

Primary and Secondary Barriers or Containment

Lac4

Primary Barriers:

- Include **Good microbial techniques** and **safety equipment** provide sufficient primary protection of workers, people and laboratory environment from exposure to infectious agents. Examples of primary barriers include
- **safety equipment or PPE personal protective equipment**, such as lab coats and gloves.
- Also other barriers such as biological safety cabinets, enclosed **containers**, and **safety centrifuge cups**.

Secondary barriers

Include **good facility design** and **operational practices** that protects the external environment outside hospitals and clinical laboratories from exposure to infectious materials.

Examples of secondary barriers include separation of work place from public areas

- decontamination facilities
- hand washing facilities
- special ventilation systems, and airlocks.

Personal Protective Equipment Personal Protective Equipment (PPE)

- are specialized clothing or equipment worn by an employee to provide protection against a hazard (e.g., infectious agents and toxins).
- General work clothes (e.g., uniform, pants, shirts, blouses) are not considered as PPE.
- Wearing and taking off PPE require significant training called **doffing and donning** of training. The use of specific PPE required is determined through a risk assessment and purpose of use.

Aerosol prevention, Mucous Membrane and Respiratory Protection:

Aerosols are microscopic droplets that may contain infectious agents or toxins, e.g. the droplets produced by a patient sneeze or a cough or infectious materials (e.g., inhaling particles or liquid sprays).

Mucous Membrane and Respiratory Products are infectious products of infected patients and they are usually infectious.

The followings are aerosol prevention equipment:

- Surgical mask.
- N95 special masks.
- Face shields.
- Special ventilation system.
- Full-face respirators.
- Gas masks.

Where to use	Protection Level	Role	Item
Clinics & public places	Blocks large droplets & splashes	Source control	Surgical Mask
Airborne isolation rooms	Filters 95% of airborne particles	Personal protection	N95 Mask
Surgery & Dental clinics	Protects against fluid sprays	Face & Eye coverage	Face Shield
Hospital isolation wards	Removes pathogens from the air	Airflow control	Ventilation System
Heavy industries & Mining	Seals against dust & vapors	Face & Lung safety	Full-face Respirator
Military & Chemical leaks	Protects against toxic gases	Chemical filtration	Gas Mask

2. Hand protection equipment

they include different gloves used according to the purposes:

1. **Latex gloves:** designed to protect hands from contact with potentially hazardous materials (e.g., infectious agents and toxins or corrosive chemicals). Also, removing gloves after use carefully to minimize contamination.
2. **Nitrile gloves** can be used by people who are allergic to latex.
3. **Cut resistance gloves** can be used by people in contact with sharp objects (Sharps objects: are needles, broken glass or other any sharp instruments capable of breaking the skin).

Item	Role	Protection Level	Where to use
Latex Gloves	Hand protection	They are very stretchy and allow you to feel small objects easily while working	Medical exams & surgeries
Nitrile Gloves	Chemical & Puncture resistance	Stronger barrier; Latex-free (safe for allergies)	Labs, kitchens, & chemical handling
Cut-Resistant Gloves	Blade & sharp edge safety	High protection against cuts & abrasions	Construction, glass handling, & butchery

3-Eye protection equipment

Eye Goggles and **safety glasses**

provide eye protection from splashes of chemicals or liquids containing infectious agents or toxins.

Laboratory goggles and safety glasses should include **face shields** to prevent splashes at an angle from reaching the eye. For people who wear glasses, prescription of special goggles are used.

4. Body protection equipment:

Lab coats and Gowns to protect skin and street clothing from potential hazards such as materials containing infectious agents or toxins and dangerous chemicals when working in a laboratory environment.

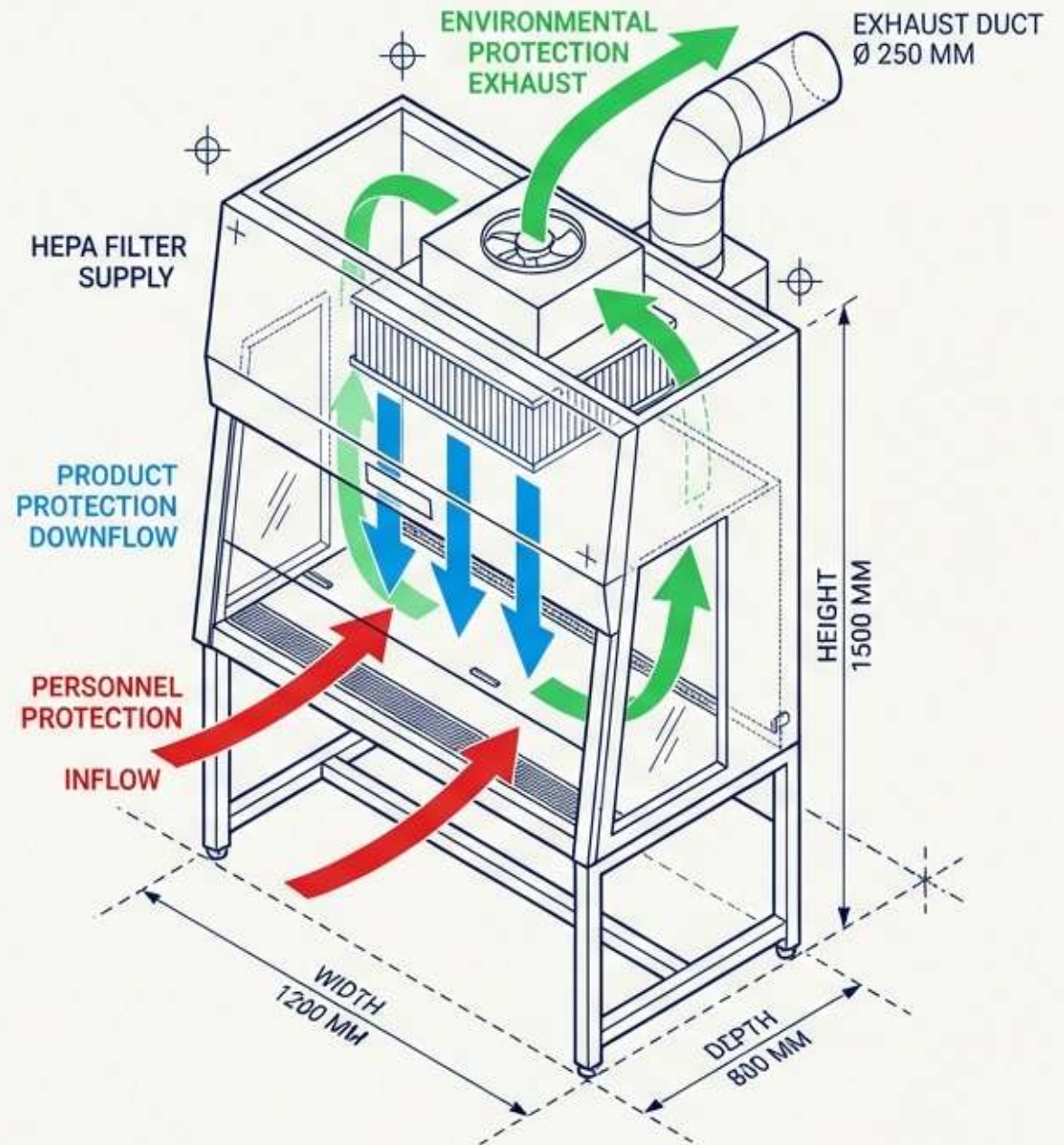
- Most lab coats can be washed and decontaminated.
- Gowns are usually disposed with other contaminated waste.
- Hair cup is used to protect hair from contamination and chemicals

5-Foot protection boots:

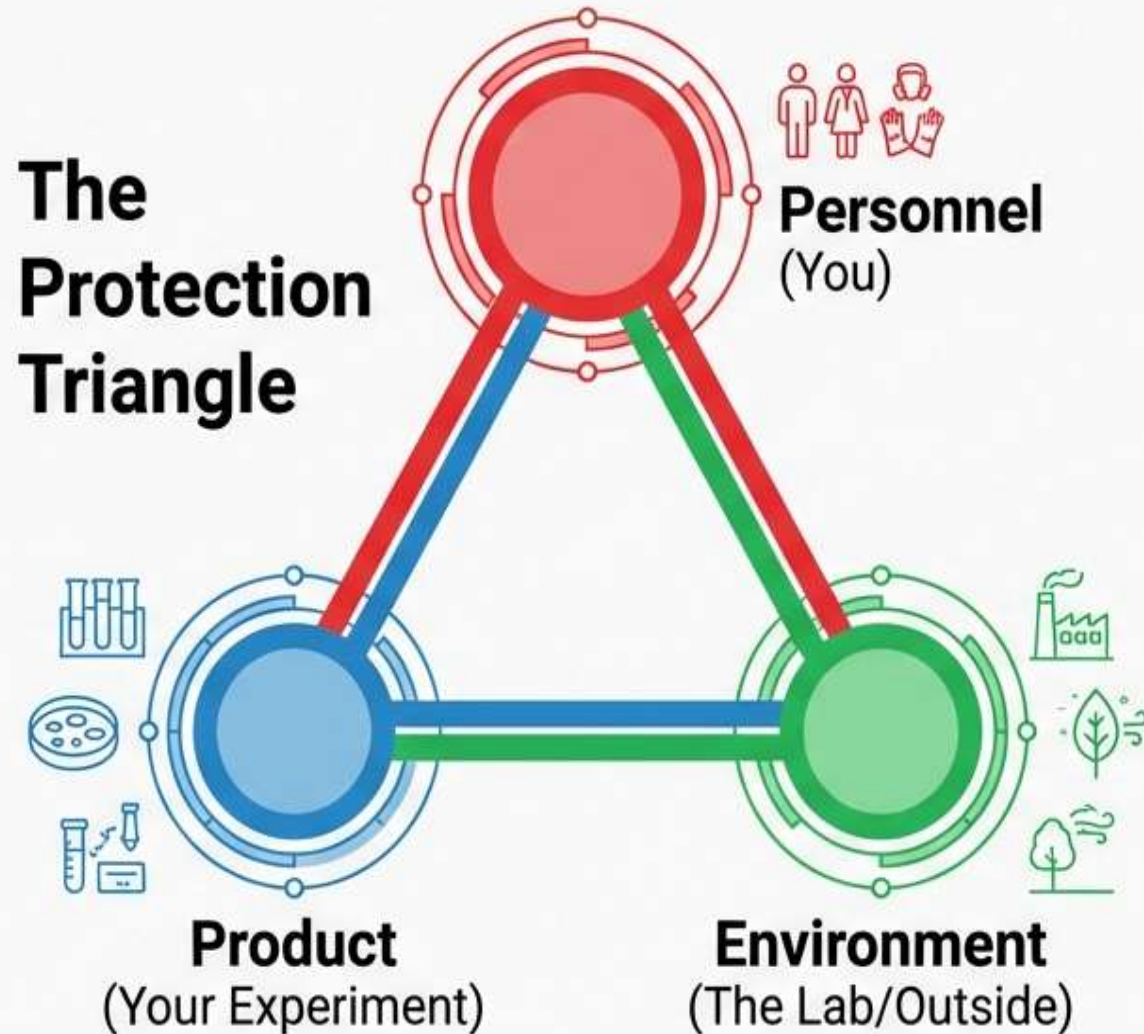
- include many kinds of boots according to purposes, also shoe cover is important to be used during entry of special units in hospitals like burned patient unit.

The Containment Architecture

Navigating Fume Hoods, Laminar Flow, and Biosafety Cabinets



What Are You Protecting?



Lab safety begins with defining the **hazard**. Every piece of ventilation equipment is engineered to defend specific points on this triangle.

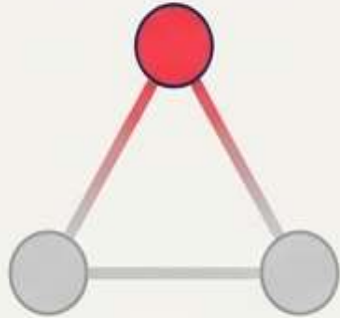
Misdiagnosing the hazard doesn't just ruin experiments—it results in catastrophic safety failures.



Diagnostic Key: These three color codes serve as your visual guide for the rest of this manual.

The Big Three: A Visual Taxonomy

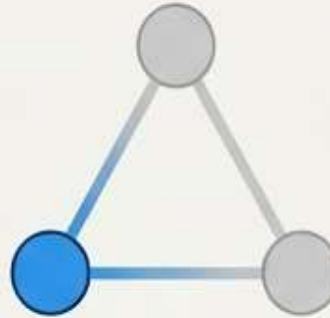
Chemical Fume Hoods



Primary Hazard: Chemical (acids, solvents).

Air Treatment: No filtration; 100% exhausted directly outside.

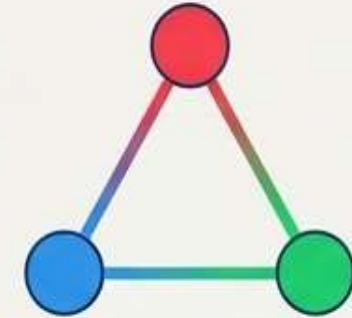
Laminar Flow Hoods



Primary Hazard: Clean-but-safe (sterile media, electronics).

Air Treatment: Supply HEPA filtration only; exhausts directly at the user.

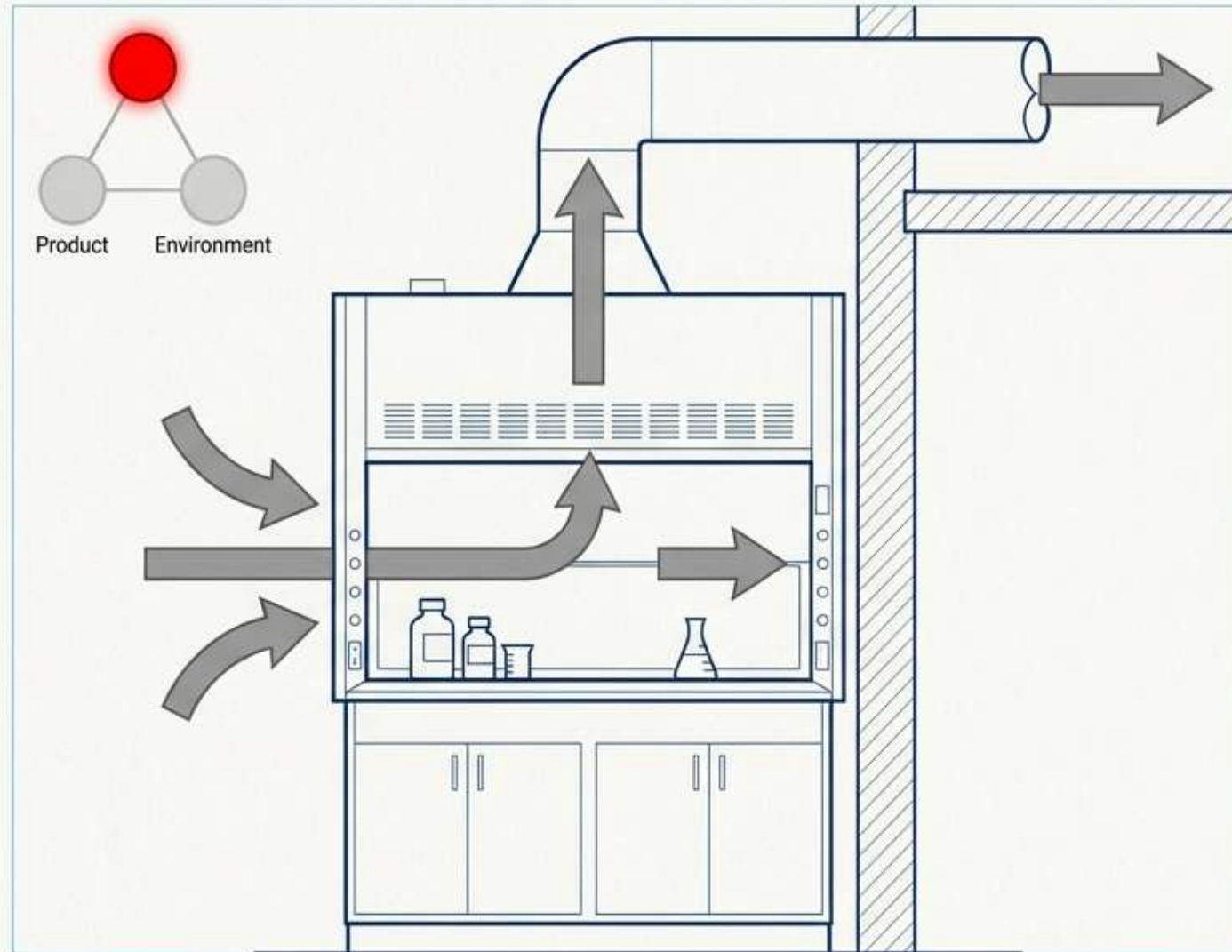
Biosafety Cabinets (BSCs)



Primary Hazard: Biological (bacteria, viruses).

Air Treatment: Supply and exhaust HEPA filtration; complex internal air barriers.

Chemical Fume Hoods: Brute Force Ventilation



The Mandate

Designed with a single job: personnel protection from noxious chemical vapors, acids, and volatile compounds.

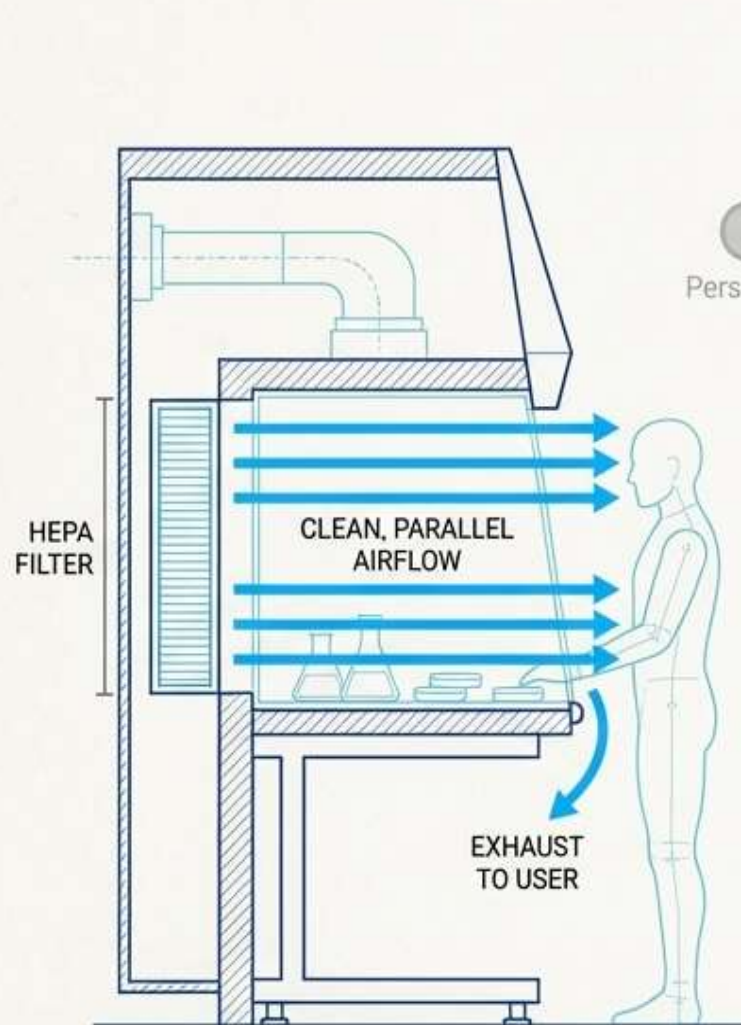
The Mechanics

Relies entirely on high face velocity (typically 80–120 feet per minute) to physically capture and exhaust fumes.

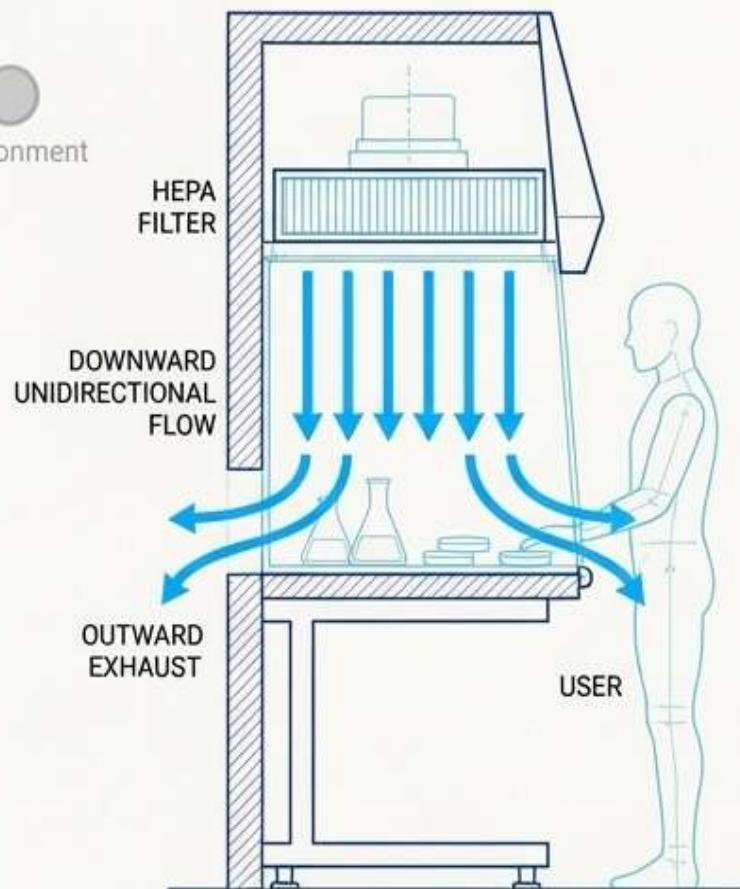
The Blind Spot

Zero product protection. Unfiltered room air is a one-way ticket to sample contamination. **Never use a fume hood for sterile biological work.**

Laminar Flow Hoods: The Invisible Shield



Horizontal Flow



Vertical Flow

The Purpose

Engineered exclusively for product protection.

Creates an ultra-clean, particulate-free zone for sterile media prep or non-hazardous tissue culture.

The Danger

All air passing over the sample is exhausted directly into the user's face.

If the sample contains infectious agents or toxic chemicals, the hood acts as a delivery system for exposure.