

University of Utah Biosafety Guidelines for Teaching Laboratories

The American Society for Microbiology (ASM) Education Board published Guidelines for Teaching Laboratories in 2012.¹ The ASM publication was influenced by the lack of clear safety guidelines for microbiology teaching labs and a multistate outbreak of *Salmonella typhimurium* originating in teaching and clinical laboratories in 2011.² Unfortunately, a similar incident occurred in 2014, thus reinforcing the need for these guidelines.³ The ASM guidelines include recommendations for working at Biosafety Level (BSL) 1 and BSL2. A major finding of the epidemiological investigation of the outbreak was deficiencies in biosafety awareness and proper training of staff and students. The University of Utah Department of Occupational and Environmental Health and Safety (OEHS) has compiled guidelines, based on the ASM recommendations, with input from the University of Utah Institutional Biosafety Committee (IBC) and from the Rutgers University Guidelines, in order to ensure our teaching labs are safe for students and to prevent pathogen exposure to persons and the environment.

This document contains biosafety requirements for teaching laboratories operating at BSL1 and BSL2. This document is meant to supplement the detailed resources outlined in the University of Utah Biosafety Manual, which can be accessed [here](#). Not all teaching laboratories are equipped to safely operate at BSL2. Any and all use of Risk Group 2 (RG2) or higher organisms must be preapproved by the University of Utah IBC: an IBC protocol must be submitted through the BioRAFT system, which can be accessed [here](#). Please contact the biosafety group in OEHS at 801-581-6590 or biosafety@oehs.utah.edu with any questions or clarifications.

Subculturing “unknown” samples and teaching about differential and selective media:

The procedures needed to identify unknown microorganisms can be performed safely, and with little to no risk to the students. Students are permitted to culture organisms from soil, water, food materials, and the air. Subculturing from the initial culture plate is permitted for the above samples, but IBC review and approval must be obtained if differential media used in the experiment could select for the growth of organisms listed at RG2 or higher. If the samples will be used to only count and understand the types of organisms in a particular environment, and no subculturing performed, then IBC approval will not be required. If the laboratory will include subculturing and isolation from environments such as water fountains, door handles or other areas that could harbor pathogens, review and approval by the IBC must be obtained. Additionally, samples must never be cultured from the students themselves without approval from the IBC, and possibly the Institutional Review Board, as

there is the potential to grow microorganisms that require BSL2, or even BSL3 containment.

It is recommended that testing of unknowns should be performed from a mixture of known microorganisms (to the instructor), or from a culture where the contents are known to the instructor, instead of from the environment.

For recommendations on surrogate microorganisms, please contact the OEHS biosafety office at biosafety@oehs.utah.edu.

Minors Working in Biological Labs at the University of Utah

All minors and their parent/legal guardian must sign the “Minor Participant Informed Consent Document” prepared by University of Utah Risk Management. Minors in laboratories are permitted to work with well-established BSL1 materials only, unless approved by OEHS. Many classes, activities, and events require a liability waiver. U of U events or activities which are planned, organized, controlled or supervised by U of U employees or authorized volunteers for minors must contact Risk Management to complete the Minor Participant Informed Consent & Parenting/Guardian Consent to Treatment, Waiver and Release for U of U Event or Activity form, <https://riskmanagement.utah.edu/intranet/contracts/liability-field-trip-waiver.php>.

Biosafety Level 1

Biosafety Level One (BSL1) includes microorganisms that are not known to cause human disease, and that can be handled safely on bench tops. The use of BSL1 is the most appropriate for most teaching laboratories.

BSL1 Requirements

Laboratory Facility Requirements:

- Non-porous floor, bench tops, chairs and stools*
 - Bench tops are impervious to water and resistant to acids, alkalis, organic solvents, and moderate heat.
 - Laboratory furniture is sturdy with surfaces for easy cleaning and decontamination. No cloth chairs. Spaces between benches, cabinet and equipment are accessible for cleaning.
- Sink for hand-washing
- Eyewash station
- Lockable door to the laboratory
- Proper pest control practices
- If the laboratory has windows that open, they are fitted with fly screens.
- *Recommended:* Separate storage area for personal belongings
- *Recommended:* Access to a working and validated autoclave**

**It is understood that some current facilities may not be able to meet these requirements due to the original design of the laboratory space. Any facility renovation or new construction would need to address these requirements.*

***Please refer to the University of Utah Biosafety Manual, which can be accessed [here](#), for details and contact OEHS with questions (biosafety@oehs.utah.edu).*

Stock Culture Requirements:

- Stock cultures must be from authorized, commercial or reputable sources. As indicated above, subculturing microbes isolated from the environment, clinical samples or other unknown locations is discouraged as BSL2 classified microbes may be isolated. Subculturing from the environment must be reviewed and approved by the IBC.
 - Examples of Recommended Microbes for work at BSL1

Microorganism	ATCC number
<i>Acinetobacter baylyi</i>	33304
<i>Alcaligenes faecalis</i>	8750
<i>Aspergillus niger</i>	16888
<i>Bacillus stearothermophilus</i>	7953
<i>Bacillus subtilis</i>	23857
<i>Citrobacter freundii</i>	8090
<i>Clostridium sporogenes</i>	3584
<i>Enterobacter aerogenes</i>	13048
<i>Enterococcus casseliflavus</i>	700327
<i>Enterococcus raffinosus</i>	49427
<i>Escherichia coli</i> B	11303
<i>Escherichia coli</i> K12	10798
<i>Geobacillus stearothermophilus</i>	12980
<i>Halobacterium salinarum</i>	33170
<i>Lactobacillus acidophilus</i>	4356
<i>Micrococcus luteus</i>	4698
<i>Neurospora crassa</i>	44318
<i>Penicillium chrysogenum</i>	10106
<i>Providencia alcalifaciens</i>	9886
<i>Pseudomonas fluorescens</i>	13525
<i>Pseudomonas putida</i>	12633
<i>Rhizopus stolonifer</i>	14037
<i>Saccharomyces cerevisiae</i>	9763
<i>Serratia liquefacens</i>	27592
<i>Serratia marcescens</i> Bizio	13880
<i>Staphylococcus epidermidis</i>	14990
<i>Staphylococcus saprophyticus</i>	15305

- Laboratory instructor must maintain documentation for all stock organisms, sources and handling of stock cultures.
- Obtain fresh stock cultures of microorganisms on a regular basis (at least annually) to be certain of the source culture, minimize spontaneous mutations and to reduce contamination.
- Protocols that can be performed easily at BSL1: anaerobic growth, Gram stain, capsule stain, endospore stain, flagella stain, carbohydrate fermentation, casein hydrolase, catalase and oxidase test, bacterial enumeration, eosin methylene blue plate, gelatin hydrolysis, hanging drop, indole methyl red Vogues-Proskauer and Citrate (IMViC), Kirby-Bauer, Luria broth, litmus milk, 4-methylumbelliferyl- β -D-glucuronide *Escherichia coli* broth medium (*E. coli* MUG), MacConkey Agar, mannitol, nitrate reduction, spread, pour and quadrant streak plate, starch

hydrolysis, transformation assay, urease, triple sugar iron, use of lambda bacteriophage, bacterial transformation, plasmid DNA isolation, restriction endonuclease digestion, polymerase chain reaction (PCR) and gel electrophoresis.

Personal Protective Equipment Requirements:

- Safety goggles or safety glasses (with side shields) must be worn when handling liquid cultures, spread plating, or when performing procedures that may create a splash. If glasses are shared among students, they must be sanitized with an appropriate disinfectant after use.
- Laboratory coats must be worn. These can be disposable or made of cloth. Disposable coats may be reused but must be replaced on any sign of contamination, damage or degradation. Lab coats must be stored within the laboratory and must be assigned to individual students, not shared. Lab coats must be laundered by an approved laundry facility. Do not take lab clothing home to launder.
- Long pants/ long skirts (ankle length), or other clothing (such as scrubs) to cover exposed skin must be worn.
- Closed toe and heel shoes that cover the entire foot must be worn.
- Gloves must be worn when the student has fresh cuts or abrasions on the hands, or any time when cultures are handled, when staining microbes and when handling hazardous chemicals. Hands must be washed immediately after handling microbial cultures and anytime accidental contact occurs with the skin. Hand cleansing must be performed with soap and water, or, if none is available, with ethanol based hand sanitizer. Soap and water must be used as soon as possible if hand sanitizer is used.

Laboratory Work Practices:

- Wash hands after entering and before leaving the laboratory.
- Long hair must be tied back.
- Long, dangling jewelry is not permitted in the laboratory.
- Lab benches must be disinfected upon entering the laboratory and at the end of the laboratory session. Any materials that are spilled must be immediately cleaned-up. Disinfectants used must be effective against microbes used in the laboratory. OEHS can be consulted for disinfectant recommendations.
- Teach, practice and enforce the proper wearing and use of personal protective equipment.

- Food, water bottles, gum, and drinks of any kind are prohibited in the laboratory.
- Do not touch your face, apply cosmetics, adjust contact lenses, bite nails, or chew on pens/ pencils in the laboratory.
- All personal items must be stowed in a clean area while in the laboratory. The use of cell phones, tablets and other personal electronic devices is prohibited.
- Mouth pipetting is prohibited.
- All containers must be labeled clearly.
- The laboratory door must remain closed at all times when the lab is in session. The laboratory instructor must approve all persons entering.
- Minimize use of sharps. Needles and scalpels are to be used according to institutional guidelines: do not re-cap needles. Most sharps should be discarded in sharps containers that are closable, puncture-resistant, leakproof on sides and bottoms. However, non-contaminated pipets and pipet tips should be disposed of in broken glass receptacles.
- Contaminated sharps, including coverslips, slides, glass and plastic pipets and pipet tips, and Pasteur pipets, are discarded immediately or as soon as possible in biohazard sharps containers that are closable, puncture-resistant, leakproof on sides and bottoms, and labeled or color-coded appropriately.
- Test tube racks or other secondary containers must be used to move cultures in the laboratory.
- Stocks and other cultures must be stored in a leak-proof container when work is complete. A sealed, leak-proof container, labeled with a biohazard symbol, must be used to transport stocks and cultures from one room to another.
- Cultures should be disinfected/inactivated prior to disposal, either by chemical disinfection or autoclaving.
- Contaminated materials that are to be decontaminated at a site away from the laboratory are placed in a durable leak-proof container labeled with a biohazard symbol, which is closed before being removed from the laboratory. Hazardous waste can be picked up by OEHS, arranged through the OEHS Lab Management System (<http://oehs.utah.edu/topics/lab-management-system>).
- Broken glass must be handled using a dustpan and broom or forceps/tongs, not picked up by students or laboratory personnel with their hands. Broken glass must be disposed of in a broken glass box, unless it is contaminated and should be disposed of in a biohazard sharps container. If contaminated, broom will need to be disposed or sterilized.
- All spills or injuries must be immediately reported to the laboratory instructor. When contaminated material is spilled, inform the laboratory assistant immediately. Proper

procedure require the instructor and student to secure area, deny entry to non-authorized people. The instructor should assume everything spilled is infectious, wear personal protective equipment (lab coat, eye protection, shoe covers and 2 pairs of gloves), cover spill with paper towels, prepare fresh disinfectant (e.g., 1:10 dilution of bleach) and pour slowly onto spill from outside to in, leave for >20 min, use tongs to pick up objects and place in sharps containers, place other waste in biohazard waste containers, remove PPE and wash hands. Spills or injuries must then be documented with OEHS, who can be reached at 801-581-6590.

- Should an exposure occur, immediately wash the affected areas with soap and water, or if exposure to eyes or mucous membranes occurred, immediately flush affected area with water for 10-15 minutes. Go directly to the Student Health Center, Madsen Clinic, 555 South Foothill Boulevard, for medical evaluation and follow-up. For life threatening injury or illness call emergency medical services by calling 911. Clinic addresses and maps are at the end of this document and should be incorporated into training documents. Complete and submit the Incident/Accident Report form to Risk Management within 24 hours of the incident. The form can be downloaded from the Risk Management website, <https://riskmanagement.utah.edu/intranet/insurance/incident-accident-info.php>.
- Advise immune-compromised students and students living with or caring for an immune-compromised person to consult physicians to determine the appropriate level of laboratory participation. (Students shall not be asked to reveal if they are immuno-compromised. A general announcement should be made that students with a reduced immune status should consult with Student Health Services. A note from Student Health Services is sufficient to excuse a student from laboratory work.)
- *Recommended:* Supply pens and pencils for students, and keep separate from personal items.
- *Recommended:* Keep note taking and discussions separate from work with laboratory materials.
- *Recommended:* Use micro-incinerators rather than Bunsen burners.

Training Practices:

- Faculty and teaching assistants must complete University of Utah laboratory safety, bloodborne pathogens and biosafety trainings, as applicable.
- Instructors and/ or teaching assistants must review basic biosafety and microbiological practice with students on the first day of lab. The requirements listed above must be included in this training session. Training session must be documented with a sign-in sheet maintained by the instructor.

- Students and instructors are required to handle microorganisms safely and in conjunction with requirements outlined in the University of Utah Biosafety Manual.
- Inform students of safety precautions applicable to each exercise before the procedure is performed.

Documentation:

- Safety Data Sheets (SDS) must be available in the laboratory for all chemicals.
- Require students to sign safety agreements indicating that they have been informed about the safety requirements and the hazardous nature of the microbes and materials that they will handle throughout the semester. The laboratory instructor must maintain student signed agreements in the laboratory.
- Maintain and post caution signs on lab doors (complete with biohazard symbol). These should be obtained from OEHS. <https://oehs.utah.edu/resource-center/forms/hazard-warning-signage-questionnaire>.
- Instructors must provide a detailed list of microorganisms that will be handled in the laboratory to students. This list can be included in the syllabus, laboratory manual, or online at the course website.
- Emergency phone numbers and information must be posted in the laboratory.

Biosafety Level Two

Biosafety Level Two (BSL2) laboratories are suitable for working with microbes posing a moderate risk to the individual and a low community risk for infection. There are many microorganisms handled at BSL2 that can cause disease in humans via ingestion or inoculation. The guidelines for BSL2 laboratories build upon those for BSL1 facilities, and typically include additional engineering controls to protect students, such as biological safety cabinets, centrifuge safety cups and safety needle devices.

BSL2 Requirements

Laboratory Facility Requirements:

- Non-porous floor, bench tops, chairs and stools*
 - Bench tops are impervious to water and resistant to acids, alkalis, organic solvents, and moderate heat.
 - Laboratory furniture is sturdy with surfaces for easy cleaning and decontamination. No cloth chairs. Spaces between benches, cabinet and equipment are accessible for cleaning.
- Sink for hand-washing
- Eyewash station
- Lockable door to the laboratory
- Proper pest control practices
- If the laboratory has windows that open, they are fitted with fly screens.
- Separate storage area for personal belongings*
- Working and validated autoclave
- Biohazard signage where cultures are used and stored (e.g. incubators), on the door to the room and on containers used to transport cultures. Contact the OEHS Biosafety team at 1-6590 to request a BSL-2 Warning sign.
- *Recommended:* Biological Safety Cabinet. Please see requirements below. All biological safety cabinets must be certified by an approved vendor annually (contact OEHS at 801-581-6590). Biological safety cabinets (Class I or II) or other appropriate personal protective or physical containment devices are used whenever:
 - a. Procedures with a high potential for creating infectious aerosols are conducted. These may include centrifuging, grinding, blending, vigorous shaking or mixing, sonic disruption, opening containers of infectious

materials whose internal pressures may be different from ambient pressures, and harvesting infected tissues from animals or eggs.

- b. High concentrations or large volumes of infectious agents are used. Such materials may be centrifuged in the open laboratory if sealed heads or centrifuge safety cups are used and if they are opened only in a biological safety cabinet.
- *Please refer to the University of Utah Biosafety Manual for details and contact OEHS with questions (biosafety@oehs.uath.edu).*

**It is understood that some current facilities may not be able to meet these requirements due to the original design of the laboratory space. Any facility renovation or new construction would need to address these requirements.*

Stock Culture Requirements:

- Stocks must be from authorized, commercial or reputable sources. Do not subculture microbes isolated from the environment, clinical samples or other unknown locations because they may be microbes that require BSL2 practices and facilities. Samples must never be obtained from clinical sites unless a full description of strain antibiotic susceptibility and resistance is provided, and the IBC has approved the use of these strains for the laboratory.
- Strains resistant to clinically relevant antibiotics shall not be handled in teaching laboratories.
- Maintain documentation for all stock organisms, sources and handling of stock cultures.
- Obtain fresh stock cultures of microorganisms on a regular basis to be certain of the source culture, minimize spontaneous mutations and to reduce contamination.
- Store stocks in a secure (locked) area.
- Substitute surrogates for common BSL2 pathogens

Examples of Common Microbes used at BSL2

Microorganism	ATCC Number
<i>Klebsiella oxytoca</i>	13182
<i>Proteus mirabilis</i>	25933,7002
<i>Proteus vulgaris</i>	29905
<i>Salmonella enterica</i>	700720
<i>Staphylococcus aureus</i>	12600

- When choosing a test organism, many instructors want to choose organisms that are clinically relevant, i.e. pathogens. There are six microorganisms that are considered major threats, not because they cause the most devastating illnesses but because they comprise the majority of antibiotic-resistant infections observed in health care settings. These are referred to as ESKAPE pathogens and include *Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumonia*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and species of *Enterobacter* (ESKAPE).
- ESKAPE pathogens should be replaced with “Safe Relatives”. Requests to use ESKAPE pathogens rather than the safer alternatives will need to be justified to the IBC, who may require additional safeguards.
 - ESKAPE pathogen > Safe Relative
 - Enterococcus faecium* > *Enterococcus raffinosus* or *Enterococcus casseliflavus*
 - Staphylococcus aureus* > *Staphylococcus epidermidis*
 - Klebsiella pneumonia* > *Escherichia coli*
 - Acinetobacter baumannii* > *Acinetobacter baylyi*
 - Pseudomonas aeruginosa* > *Pseudomonas putida*
 - Enterobacter species* > *Enterobacter aerogenes*

Personal Protective Equipment Requirements:

- Safety goggles or safety glasses must be worn when handling liquid cultures, spread plating, or when performing procedures that may create a splash.
- Closed toe and heel shoes that cover the entire foot must be worn.
- Long pants/ long skirts (ankle length), or other clothing (such as scrubs) to cover exposed skin must be worn.
- Laboratory coats must be worn. These can be disposable or made of cloth. Disposable coats may be reused but must be replaced on any sign of contamination, damage or degradation. Lab coats must be stored within the laboratory and must be assigned to individual students, not shared. Lab coats must be laundered by an approved laundry facility. Do not take lab clothing home to launder.
- Gloves must be worn when handling cultures, when staining microbes and when handling hazardous chemicals. Hands must be washed immediately after handling microbial cultures and anytime accidental contact occurs with the skin. Hand cleansing must be performed with soap and water, and if none is available with ethanol based

hand sanitizer. Soap and water must be used as soon as possible if hand sanitizer is used.

Laboratory Work Practices:

- Instructors/Supervisor limits access to the laboratory. In general, persons who are at increased risk of acquiring infection or for whom infection may be unusually hazardous are not allowed in the laboratory or animal rooms. The director has the final responsibility for assessing each circumstance and determining who may enter or work in the laboratory.
- Instructors/Supervisor establishes policies and procedures whereby only persons who have been advised of the potential hazards and meet any specific entry requirements (e.g., immunization) may enter the laboratory
- When the infectious agent(s) in use in the laboratory require special provisions for entry (e.g., vaccination), a hazard warning sign, incorporating the universal biohazard symbol, is posted on the access door to the laboratory work area. The hazard warning sign identifies the infectious agent, lists the name and telephone number of the Instructor/Supervisor or other responsible person(s) for entering the laboratory.
- An insect and rodent control program is in effect.
- Wash hands after entering and before leaving the laboratory.
- Long hair must be tied back.
- Long, dangling jewelry is not permitted in the laboratory.
- Teach, practice and enforce the proper wearing, use, donning and doffing of personal protective equipment
- Lab benches must be disinfected upon entering the laboratory and at the end of the laboratory session. Additionally, if any materials are spilled, they will be immediately cleaned-up.
 - Disinfectants used must be effective against microbes used in the laboratory. OEHS can be consulted for disinfectant recommendations.
- Food, water bottles, gum, and drinks of any kind are prohibited in the laboratory.
- Do not touch your face, apply cosmetics, adjust contact lenses, bite nails, or chew on pens/ pencils in the laboratory.
- All personal items must be stowed while in the laboratory. The use of cell phones is prohibited.
- Mouth pipetting is prohibited.
- All containers must be labeled clearly.
- The laboratory door must remain closed at all times when the lab is in session.

- Minimize use of sharps. Needles and scalpels are to be used according to institutional guidelines: do not re-cap needles. Most sharps should be discarded in sharps containers that are closable, puncture-resistant, leakproof on sides and bottoms. However, non-contaminated pipets and pipet tips should be disposed of in broken glass receptacles.
- Contaminated sharps, including coverslips, slides, glass and plastic pipets and pipet tips, and Pasteur pipets, are discarded immediately or as soon as possible in biohazard sharps containers that are closable, puncture-resistant, leakproof on sides and bottoms, and labeled or color-coded appropriately.
- Test tube racks or other secondary containers must be used to move cultures in the laboratory.
- Stocks and other cultures must be stored in a leak-proof container when work is complete. A sealed, leak-proof container, labeled with a biohazard symbol, must be used to transport stocks and cultures from one room to another.
- Students must be taught proper technique to minimize production of aerosols. For example: when pipetting, place tip on side of tube and allow liquid to run down the side of the tube, and when flaming a loop to transfer culture, have a sterile agar plate used as a “sizzle” plate so students do not touch a culture with a really hot loop.
- All procedures that generate aerosols: centrifuging, grinding, blending, shaking, mixing, sonicating, etc., must be performed inside a biological safety cabinet or using appropriate engineering controls (centrifuge safety cups). Biological safety cabinets must also be used when opening a container that can become depressurized when opened, and could release aerosols of the stock culture, and students must be trained in the proper use of biological safety cabinets.
- All waste and cultures are appropriately labeled and must be disinfected/inactivated prior to disposal, either by chemical disinfection or autoclaving.
- Contaminated materials that are to be decontaminated at a site away from the laboratory are placed in a durable leakproof container labeled with the biohazard symbol, which is closed before being removed from the laboratory. Hazardous waste can be picked up by OEHS, arranged through the OEHS Lab Management System (<http://oehs.utah.edu/topics/lab-management-system>).
- Broken glass must be handled using a dustpan and broom or forceps/tongs, not picked up by students or laboratory personnel with their hands. Broken glass must be disposed of in a broken glass box, unless it is contaminated and should be disposed of in a biohazard sharps container. If contaminated, broom will need to be disposed or sterilized.
- All spills or injuries must be immediately reported to the laboratory instructor. When contaminated material is spilled, inform the laboratory assistant immediately. Proper

procedure require the instructor and student to secure area, deny entry to non-authorized people. The instructor should assume everything spilled is infectious, wear personal protective equipment (lab coat, eye protection, shoe covers and 2 pairs of gloves), cover spill with paper towels, prepare fresh disinfectant (e.g., 1:10 dilution of bleach) and pour slowly onto spill from outside to in, leave for >20 min, use tongs to pick up objects and place in sharps containers, place other waste in biohazard waste containers, remove PPE and wash hands. Spills or injuries must then be documented with OEHS, who can be reached at 801-581-6590.

- Should an exposure occur, immediately wash the affected areas with soap and water, or if exposure to eyes or mucous membranes occurred, immediately flush affected area with water for 10-15 minutes. Go directly to the Student Health Center, Madsen Clinic, 555 South Foothill Boulevard, for medical evaluation and follow-up. For life threatening injury or illness call emergency medical services by calling 911. Clinic addresses and maps are at the end of this document and should be incorporated into training documents. Complete and submit the Incident/Accident Report form to Risk Management within 24 hours of the incident. The form can be downloaded from the Risk Management website, <https://riskmanagement.utah.edu/intranet/insurance/incident-accident-info.php>.
- Advise immune-compromised students and students living with or caring for an immune-compromised person to consult physicians to determine the appropriate level of laboratory participation. (Students should not be asked to reveal if they are immuno-compromised. A general announcement should be made that students with a reduced immune status should consult with student health services. A note from Student Health Services is sufficient to excuse a student from laboratory work.)
- Supply pens and pencils for students, and keep separate from personal items.
- Keep note taking and discussions separate from work with laboratory materials. Note taking can be performed on a pull out desk shelf, if available, but must be taken away from the work area. If this is not available, lecture must be performed before any materials are brought to the bench areas.
- Use micro-incinerators rather than Bunsen burners. Bunsen burners are not permitted in biological safety cabinets. Micro-incinerators can also be used to heat fix bacterial smears on microscope slides and flaming the end of a test tube by passing these items over the entrance to the micro-incinerator.

Training Practices:

- Teaching assistants must complete OEHS laboratory safety, bloodborne pathogen and BSL2 biosafety trainings.

- Instructors and/ or teaching assistants must review basic biosafety and microbiological practice with students on the first day of lab. The requirements listed above must be included in this training session. Training session must be documented with a sign in sheet maintained by the instructor.
- Require students and instructors to handle microorganisms safely and in conjunction with requirements outlined in the University of Utah Biosafety Manual.
- Inform students of safety precautions applicable to each exercise before the procedure is performed.
- Require students to demonstrate proficiency in standard aseptic technique and BSL1 practices before allowing them to work at BSL2.

Documentation:

- A biosafety manual is prepared and adopted. Students are advised of special hazards and are required to read instructions on practices and procedures and how to follow them
- Safety Data Sheets (SDS) sheets must be available in the laboratory for all chemicals.
- If available, Pathogen Safety Data Sheets (PSDSs) (previously titled Material Safety Data Sheets for infectious substances) are technical documents that describe the hazardous properties of a human pathogen and recommendations for work involving these agents in a laboratory setting. These documents have been produced by the Public Health Agency of Canada (the Agency) as educational and informational resources for laboratory personnel working with these infectious substances and can be accessed at <http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/index-eng.php>.
- Spills and Post-Exposure Procedures must be available in the laboratory.
- Require students to sign safety agreements indicating that they have been informed about the safety requirements and the hazardous nature of the microbes and materials that they will handle throughout the semester. Maintain student signed agreements at the institution.
- Prepare, maintain and post caution signs to the laboratory, complete with biohazard symbol.
- Instructors must provide a detailed list of microorganisms that will be handled in the laboratory to students. This list can be included in the syllabus, laboratory manual, or online at the course website.
- Register all work at BSL2 with the Institutional Biosafety Committee.
- Maintain an inventory of the quantity and location of all RG2 agents, in line with ASM recommendations.⁴ Create a record of RG2 agents to include the following: (1)

identification (name and species of agent), (2) quantity (e.g., approximate number of vials for each agent), (3) location (building, room and cold storage unit ID), (4) name of person familiar with that agent, (5) date entry created, and (6) other related information, such as source, and variant/strain.

- Follow all requirements for BSL2 as outlined in the University of Utah Biosafety Manual.
- Emergency numbers and information must be posted in the laboratory.

References:

1. ASM teaching guidelines: <http://www.asm.org/index.php/education-2/22-education/8308-new-version-available-for-comment-guidelines-for-best-biosafety-practices-in-teaching-laboratories>
2. CDC report regarding 2011 *Salmonella typhimurium* outbreak: <http://www.cdc.gov/salmonella/2011/lab-exposure-1-17-2012.html>
3. CDC report regarding 2014 *Salmonella typhimurium* outbreak: <http://www.cdc.gov/salmonella/typhimurium-labs-06-14/index.html>
4. ASM Statement: What is in your laboratory freezer? <http://www.asm.org/index.php/public-policy/99-policy/policy/93059-freezer-8-14>

Document adapted, with permission, from the Rutgers University Teaching Laboratory Guidelines

Medical Assistance

Student Health Center at the Madsen Clinic

Location



555 Foothill Dr. Level 1

Salt Lake City, UT 84112

Phone: 801-581-6431

Fax: 801-585-5294

Hours

- Operating Hours: Monday-Friday, 7:30 am to 5 pm
- Appointment Hours: Monday-Friday, 8 am to 4 pm
- Walk-in (vaccines, lab tests) Hours: Monday-Friday, 9 am to 4 pm

Note: Clinic is closed on Wednesdays, 12-2pm.

Extended Hours

- Tuesdays, evening appointments to 6:30 pm
- Saturdays, appointments from 9 am to 11:30 am
- Fall and Spring Semesters only
 - Tuesday, 7:30 am to 7:30 pm
 - Saturday, 9:00 am to 12:00 pm

Note: Extended hours do not apply to Tuesdays or Saturdays during or near breaks/holidays.

Collegiate Assistance Program

If you need to speak to a nurse when the Student Health Center is closed, call 1-877-643-5139 for the Collegiate Assistance Program. You need to be enrolled in the university's Student Health Insurance Plan through United HealthCare. You will also need the PIN number on the back of your insurance card for the call.

General and After-Hours Care

Student Health Insurance Plan Preferred Provider Network

University of Utah Health Care Urgent Care centers provide extended hours for general care (<http://healthcare.utah.edu/primarycare/urgent.php>). Or call 801-581-6431 for recorded directory information.