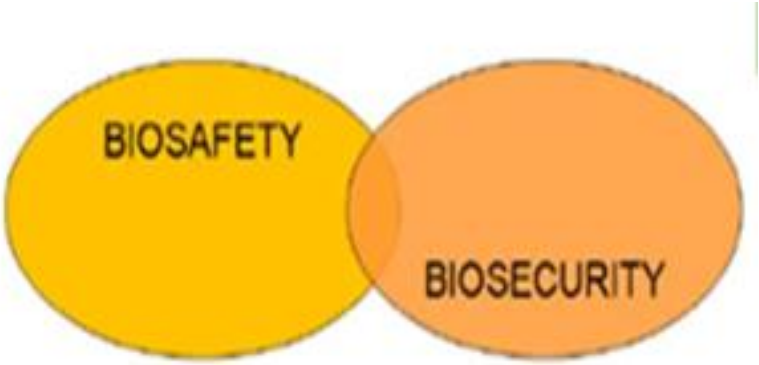


BIOSAFETY CABINETS (BSC)

Assist. Prof.Dr. Sumaiah Ibrahim

biosafety cabinet (BSC)

- It is a primary containment device used with biological material.
- While handling biological agents, it is the biological equivalent of using hazardous chemicals inside a fume hood. Like a chemical fume hood
- a **biosafety cabinet** protects the user from hazardous material using directional air …

Introduction

- Biosafety cabinets (BSCs) are primary means of containment, developed for working safely with infectious micro-organisms

- BSCs are only one overall part of biosafety program, which requires consistent use of
  - good microbiological practices
  - primary containment equipment
  - primary containment facility design

- The U.S. Centers for Disease Control and Prevention (CDC) classifies BSCs into three classes.
- These classes and the types of BSCs within them are distinguished in two ways:
  - Level of personnel protection provided
  - Level environmental protection provided
  - Level of product protection provided.

Importance of a Biosafety cabinet

- Provide protection to the
  - personnel handling infectious material
  - environment by preventing the release of microbes
  - product (e.g. in handling cell cultures)

Historical perspective

1. Early prototype clean air cubicles (clean filtered air was blown directly at the working surface inside a cubicle – this places the personnel in a contaminated air stream)
2. Concept of small workstation (non-ventilated cabinets – wood/stainless steel)
3. Ventilated cabinets (lack of controlled/ adequate air flow leading on to mass airflow) Class I
4. HEPA filter were introduced (undergoing modifications till date)

HEPA FILTER

- HEPA – High efficiency particulate air filter
- It removes the most penetrating particle size (MPPS) of 0.3 μm with an efficiency of at least 99.97 %
- The typical HEPA filter is a single sheet of borosilicate fibers treated with a wet-strength water-repellant binder

- The filter medium is pleated to increase the overall surface area, with pleats being separated by corrugated aluminum tubes
- This separation is mainly to prevent collapse
- It removes particulate matter by three mechanisms interception, impaction, diffusion
- The filtering efficiency depends upon fiber diameter, filter thickness and face velocity
- These filters are fitted either in the exhaust or air supply system to remove particulate matter

Biosafety Cabinets Class I (BSC-I)

BIOSAFETY CABINET - I

- Provides personnel and environmental protection, but no product protection
- Exhaust system – HEPA filter
- Class I BSC – unfiltered room air is drawn in through the work opening and across the work surface
- Inward airflow – Minimum velocity – 75 linear feet / minutes


mrc

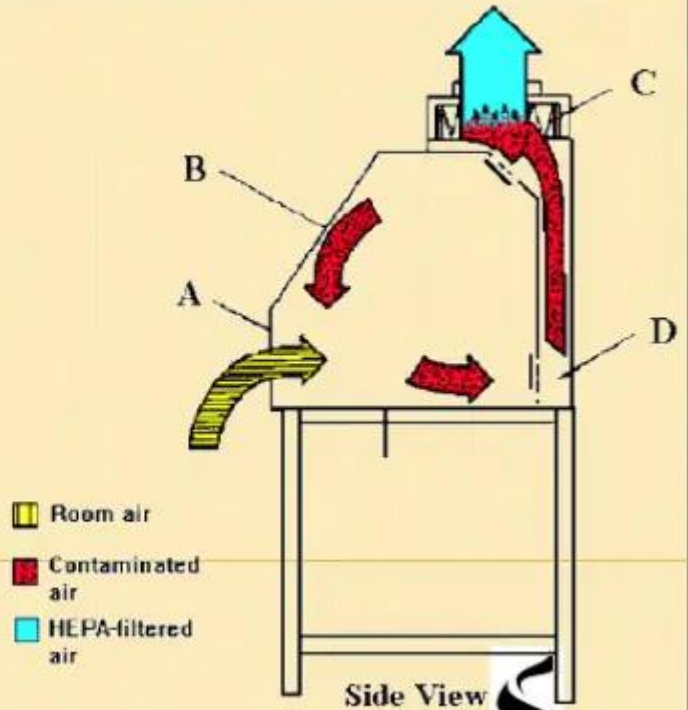

LABCONCO

Classification of Biosafety Cabinet

Class I Biosafety Cabinets

A. Front opening
B. Sash
C. Exhaust HEPA Filter
D. Exhaust plenum

- This is a negative-pressure, ventilated cabinet usually operated with an open front.
- All of the air from the cabinet is exhausted through a HEPA filter either into the laboratory or to the outside.
- The Class I BSC is designed for general microbiological research with low- and moderate-risk agents.



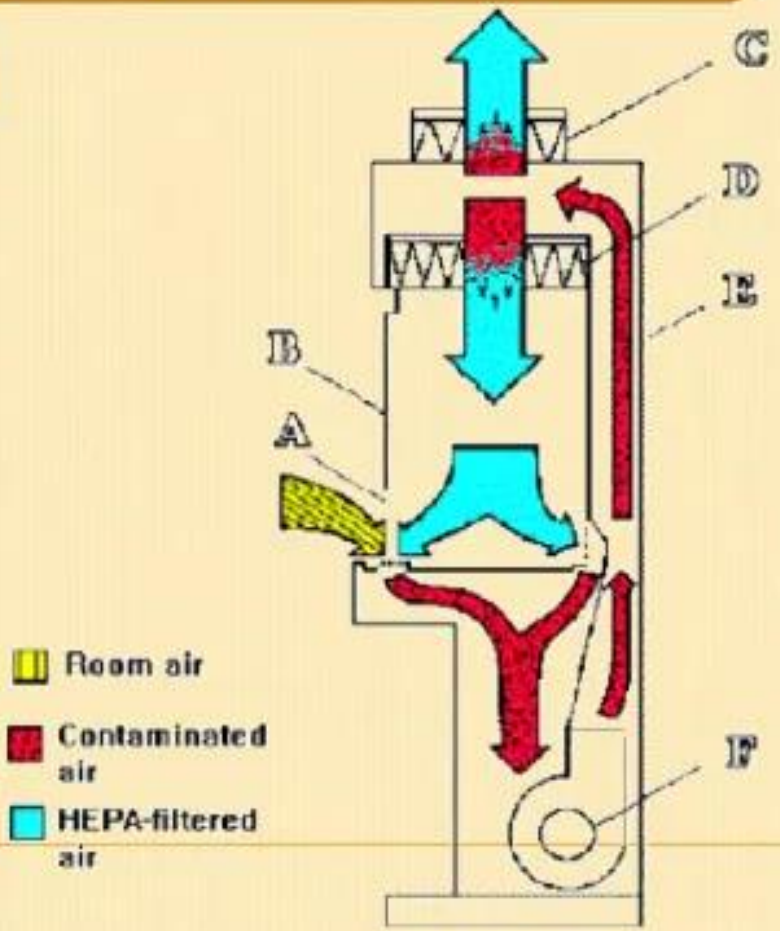
Biosafety Cabinets Class II (BSC-II)

Classification of Biosafety Cabinet

Class II Type A-I Biosafety Cabinets

A. front opening
B. sash
C. exhaust HEPA filter
D. rear plenum
E. supply HEPA filter
F. blower

- It is designed with inward air flow to protect personnel, Product & Environment
- HEPA-filtered downward vertical laminar airflow for product protection, and HEPA-filtered exhaust air for environmental protection



Side View


NUAIRE
MAGNEHELIC

Class II Biosafety Cabinet Features

- Class II laminar flow cabinets are used in hospitals, clinics, and research and pharmaceutical laboratories that work with pathogenic biological agents (PBA) and microorganisms.

- Thus, it is vital for the cabinet to meet requirements for the protection of the environment, product, and personnel attained via the following:

1.Air inflow through front access opening that creates an air curtain protecting the work chamber from any access of contaminants into the work chamber or any escape of hazardous aerosols out of it.

2.HEPA filtered unidirectional vertical down flow ensuring sterile work environment in the work zone.

3.HEPA filtered air outflow exhausted to the room.

Specifications for Class 2 Cabinets

- The cabinet work chamber has the maximum large size with the minimal external cabinet dimensions.
- Laminated safety glass
- Arm support
- Laminar flow speed and clogging level of the filter is shown on the main screen
- UV light and fans with timer for easier programming
- Pullout UV unit
- Comfortable and easy to use

Biosafety Cabinets Class III (BSC-III)


Class III

CLASS III

- Highly infectious agents, hazardous operations
- Gas tight → no leak greater than 1 *10-7 cc/sec with 1% test gas at 3 inches pressure water gauge
- Non opening view window
- Passage of materials through a dunk tank
- Double door pass through box with autoclave

Classification of Biosafety Cabinet

Class III Biosafety Cabinets

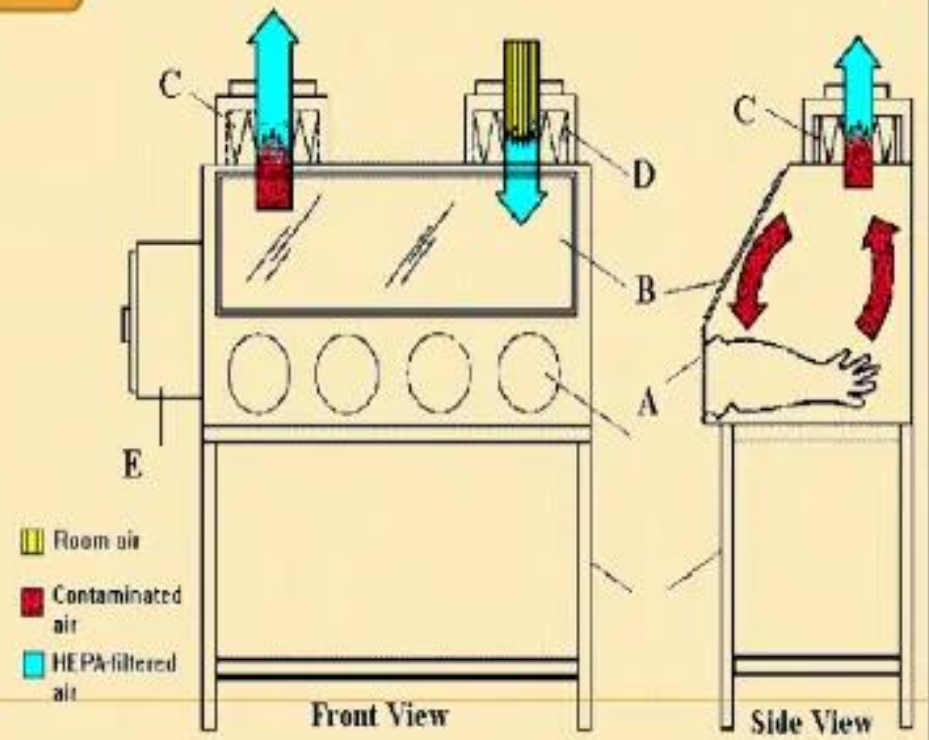
- This is a totally enclosed, ventilated cabinet
- Gas-tight construction
- Offers the highest degree of personnel and environmental protection from infectious aerosols as well as protection of research materials from microbiological contaminants.

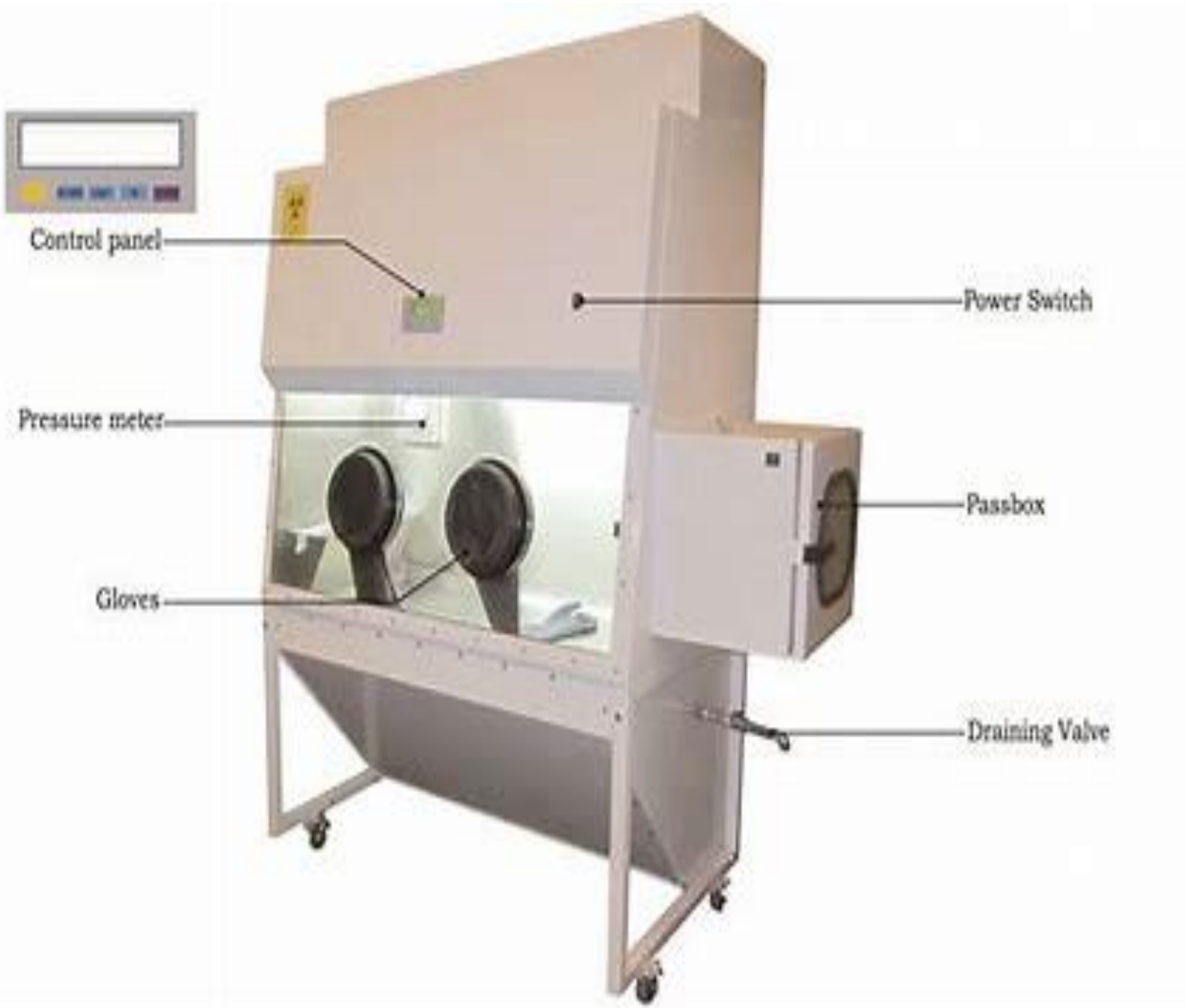
Classification of Biosafety Cabinet

Class III Biosafety Cabinets

A. glove ports with O-ring for attaching arm-length gloves to cabinet
B. Sash
C. exhaust HEPA filter
D. supply HEPA filter
E. double-ended autoclave or pass-through box

Note: A chemical dunk tank may be installed which would be located beneath the work surface of the BSC with access from above. The cabinet exhaust needs to be connected to the building exhaust system.




Control panel
Power Switch
Pressure meter
Passbox
Gloves
Draining Valve

Work practices and procedures

- Checklist of materials and work activity protocol
- Arm movement slowly
- Minimum persons
- Lab coats buttoned fully
- Proper Stool height

Check list

- Daily check of airflow by airflow indicator and monthly or weekly with an anemometer

- Ideal air flow – 0.7 to 1 m/s

- All procedures should be done atleast four inches in from the front grille
- Only the materials needed for work should be kept inside
- Wait for minimum of four minutes to switch off the blowers after the work is over

Decontamination

- Disinfectant selection → EPA registration number in the label and list of infectious agents that the disinfectant is effective

- BSC – ethanol not used as decontamination as it evaporates – no proper contact time – ethanol can be used as a rinsing agent

- Formaldehyde vapour sterilisation to be done to kill spores

Disinfection method A

- Cabinets with an internal electric power supply
- Place 25 ml formalin(cabinet with internal volume of 0.38cu.m) to a vaporizer, or into a beaker on a hotplate
- Close the cabinet and ensure that the exhause blow back valve is closed
- Boil away formalin

Disinfection method B

- 35ml formalin in a 100ml beaker inside the cabinet → add 10g potassium permanganate
  → seal the cabinet

- Leave the cabinet at least 5 hours , preferably overnight and label DANGER – FUMIGATION IN PROGRESS
- Open next day and work after 30 min for residual formaldehyde to exhaust


thank
you