SDSU

HealthLINK Center

Lab Specific Safety

Disclaimer: This resource is provided as an example and reference and was written/compiled in 2025. It reflects laboratory-specific safety guidelines and requirements applicable to the SDSU HealthLINK Center and SDSU policies at the time of writing. Users should consult their own institution's environmental health and safety office, laboratory management, or other appropriate institutional representatives for the most current guidelines, requirements, and procedures applicable to their organization. The content is solely the responsibility of the authors and does not necessarily represent the official views of the SDSU HealthLINK Center.

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1. OVERVIEW

1.1. Intro / Purpose:

The SDSU HealthLINK Center's Biomedical wet lab supports transdisciplinary research aimed at addressing minority health and reducing health disparities, specifically by providing general and molecular biology tools and resources. The lab hosts equipment and personnel that receive human biospecimens (saliva, blood serum, urine, general skin, mouth swabs, and other bodily fluids), evaluates samples via basic molecular biology and chemistry assays, and stores specimens via long-term Ultra-low freezing (-80°C). We aim to provide valuable lab services to researchers who would otherwise not have access to biomedical lab resources. Our long-term goal is to develop a cost-recovery service to sustain the ongoing availability and cost-effectiveness of these services.

The lab and its personnel are equipped to work with unfixed human or non-human primate organs, tissue, or cell cultures; human blood and blood products; human bodily fluids (such as urine or saliva); and water or environmental samples. Potential hazards personnel may be exposed to include exposure to potential blood-borne pathogens (as samples are not tested for infectious diseases), risk of needle stick, and mixing of biohazardous substances and/or creation of aerosols via vortexing, pipetting, centrifugation, etc. Personnel may also be exposed to laboratory reagents and general chemicals such as bleach and alcohol. Potential use of samples using recombinant DNA requires Biological Use Authorization (BUA) approval.

1.2. Requirements / Responsibilities:

This procedure should be adhered to for any person who will be working with blood, human specimens (bodily fluids, saliva, urine, stool, general swabs of the skin or mouth, hair, nails, etc.), water/environmental samples, etc. It is each person's responsibility to read and understand these procedures and abide by them when working in the wet lab.

Work with bloodborne pathogens

Workers potentially exposed to bloodborne pathogens are required to submit a Hepatitis B Vaccine acceptance/declination form. SDSU offers the Hepatitis B vaccine series, free of charge, to all employees who have occupational exposure to blood and other potentially infectious materials. The Hepatitis B vaccination is available after the employee has received training. The vaccine series is not a condition for employment. An

employee may initially decline the vaccine and decide to accept it at a later date. A declination form is required to ensure the vaccine series is offered. Complete and submit the form above indicating whether you would like to request or decline the Hepatitis B vaccination.

Personal Protective Equipment and Work Practices

Personal Protective Equipment (PPE) and work practices are essential to ensure the safety of personnel and the environment. The following precautions should always be followed while working in the lab:

- Always wear long pants without rips and closed-toe shoes. Sandals and shorts should **never** be worn
- PPE should be worn as required and in the appropriate sizes that are comfortable for the researchers. PPE should be impervious and prevent biohazards from contaminating skin and/or personal clothing
- Check PPE for rips or tears and ***never*** use damaged or defective PPE
- PPE must be changed as soon as feasible after contamination. Disposable PPE should be placed in a biomedical waste container, and reusable PPE should be placed in a closed container labeled with the biohazard symbol for decontamination
- PPE must not be worn outside the laboratory and should never be laundered at home
- Do not touch clean surfaces with gloved hands
- Wash hands with soap and water for 30 seconds after removing PPE and before leaving the laboratory
- Do not drink, eat, or smoke in the laboratory. Do not store beverages or food in the lab
- Avoid touching eyes, nose, or mouth with gloved hands
- Do not pipette liquids by mouth
- Minimize or eliminate the use of sharps when possible
- Minimize the potential for aerosol formation and confine aerosols as close as possible to their source of generation
- Disinfect work surfaces and equipment after use

Refer to a chemical's MSDS or a reagent's manual for additional guidance on necessary PPE. For information about work practices when working with moderate-risk infectious agents or toxins, refer to Section 2.1.

1.3. Materials / Software / Calibration / Credentials Needed:

Personnel working within a laboratory space should don a lab coat and disposable latex or nitrile gloves at all times. When working with liquids

that may splash, safety goggles should be worn as well. Additional PPE may be required; refer to each procedure for additional information.

1.4. Document Format:

(Do not modify this section.) Adhere to these formatting standards:

- Use Palatino font, size 12 for text. Size 11 for text within tables.
- 1st level heading: **TITLE OR PRIMARY HEADING IN BOLD, USE ALL CAPS**. Size 14
- **2nd level heading: Title or Heading in Bold. Use Title Caps. Size 12**
- 3rd level heading: Heading underlines. No title caps except the first word. Size 12
- 4th level heading: *Heading in italics*. No title caps except the first word. Size 12
- [Text in brackets consist of internal instructions or text to be replaced in templates]
- (Text in parentheses includes examples or acronyms)
- Blue text is hyperlinked to other sections of the document or to files and folders external to the document

1.5. Definitions:

An **aerosol** for the purpose of this protocol is an airborne particle consisting of or originating from living organisms.

A **biohazard** is any biological agent that poses a risk to human health and/or the environment. This includes:

- Human and animal samples such as tissue, blood, bodily fluids, etc.
- Animal parts/carcasses
- Cultures and stocks of infection agents
- Live and attenuated viruses
- Waste products from bacteria, viruses, and spores
- Plastic pipettes/tips
- Gloves, paper towels, absorbent pads, etc. that had contact with biohazards
- Wastes including specimen cups or plastic containers containing recognizable fluid blood, blood products, or body fluids
- Reagents and other chemicals

A **biological agent** is any microorganism, infectious substance, or any component of any such microorganism or infectious substance that is capable of causing death, disease, or other biological malfunction in any living organism; deterioration of food, water, equipment, supplies, or material of any kind; or deleterious alterations of the environment.

A **Biosafety Cabinet (BSC)** is a ventilated containment device used to protect airborne biological agents.
Biosafety level 2 (BSL-2) laboratories are suitable for work with pathogenic agents associated with human disease and pose a moderate hazard to personnel and/or the environment.
A **flammable liquid** is a liquid chemical that has a vapor pressure not exceeding 40 lbs/in^2 at 100°F and has a flashpoint at or below 199.4°F.
A **hazard** is a substance or situation capable of causing adverse effects to health or safety.
Sharps are any instrument that could potentially pierce or cut skin. This includes needles, blades, biohazard-contaminated small glass items, capillary tubes, etc.
Toxins are toxic materials or products of plants, animals, microorganisms, infectious substances, or recombinant or synthesized molecules, and include any poisonous substance or biological product that may be engineered.

2. PROCEDURE:

2.1. BMBL Laboratory Biosafety Level Criteria

The Biomedical Laboratory is rated at BSL 2. Please refer to the Biosafety in Microbiological and Biomedical Laboratories guidelines for additional details about working under this designation.

Biosafety Level 2 (BSL-2) builds upon Biosafety Level 1 (BSL-1), but differs in that 1) all laboratory personnel are specifically trained in handling pathogenic agents and are supervised by scientists competent in handling infectious agents and associated procedures; 2) access to the laboratory is restricted when work is being conducted; 3) all procedures in which infectious aerosols or splashes may be created are conducted in Biosafety Cabinets (BSCs) or other physical containment equipment.

2.1.1. Standard microbiological practices

- Persons must wash their hands after working with potentially hazardous materials and before leaving the laboratory.
- Eating, drinking, smoking, handling contact lenses, applying cosmetics, and storing food for human consumption is not permitted in the laboratory areas.
- Mouth pipetting is prohibited; mechanical pipetting devices must be used.

- Follow all policies for safe handling of sharps, such as needles, pipettes, and broken glassware.
- Perform all procedures to minimize the creation of splashes and/or aerosols.
- Decontaminate work surfaces after completion of work and after any spill or splash of potentially infectious material with appropriate disinfectant.
- Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method.

2.1.2. Special Practices

- All persons entering the laboratory are advised of the potential hazards and must meet posted entry/exit requirements.
- Laboratory personnel are provided medical surveillance, as appropriate, and offered available immunizations for agents handled or potentially present in the laboratory.
- The laboratory supervisor must ensure the laboratory personnel demonstrate proficiency in standard and special microbiological practices before working with BSL-2 agents.
- Potentially infectious materials must be placed in a durable, leak-proof container during collection, handling, processing, storage, or transport within a facility.
- Laboratory equipment should be regularly decontaminated, as well as after spills, splashes, or other potential contamination.
- All procedures involving the manipulation of infectious materials that may generate aerosol should be conducted within a BSC or other physical containment devices.

2.1.3. Safety Equipment

- Properly maintained BSCs, other appropriate personal protective equipment, or other physical containment devices must be used whenever:
    - Procedures with a potential for creating infectious aerosols or splashes are conducted.
    - High concentrations or large volumes of infectious agents are used.
- BSL-2 PPE includes the following PPE:
    - Cap
    - Gown or lab coat
    - Shoe covers
    - Double gloved hands

    - Safety goggles or glasses
    - Face mask (N95 preferred, but surgical is acceptable)
- Protective laboratory coats designated for laboratory use must be worn while working with hazardous materials. Remove protective clothing before leaving for non-laboratory areas.
- Eye and face protection is used for anticipated splashes or sprays of infectious or other hazardous materials when the specimen must be handled outside the BSCs or containment device.
- Gloves must be worn to protect hands from exposure to hazardous materials.
- All work should be performed in the BSC.

2.1.4. Laboratory Facilities

- Laboratory doors are self-closing and are locked in accordance with the SDSURF policies.
- Laboratories have a sink for hand washing.
- The laboratory is designed so that it can be easily cleaned and decontaminated.
- Laboratory furniture must be capable of supporting anticipated loads and uses. Spaces between benches, cabinets, and equipment should be kept accessible for cleaning.
- BSCs must be installed so that fluctuations in the room air supply and exhaust do not interfere with proper operations.
    - Vacuum lines are protected with liquid disinfectant traps.
    - HEPA-filtered exhaust air from a Class II BSC can be safely recirculated back into the laboratory environment if the cabinet is tested and certified at least annually and operated according to the manufacturer's recommendations.
- An eyewash station is readily available and is serviced monthly.
- A method for decontaminating all laboratory wastes is made available.

2.2. Use of the Biological Safety Cabinet (BSC)

The biosafety cabinet is the primary means of protecting lab personnel, the product, and the environment from biological hazards. All work with infectious agents should be manipulated in the BSC, especially those practices that could generate aerosols. Using the BSC properly includes the following:

A. Do not work in a BSC while a warning light or alarm is signaling. Before using the cabinet, check the control panel for warnings or messages.
B. Turn on the cabinet fan 15 minutes before beginning work.
C. Disinfect the cabinet work surface with 70% ethanol or other disinfectant and wipe surfaces.
D. Keep the front and rear grilles clear.
E. Place supplies in the cabinet. Locate the container inside the cabinet for disposal of pipettes. (Movement of hands in and out of the cabinet to discard pipettes into a container located outside of the cabinet creates turbulence and disrupts the air barrier that maintains sterility inside the cabinet.)
F. Keep the work area of the BSC free of unnecessary equipment or supplies. Clutter inside the proper airflow and the level of provided.

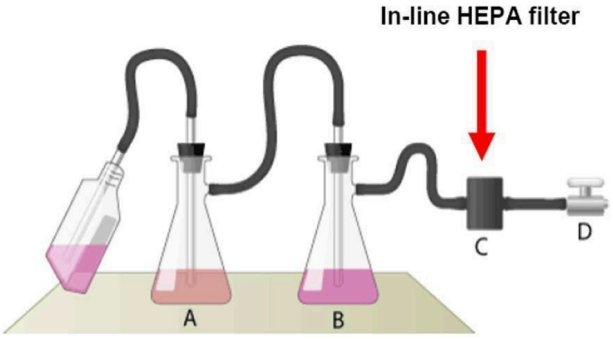


Figure 1

BSC may affect protection

G. Always use mechanical pipetting aids.
H. Minimize traffic around the biosafety cabinet and avoid drafts from doors and air conditioning.
I. Work as far to the back (beyond the air split) of the BSC workspace as possible.
J. Avoid using open flames inside BSCs.
K. Some BSCs are equipped with hose vacuum systems. When using a hose vacuum system (Figure 1), place a hydrophobic filter (C) between the overflow flask (B) and the vacuum port (D). Examples include Whatman Vacu-guard (Figure 2) and Pall Gelman Vacushield in-line disk filters. Turn off the vacuum when not in use.
L. When work is completed, remove equipment and supplies from the cabinet. Wipe the work area with 70% ethanol and allow the cabinet fan to run for 15 minutes.
M. Some BSCs are equipped with ultraviolet (UV) lights. If one is used, the tube should be wiped with 70% ethanol every two weeks, while turned off, to remove dust. UV radiation should not take the

Figure 2

place of 70% ethanol for disinfection of the cabinet interior.

N. The UV lamp should never be on while an operator is working in the cabinet.

O. The BSC should be certified annually.

2.3. Working with Biological Samples

This section will provide personnel with information on how to collect, transport, and process biological samples. This includes the conditions for which samples should be handled. Different storage and handling conditions may be necessary for different specimen types and should be verified prior to work with those specimens as improper handling and/or storing can lead to degradation of samples. Records of storage and handling conditions for each sample should be kept on file.

2.3.1. Collecting blood, serum, and blood products

All blood will be handled under BSL2 conditions using Universal Precautions. Blood will be collected from healthy populations by a licensed phlebotomist in a dedicated room. Current phlebotomy practices will be used for venipuncture: the site cleaned with an antiseptic, elastic band, or tourniquet to apply pressure to the upper arm, insertion of the needle, and use of sealed blood collection vials (vacutainer) collection tubes. After drawing blood, pressure will be applied to the puncture site using a sterile gauze pad to stop the bleeding. Engineered sharps will be used for venipuncture and disposed of in biohazardous sharps containers. Work with blood will be done by trained personnel in proper PPE as described in Section 2.1.

2.3.2. Collecting non-blood biospecimens (e.g., bodily fluids, saliva, urine, stool, general swabs of the skin or mouth, etc.)

Biospecimens will be collected from healthy populations by trained personnel or phlebotomists in a dedicated room. The participant will be instructed verbally and provided instructions in writing, on the method for sterile sample collection. Participants will place their labeled samples in the sample collection cubby door located in the restroom adjacent to the phlebotomy/collection suite.

2.3.3. Receiving previously collected samples

Researchers requesting HealthLINK services may choose to purchase samples from an outside vendor, collect their own specimens (described in the researcher's BUA), or request we use samples that have been kept in storage. In these instances, HealthLINK will receive the previously collected samples in person

(handoff) or by mail. Researchers are responsible for submitting their BUA and following all regulations from appropriate agencies prior to receipt of these samples by HealthLINK. Once HealthLINK receives the samples, personnel will perform sample intake which includes a visual quality control inspection to ensure the samples are of acceptable quality and physical state, and not damaged during shipping/handling.

2.3.4. Transportation of samples

Samples will be transported between the collection/phlebotomy suite (6475 Alvarado Rd, Ste. 233, Rm. 12) and lab (Ste. 104) in a labeled secondary container, on ice if necessary for the preservation of samples for downstream processing. When necessary, samples will be transported in labeled secondary containers to the Biosciences Center (BSC) on the SDSU campus for the use of the facilities there. The BSC will house SDSU HealthLINK equipment that requires specific infrastructure that the Alvarado Rd facility cannot support (e.g., equipment that requires a fume hood). Samples (on ice if necessary) will be transported within a labeled secondary container.

2.3.5. Sample processing

Sample manipulation, aliquoting, and assays involving biospecimens will be performed in a sterilized biosafety cabinet or in closed instruments and machines (e.g. microplate reader, QIAcube Connect, Chemistry Analyzer) and mixed with preservatives or kit components specific to the assay performed. DNA, RNA, and protein will be isolated using standard assay kits. BSL2 aseptic technique will be used by personnel to reduce the contamination of samples and the area. 70% Ethanol or 10% bleach will be used to sterilize equipment and surfaces prior to and after use. Inverted microscope slides, HPLC, PCR, and qPCR reagents will be mixed and prepared on the bench top and placed in plastic or glassware specific to each machine. Biohazardous procedures that produce aerosols will be executed in the biosafety cabinet. Sealed rotors in centrifuges will be used. All work will be performed by trained personnel in proper PPE using Universal Precautions.

2.3.6. Storage

Biospecimen samples will be properly disposed of (see below for specific disposal practices) or aliquoted, labeled, and stored

according to specifications for each sample type. In general, samples needing long-term storage should be placed in the -80°C freezer in a well-labeled freezer box; however, storage conditions should be confirmed prior to receiving and/or handling biospecimens.

2.3.7. Hazard and risk assessments

High-risk procedures shall be executed with the utmost caution. Some of these procedures with higher risk may include exposure to potential blood-borne pathogens (samples are not tested for infectious diseases and should be treated as if they are infectious), risk of needle stick, mixing of biohazardous substances via vortexing, pipetting, and centrifugation.

Safety measures are instituted to minimize the risk of exposure. Some of these measures include: following Universal Precautions, engineered sharps for venipuncture, employing many automated closed machines to reduce exposure to reagents and samples, using proper PPE and aseptic technique for BSL2 work, utilizing benchtop splash shields or the biosafety cabinet, flammables cabinet, sharps containers, filter pipette tips, centrifuge biocontainment lids, and secondary containment during transport and storage.

2.4. Laboratory Centrifuge Safety

Centrifuges, which operate at high speed, have great potential for injuring users if not operated properly. Unbalanced centrifuge rotors can result in injury or death. Sample container breakage can release aerosols that are harmful if inhaled.

The majority of all centrifuge accidents result from user error. To avoid injury, workers should follow the manufacturer's operating instructions for each make and model of centrifuge that they use.

Follow these steps for the safe operation of centrifuges:

- Ensure that centrifuge bowls and tubes are dry.
- Ensure that the spindle is clean.
- Inspect tubes or containers for cracks or flaws before using them.
- Use matched sets of tubes, buckets, and other equipment.
- Always use safety centrifuge cups to contain potential spills and prevent aerosols.

- Avoid overfilling tubes or other containers (e.g., in fixed-angle rotors, centrifugal force may drive the solution up the side of the tube or container wall).
- Ensure that the rotor is properly seated on the drive shaft.
- Make sure that tubes or containers are properly balanced in the rotor.
- Only check the O-rings on the rotor if you are properly trained.
- Apply vacuum grease in accordance with the manufacturer's guidelines.
- Close the centrifuge lid during operation.
- Do not exceed the rotor's maximum run speed.
- Make sure that the centrifuge is operating normally before leaving the area.
- Make sure that the rotor has come to a complete stop before opening the lid.

When centrifuging infectious materials, wait 10 minutes after the rotor comes to a complete stop before opening the lid. If a spill occurs, use appropriate decontamination and cleanup procedures for the spilled materials. Report all accidents to the Biomedical Lab Coordinator and Biosafety Officer immediately.

2.5. Proper Chemical Handling

2.5.1. General Practices

Prior to working with chemicals, personnel should be aware of all the potential risks associated with using that chemical by completing a risk assessment. This includes:

- Identifying the chemical and amount of that chemical required to perform the experiment.
    - If the chemical is particularly hazardous, consider possible substitutes.
- Evaluate the hazards posed by the use of the chemical and the experimental conditions; consider hazards in terms of toxicity, physical, reactivity, flammability, explosive, radiation, and biological.
    - Refer to the chemical's safety data sheet (SDS) for information about these potential hazards.
- Determine appropriate engineering controls, administrative controls, and/or PPE required to prevent workplace accidents.

- Determine proper first aid and spill measures necessary in the event of an accident.

Additional precautions that can be taken to ensure safety include:

- Avoiding the underestimation of risk.
    - Precautions should be taken such that mixtures of chemicals are assumed more toxic than their components unless otherwise known.
    - If chemicals have unknown hazards or an incomplete SDS, try to determine possible hazards by comparing them to similar chemicals.
- Use the least amount of chemicals as possible to reduce exposure.
- Never return unused chemicals to their original containers.
- Check the Permissible Exposure Limits (PELs) and ensure they are not exceeded.
- Ensure proper ventilation.
- When receiving or working with new chemicals, determine:
    - What is the chemical?
    - What is its classification?
    - How should it be handled?
    - How should it be stored?
    - How should it be disposed of?

Always be mindful of hazardous chemicals. Hazardous chemicals have varying degrees of severity, so it's important to understand what the hazard is and how to properly handle, store, and dispose of those chemicals such that they don't harm personnel or the environment. Common chemical classifications include but are not limited to, oxidizers, organic/inorganic acids, organic/inorganic bases, toxic chemicals, flammables, and reactive chemicals.

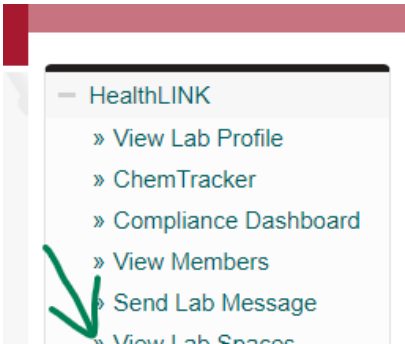
2.5.2. Using BioRAFT for Chemical Safety

2.5.2.1. Using ChemTracker

BioRAFT's ChemTracker tool allows an easy and convenient way to track which chemicals are in the lab, where they're located, and how much of each chemical remains.

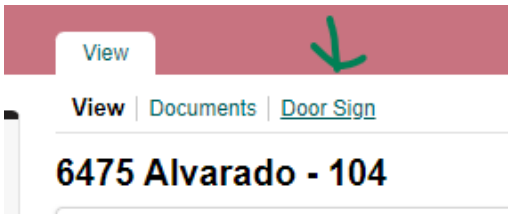
2.5.2.2. Creating a digital door sign

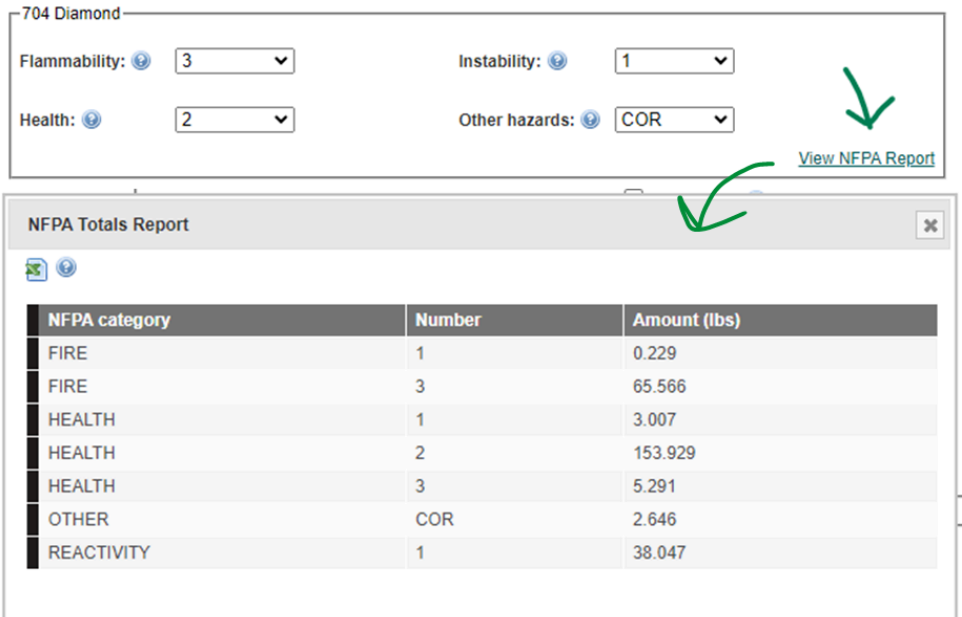
A door sign is an important tool to alert lab members to the types of materials that



might be encountered in the lab, precautions that must be taken when working in the lab, and who to contact in the event of an emergency. The door sign can be generated digitally through BioRAFT and printed to be hung outside of the lab. To create a digital door sign:

1. Log into BioRAFT with SDSU credentials.
2. On the left-hand side of the screen, click the **HealthLINK** drop-down and select **View Lab Spaces** (Figure 4).
3. From the list of HLINK spaces, select the space you would like to create the door sign for.
4. At the top of the screen, select the **Door Sign** option (Figure 5).
5. Scroll to the bottom of the page and select **Edit Digital Door Sign.**
6. Enter the necessary edits.
    a. If you need to edit the 704 Diamond (which indicates the hazards), select the **View NFPA Report**. A pop-up will appear with the categories, numbers, and chemical weights. The corresponding number that should go in each category is the one with the highest chemical weight. (Figure 6) For example: If number 1 has a weight of 2.3 lbs and number 3 has 231.4 lbs in the Fire category, number 3 will go in the number category. The hazards will





automatically be calculated based on the chemical inventory recorded in ChemTracker

7. After the edits have been made, select **Submit** at the bottom of the screen.
8. Email SDSU Environment, Health, and Safety (EH&S) to receive a PDF version of the door sign that can be printed and hung in the lab.

2.5.3. Storage Considerations

Proper chemical storage is necessary to ensure the safety of personnel and the environment, ensure chemical functionality, and reduce chemical waste. Chemicals should be dated upon receipt to ensure they are used before expiration. If chemicals are transferred to another container, ensure the new label has all the relevant information.

Chemicals should generally be stored in cool, well-ventilated, and dry areas away from heat and light. Bottles must be stored upright on shelves or counters able to accommodate the height of the bottle. Lids and caps must be tightly closed. Ensure chemicals are compatible with the container they are stored in and periodically verify the integrity of the containers, shelves, cabinets, and/or labels. Chemicals must not be stored under or on tables or in corridors. Chemicals should not be stored above head height when possible. Hazardous chemicals must be stored in a compatible secondary container that is large enough to contain the entire contents of the bottle in case of a leak or spill.

Gas cylinders must be stored upright and must be kept secured, most commonly anchored to a rack with metal chains at 1/3 the cylinder height and 2/3 the cylinder height. Store away from sources of ignition. The cap must be securely fastened when not in use. Flammable and oxidizing gasses must be stored at least 20 feet apart unless a 5-foot fire-resistant partition with a 30-minute fire rating is placed between them. Cylinders should be in a well-ventilated, cool, and dry area away from corrosive materials.

Highly reactive chemicals may require varied storage conditions, and the SDS should always be consulted prior to storage. Labels

should clearly state the material is dangerous and highly reactive. Never open the chemical past its expiration date.

Toxic chemicals should be stored in designated areas with clear signage indicating their hazards. Storage of toxic chemicals should be minimized. Containers should be securely closed and stored in a shatter-proof secondary container. Access to toxic materials should be limited.

2.5.4. Chemical Incompatibility and Segregation

Certain chemicals should be segregated to prevent chemical reactions that may result from unintentional mixing via spills, leaks, container degradation, vapor escape, natural disasters, or laboratory emergencies. These chemicals can be segregated by physically separating them into different shelving units, rooms, or cabinets. The SDS for each chemical should be checked prior to storage.

2.5.5. Working with Flammable Liquids

As flammable liquids usually have high vapor pressures at room temperature, they can ignite or burn when mixed with air in the appropriate ratio. Their vapor pressures can increase with temperature, so they can become more hazardous as temperatures increase. The concentrated vapors of flammable liquids may be heavier than air and can cause vapor trails which can travel to reach an ignition source, resulting in a flashback fire. Fire can also result from reactions between flammables or combustibles and oxidizers. As such, flammable liquids must be carefully stored and handled.

2.5.5.1. Labeling and Storage

All flammable liquids must be clearly labeled with the correct chemical name and hazard. Handwritten labels are acceptable so long as they aren't chemical or structural formulas. Storage of flammables outside the flammable-rated storage cabinets should be minimized. The volume stored outside of the rated cabinets must not exceed 10 gallons in a single laboratory. 5-gallon containers must be stored inside the cabinet. Any refrigerators used for storage must be designed/rated for this purpose. Keep flammables segregated from incompatible materials including oxidizers.

2.5.5.2. Handling

The following considerations should be followed when working with flammable liquids:

- Fume hoods, or other locally exhausted ventilation, should be used.
    - Local exhaust ventilation is particularly important when using larger quantities (greater than 500 ml) or when flammables are heated or at increased pressure.
- Flammable liquids should be used in areas free of ignition sources, including spark-emitting motors or equipment.
- Larger quantities of flammable liquids must be handled using spark-free tools.
- Never heat flammable liquids by using an open flame. Use steam baths, water baths, oil baths, heating mantles, or hot air baths.
- Keep a B-rated fire extinguisher in the laboratory and ensure it is serviced annually. Standard BC or ABC extinguishers can be used as long as the extinguishing media are compatible with the specific chemicals in use.

2.6. Safe Use and Disposal of Sharps

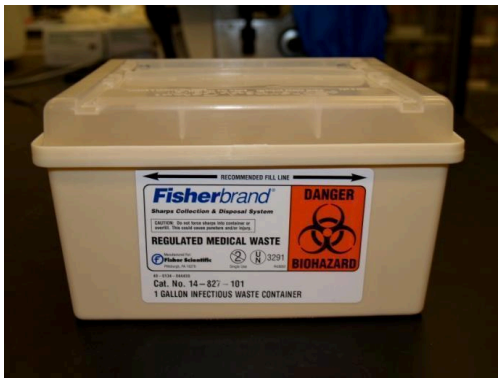
Careful use and disposal of sharps are necessary for ensuring the safety of lab personnel.

2.6.1. <u>To prevent needlestick injuries:</u>

- Avoid using needles whenever possible. Attempt to revise protocols to utilize a different tool.
    - Replace glass materials with plastic (such as Pasteur pipettes)
- Do not bend, break, or otherwise manipulate needles by hand.
- Do not recap needles by hand.
- Do not remove needles from syringes by hand.
- Immediately after use, discard the needle and syringe (whether contaminated or not) into puncture-resistant sharps containers.

RECAPPING OF NEEDLES IS PROHIBITED.

- Never discard sharps into regular trash.
- Never discard sharps into bags of biological waste.
- Use care and caution when cleaning up after procedures that require the use of syringes and needles.
- Do not overfill sharps containers. Close completely when 3/4 full. Discard as biohazardous waste or request a pickup from EH&S x46778.
- Locate sharps containers in areas in which needles are commonly used. Make containers easily accessible.



A Sharps Container Safety System will be utilized for safe and effective disposal of contaminated needles, syringes, and other sharps. The containers are puncture-resistant and autoclave/incinerator safe.

2.6.2. <u>In the event of a needle stick injury:</u>
Emergency Procedure detailed in Section 2.10

Emergency response procedure titled Emergency Response Procedures and Contacts – Needle-stick or Exposure to Blood, Body Fluids, and Infectious Agents can be found at http://bfa.sdsu.edu/ehs/biosafety.htm.

2.7. Waste Disposal Procedures

This section includes general guidelines for proper waste disposal. Personnel should refer to the section which applies to the item being disposed of. Detailed information can be found in the Hazardous Waste Protocol.

2.7.1. <u>Lab debris</u>
Lab debris includes chemically contaminated gloves, paper towels, absorbent pads, plastic and glass containers, and pipette tips with residual fluid. Containers should be rigid and leak-proof; cardboard is only okay if it is lined with a trash bag, the top is not punched out (the lid must be removed each time), and there is no leaking. A hazardous waste label must be entirely filled out and placed on the container.

2.7.2. <u>Broken glass</u>
Dry broken or unbroken glass that doesn't contain chemical, biohazardous, and/or radiological contamination should be disposed of in a broken glass container. This label should be rigid

and labeled as “Broken Glass,” but should not contain a hazardous waste label.

2.7.3. Biohazards

All biohazardous waste should be disposed of in a labeled, red biohazard bag. Bags should be placed in rigid, leak-proof secondary containers. The bag should include a generator label and biohazard symbol, and the secondary container should have the international biohazard symbol and the word “Biohazard” on all sides. Bags should never be overfilled. Bags should be goose-neck tied closed when ¾ full and should be disposed of within seven days. Bags should be transported in a rigid, leak-proof secondary container when moved to the accumulation site. Secondary containers should be decontaminated using a 10% bleach solution for at least three minutes after emptying.

2.7.4. Sharps

Sharps should be disposed of in a rigid, leak-proof container. The container should be taped closed when ¾ full and disposed of within seven days. Sharps waste containers must be labeled with the words “Sharps Waste” or the international biohazard symbol with the word “BIOHAZARD.” The labels should never be defaced. Sharps containers should not be labeled with a hazardous waste label and should not be dated.

2.8. Biohazardous Spill Cleanup Procedure

The following procedures are guidelines for biohazardous spill cleanup. In each of the following cases, depending on the size of the spill, notify everyone in the lab, and call EH&S at (619) 594-2865 or (619) 594-6965. If a spill contains biohazardous materials from BSL 2 facilities or higher, or if the spill is considered too large or too dangerous for laboratory personnel to safely clean up, secure the area — including the whole lab — then call EH&S immediately for assistance. Alert the lab coordinator and Center Research Manager of the spill as soon as possible.

2.8.1. Spills inside the BSC:

- Wait at least five minutes to allow the BSC to contain aerosols.
- Wear a lab coat, safety glasses, and gloves during cleanup.
- Allow the cabinet to run during cleanup.
- Apply disinfectant and allow a minimum of 20 minutes of contact time.

    - For chemical disinfection of liquid biohazardous waste, freshly prepare a 10% bleach solution (1 part bleach to 9 parts liquid waste, 30 min. contact time, followed by sewering), or use an approved product listed on the EPA's Registered Antimicrobial Products Effective Against Mycobacterium tuberculosis Human HIV-1 and Hepatitis B Virus.
- Wipe up spills with disposable disinfectant-soaked paper towels.
- Wipe the walls, work surface, and equipment in the cabinet with a disinfectant-soaked paper towel.
- Discard contaminated disposable materials using appropriate biohazardous waste disposal procedures.
- Expose non-autoclavable materials to disinfectant (20-minute contact time) before removal from the BSC.
- Remove protective clothing used during cleanup and place it in a biohazard bag for autoclaving.
- Run the cabinet 10 minutes after cleanup before resuming work or turning the cabinet off.

2.8.2. Spills in the lab outside the BSC

- Call EH&S at (619) 594-2865 if the material is BSL 2 or greater containment.
- Clear the area of all personnel. Wait at least 30 minutes for the aerosol to settle before entering the spill area.
- Remove any contaminated clothing and place it in a biohazard bag to be autoclaved.
- Put on a disposable gown, safety glasses, and gloves.
- Initiate cleanup with disinfectant as follows:
    1. Place dry paper towels on the spill (to absorb liquids); then layer a second set of disinfectant-soaked paper towels over the spill.
    2. Encircle the spill with additional disinfectants being careful to minimize aerosolization while assuring adequate contact.
    3. Decontaminate all items within the spill area.
    4. Allow 20 minutes of contact time to ensure the germicidal action of the disinfectant.
    5. Wipe equipment with appropriate disinfectant.

6. Discard contaminated disposable materials using appropriate biohazardous waste disposal procedures.
7. Disinfect reusable items.

2.9. Disinfection Summary

Refer to the following tables for approved disinfection practices for each category of compounds. When working with sensitive equipment, refer to each instrument's protocol for specific disinfection guidelines. For general disinfection in the SDSU HealthLINK Center Labs, 70% Ethanol or freshly diluted 10% bleach is sufficient, unless the work necessitates a different disinfection compound. Check with the Biomedical Lab Coordinator and Biosafety Officer before using an alternative disinfection method.

Disinfection Guidelines							
Category	Requirements			Inactivates			
	Dilution	Contact Time		Vegetative Bacteria	Lipovirus	Non-lipid Viruses	Bacterial Spores
		Lipovirus	Broad Spectrum				
Quaternary ammonium compounds	.1-2%	10 min	Not effective	+	+	+	+
Chlorine Compounds	500 ppm	10 min	30 min	+	+	+	+
Ethyl alcohol	70-85%	10 min	Not effective	+	+	Variable	
Isopropyl alcohol	70-85%	10 min	Not effective	+	+	Variable	

Table 1: Disinfection guidelines for different types of compounds

Compound Characteristics								
Category	Characteristics							
	Shelf life >1 week protected from light and air	Corrosive	Flammable	Residue	Inactivated by Organic Matter	Compatible for Optics	Skin Irritant	Eye Irritant

Quaternary ammonium compounds	+				+	+	+	+
Chlorine compounds	+	+		+	+		+	+
Ethyl alcohol	+		+					+
Isopropyl alcohol	+		+					+

Table 2: characteristics for different types of compounds

2.10. Needlestick and Bite Injury or Exposure to Blood, Bodily Fluids

Call 9-1-1 from campus phone or (619) 594-1991 on cell phone/after hours.

Prompt response is important if a person has been injured or exposed (by needlestick, bite, splash, or direct contact) to human or non-human primate blood, body fluids, bloodborne pathogens, infectious agents, toxins, or recombinant DNA. Every situation is unique. Practice good judgment. All actions should be made with the person's health as the first priority.

2.10.1. Immediately after the incident

- For serious or life-threatening emergencies, immediately call 911 from a cell phone
- Wash the wound or skin with soap and water.
- Flush or rinse out the affected mucous membrane (eyes, nose, mouth, etc.) with water.
- In emergency situations, seek medical treatment immediately at the nearest medical facility equipped to handle emergencies. This may include calling 911. A medical emergency is generally defined as a sudden and unforeseeable injury or illness of such a nature that failure to get immediate medical care could be life-threatening or cause serious harm to bodily functions. Some examples include severe bleeding from any site, loss of consciousness, seizures, or severe or multiple injuries.
- Refer to SDSURF guidelines: Injured at Work.

2.10.2. After (or during) the incident as safe to do so:

- Notify the Person in Charge: Biomedical Lab Coordinator, Responsible Investigator, and your Supervisor/Manager.

- Notify SDSU HealthLINK Center;'s Administrative team at healthlink.admin@sdsu.edu
- The injury should be reported within 8 hours to SDSURF Human Resources at (619) 594-4139.
- Prompt reporting of any work-related injury or illness is important. Benefits cannot begin until the SDSURF is aware of the circumstances of the incident. Ensure your right to benefits by reporting every job-related injury, no matter how slight you may think it is. Even a cut finger can lead to a more serious condition if infection develops.
- Complete an SDSURF Accident / Incident Report and email the completed form to sdsurfriskmanagement@sdsu.edu. The person in charge (Responsible Investigator, Lab Coordinator, or Supervisor/Manager) must:
    - Notify SDSURF Human Resources for incidents involving employees or volunteers.
    - Report the exposure incident to the Biosafety Officer, Carolina Esquer at (619) 594-1024.
    - Properly contain and secure the biohazardous materials and/or contaminated sharps for follow-up investigation and disposal.

2.10.3. In the event of an emergency

Call 911 or seek medical treatment immediately at the nearest medical facility equipped to handle emergencies.

2.10.4. In the event of a non-emergency during work hours

Be prepared to know when and where the injury occurred, what happened, and who witnessed the incident. If medical treatment is necessary, the SDSURF Human Resources Office will direct you to a medical facility that specializes in the treatment of industrial accidents and injuries.

2.10.5. In the event of a non-emergency after work hours or on weekends

Within San Diego County:

Seek medical treatment at any San Diego County Sharp Rees-Stealy or U.S. HealthWorks Medical Clinic. See Authorized Medical Provider Network.

Outside of San Diego County:

Refer to http://www.talispoint.com/travelers/ext/?lob=wc" to locate an authorized facility, or go to mywcinfo.com to obtain a clinic provider.

2.11. Emergency Contacts

Name	Office Phone #	Home/Cell Phone #
Responsible SDSU HealthLINK Center Investigator, Dr. Scott Kelley	x45371	
SDSU HealthLINK Center Lab Coordinator, Shyan Polman		
SDSURF Facilities Services	x44754	619-594-4754
SDSU Department of Public Safety - Emergency	911	
Non-emergency	x41991	619-594-1991
SDSU EH&S	x46778	619-594-6778
Biosafety Officer, Carolina Esquer	Zoom office phone: (619) 594-1024	619-625-0102
SDSURF Human Resources Authorized Workers Comp Providers	x43769 x44139	619–594–3769 619-594-4139

3. TRAINING PLAN:

3.1. Purpose

The purpose of this training is to ensure all people working within the wet lab can perform their work safely and efficiently.

3.2. Delivery

Biosafety Training through the CITI Program is required by all personnel working in the lab.

3.3. Training Materials

The following courses are required for research conducted in the SDSU HealthLINK Center Biomedical and Phlebotomy labs:

- CITI Training:
    - Responsible Conduct of Research (RCR) - Faculty, Staff, and Students
    - Responsible Conduct of Research (RCR) - Researchers Using Animal Subjects

- Biosafety/Biosecurity - Biosafety Training
- Biosafety/Biosecurity - Bloodborne Pathogens/Human Sourced Materials
- Biosafety/Biosecurity - Recombinant DNA
- Biosafety/Biosecurity - Shipping and Transporting Biological Material
- Laboratory Chemical Safety - Hazardous Waste
- Laboratory Chemical Safety - Biohazardous Waste Lab
- Human Subjects Research (HSR) - Biomedical Researchers
- Information Privacy Security (IPS) - Information Privacy & Security (IPS) | Faculty/Staff/Student/IRB Member

Training on lab-specific techniques and demonstration of competency on each procedure and piece of equipment is also required before commencement of work.

4. COMPETENCY ASSESSMENT

4.1. Purpose

The purpose of a competency assessment is to ensure all people working in BMG lab spaces minimize risk to themselves, others, and the environment.

4.2. Competency Tool

CITI Program

4.3. Rubric

An 80% or higher is required to qualify as passing.

4.4. Tracking of Completion / Reassessment

Modules and quizzes can be revisited if the 80% threshold is not met. Personnel should present their completion certificates received from CITI to the lab coordinator.

5. PROCEDURE RE-EVALUATION

This procedure should be re-evaluated when SDSU, local, state, or national safety measures are modified. This procedure will also need to be re-evaluated when emergency contact information changes.

6. SUPPORT CONTACT INFORMATION

Questions regarding this procedure or for additional safety information, contact the HealthLINK admin team, or the Lab Coordinator and the Center Research Manager.

7. APPENDICES

For additional information regarding the use and maintenance of equipment in the lab, refer to their product manuals.

Routine cleaning should be completed and documented.