

Laboratory Guidelines for Working with Biosafety Level 1&2 Human Pathogens

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1. Biosafety Level 1 (BSL-1)

BSL-1 labs are used to study infectious agents or toxins not known to consistently cause disease in healthy adult humans or animals. Workers follow basic safety procedures, called [standard microbial practices](#), and require no special equipment or design features. Standard engineering controls in BSL-1 laboratories include easily cleaned surfaces that are able to withstand the basic chemicals used in the laboratory.

Specific considerations for a BSL-1 laboratory include the following:

1.1 Laboratory practices

Standard Microbiological Practices (CDC) (Source: <https://www.vumc.org/safety/bio/biosafety-basics-level-1>)

- Limit access to work areas. Close doors during work with research materials.
- Wash hands after handling biological materials, removing gloves, or before leaving work area.
- Don't eat, drink, etc. in the work area.
- Never mouth pipette.
- Use sharps only when no alternatives (e.g., safety devices or non-sharps) exist.
- Handle and dispose sharps carefully and properly.
- Minimize activities that are likely to create splashes, sprays, or aerosols.
- Don't have to be in a biological safety cabinet, but close to a flame. Work can be performed on an open lab bench or table.
- Decontaminate work surfaces at least daily using 70% ethanol.
- Decontaminate waste materials before disposal using 10-15% bleach for at least 15 min.
- Wear a BUTTONED lab coat to protect street clothes.
- Shorts and open toes are not allowed when working with BSL 1 cells or solutions.
- Wear gloves if hands have broken skin or a rash.
- Wear eye/face protection if splashes or sprays are anticipated.
- Transport materials outside of the laboratory using secondary containment (e.g., a plastic bucket that is deeper than the height of the container) and a cart.
- Avoid public areas during transport.
- Transfer materials to and from the campus according to federal and international regulations.
- Be familiar with written instructions for laboratory procedures and proper responses to emergencies.

1.2 Safety equipment

- PPE (lab coats, gloves, eye protection) are worn.

1.3 Facility construction

- A sink must be available for hand washing.
- The lab should have doors to separate the working space with the rest of the facility.

2. Biosafety Level 2 (BSL-2)

BSL-2 laboratories are used to study moderate-risk infectious agents or toxins that pose a moderate danger if accidentally inhaled, swallowed, or exposed to the skin. Design requirements for BSL-2 laboratories include hand washing sinks, eye washing stations, and doors that close and lock automatically. BSL-2 laboratories must also have access to equipment that can decontaminate laboratory waste, including an incinerator, an autoclave, and/or another method of decontamination, depending on the biological risk assessment.

In addition to BSL-1 considerations, BSL-2 laboratories have the following containment requirements:

2.1 Laboratory practices

Standard Microbiological Practices (CDC) (Source: <https://www.vumc.org/safety/bio/basics-biosafety-level-2>)

- Limit access to work areas. Close doors during work with research materials.
- Post biohazard warning signs at access points and on equipment containing or contaminated by potentially infectious materials.
- Wash hands after handling biological materials, removing gloves, or before leaving work area.
- Don't eat, drink, etc. in the work area.
- Never mouth pipette.
- Use sharps only when no alternatives (e.g., safety devices or non-sharps) exist.
- Take extreme precautions when sharps must be used. Dispose sharps carefully and properly.
- Conduct procedures likely to create splashes, sprays, or aerosols within a biological safety cabinet that is certified annually.
- Do not open the container except in the biological safety cabinet.
- Decontaminate work surfaces at least daily using 70% ethanol.
- Decontaminate waste materials before disposal with 10-15% bleach for at least 15 min.
- Wear a BUTTONED lab coat to protect street clothes.
- Shorts and open toe shoes are not allowed when working with BSL 2 cells or solutions.
- Wear gloves when hands may contact potentially infectious materials, contaminated surfaces, or equipment.
- Wear eye/face protection if splashes or sprays are anticipated during work outside a biological safety cabinet.
- Transport materials outside of the laboratory using secondary containment (e.g., a plastic bucket that is deeper than the height of the container) and a cart. The container should be sealed with a cap or sponge. Avoid public areas during transport.
- Transfer materials to and from the campus according to federal and international regulations.
- Be familiar with written instructions for laboratory procedures and proper responses to emergencies.
- Report spills, exposures, illnesses, and injuries immediately.

2.2 Safety equipment

- Appropriate PPE is worn, including lab coats and gloves, eye protection and face shields.
- All procedures that can cause infection from aerosols or splashes are performed within a [biological safety cabinet \(BSC\)](#).
- An autoclave or an alternative method of decontamination is available.

2.3 Facility construction

- The laboratory has self-closing doors.
- A sink and eyewash are readily available.

3. References and Contacts

1. Biosafety in Microbiological and Biomedical Laboratories (5th ed.). 2007. U.S. Government Printing Office, Washington, D.C. Link: http://www.cdc.gov/OD/ohs/biosfty/bmb15/BMBL_5th_Edition.pdf

2. NIH Guidelines for Research Involving Recombinant DNA Molecules. 2002. Link: http://www4.od.nih.gov/oba/rac/guidelines_02/NIH_Gdlnes_lnk_2002z.pdf

3. OSHA Bloodborne Pathogens Standard 29CFR 1910.1030. 2001. U.S. Department of Labor, Occupational Safety and Health Administration. Link: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051

4. Biohazardous Waste Basics. University of Tennessee Biosafety Office. Link: <http://biosafety.utk.edu/pdf/biowastebasics.pdf>

5. Public Health Emergency

<https://www.phe.gov/s3/BioriskManagement/biocontainment/Pages/BSL-Requirements.aspx>