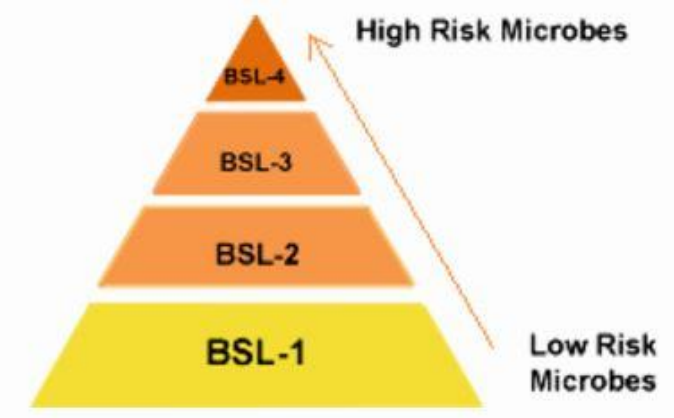
RILEY COUNTY HEALTH DEPARTMENT

Public Health
Prevent. Promote. Protect.

Biosafety Laboratories and Levels

What is Biosafety?

Biosafety is the use of practices in the correct handling of biohazardous agents, agents that have the potential to infect people, plants or animals.



The CDC and World Health Organization (WHO) have created guidelines for protecting workers and limiting potential exposure to pathogens in the laboratory setting. There are four biosafety levels; each level has specific controls in place for the containment of microbes. A higher number ranking means the lab deals with higher-risk organisms, and, therefore has more precautions and controls in place.

Standard Microbiological Practices are practices that must be enforced in the laboratory setting. They include, 1) washing hands after working with materials in the laboratory; 2) eating, drinking, smoking, handling contact lenses, applying cosmetics and storing food for human consumption are not allowed in laboratory areas. Foods must be stored outside the laboratory in containers (refrigerators or cabinets) designated for that use; 3) Mouth pipetting is prohibited – only mechanical pipetting devices may be used; 4) Policies for the safe handling of sharps (including needles, scalpels, pipettes and glassware) must be developed and implemented; 5) all procedures are to be completed while minimizing splashes and/or aerosols; 6) work surfaces must be decontaminated after use; and 7) All cultures, stocks and other potentially infectious materials must be decontaminated before disposal

Aerosol Generating Processes	
• Centrifuging	• Grinding
• Blending	• Vigorous shaking or mixing
• Sonic disruption	• Opening containers with high internal pressures
• Inoculating animals intra-nasaly	• Harvesting tissues from animals or embryonate eggs

For more information, visit:
https://www.cdc.gov/labs/index.html

Biosafety Level-1			
BSL-1 Example: High school biology lab			
Agents	Practices	Primary Barriers and Safety Equipment	Facilities (Secondary Barriers)
Not known to consistently cause disease in human adults	Standard microbiological practices	• PPE: laboratory coats and gloves; eye and face protection as needed	Laboratory bench and sink required
Example organism: nonpathogenic E. coli			

Biosafety Level-2			
BSL-2 Example: Riley County Health Department; hospitals			
Agents	**Practices**	**Primary Barriers and Safety Equipment**	**Facilities (Secondary Barriers)**
• Agents associated with human disease • Routes of transmission include percutaneous injury, ingestion, mucous membrane exposure	BSL-1 practices plus: • Limited access • Biohazard warning signs • Sharps precautions • Biosafety manual defining any needed waste decontamination or medical surveillance policies	• BSCs or any other physical de-containment devices used for all manipulations of agents that cause aerosols or splashes of infectious materials • PPE: laboratory coats, gloves, face and eye protection	BSL-1 plus: • Autoclave available
Example organism: HIV, Staphylococcus aureus, influenza			

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Biosafety Level-3			
BSL-3 Example: KSU Biosecurity Research Institute; state health department			
Agents	**Practices**	**Primary Barriers and Safety Equipment**	**Facilities (Secondary Barriers)**
• Indigenous or exotic agents that may cause serious of potentially lethal disease	BSL-2 practices plus: • Controlled access • Decontamination of all waste • Decontamination of laboratory clothing before laundering	• BSCs or other physical containment devices used for manipulation of agents • PPE: laboratory coats, gloves, face and eye protection	BSL-2 plus: • Physical separation from access corridors • Self-closing, double-door access • Exhausted air not recirculated • Negative airflow in laboratory • Entry through airlock or anteroom • Hand washing sink near laboratory exit
Example organism: Yellow Fever; West Nile Virus; Mycobacterium tuberculosis (TB)			

Biosafety Level-4			
BSL-4 Example: National Bio-and Agro-Defense Facility (NBAF); CDC			
Agents	**Practices**	**Primary Barriers & Safety Equipment**	**Facilities (Secondary Barriers)**
• Dangerous/exotic agents that pose a high risk of aerosolized-infections that are frequently fatal, for which there are no vaccines or treatments • Agents with close or identical antigenic relationship to a known BSL-4 organism • Related agents with unknown transmission	BSL-3 practices plus: • Clothing change before entering • Shower on exit • All material decontaminated on exit from facility	• All procedures conducted in Class III BSCs or Class I or II BSCs in combination with full-body, air-supplied positive pressure exit	BSL-3 plus: • Physical separation from access corridors • Self-closing double-door access • Exhausted air not recirculated • Negative airflow in laboratory • Entry through airlock or anteroom • Hand washing sink near laboratory exit
Example organism: Ebola Virus			

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