BSL-2 Laboratory-Specific Training Guide

The Biosafety Level 2 (BSL-2) for Labs training covers the basic principles and practices of biosafety in a BSL-2 laboratory. Since this is a general training, it does not cover lab-specific biosafety issues that may be relevant to personnel conducting experiments in the laboratory. According to Biosafety in Microbiological and Biomedical Laboratories (BMBL, 6th Edition), the following guidelines apply to laboratory-specific training provided by the laboratory supervisor:

* The laboratory supervisor must ensure that laboratory personnel receive appropriate training regarding their duties, the necessary precautions to prevent exposures, and exposure evaluation procedures. Personnel must receive annual updates or additional training when procedural or policy changes occur.
* The laboratory supervisor must ensure that laboratory personnel demonstrate proficiency in standard and special microbiological practices before working with BSL-2 agents.

The following topics are applicable to BSL-2 research and can be used to assist Principal Investigators and lab supervisors with providing and documenting laboratory-specific training:

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| BSL-2 Criteria | Item Description | Laboratory–Specific Guidance |
| Standard Microbiological Practices | Persons must wash their hands after working with potentially hazardous materials and before leaving the laboratory. | Discuss lab protocols for hand washing. |
| Standard Microbiological Practices | Eating, drinking, handling contact lenses, applying cosmetics, and storing food for human consumption must not be permitted in laboratory areas. Food must be stored outside the laboratory area in cabinets or refrigerators designated and used for this purpose. | Discuss where food and drinks can be stored and consumed outside the lab in a designated area. |
| Standard Microbiological Practices | Policies for the safe handling of sharps, such as needles, scalpels, pipettes, and broken glassware must be developed and implemented. | If sharps are used, discuss that careful management of needles and other sharps are of primary importance.  If needles are used, discuss that needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal. Used disposable needles and syringes must be carefully placed in conveniently located puncture-resistant containers used for sharps disposal.  If non-disposable sharps are used, they must be placed in a hard walled container for transport to a processing area for decontamination, preferably by autoclaving.  Plasticware should be substituted for glassware whenever possible. |
| Standard Microbiological Practices | Perform all procedures to minimize the creation of splashes and/or aerosols. | Discuss any procedures that may generate splashes and/or aerosols, and procedures that will be followed to minimize the risk. |
| Standard Microbiological Practices | Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method. | Discuss the proper methods for disposal of cultures, stocks and other potentially infectious materials generated in the lab.  If materials will be decontaminated outside of the immediate laboratory, they must be placed in a durable, leak proof container and secured for transport.  If biohazard waste will be autoclaved, discuss the type of biohazard waste that should be autoclaved, procedures for safely autoclaving waste, and procedures for disposal after autoclaving (review the [Biological and Infectious Waste Management Plan](https://sc.edu/about/offices_and_divisions/ehs/documents/usc_biological_and_infectious_waste_management_plan.pdf) for more information). |
| Standard Microbiological Practices | A sign incorporating the universal biohazard symbol must be posted at the entrance to the laboratory when infectious agents are present. | Review [BSL-2 signage](https://www.sc.edu/about/offices_and_divisions/ehs/documents/biological_safety/bsl-2_sign_for_lab_door.pdf) on the entrance door that must include: the laboratory’s biosafety level, the supervisor’s name (or other responsible personnel), telephone number, and required procedures for entering and exiting the laboratory. |
| Standard Microbiological Practices | An effective integrated pest management program is required. | Additional information is available in the [Integrated Pest Management Policy for Research Laboratories](https://sc.edu/about/offices_and_divisions/ehs/documents/usc-integrated-pest-management-policy.pdf). |
| Standard Microbiological Practices | The laboratory supervisor must ensure that laboratory personnel receive appropriate training regarding their duties, the necessary precautions to prevent exposures, and exposure evaluation procedures. Personnel must receive annual updates or additional training when procedural or policy changes occur. | Discuss the specific duties of each member of the lab. Review precautions to prevent exposures, and exposure evaluation procedures. Additional information is available in the [USC Protocol for Post-Exposure Evaluation and Follow-up](https://sc.edu/about/offices_and_divisions/ehs/documents/usc-protocol-for-post-exposure-evaluation-and-follow-up.pdf).  Discuss how personnel receive annual updates or additional training when procedural or policy changes occur. |
| Standard Microbiological Practices | Personal health status may impact an individual’s susceptibility to infection, ability to receive immunizations or prophylactic interventions. Therefore, all laboratory personnel and particularly women of child-bearing age should be provided with information regarding immune competence and conditions that may predispose them to infection. Individuals having these conditions should be encouraged to self-identify to the institution’s healthcare provider for appropriate counseling and guidance. | USC Columbia campus students with occupational health questions or concerns regarding these issues should consult with [Student Health Services](http://sc.edu/about/offices_and_divisions/student_health_services/index.php).  USC School of Medicine faculty and staff should contact Jennifer Evans, USC SOM Employee and Student Health Nurse at [Jennifer.Evans@uscmed.sc.edu](mailto:Jennifer.Evans@uscmed.sc.edu) or 803-216-3374. |
| Special Practices | All persons entering the laboratory must be advised of the potential hazards and meet specific entry/exit requirements. | Discuss any necessary information that should be communicated to persons entering the lab, so they are advised of applicable hazards and entry or exit requirements (e.g., use of PPE). |
| Special Practices | Laboratory personnel must be provided medical surveillance and offered appropriate immunizations for agents handled or potentially present in the laboratory. | If medical surveillance or immunizations should be provided for the agents used in the lab, USC Columbia campus students should consult with [Student Health Services](http://sc.edu/about/offices_and_divisions/student_health_services/index.php).  USC School of Medicine faculty and staff should contact Jennifer Evans, USC SOM Employee and Student Health Nurse at [Jennifer.Evans@uscmed.sc.edu](mailto:Jennifer.Evans@uscmed.sc.edu) or 803-216-3374. |
| Special Practices | A laboratory-specific biosafety manual must be prepared and adopted as policy. The biosafety manual must be available and accessible. | Each laboratory should maintain lab-specific biosafety manual. This includes a copy of the [University’s Biosafety Manual](https://sc.edu/about/offices_and_divisions/ehs/research_and_laboratory_safety/biological_safety/biosafety_manual/index.php), and other biosafety resources applicable based on the type of biological hazards used in the lab. This may include the [biological spill procedures](https://sc.edu/about/offices_and_divisions/ehs/documents/biological_safety/usc-biological-spill-clean-up-procedures.pdf), [exposure protocol](https://sc.edu/about/offices_and_divisions/ehs/documents/usc-protocol-for-post-exposure-evaluation-and-follow-up.pdf), [biosafety training](https://sc.edu/about/offices_and_divisions/ehs/training/research_laboratory_safety/biological_safety_training/index.php) records, approved [IBC protocols](https://sc.edu/about/offices_and_divisions/ehs/research_and_laboratory_safety/biological_safety/ibc/index.php) or other SOPs. |
| Special Practices | The laboratory supervisor must ensure that laboratory personnel demonstrate proficiency in standard and special microbiological practices before working with BSL-2 agents. | The individual being trained should demonstrate proficiency in proper microbiological practices to the lab supervisor before starting BSL-2 experiments. |
| Special Practices | Potentially infectious materials must be placed in a durable, leak proof container during collection, handling, processing, storage, or transport within a facility. | Review the appropriate containers for each potentially infectious material based on the circumstances when the container is used (e.g., collection, storage, transport in a facility). |
| Special Practices | Laboratory equipment should be routinely decontaminated, as well as, after spills, splashes, or other potential contamination. | Discuss how spills involving infectious materials should be contained, decontaminated, and cleaned up by staff properly trained and equipped to work with infectious material. Additional information is available in the [biological spill clean-up procedures](https://sc.edu/about/offices_and_divisions/ehs/documents/biological_safety/usc-biological-spill-clean-up-procedures.pdf).  Discuss how equipment can be decontaminated before repair, maintenance, or removal from the laboratory. Additional information is available in the [laboratory equipment decontamination form](https://sc.edu/about/offices_and_divisions/ehs/documents/equipment_decontamination_form.pdf). |
| Special Practices | Incidents that may result in exposure to infectious materials must be immediately evaluated and treated according to procedures described in the laboratory biosafety safety manual. | Discuss that all incidents that may result in exposure must be reported to the lab supervisor. Medical evaluation, surveillance, and treatment should be provided, and appropriate records maintained. Additional information is in the [USC Protocol for Post-Exposure Evaluation and Follow-up](https://sc.edu/about/offices_and_divisions/ehs/documents/usc-protocol-for-post-exposure-evaluation-and-follow-up.pdf) |
| Special Practices | All procedures involving the manipulation of infectious materials that may generate an aerosol should be conducted within a properly maintained biological safety cabinet (BSC) or other physical containment devices. | Review specific procedures with a potential for creating infectious aerosols or splashes. These may include pipetting, centrifuging, grinding, blending, shaking, mixing, sonicating, opening containers of infectious materials, inoculating animals intranasally, and harvesting infected tissues from animals or eggs.  Review appropriate containment for this work. |
| Safety Equipment | Properly maintained BSCs (preferably Class II), other appropriate personal protective equipment, or other physical containment devices must also be used whenever high concentrations or large volumes of infectious agents are used. | Discuss any lab experiments involving high concentrations or large volumes of infectious agents. Such materials may be centrifuged in the open laboratory using sealed rotor heads or centrifuge safety cups. Additional information is available in the [Biological Safety Cabinet Manual](https://sc.edu/about/offices_and_divisions/ehs/documents/usc-biological-safety-cabinet-program-manual.pdf). |
| Safety Equipment | Protective laboratory coats, gowns, smocks, or uniforms designated for laboratory use must be worn while working with hazardous materials. Remove protective clothing before leaving for non-laboratory areas (e.g., cafeteria, library, administrative offices). Dispose of protective clothing appropriately, or deposit it for laundering by the institution. It is recommended that laboratory clothing not be taken home. | Discuss personal protective equipment (PPE) required for working with different types of hazardous materials.  Review procedures for removing protective clothing before leaving for non-lab areas.  Discuss proper management of protective clothing (e.g., disposal, deposit for laundering by the institution, not taken home for cleaning). |
| Safety Equipment | Eye and face protection (goggles, mask, face shield or other splatter guard) is used for anticipated splashes or sprays of infectious or other hazardous materials when the microorganisms must be handled outside the BSC or containment device. Eye and face protection must be disposed of with other contaminated laboratory waste or decontaminated before reuse. | Discuss the proper location and use of eye and face protection when conducting any procedures that may create splashes or sprays of infectious materials that require handling microorganisms outside the BSC or containment device.  Review procedures for eye and face protection to either be disposed with other contaminated lab waste or to be decontamination before reuse.  Persons who wear contact lenses in laboratories should also wear eye protection. |
| Safety Equipment | Gloves must be worn to protect hands from exposure to hazardous materials. Glove selection should be based on an appropriate risk assessment. Gloves must not be worn outside the lab.  Change gloves when necessary. Wear two pairs of gloves when appropriate.  Remove gloves and wash hands when work with hazardous materials has been completed and before leaving the lab.  Dispose of used gloves with other contaminated lab waste. Hand washing protocols must be rigorously followed. | Discuss that gloves must be worn to protect hands from exposure to hazardous materials.  Alternatives to latex gloves should be available.  Gloves must not be worn outside the laboratory.  Change gloves when contaminated, integrity has been compromised, or when otherwise necessary.  Discuss any circumstances when wearing two pairs of gloves would be appropriate.  Remove gloves and wash hands when work with hazards is completed and before leaving the lab.  Do not wash or reuse disposable gloves. Dispose of used gloves with other contaminated lab waste. Discuss lab-specific protocols for hand washing. |
| Safety Equipment | Eye, face, and respiratory protection should be used in rooms containing infected animals as determined by the risk assessment. | Review required personal protective equipment (e.g., eye, face, and respiratory protection) to use when working in rooms containing infected animals. Review specific risks and the proper use and any limitations of required PPE. |
| Laboratory Facilities | A method for decontaminating all laboratory wastes should be available in the facility (e.g., autoclave, chemical disinfection, incineration, or other validated decontamination method). | Discuss proper methods for decontaminating all lab waste in the facility. This may include reviewing methods of disposal available for all types of biological or infectious solid, liquid and sharps waste that is generated in the facility. |

# **Laboratory-Specific Training Verification:**

I have reviewed this lab-specific training guide with my Principal Investigator or laboratory supervisor. I understand the information contained in this guide, have had the opportunity to ask questions, and will follow these safe work practices and procedures when conducting BSL-2 experiments in the laboratory.

**Lab Staff Completing Training:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_

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**Principal Investigator’s Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_

(Print) (Signature) Date

***Note: This guide can be maintained in the laboratory as an official record of lab-specific training.***