

A close-up photograph of a petri dish held by a hand wearing a blue nitrile glove. The petri dish contains a bacterial culture on a red agar medium. The culture shows numerous small, red, circular colonies scattered across the surface. In the background, there are other petri dishes and bottles, some containing yellow and red liquids, suggesting a laboratory setting. The text "Microbial Safety in relation to Pathogens" is overlaid on the image in a bold, black, serif font.

**Microbial Safety in relation to  
Pathogens**

## **Biosafety Concept:**

- **Biosafety concepts in quality control laboratories ensure that adequate safety conditions are implemented to avoid potential hazards associated with the handling of milk and milk products.**
- **The biosafety guidelines define the essential competencies needed by laboratory personnel to work safely in a laboratory.**
- **A biohazard is any organism or material produced by such an organism, that is known or suspected to cause human or animal disease.**
- **Biosafety is the measure requiring standard lab practices facility design, water supply/sinks for hand washing, ventilation, safety equipment, personal protective equipment (PPE) and biosafety cabinets.**

## **Biosafety Levels:**

- ❖ **The bio-safety levels in microbiological laboratories can be designated as bio-safety level (BSL) 1, 2, 3 and 4. The levels are classified into four groups depending on the safety requirements, the highest safety standards (Level-4) are reserved for the most hazardous pathogens (Risk Group 4), and the least stringent (Level-1) for those which have minimal impact on health (Risk Group 1).**
- ❖ **Containment is achieved through the use of appropriate safety equipment, facility design and lab procedures and practices.**
- ❖ **Biological safety cabinets reduce the risk of airborne infection by reducing the escape of aerosolized infectious agents into the laboratory environment as well as protect the work inside the cabinet from airborne contamination.**

- ❖ **Class I: Standard microbiological practices (washing hands, prohibition of mouth pipetting, restriction of eating in laboratory, decontamination work surfaces after completion of work etc.**
- ❖ **Open-fronted (ii) protects operator and environment (iii) for work with low and moderate risk agents. An inward flow of room air through the work opening, away from the operator, prevents the escape of airborne pathogens into the laboratory. HEPA filtration of exhaust air provides environmental protection. A disadvantage of this type of cabinet is that the product is exposed to contaminants that are pulled in from the room environment. Eg. *B. subtilis***

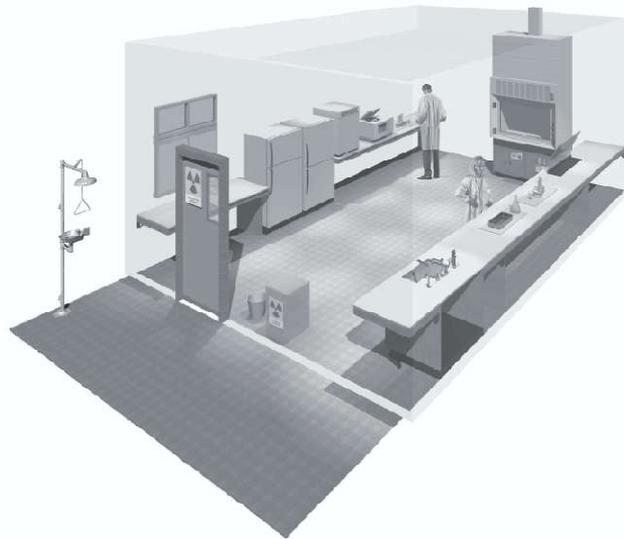


Figure 2. A typical Biosafety Level 1 laboratory



- ❖ Class II: BSL-1 practices plus biohazard warning signs, sharp precautions, biosafety manual, waste decontamination.
- ❖ Open-fronted (ii) protects operator, product and environment from particulate contamination (iii) for work with low to moderate risk agents (Risk Group 2 associated to cause disease). Escape of pathogens into the worker's environment is prevented by an inward flow of room air which enters the front opening without crossing the work area and by HEPA filtration of exhaust air. Eg., *Salmonella* sp.
- ❖ Autoclave and eyewash readily available.

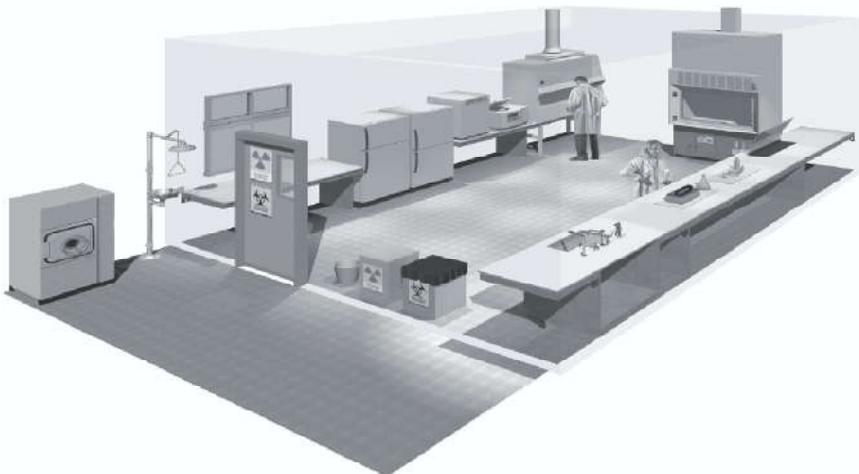


Figure 3. A typical Biosafety Level 2 laboratory

- ❖ Class III: BSL-2 practices plus decontamination of all wastes and decontamination of lab clothing before laundering.
- ❖ Totally enclosed, gas tight (BSL-2 with self-closing double door access) with glove ports for manipulation of pathogens (ii) provides the greatest level of operator and product protection (iii) for work with risk pathogens (causing lethal disease). Eg., *Mycobacterium tuberculosis*. Physical separation from access corridors, handwashing- sink, exhaust air not recirculated and eyewash readily available in lab.

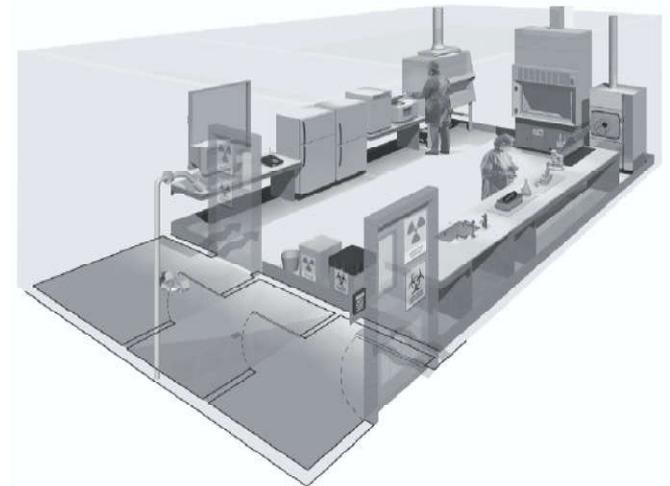


Figure 4. A typical Biosafety Level 3 laboratory

❖ **Class IV: Level 4 containment is used for work with risk Group 4 agents (causing lethal disease). BSL-3 practices plus clothing change before entering, shower on exit, all material decontaminated on exit from facility.**

❖ **Physical isolation of the laboratory, with an airlock for access, entry restricted to authorized personnel and recorded in a log book, no one should work alone, use of protective suits, additional safety measures for ventilation, waste treatment, gas and water services, separate building. Eg., Ebola virus**

