

Biosafety Levels

A biosafety level (BSL), or pathogen/protection level, is a set of biocontainment precautions required to isolate dangerous biological agents in an enclosed laboratory facility. The levels of containment range from the lowest biosafety level 1 (BSL-1) to the highest at level 4 (BSL-4).

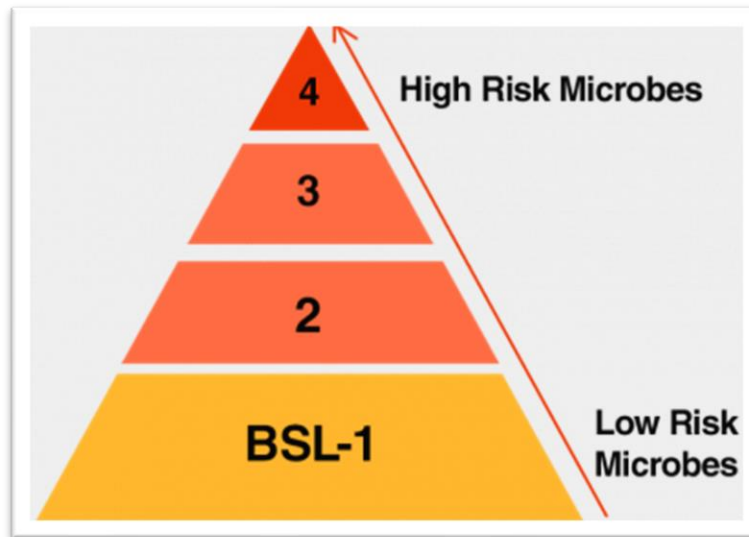


Figure1: Biosafety Levels

There are four biosafety levels (BSL-1, BSL-2, BSL-3, and BSL-4)

1. BSL-1

As the lowest of the four, biosafety level 1 applies to laboratory settings in which personnel work with low-risk microbes that pose little to no threat of infection in healthy adults. An example of a microbe that is typically worked with at a BSL-1 is a nonpathogenic strain of *E. coli*.



Requirments of BSL–1 laboratory

- Mechanical pipetting only
- Daily decontamination of all work surfaces when work is complete
- Hand washing
- Personal protective equipment, such as; eye protection, gloves and a lab coat or gown

2. BSL–2

This biosafety level covers laboratories that work with agents associated with human diseases (i.e. pathogenic or infections organisms) that pose a moderate health hazard. Examples of agents typically worked with in a BSL-2 include equine encephalitis viruses and HIV, as well as *Staphylococcus aureus* (*staph* infections).



Requirements in BSL-1 laboratory

- Appropriate personal protective equipment (PPE), including lab coats and gloves.

Eye protection and face shields can, as needed.

- All procedures are performed within a biological safety cabinet (BSC).
- An autoclave of decontamination is available for proper disposals.
- The laboratory has self-closing, lockable doors.

3. BSL-3

BSL-3 laboratory typically includes work on microbes that are either indigenous or exotic, and can cause serious or potentially lethal disease through inhalation. Examples of microbes worked with in a BSL-3 includes; yellow fever, West Nile virus, and the bacteria that causes tuberculosis.



Common requirements in a BSL-3 laboratory include:

- Standard personal protective equipment must be worn, and respirators might be required
- All work with microbes must be performed within an appropriate BSC
- Sustained directional airflow to draw air into the laboratory from clean areas towards potentially contaminated areas
- A self closing set of locking doors with access away from general building corridors

4. BSL-4

As the highest level of biological safety, a BSL-4 lab consists of work with highly dangerous and exotic microbes. Infections caused by these types of microbes are frequently fatal, and come without treatment or vaccines. Two examples of such microbes include Ebola and Marburg viruses.



In addition to BSL-3 considerations, BSL-4 laboratories have the following containment requirements:

- Personnel are required to change clothing before entering, shower upon exiting
- Decontamination of all materials before exiting
- Personnel must wear appropriate personal protective equipment from prior BSL levels, as well as a full body, air-supplied, positive pressure suit
- A Class III biological safety cabinet