

Guidelines for teaching laboratories that use Biosafety Level 2 (BSL-2) agents

The following guidelines are designed to encourage awareness of the risks, uniformity in best teaching practices, and safety of the students. These guidelines are not mandatory but are designed to promote best practices in the teaching laboratory.

BSL-2 is suitable for organisms that pose a moderate individual risk and low community risk for infection. When good microbiological techniques are used, these organisms rarely cause serious disease, and effective treatment for laboratory-acquired infections is available.



Biosafety Lab Level 2

Best practices must be adopted to minimize the risk of laboratory-acquired infections and to train students in the proper handling of organisms that require BSL-2 procedures. Students should always demonstrate proficiency in laboratory techniques using organisms that require BSL-1 practices before being allowed to handle organisms that require BSL-2 practices.

The practices set forth in these guidelines fall into six major categories: personal protection, laboratory physical space, stock cultures, standard laboratory practices, training, and documents. For ease of use, the requirements and practices are brief.

Personal Protection Requirements for BSL-2 teaching laboratories

1. Wear safety goggles or safety glasses for normal laboratory procedures involving liquid cultures that do not generate a splash hazard (e.g., proper pipetting, [spread plates](#), etc.). Use safety goggles and face shields or safety

goggles and masks when performing procedures that may create a splash hazard.

2. Wear closed-toe shoes that cover the top of the foot.
3. Wear gloves when handling microorganisms or hazardous chemicals.
4. Wear laboratory coats.

Laboratory Physical Space Requirements for BSL-2 teaching laboratories should have:

1. Nonporous floors, benchtops, chairs, and stools.
2. Sink for hand washing.
3. Eyewash station.
4. Lockable door to the room.
5. Follow proper pest control practices.
6. Keep the storage area for personal belongings separate from the work area.
7. Arrange for licensed waste removal according to local, state, and federal regulations.
8. Post biohazard signage wherever cultures are used and stored.
9. On the door to the room.
10. On any containers used to transport cultures.
11. A biological safety cabinet is required when large volumes of culture are used or when a procedure will create aerosols.

Stock Culture Requirements for BSL-2 teaching laboratories

1. Only use cultures from authorized, commercial, or reputable sources (e.g., an academic laboratory or state health department). Maintain documents about stock organisms, sources, and handling of stock cultures.
2. Obtain fresh stock cultures of microorganisms annually (e.g., purchased, revived from frozen stock cultures, etc.) to be certain of the source culture, has minimal [spontaneous mutations](#), and reduce contamination.
3. Keep stock cultures in a secure area.

Standard Laboratory Practices for BSL-2 teaching laboratories

1. Wash hands after entering and before exiting the laboratory.
2. Tie back long hair.

3. Do not wear dangling jewelry.
4. Disinfect bench before and after the laboratory session with a disinfectant known to kill the organisms handled.
5. Use disinfectants according to manufacturer instructions.
6. Do not bring food, gum, drinks (including water), or water bottles into the laboratory.
7. Do not touch the face, apply cosmetics, adjust contact lenses, or bite nails.
8. Do not handle personal items (cosmetics, cell phones, calculators, pens, pencils, etc.) while in the laboratory.
9. Do not mouth pipette.
10. Label all containers clearly.
11. Keep the door closed while the laboratory is in session. The laboratory director or instructor approves all personnel entering the laboratory.
12. Minimize the use of sharps. Use needles and scalpels according to appropriate guidelines and precautions.
13. Use proper transport vessels (test tube racks) for moving cultures in the laboratory and store vessels containing cultures in a leak-proof container when work with them is complete.
14. Use leak-proof containers for storage and transport of infectious materials.
15. Use [microincinerators](#) or disposable loops rather than [Bunsen burners](#).
16. Arrange for proper (safe) decontamination and disposal of contaminated material by arranging for licensed waste removal according to local, state, and federal regulations. An autoclave is fine to sterilize, but cannot be used as
17. Do not handle broken glass with fingers; use a dustpan and broom.
18. Notify the instructor of all spills or injuries.
19. Document all injuries according to university policy.
20. Keep note-taking and discussion practices separate from work with hazardous or infectious material.
21. Use only institution-provided marking pens and writing instruments.
22. Teach, practice, and enforce the proper wearing and use of gloves.
23. Advise immune-compromised students (including those who are pregnant or may become pregnant) and students living with or caring for an immune-compromised individual to consult physicians to determine the appropriate level of participation in the laboratory.

Training Practices for Biosafety level 2 (BSL-2) teaching laboratories

1. Be aware that if student assistants are employees of the institution, they will be subject to PERRP, state, and/or institutional regulations.
2. Conduct extensive initial training for instructors and student assistants to cover the safety hazards of each laboratory.

3. Conduct training for instructors whenever a new procedural change is required.
4. Conduct training for student assistants annually.
5. Require students and instructors to handle microorganisms safely and responsibly.
6. Require students to demonstrate competency at BSL-1 before working with BSL-2 organisms.
7. Inform students of safety precautions relevant to each exercise before beginning the exercise.
8. Emphasize to students the importance of reporting accidental spills and exposures.

Document Practices for Biosafety level 2 (BSL-2) teaching laboratories

1. Require students to sign safety agreements explaining that they have been informed about safety precautions and the hazardous nature of the organisms they will handle throughout the course.
2. Maintain student-signed safety agreements at the institution.
3. Prepare, maintain, and post proper signage.
4. Document all injuries and spills; follow university policy.
5. Make Safety Data Sheets (SDS) available at all times, via print or electronic form.
6. Post emergency procedures and updated contact information in the laboratory.
7. Maintain and make available (e.g., in a syllabus, in a laboratory manual, or online) to all students a list of all cultures (and their sources) used in the course.
8. Keep a biosafety manual specific to the laboratory and/or course in the laboratory.
9. Have access to the current version of [Biosafety in Microbiological and Biomedical Laboratories](#) (BMBL) in the laboratory.

References

Biosafety Guidelines for Handling Microorganisms in the Teaching Laboratory: Development and Rationale by: Elizabeth A. B. Emmert and the ASM Task Committee on Laboratory Biosafety Department of Biological Sciences, Salisbury

University, Salisbury. [JOURNAL OF MICROBIOLOGY & BIOLOGY EDUCATION, May 2013, p. 78-83](#)

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[Biosafety in Microbiological and Biomedical Laboratories \(BMBL\) 6th Edition | CDC Laboratories](#)