or higher, where there is a risk of contamination through the inhalation of aerosols. In addition, the cabinet is used for sterile work such as with cell cultures or when working with non-volatile carcinogenic or reprotoxic substances.

In order to protect both the researcher and the experiment to the fullest extent possible, the BSC must be used properly and must be properly cleaned and maintained. Maintenance is carried out on an annual basis at the University and MUMC+. This can be verified by means of a label affixed to the front of the cabinet stating the date of the check.

Purchase/installation of a BSC

At Maastricht University, only BSC type IIb with a thimble connection may be purchased. This process is supervised by the IDEE in liaison with the BSO.

For a BSC to work correctly, there must be as little disruption to the airflow as possible. This should be borne in mind when installing the cabinet. As such, installation and purchase should always be carried out in liaison with the BSO.

After installation, the function of the BSC must be validated by a certified company.

Work instructions for working safely

- Allow the cabinet to run for at least ten minutes before commencing work so that the laminar airflow is fully adjusted and only sterile air is blown into the cabinet.
- Wear a close-fitting lab coat with close-fitting cuffs or sleeve covers.
- Remove rings, watches, and bracelets, and wear gloves, if necessary.
- Check whether the airflow is sufficient.
- Disinfect the workbench with a suitable disinfectant (see work instruction Disinfection of laboratories), paying close attention to the grids at the front and rear of the cabinet; pay attention to the minimal contact time of the disinfectant.
- Collect the materials that are required for the work beforehand.
- Avoid disruptions to the airflow (downflow):
    - Do not place materials on the air grids.
    - Place all requisite materials in the cabinet.
    - Do not use Bunsen burners, as they can disrupt the downflow.
    - Keep activities inside the cabinet to a minimum; make as few movements as possible.
    - Movements should be slow and calm.
- After liquid spillages, check the area under the workbench for contamination and clean, if necessary. Replace the pre-filter if it is decontaminated (for the method, please refer to the Maintenance and Management section).

Work instructions for cleaning

- After completing work, clean the workbench and grid with a suitable disinfectant. If active chlorine or Virkon S (non-enveloped viruses) is required for disinfection, the surfaces must be rinsed afterwards with plenty of water/a tissue soaked in water to ensure that all chlorine and Virkon S residues are removed.

- As the operator of the cabinet, you must carry out regular cleaning of the outside of the cabinet (including the top) with a damp cloth.

Faults and incidents

- In the event of an alarm signal/warning light (airflow too low), work must be stopped immediately and open cultures and sterile materials must be sealed.
- Rectify the cause of the fault.
- Clean the workbench with a suitable disinfectant.

If the problem cannot be resolved

- Disinfect the material and remove it from the BSC.
- Clean the workbench, etc. with a suitable disinfectant.
- Close the working opening (use an adapter, if applicable).
- Switch the BSC off.
- Affix a label to the BSC bearing the words 'Out of use'.
- Report the BSC fault to the IDEE (UM) or TS (MUMC+).

Maintenance and management

The BSC is validated on an annual basis by a certified company.

As the operator of the cabinet, ensure that the cabinet is clean and disinfected before annual maintenance. Ensure that the bottom of the workbench and the edges around the pre-filter are also included.

- Complete the form Release Biosafety Cabinet (BSC) in accordance with the procedure Release of equipment, furniture, and GMO laboratories and have it signed by the BSO if it relates to an ML-II laboratory. The form must be handed over to the maintenance company.
- The pre-filter is replaced by the maintenance company during regular maintenance if this is checked on the form Release Biosafety Cabinet (BSC). If you need to replace the pre-filter yourself, proceed as follows (consult with IDEE [UM] or TD [MUMC+] if anything is unclear):
    - Wear gloves, a close-fitting lab coat, and sleeve covers. Wear an FFP2 mouth/nose mask in an ML-II laboratory.
    - Disinfect the work surface of the cabinet with a suitable disinfectant.
    - Lift the workbench out of the cabinet and clean the underside with a tissue soaked in a suitable disinfectant.
    - Take a plastic waste bag, roll up the pre-filter, and place the pre-filter in the bag by turning the bag inside out to envelop the pre-filter inside so that the inside of the plastic bag cannot be contaminated. Seal the plastic bag and deposit it in the yellow GMO WIVA container.
    - Clean the drip pan, walls, and window. Fit the new pre-filter, cut it to the correct length, and ensure that it fits tightly on all sides. Return the workbench and any arm supports to their locations and lower the window to its normal position.
- Maintenance work on a BSC is administered in accordance with the quality care system of the IDEE/TS.
- If necessary, the HEPA filters will be replaced by the maintenance company. Whether or not they need to be replaced will be determined based on measurements of the airspeed, temperature with prolonged use, circulation, etc., and recorded in the maintenance report.
- The small HEPA filter in the exhaust can be removed without being in contact with the filter itself as it is packaged in plastic.
- If the large HEPA filter needs to be replaced, proceed as follows:
    - The lab manager releases the BSC using the form Release Biosafety Cabinet (BSC)
    - The maintenance company places the disinfection instrument in the cabinet.
    - The room needs to be closed by the room manager.
    - A sign must be affixed to the access door to the work area, specifying that access to the room is prohibited.
    - The disinfection is carried out overnight. On the following day, the cabinet must be switched on for an additional hour so that any residual vapor can be removed by the ventilation system.
    - Slide the front window upwards and switch the audible signal off.
    - Lift the workbench out of the cabinet and clean the underside with 70% ethanol.
    - Remove the pre-filter as outlined above.

- Clean the drip pan, walls, and window.
- Fit the new pre-filter, cut it to the correct length, and ensure that it fits tightly on all sides.
- The HEPA filter is packed in plastic by the maintenance company and can be removed using the same route as for solid waste. To this end, contact afval@mumc.nl.
- Return the workbench and arm support to their locations and lower the window to its normal position.
- Check that everything is functioning correctly and allow the cabinet to run for fifteen minutes before use.
- As the operator, you must check that the maintenance sticker has been replaced.
- As the IDEE/TS, archive the inspection report and send the operator an e-mail informing him/her that the HEPA filter in the cabinet in question has been replaced.
- As the IDEE/TS, send an overall report to the BSO on an annual basis.

- As the FS (UM) or TS (MUMC+), affix a biohazard symbol or symbol for hazardous substances to the tubes for the room supply and discharge ducts and to the fan, all of which are located in the technical room.

Responsibilities

IDEE (UM) or TS (MUMC+) employee

- All maintenance work on the BSC
- Checks to ensure compliance with the annual maintenance contract
- Archiving of test reports

Cabinet operator

- Contact with IDEE or TS
- Replacement of the pre-filter following a spillage or in the event of severe contamination

BSO

- Annual check to ensure compliance with responsibilities
- Keeping this procedure up to date

Abbreviations and definitions

Aerosols	Small microscopic droplets of liquid that are spread through the air
BSC	Biosafety cabinet
BSO	Biosafety Officer
FFP	Filtering Facepiece Particle
FS	Facility Services
GMO	Genetically Modified Organism
HEPA filter	A High Efficiency Particulate Air filter is a fine particulate filter that captures submicron particles in accordance with the specifications
IDEE	Instrument Development, Engineering and Evaluation (UM)
ML-I/ML-II	Microbiological Laboratory Class I/II
MUMC+	Maastricht University Medical Centre+
Product protection	Protection of cells, etc. against contamination from outside of the biosafety cabinet
TS	Technical Service (MUMC+)
UM	University Maastricht

References

- 'Biological safety cabinet: How it works to protect you' instruction video https://www.youtube.com/watch?v=96-aZLom340
- Website HSB Maastricht
- Instruction DVD entitled 'Precies zoals het hoort' ('Exactly right'); http://www.youtube.com/watch?v=xbdi95IxUw8&feature=youtu.be

Further information

For further information, please contact the BSO.