

Laboratory Safety & Compliance

Saint Louis University
Environmental Health and Safety
Office of the Vice President for Research
South Campus – Caroline C305

Other Training Offered

- ▶ Bloodborne Pathogens Awareness Training
- ▶ Infectious Materials Shippers Training
- ▶ Radiation Safety Orientation
- ▶ BSL-3 Facility Awareness Training
- ▶ ABSL-3 Facility Awareness Training
- ▶ Select Agent and High Containment Awareness Training
- ▶ Laser Safety Training

What are the Regulatory and Training Requirements For Laboratory Employees?

Occupational Safety and Health Administration

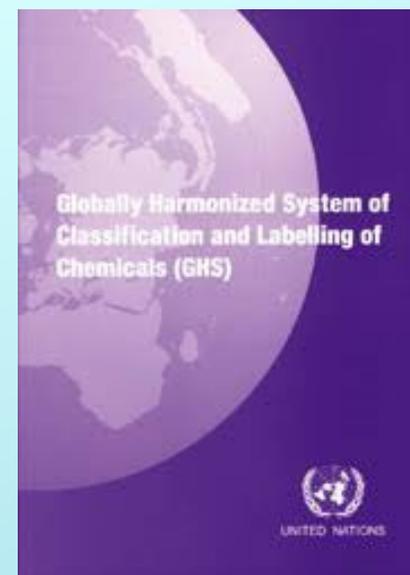
Bloodborne Pathogens Standard (29 CFR 1910.1030)

- ▶ Applies to all employees who have a risk of occupational exposure to blood or other potentially infectious materials (OPIM)
- ▶ “Bloodborne Pathogens Awareness” training
 - Required annually
 - Available online
- ▶ Exposure Control Plan (available online)



Occupational Safety and Health Administration

- ▶ Laboratory Standard (29 CFR 1910.1450)
 - Occupational Exposure to Hazardous Chemicals in Laboratories
 - Chemical Hygiene Plan (available online)
- ▶ Hazard Communication Standard (29 CFR 1910.1200)
 - Discloses toxic and hazardous substances in the workplace
 - Includes requirements for training, labels, safety data sheet retention, and exposure monitoring
- ▶ Globally Harmonized System (GHS)
 - Pictograms
 - Signal Words
 - Warning – less severe
 - Danger – more severe
 - Standardized Safety Data Sheets (SDS)



GHS - Hazard Pictograms and correlated exemplary Hazard Classes

Physical Hazards



Explosives,
Self-Reactives,
Organic Peroxides



Flammables,
Pyrophorics,
Self-Heating,
Emits Flammable Gas,
Self Reactives,
Organic Peroxides



Oxidizers



Compressed Gases



Corrosive to Metals

Health Hazards



Acute Toxicity
(Fatal or Toxic)



Skin Corrosion/Burns,
Eye Damage, Irritant (Skin and Eye),
Skin Sensitizer,
Acute Toxicity (Harmful),
Narcotic Effects,
Respiratory Tract Irritant,
Hazardous to Ozone Layer



Carcinogen,
Mutagenicity,
Reproductive Toxicity,
Respiratory Sensitizer,
Target Organ Toxicity,
Aspiration Hazard

Env. Hazards



Hazardous to the
Aquatic Environment

Safety Data Sheet (SDS)

Information Required for an SDS

	Heading	Subheading
1.	Identification	(a) Product identifier used on the label; (b) Other means of identification; (c) Recommended use of the chemical and restrictions on use; (d) Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party; (e) Emergency phone number.
2.	Hazard(s) identification	(a) Classification of the chemical in accordance with paragraph (d) of §1910.1200; (b) Signal word, hazard statement(s), symbol(s) and precautionary statement(s) in accordance with paragraph (f) of §1910.1200. (Hazard symbols may be provided as graphical reproductions in black and white or the name of the symbol, e.g., flame, skull and crossbones); (c) Describe any hazards not otherwise classified that have been identified during the classification process; (d) Where an ingredient with unknown acute toxicity is used in a mixture at a concentration = 1% and the mixture is not classified based on testing of the mixture as a whole, a statement that X% of the mixture consists of ingredient(s) of unknown acute toxicity is required.
3.	Composition/ information on ingredients	Except as provided for in paragraph (i) of §1910.1200 on trade secrets: For Substances (a) Chemical name; (b) Common name and synonyms; (c) CAS number and other unique identifiers; (d) Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance. For Mixtures In addition to the information required for substances: (a) The chemical name and concentration (exact percentage) or concentration ranges of all ingredients which are classified as health hazards in accordance with paragraph (d) of §1910.1200 and (1) are present above their cut-off/concentration limits; or (2) present a health risk below the cut-off/concentration limits. (b) The concentration (exact percentage) shall be specified unless a trade secret claim is made in accordance with paragraph (i) of §1910.1200, when there is batch-to-batch variability in the production of a mixture, or for a group of substantially similar mixtures (See A.0.5.1.2) with similar chemical composition. In these cases, concentration ranges may be used. For All Chemicals Where a Trade Secret is Claimed Where a trade secret is claimed in accordance with paragraph (i) of §1910.1200, a statement that the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret is required.
4.	First-aid measures	(a) Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion; (b) Most important symptoms/effects, acute and delayed. (c) Indication of immediate medical attention and special treatment needed, if necessary.
5.	Fire-fighting measures	(a) Suitable (and unsuitable) extinguishing media. (b) Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products). (c) Special protective equipment and precautions for fire-fighters.
6.	Accidental release measures	(a) Personal precautions, protective equipment, and emergency procedures. (b) Methods and materials for containment and cleaning up.
7.	Handling and storage	(a) Precautions for safe handling. (b) Conditions for safe storage, including any incompatibilities.
8.	Exposure controls/personal protection	(a) OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended

		by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available. (b) Appropriate engineering controls. (c) Individual protection measures, such as personal protective equipment.
9.	Physical and chemical properties	(a) Appearance (physical state, color, etc.); (b) Odor; (c) Odor threshold; (d) pH; (e) Melting point/freezing point; (f) Initial boiling point and boiling range; (g) Flash point; (h) Evaporation rate; (i) Flammability (solid, gas); (j) Upper/lower flammability or explosive limits; (k) Vapor pressure; (l) Vapor density; (m) Relative density; (n) Solubility(ies); (o) Partition coefficient: n-octanol/water; (p) Auto-ignition temperature; (q) Decomposition temperature; (r) Viscosity.
10.	Stability and reactivity	(a) Reactivity; (b) Chemical stability; (c) Possibility of hazardous reactions; (d) Conditions to avoid (e.g., static discharge, shock, or vibration); (e) Incompatible materials; (f) Hazardous decomposition products.
11.	Toxicological information	Description of the various toxicological (health) effects and the available data used to identify those effects, including: (a) Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact); (b) Symptoms related to the physical, chemical and toxicological characteristics; (c) Delayed and immediate effects and also chronic effects from short- and long-term exposure; (d) Numerical measures of toxicity (such as acute toxicity estimates). (e) Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition), or by OSHA.
12.	Ecological information (Non-mandatory)	(a) Ecotoxicity (aquatic and terrestrial, where available); (b) Persistence and degradability; (c) Bioaccumulative potential; (d) Mobility in soil; (e) Other adverse effects (such as hazardous to the ozone layer).
13.	Disposal considerations (Non-mandatory)	Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.
14.	Transport information (Non-mandatory)	(a) UN number; (b) UN proper shipping name; (c) Transport hazard class(es); (d) Packing group, if applicable; (e) Environmental hazards (e.g., Marine pollutant (Yes/No)); (f) Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code); (g) Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises.
15.	Regulatory information (Non-mandatory)	Safety, health and environmental regulations specific for the product in question.
16.	Other information, including date of preparation or last revision	The date of preparation of the SDS or the last change to it.

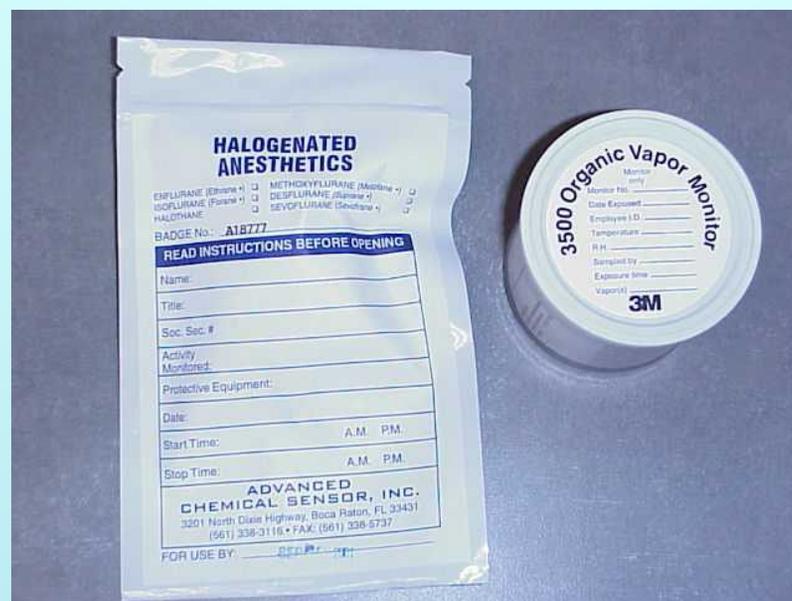
Labeling Chemical Containers

- ▶ Chemical Names
 - No abbreviations
 - List all components
- ▶ Chemical Concentration (if applicable)
- ▶ Hazards



Chemical Exposure Monitoring

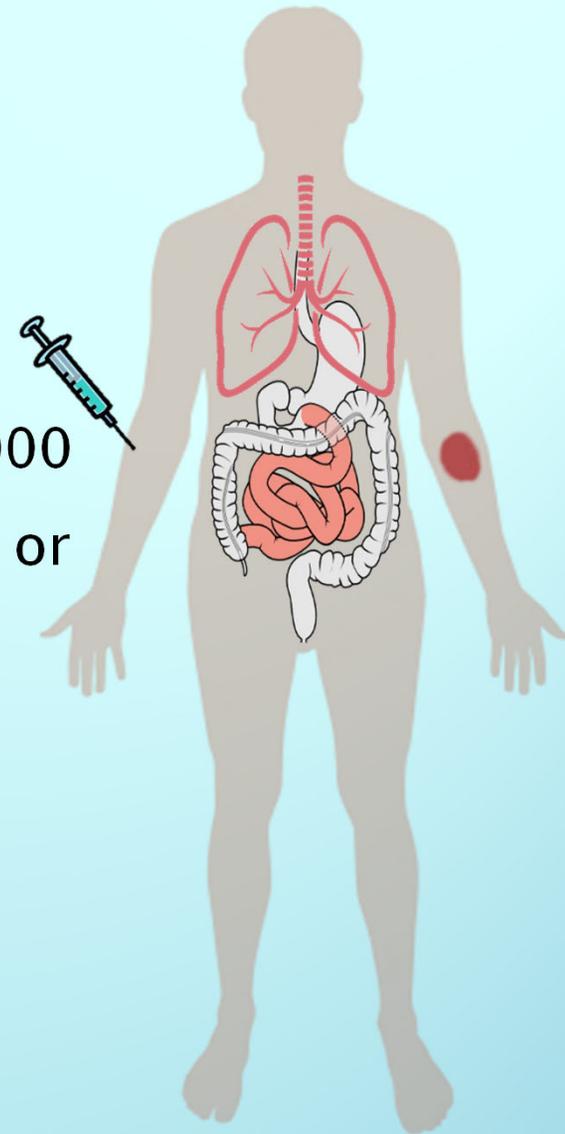
- ▶ Exposure monitoring is available for all employees working with chemicals
- ▶ Chemical Monitoring Devices (badges) are used to monitor an employee's work exposure
- ▶ Results are compared to the OSHA Permissible Exposure Limits (PEL's) that are found on the Safety Data Sheets
- ▶ Contact EHS with any Indoor Air Quality concerns



Exposures

(Biological, Chemical, or Radioactive)

- ▶ Inhalation (Breathe in a hazard)
 - Remove exposed personnel to fresh air
- ▶ Ingestion (Swallow a hazard)
 - Improperly stored/handled items
 - Inadequate handwashing before eating
 - Contact Public Safety immediately (314) 977-3000
- ▶ Skin or Eye Contact (Absorbed through direct skin or eye contact)
 - Improperly stored/handled items
 - Splashes/spills
 - Wash/flush the area with water
- ▶ Injection (Contaminated object breaks the skin)
 - Needles, broken glass, animal bites/scratches, etc.
 - Wash the area with soap and water

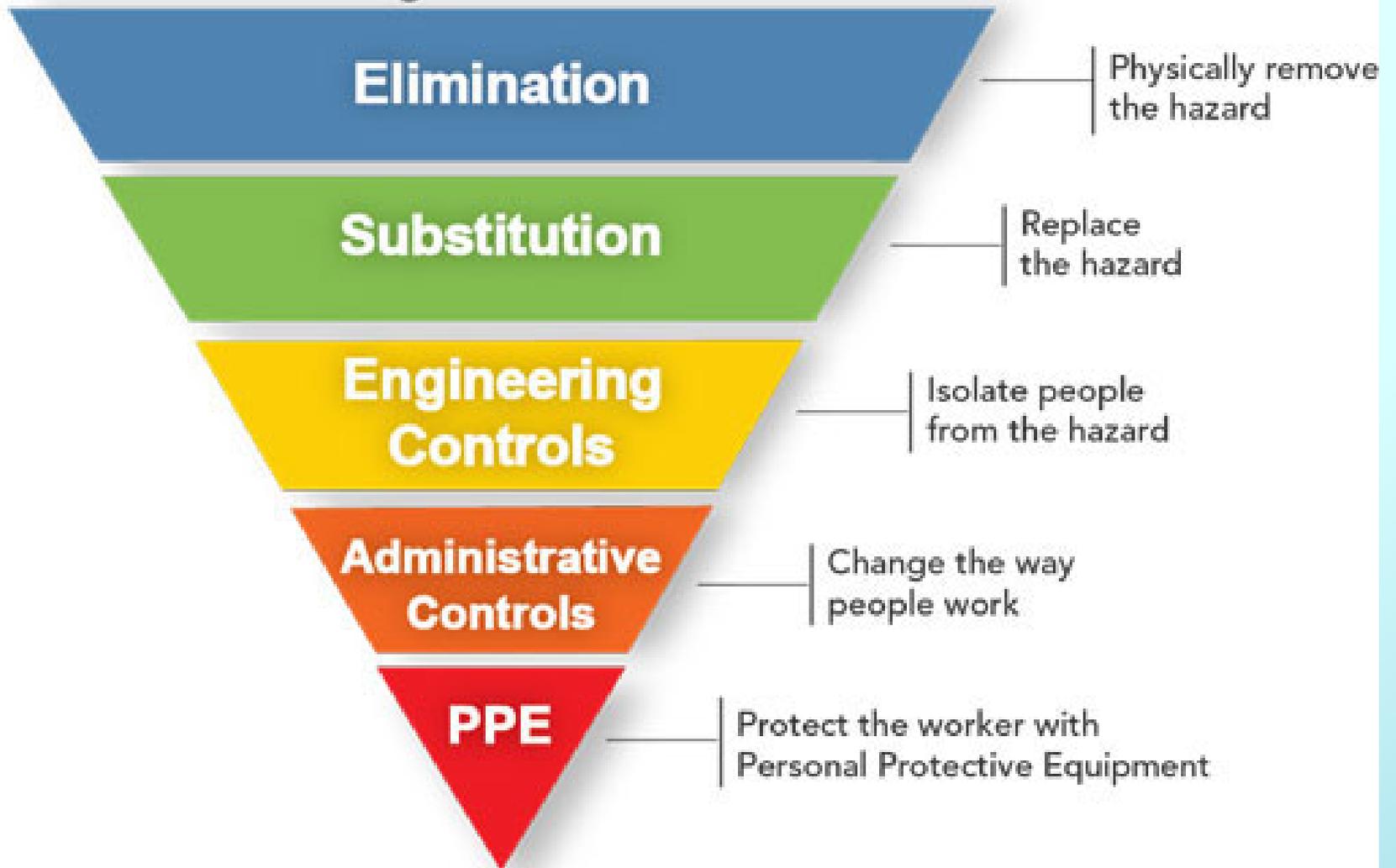


Hierarchy of Controls

Most effective



Least effective



Personal Protective Equipment

- ▶ Eye Protection
 - Wear what is appropriate for the hazard (safety glasses, goggles, etc.)
- ▶ Gloves
 - Nitrile, Latex, Vinyl, etc.
- ▶ Lab Coats
- ▶ Respiratory Protection
 - Medical Questionnaire
 - Respirator Fit Test
 - Respirator Training
- ▶ Closed-Toed Shoes
- ▶ Pants
 - No shorts in laboratory



Personal Protective Equipment

Glove Use

- ▶ Choose proper gloves
- ▶ Inspect gloves before and during use
- ▶ All gloves are porous – **CHANGE REGULARLY**
- ▶ Do not re-use disposable gloves
- ▶ Do not wear gloves outside the laboratory
- ▶ Wash hands regularly



Laboratory Hazard Signage

M467
Schwitalla Hall

Principal Investigator
Department
Lab Contact: 314-977-XXXX
Emergency Contact: 314-555-XXXX

The signage features a grid of hazard icons. The first row contains five icons: a red square with a flame (Flammable Materials), a black hand with a flame (Corrosive), a red square with a flame (Flammable Gas), a white circle with a bomb (Reproductive Toxin), and a green square with a flame (Non-Flammable Gas). The second row contains a green square with a shower and eye icon (Safety Shower/Eyewash) followed by four grey squares. The third row contains a row of icons: a hand, safety glasses, a lab coat, a grey circle, a grey circle, a grey circle, a hand with a flame (no open flames), a bicycle (no bicycles), a hand with a flame (no smoking), and a hand with a flame (no eating/drinking). Below the icons is the text "AUTHORIZED PERSONNEL ONLY".

FLAMMABLE MATERIALS

CORROSIVE

FLAMMABLE GAS

REPRODUCTIVE TOXIN

NON-FLAMMABLE GAS

SAFETY SHOWER/ EYEWASH

AUTHORIZED PERSONNEL ONLY

Office of Environmental Health and Safety: 977-8608 (8 am-5 pm M-F)
Only EHS may remove this sign.

Department of Public Safety: 9-977-3000
Last printed: January 13, 2014

- ▶ Contact EHS to update signage
- ▶ Lab Contact can be a lab phone number
- ▶ Emergency Contact should be a cell number reachable 24 hrs.

Chemical Storage in the Lab



- ▶ Designate storage for food and beverages outside of the lab
- ▶ Keep hazardous chemicals below eye level
- ▶ Store incompatibles in separate containment

- ▶ Use designated storage cabinets for acids and flammables
- ▶ **NEVER** store chemicals on the floor
- ▶ Check on the condition of your chemicals periodically

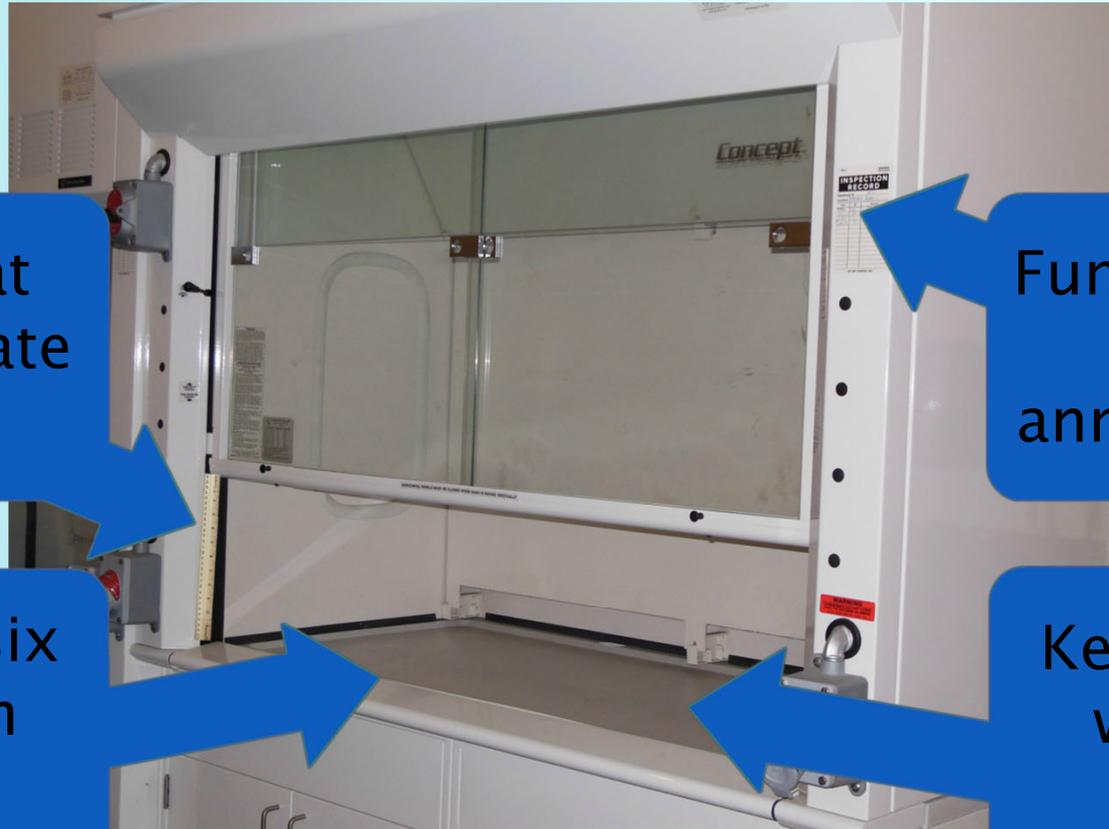


Gas Cylinders

- ▶ Ensure contents of cylinders are properly identified
- ▶ Keep cylinders capped until gas is ready to be used
- ▶ Keep gas cylinders upright and secure at all times
- ▶ Use cylinder carts to move cylinders – Do Not “Roll” or “Walk” cylinders
- ▶ Do not force connection fittings or tamper with safety devices in cylinder valves or regulators



Fume Hood Guidelines



Keep sash at the appropriate height

Fume hoods are certified annually by EHS

Keep items six inches from the front

Keep adequate work space clear

- ▶ All containers must be capped, labeled, and in good condition
- ▶ Do not block the opening at the back of the hood
- ▶ Keep the fume hood organized and clean regularly

Laboratory Specific Training

- ▶ Must be completed and documented for all personnel working in the lab
- ▶ Identify hazards and safety features present in your lab
- ▶ Review SOPs for work with certain chemicals:
 - carcinogens
 - cryogenics
 - gas cylinders

Saint Louis University
Laboratory Specific Training Outline

Employee Name: _____ Principal Investigator: _____
 Department: _____ Building/Rooms/Laboratories: _____

All laboratory faculty, staff, students and volunteers shall review and complete the following upon initial hire and any time a new significant hazard is introduced into the work area:

Review and list the location of the following items:	Date Completed:
Laboratory Safety Manual location:	
- Chemical Hygiene Plan/Exposure Control Plan reviewed on:	
Copies of MSDS/SDS are located:	
Hazardous chemical inventory is located:	
First aid kit is located:	

Personnel has been instructed on:	Date Completed:
Properly labeling <u>ALL</u> chemical waste with the following: -Waste or Hazardous Waste -All contents within the container -Accumulation start date (mm/dd/yyyy)	
Properly disposing of <u>ALL</u> biological waste -Sharps in an OSHA approved sharps container -Location of biowaste boxes/autoclave procedures	
Properly labeling <u>ALL</u> chemical containers with the following: -Chemical Name -Concentration (if applicable) -Hazard Class (i.e., Flammable, Toxic, Corrosive, etc.)	
Detecting the presence or release of a hazardous chemical and how to report concerns (Examples: odor, color change, etc.)	
Biological and chemical spill procedures	
Laboratory specific standard operating procedures (SOPs) and/or protocols	
Lab specific biosafety training (i.e. agent, signs and symptoms of exposure, human derived materials)	
Appropriate personal protective equipment (PPE) use and storage location	
Location of the nearest eye wash station, safety shower and fire extinguisher	
Location of emergency contact information. (i.e., PI, OEHS, DPSEP, Employee Health)	
All applicable emergency procedures	
Proper storage of hazardous chemicals (compatibility, conditions) within the lab	
Proper use of specific laboratory equipment	
An acceptable location for food and drinks. These items cannot be in the lab.	

Training Administered by: _____
 Employee Signature: _____ Date: _____

ChemKlenz

- ▶ Currently available in all buildings with laboratories – look for the green wall mounted bottle holders
- ▶ Use ChemKlenz for small spills and contact EHS for disposal instructions and to report the spill
- ▶ Do not use for mercury, biological, or radioactive spills
- ▶ Waste is considered hazardous and must be disposed of by Environmental Health and Safety
- ▶ For large spills, contact DPS at (314) 977-3000



Mercury Thermometer Trade-In

MERCURY THERMOMETER TRADE-IN PROGRAM

FREE!



Left: A spirit-filled thermometer. Right: a mercury-filled thermometer.

What:

The Office of Environmental Health and Safety will trade non-mercury thermometers 1:1 for mercury thermometers.

How:

Fill out a form on our website noting the amount of mercury thermometers you would like to trade in and select the thermometer(s) that you would like to receive in return.

Why:

A broken mercury thermometer can unnecessarily expose lab personnel to mercury vapor, a neurotoxin.

Each broken mercury thermometer has the potential to cost >\$300 for proper disposal.

For more details, visit our website.

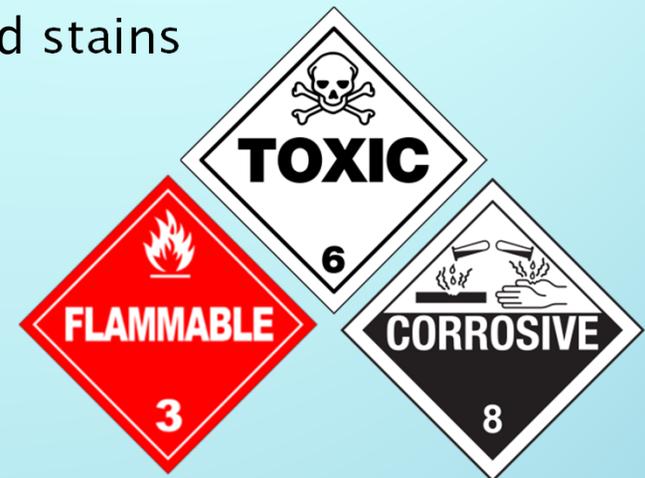
oehs.slu.edu

OEHS Quick Links – Mercury Thermometer Trade-In Program

The screenshot shows a web browser window displaying the 'Mercury Thermometer Trade-In Request' form. The browser's address bar shows the URL: www.slu.edu/office-of-environmental-health-and-safety/chemical-safety/mercury-thermometer-trade-in-program/mercury-thermometer-trade-in-request. The page header includes the 'office of Environmental Health and Safety' logo. A navigation menu on the left lists various safety-related links. The main content area features the form title 'Mercury Thermometer Trade-In Request' and a sub-header 'Mercury Thermometer Trade-In Request Form'. Below this, a brief instruction reads: 'Use this form to trade in your mercury thermometers 1:1 for non-mercury thermometers.' A 'Required' section lists the following fields: 'Principal Investigator *', 'Department *', 'Building *', 'Room *', 'Contact Name *', and 'Contact Telephone *'. Each field is accompanied by an empty input box. At the bottom of the page, there is a footer with navigation links: 'APPLY NOW', 'CONTACT US', 'MYSLU', 'GIVE TO SLU', 'JOBS', 'VISIT US', and 'SOCIAL'. The system tray at the bottom right shows the time as 12:39 PM on 4/14/2015.

Hazardous Waste

- ▶ Any waste (liquid, solid, gas, sludge) that because of its quantity or characteristics may pose a threat to human health or the environment
- ▶ Items that are ignitable, corrosive, reactive, toxic, or biological in origin
- ▶ Examples include, but are not limited to:
 - Flammable and non-flammable organic solvents
 - Corrosives – acids & bases (caustics)
 - Oxidizers – nitric acid, nitrates, hydrogen peroxide, sulfuric acid
 - Reactives – hydrides, azides, picric acid
 - Toxics – poisons, mutagens, carcinogens, dyes and stains
 - Controlled substances
 - Heavy metals – Ag, As, Ba, Cd, Cr, Pb, Hg, Se
 - Acutely hazardous chemicals
 - UV germicidal lamps/sodium vapor lamps
 - Paper and cloth rags used to clean solvent spills
 - Photo-fixer, photo-developer, x-ray film



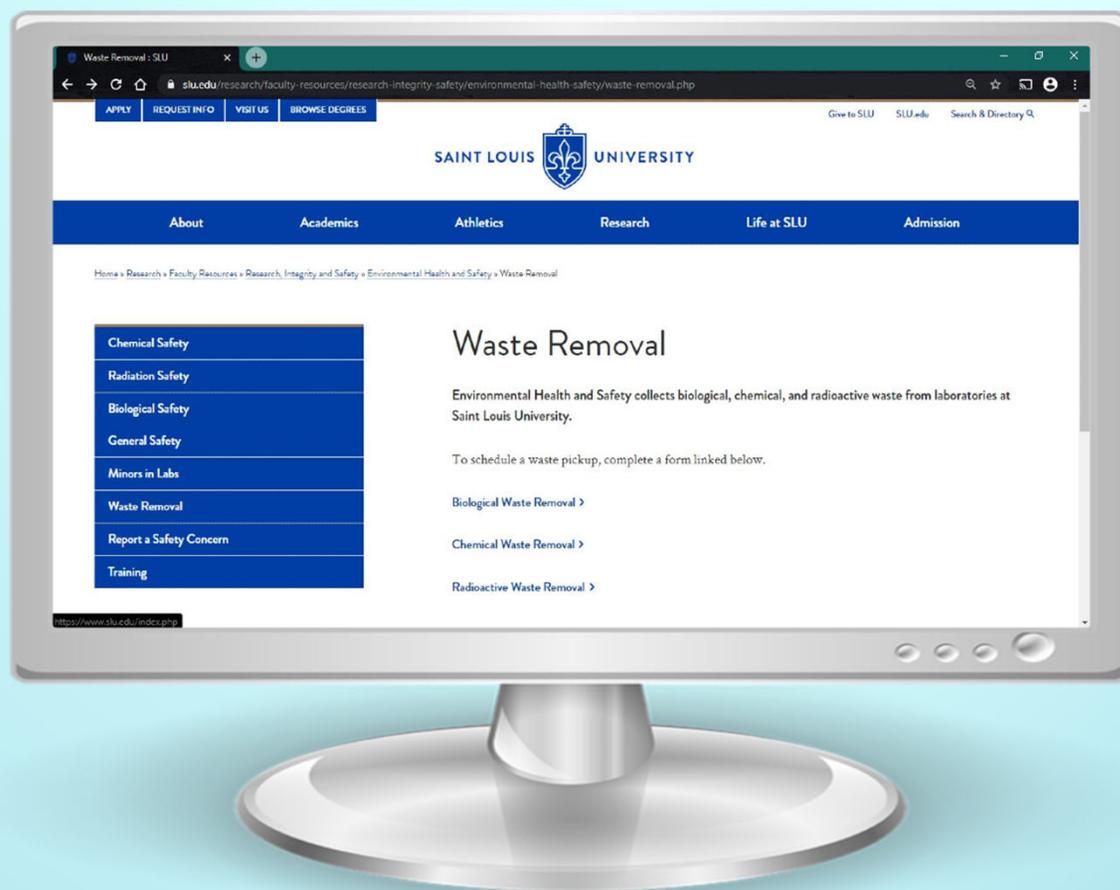
How do I Label Chemical Waste Properly ?



- ▶ As the generator, you are responsible for chemical waste in your satellite accumulation area. It is your responsibility to:
- ▶ Determine what is “HAZARDOUS WASTE” and label the container properly.
- ▶ Include all the chemical components (solvents, buffers, etc.)
- ▶ Include the accumulation start date
 - Month/Day/Year
- ▶ Request a chemical waste pickup before starting a second container.

Waste Removal Requests

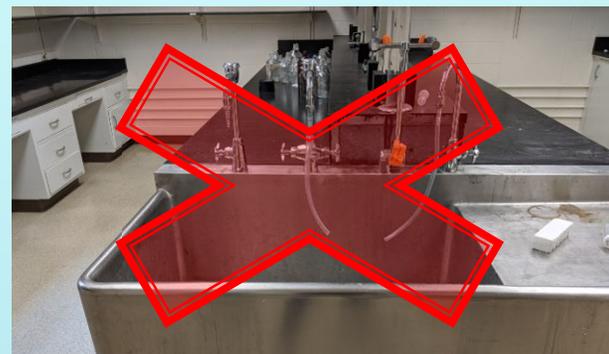
- ▶ Online Chemical Waste Removal Form
- ▶ chemwaste@slu.edu
 - Chemical waste questions
 - Send additional info (SDS, content info, etc.)



Laboratory Waste Disposal

- ▶ All Hazardous Waste Must Be Collected by Environmental Safety for proper disposal
- ▶ Do NOT put hazardous chemicals down sewer drain!
- ▶ Dilution/Evaporation is NOT the solution !!!

**CONTACT
ENVIRONMENTAL
SAFETY FIRST!!!**



Laboratory Waste Disposal

Approved for Regular Trash Disposal

- ▶ Paper / Paper Towels / Plastic
- ▶ Gloves (not contaminated)
- ▶ Triple rinsed chemical containers
- ▶ Non-hazardous solid chemicals
- ▶ Lab ware, pipette tips, etc. free of visible chemical contamination
- ▶ Glass Box – Clean glass and clean broken glass (Must be labeled appropriately for housekeeping staff)

Approved for Drain Disposal

- ▶ Non-hazardous salt solutions
- ▶ Bleach used as a disinfectant
- ▶ Buffers (depending on components)
- ▶ Non-hazardous chemicals
- ▶ Chemicals released during a laboratory process that deems the collection of the chemical impossible or unsafe

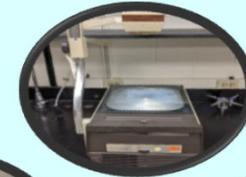
Electronics Recycling



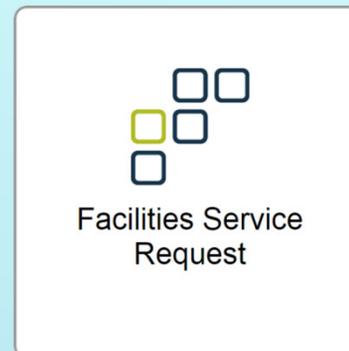
Alkaline Batteries



Other Batteries



Equipment



What Can Go Into Glass Disposal Boxes?



No Mercury Instruments!



No Mercury Containing Lamps!



No Metal Sharps!



Clean Glass (Broken or Unbroken)

Emergency Procedure Guide



Medical Emergency

Report patient condition, locate AED if needed and provide care

CALL
977-3000
OR **911**



Gas Leak or Chemical Spill

Evacuate and wait for safety guidance from first responders

CALL **977-3000**



Biological or Radioactive Materials

Do not leave the immediate area

CALL **977-3000**



Fire

Activate fire pull stations, utilize a fire extinguisher if trained and evacuate the building

CALL **977-3000**



Violent Intruder

RUN and evacuate or BARRICADE and HIDE or prepare to FIGHT

CALL
977-3000
OR **911**



Severe Storms

Seek shelter in an interior room or hallway away from windows and report damage

CALL **977-3000**



Earthquake

DROP to the ground and take COVER under a sturdy table or other piece of furniture and HOLD ON until the shaking stops, then EVACUATE the building

CALL **977-3000**



Campus Safety

Report Crime, suspicious persons, or safety concerns

CALL **977-3000**

Types of Fires

- ▶ Class A – Combustible solids (paper, wood, etc)
- ▶ Class B – Flammable liquids and gases
- ▶ Class C – Electrical (computers, lab equipment, etc)
- ▶ Class D – Metals (not common)



Class B and C (CO₂)



Class A, B, C



Class D

Fire Safety Reminders

- ▶ **Corridors/Stairways**
 - Designated safe areas for egress
 - Must not be used for storage
 - Remove combustible materials and chemicals
 - Do not stage equipment in the hallways when being received/moved
- ▶ **Plan ahead!**
- ▶ **Know location (before an emergency):**
 - Evacuation route
 - Fire extinguishers
 - Pull stations (may not be on every floor)
 - Fire exits / Evacuation routes
- ▶ **Keep fire doors closed**



How to use a Fire Extinguisher

Remember P.A.S.S.

- ▶ **P**ull the pin
- ▶ **A**im the nozzle at the base of the fire
- ▶ **S**queeze the handle
- ▶ **S**weep side to side



** Fire extinguishers are provided for your protection and voluntary use for actual emergencies ** “1 and Done”



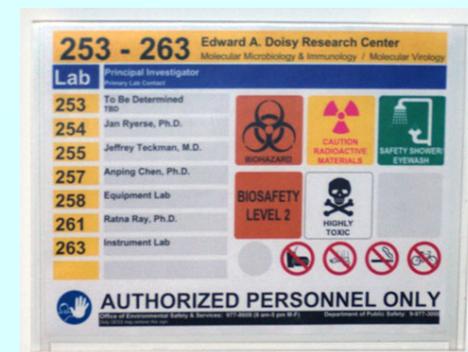
General Radiation Safety Awareness

▶ Restricted Areas

- These signs indicate restricted areas where radioactive materials are used and stored.
- Do not be afraid to enter these areas; take appropriate precautions and be respectful of the presence of radioactive material.

▶ Radioactive Work Areas and Waste Storage Areas

- Radioactive work areas and waste storage areas are labeled for your safety.
- Do not attempt to handle equipment or labware in radioactive work areas unless you are trained and authorized.
- Do not lean on countertops in radioactive work areas.
- Do not attempt to handle radioactive waste or containers unless you are trained and authorized.
- Do not handle any items marked "RADIOACTIVE" whether handwritten or marked with yellow/magenta trefoil labels unless you are trained and authorized to do so.





General Radiation Safety Awareness

▶ Radioactive Packages

- You may not order radioactive materials without authorization.
- Do not attempt to open a radioactive package unless you are trained and authorized to do so AND it has been processed by Radiation Safety.



▶ Security

- Make sure doors are closed and locked when leaving a restricted area.



▶ Food and Drink

- Do not consume or store food and drink in restricted areas.
- This includes applying cosmetics, lip balm, and contact lenses.



▶ Radioactive Spills

- If you suspect radioactive materials have been spilled, stay where you are and call for assistance, 314-977-3000.
- Do not attempt to leave area until cleared to prevent the spread of radioactive contamination.



▶ Questions: Contact Radiation Safety

- 314-977-8609 or <https://slu.edu/ehs>

Minors in Labs

- ▶ Applies to all minors (STARS and Non-STARS) in the laboratory.
- ▶ Must be approved by EHS

Minors in Labs Documents	^
Policy on Minors in Laboratories	
Form A - Request for Approval of Research Project Involving Minor Participants in Laboratories	
Form B - Parent/Guardian Consent for a Minor in Laboratories	
Minors in Laboratories - Faculty Step by Step Guide to Approval and Onboarding	
STARS Students at SLU: How to Obtain an ID Badge	
OHP Enrollment Form: Medical History Questionnaire	

Questions / Comments

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Biological Safety



Biosafety training outline

- ▶ Risk groups and biosafety levels
- ▶ Work practices and procedures
- ▶ Regulatory aspects, standards & guidelines

Risk Groups and Biosafety levels

Risk Groups (RG) and Biosafety levels (BSL)

Definitions

- ▶ Biohazard – An agent of biological origin that has the capacity to produce harmful effects on humans or the environment.
- ▶ Biosafety – The application of knowledge, techniques and equipment to prevent personal, laboratory and environmental exposure to potentially infectious agents or biohazards.

Laboratory Acquired Infections (LAI)

Exposures:

- ▶ Most are acquired via inhalation
- ▶ Other: ingestion, inoculation (sharps), splashes, direct & indirect contact

51% LAIs occur in research laboratories

▶ Viral:

- 16% from clinical labs
- 70% from research labs
 - 32% from animal related activities

▶ Bacterial:

- 76% from clinical labs
- 8% from research labs

▶ Other:

- Parasites
- Molds
- Fungi
- Prions



Risk Groups & Biosafety Levels

- ▶ The Risk Group (RG) of an agent is an important factor to be considered during the biosafety risk assessment process.
- ▶ Biological agents and toxins are assigned to their relevant Risk Groups based on their ability to cause disease in healthy human adults and spread within the community.
- ▶ Biosafety Levels (BSL) are ways to contain the agent
 - facilities, safety equipment, practices, PPE, etc.
- ▶ Once risk is assessed then the appropriate BSL is determined
- ▶ Risk Groups are used in risk assessment
- ▶ BSL are used in risk management

NIH Risk Groups

- ▶ RG1 – agents not associated with disease in healthy adults
 - RG1 ex. – adeno-associated viruses (AAV), Baculoviruses
- ▶ RG2 – agents associated with human disease which is rarely serious
 - preventive/therapeutic interventions *are often* available
 - RG2 ex. – human origin cells (BBP), influenza, Zika virus
- ▶ RG3 – agents associated with serious or lethal human disease
 - preventive/therapeutic interventions *may be* available
 - RG3 ex. – SARS-CoV-2, *Mycobacterium tuberculosis*, SARS
- ▶ RG4 – agents cause serious or lethal human disease
 - preventive/therapeutic interventions *not usually* available
 - RG4 ex. – Ebola, Marburg, Lassa

Safe Work Practices for all Biosafety Levels

- ▶ Wash hands after work; when removing gloves; before leaving lab
- ▶ No eating, drinking, applying cosmetics, handling contact lenses
- ▶ No plants or animals in laboratories that are not part of the research
- ▶ Maintain labs in clean, orderly fashion
- ▶ Limit access to lab when work with organisms is in progress
- ▶ Use good microbiological techniques (No mouth pipetting)
- ▶ Use plastic instead of glass when possible
- ▶ Dispose of sharps properly
- ▶ Plan your work
 - Know in advance what you are working with

Biosafety Levels (BSL)

LOWEST

Basic Laboratories



**Containment
Laboratories**



HIGHEST

BSL-1

- Work is typically done on the open bench
- Standard microbiological practices
- General laboratory safety & hand washing

BSL-2

- Specific agent training for the lab
- Biosafety cabinets (BSC) used
 - Prevention of aerosol/splash exposures
- PPE, primary & secondary containment

BSL-3

- Specialized training and approval required
- Additional PPE, all work within BSC

BSL-4

- Not at SLU (specialized labs, suits, etc.)

Work Practices and Procedures

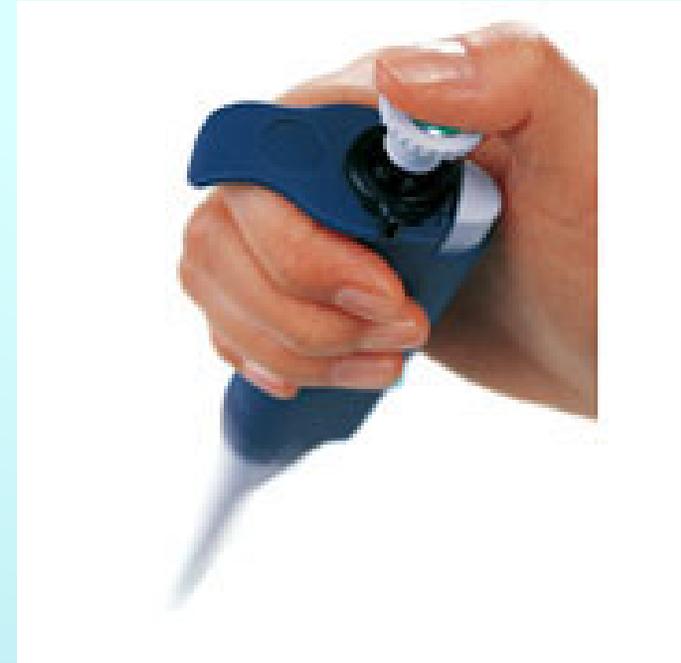


Biosafety Concepts

Biosafety in Microbiological and Biomedical Laboratories (BMBL)
6th Edition

Standard Microbiological Practices

- ▶ Awareness of potential hazards
- ▶ Trained & proficient in techniques
- ▶ Supervisors responsible for:
 - Appropriate Laboratory facilities
 - Personnel & Training
- ▶ Special practices & precautions
 - Occupational Health Programs



Biosafety Issues

The BMBL

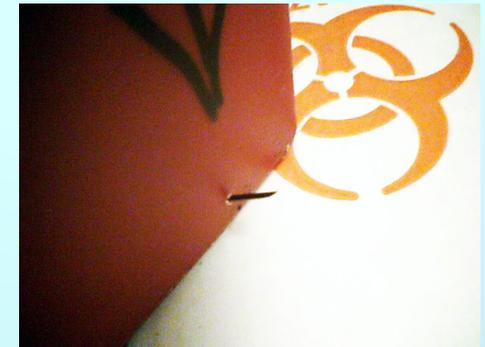
Safety Equipment

- ▶ Minimize exposure to hazard
 - Prevent contact/Contain aerosols
- ▶ Primary Containment Barrier
 - Biological Safety Cabinets
- ▶ Engineering controls/equipment
- ▶ Personal Protective Equipment (PPE)
 - Gloves, gowns, respirator, face shield, shoe covers
- ▶ Covered or ventilated animal cage systems



Sharps Safety

- ▶ Approved sharps containers are puncture & leak-resistant and should be used for the disposal of metal sharps such as scalpels, razor blades and needles.
- ▶ Contaminated glass should also be placed in the sharps container for safe disposal.
- ▶ The sharps container should be near the working area to avoid carrying sharps.
- ▶ Do not recap needles.
- ▶ If metal sharps are found in the regular trash – Housekeeping will not remove trash & will contact EHS
- ▶ Do not leave exposed sharps on the bench.



Proper Biowaste Handling

ALL BIOLOGICAL MATERIAL MUST BE DISPOSED OF PROPERLY

- ▶ Solid Waste (two options):
 - Stericycle (biohazard boxes)
 - Autoclave (steam sterilization)
- ▶ Liquid biological waste:
 - 1:9/10% bleach concentration (final concentrations)
 - Hold 24 hours, then pour down the sink with running water

Stericycle Box Handling

- ▶ Biohazard packaging materials (boxes, bags, manifests and labels) are obtained from EHS
- ▶ DOT requires twisting & tying the red bag in a single knot
 - 5 minutes – upside down – holding water
- ▶ 45 Lbs. (lift with one hand test).
- ▶ Close and tape box as per instructions of box
 - No red bag should show once the box is sealed.
- ▶ Affix Stericycle label on the side of the box in the marked area with date visible
 - Submit biowaste pickup request through EHS “Biological Waste Pickup” form

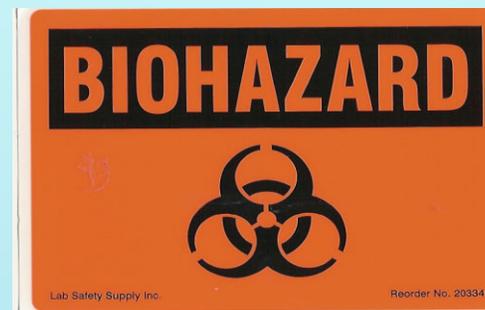


Autoclaved solid waste

- ▶ Biohazardous waste should be collected in a red biohazard bag and autoclaved.
- ▶ Autoclaves need to be validated weekly and results documented.
- ▶ Autoclaved waste should either be placed into a biohazard box or into a black trash bag for regular trash disposal.
- ▶ Sharps still need to be placed in a sharps approved container.

Biohazard Labels

- ▶ OSHA requires biohazard labels to be affixed to containers, refrigerators and freezers containing human BBPs or OPIMs
 - 29 CFR 1910.1030(g)(1)(i)(A)
- ▶ Labels shall be fluorescent orange or orange-red with lettering and symbols in a contrasting color.
- ▶ BSL-2 (agents in use) and BSL-3 laboratories require biohazard labels as noted in the BMBL, 6th ed., 2020.



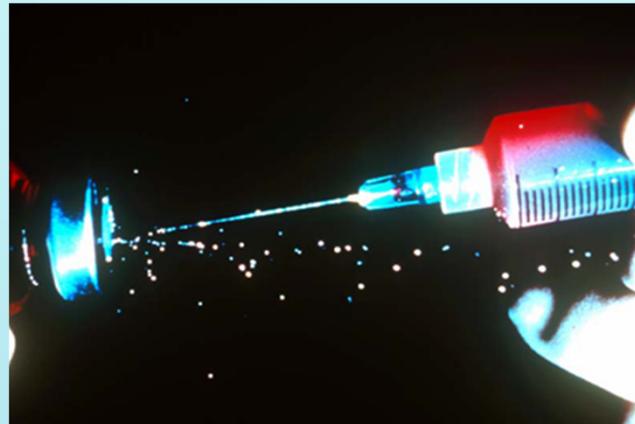
Surface Decontamination

- ▶ 10% Bleach, 70% Ethanol
- ▶ Halogens (Sodium and Calcium hypochlorite)
- ▶ Quaternary Ammonium Compounds
- ▶ Aldehydes (Formalin)
- ▶ Hydrogen peroxide
- ▶ **BOTTOM LINE** – Use a disinfectant that is proven to provide kill of the agent with which you're working.



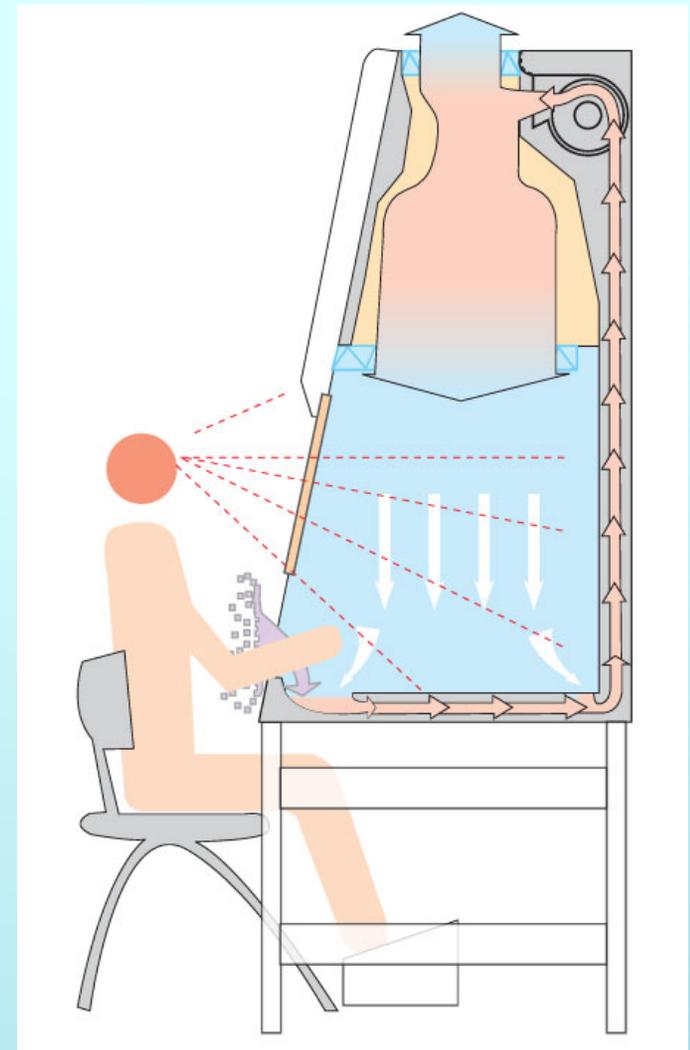
Aerosol Generating Procedures

- ▶ Pipetting (vigorous mixing)
- ▶ Mixing & vortexing
- ▶ Centrifugation
- ▶ Inoculating biochemicals or blood culture bottles
- ▶ Pouring of specimens
- ▶ Flaming loops
- ▶ Open bench subculturing
- ▶ Hot loop into broth or media
- ▶ Loading syringes
- ▶ Flow cytometry & sorting
- ▶ Lasers
- ▶ Grinding and homogenizing
- ▶ Opening lyophilized cultures
- ▶ Entering / opening vessels at non-ambient pressures
- ▶ Bone saw at autopsy
- ▶ Sonication



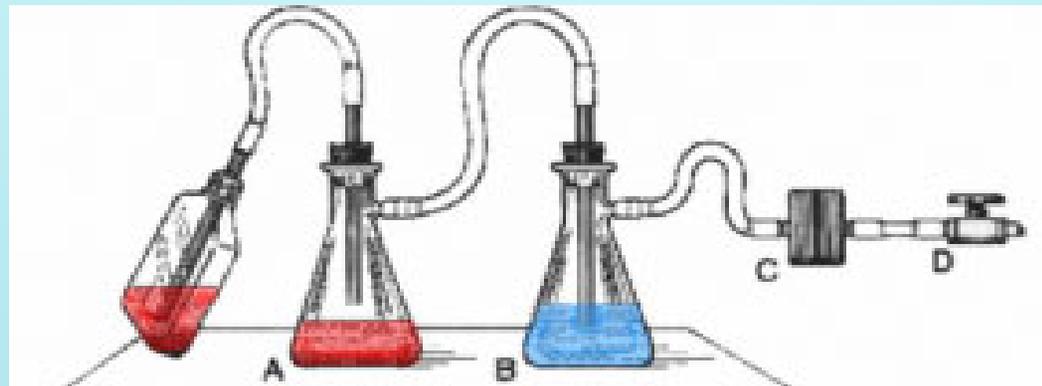
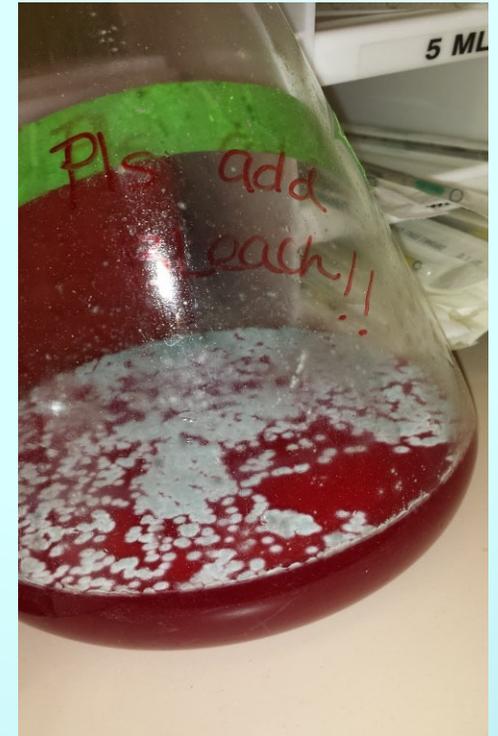
Biosafety Cabinet Use

- ▶ BSCs must be tested and certified at the time of installation, any time it is moved, and at least annually.
- ▶ No flammable compressed gas
 - Flames disrupt air flow and may damage HEPA filter
- ▶ Keep vents clear of tools/debris
 - this prevents proper airflow
- ▶ Use appropriate disinfectant
- ▶ Wear PPE (gloves, gown/coat)



Vacuum use

- ▶ Begin with fresh bleach in the flask
 - final concentration should be 10% bleach
- ▶ Empty frequently to avoid contamination
- ▶ Label the contents
- ▶ HEPA filters should be in-line to protect the house vacuum and a second overflow flask is also useful
- ▶ Use coated glass and/or secondary containment if stored on the floor



Regulatory aspects, standards & guidelines



Research & Regulatory Oversight

- ▶ Occupational Safety and Health Administration (OSHA)
 - ▶ Bloodborne Pathogens and the Laboratory Standard for working with SA Toxins
- ▶ Department of Health & Human Services (DHHS): Select Agent Program
- ▶ Centers for Disease Control and Prevention (CDC)
 - ▶ Permit requirements
- ▶ United States Department of Agriculture (USDA): Select Agent Program
 - ▶ Animal Plant and Health Inspection Service (APHIS)
 - ▶ Permit requirements
- ▶ Department of Transportation (DOT): Ground Shipping
- ▶ International Air Transport Association (IATA): Air Shipping
- ▶ NIH Guidelines for Research Involving Recombinant DNA Molecules

Registration of Research Protocols

- ▶ Institutional Biosafety Committee (IBC)
 - Biological Agents, recombinant or synthetic nucleic acids (rsNA), biological toxins, prions & select agents
- ▶ Radiation Safety Committee (RSC)
 - Radiological
- ▶ Institutional Animal Care and Use Committee (IACUC)
 - Animals
- ▶ Institutional Review Board (IRB)
 - Humans
- ▶ Conflict of Interest in Research Committee (COIRC)

IBC and IBC Protocols

- ▶ Research Institutions with NIH funding must register experiments using rsNA molecules with the Institutional Biosafety Committee (IBC).
- ▶ The IBC has responsibility for the oversight, review and approval of all biological research conducted at Saint Louis University and institutional compliance with federal, state and local requirements governing the use of biological materials.
- ▶ IBC protocols are active for five years
 - Annual continuing reviews (per *NIH guidelines*)
 - Ensures personnel, locations, etc. are up-to-date.
- ▶ All personnel listed on an IBC protocol are required to read the protocol as part of their eIBC protocol-specific training.
- ▶ Questions regarding IBC submissions, renewals, or continuing reviews can be emailed to eIBC@slu.edu, or contact Patricia Osmack, IBC Manager

Shippers Training

- ▶ Training is required for anyone involved in the shipping or transport process
- ▶ Required Shipper's Training Includes:
 - General Awareness
 - Safety
 - Function Specific
 - Security Awareness
 - Dangerous Goods readied for shipment are a security risk and must be secured from unauthorized access prior to shipment.
 - All visitors must be escorted in areas where packaged Dangerous Goods await shipment.
 - Keep laboratory doors and cabinets holding dangerous goods closed and locked.
 - Call DPS 314-977-3000 for any security issues.



Shipping Hazardous Materials

- ▶ Dangerous goods
 - must be shipped in accordance with 49 CFR, Parts 171–180.
- ▶ Biological agents
 - Must be shipped following DOT and/or IATA guidelines.
 - Contact EHS with any questions about specific online training requirements.
- ▶ Shipping Chemicals
 - Please contact EHS prior to shipping ALL CHEMICALS

Occupational Health Program (OHP)

Awareness & Enrollment

▶ What is the OHP?

- The OHP is a medical surveillance program for assuring that employees are monitored (for occupational Laboratory and Animal Care Workers only).

▶ How do I enroll?

- PI will be provided an OHP Medical Questionnaire for you to complete.
- For work with animals, the PI will also provide a “Safe Handling of Animals for OHP” form for you to complete.
- After you complete the form, it must be submitted confidentially (because it contains Personal health information) to the Occupational Health Program Manager.

▶ Can I choose not to participate?

- If you choose not to participate in the OHP, you must notify the SLU Occupational Health Program Manager, Dr. Steven Cummings, in writing using the “Informed Consent Declination Documentation” form that is the final page of the OHP Medical Questionnaire.
- Opting out of the OHP may prevent you from participating in certain research that is part of your job. This should be discussed with your supervisor.

eIBC Protocol-Specific Training

- ▶ All Saint Louis University laboratories are required to have and document **protocol-specific training*** for all faculty, staff, students, and volunteers working in the laboratory.
- ▶ Principal Investigators and Managers in labs that work with any biohazardous agent should:
 - Require all personnel to read eIBC Protocols on which they are listed
 - Explain symptoms of accidental exposures to employees
 - Require self-reporting in the event of illness
 - Require reporting of any spill or release of an agent to the supervisor and to EHS.

***This training should be documented in the Biosafety Training Form**

Hazardous Exposure or Spill

- ▶ Flush the contaminated area with water for ≥ 15 minutes
- ▶ Evacuate the immediate area around a spill
 - Avoid leaving and tracking the spill to other areas
- ▶ Call Public Safety at 314-977-3000
- ▶ Provide Important Information:
 - Specific hazard name, exact location, amount spilled, phone #
- ▶ Avoid hazard inhalation, absorption and/or contamination

NEVER leave a message for an emergency !!!

Sharps Injuries

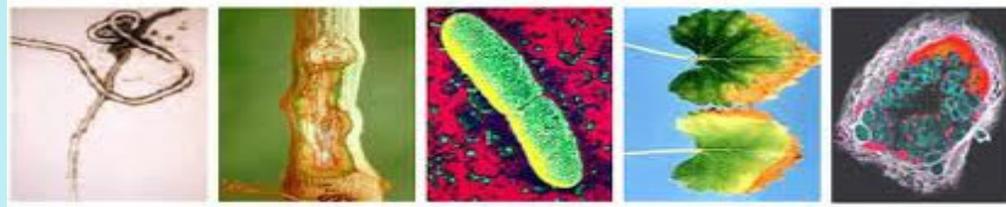
- ▶ Notify your supervisor immediately, if available.
- ▶ Determine risk of exposure to a biological agent.
- ▶ Immediately report incident to supervisor and seek treatment at Concentra Urgent Care or the emergency room to determine treatment.
- ▶ File an incident report as instructed by the Occupational Health Program (OHP).
- ▶ Follow recommendations for follow-up treatment.



Contact Concentra Urgent Care:
3100 Market Street
St. Louis, MO 63103
Phone: 314-421-2557
Hours: 8AM-5PM

Emergency or After Hours Contact:
SSM Health Saint Louis University
Hospital Emergency Department

Select Agents and Toxins Awareness



- ▶ Restricted work, unless approved by RO, IBC, and CDC
- ▶ YOU MUST BE APPROVED TO ACCESS AGENT
- ▶ Covers ALL who have access to Select Agents and Toxins
- ▶ High-level of federal-level security and scrutiny
 - <https://www.selectagents.gov/>
- ▶ Extensive training to work with agents

RO: Christopher Eickhoff

Caroline Bldg. Rm. 305D – (314) 977-6888

ARO: Tammy Blevins

Caroline Bldg. Rm. 305B – (314) 977-6870

ARO: Patricia Osmack

Caroline Bldg. Rm. 305C – (314) 977-6897

42 CFR Part 73 (CDC): Human & Overlap agents
7 CFR Part 331 (APHIS): Plant
9 CFR Part 121 (APHIS): Animal (& Overlap agents)

Environmental Health and Safety Website

<http://slu.edu/EHS>

The screenshot shows a web browser window displaying the Environmental Health and Safety website for Saint Louis University. The browser's address bar shows the URL slu.edu/research/faculty-resources/research-integrity-safety/environmental-health-safety/. The website features a blue header with navigation links: APPLY, REQUEST INFO, VISIT US, and BROWSE DEGREES. The Saint Louis University logo is centered in the header. Below the header is a dark blue navigation bar with links for About, Academics, Athletics, Research, Life at SLU, and Admission. The main content area includes a breadcrumb trail: Home » Research » Faculty Resources » Research, Integrity and Safety » Environmental Health and Safety. On the left, a vertical menu lists: Chemical Safety, Radiation Safety, Biological Safety, General Safety, Minors in Labs, Waste Removal, Report a Safety Concern, and Training. The main text area is titled "Environmental Health and Safety" and contains three paragraphs of introductory text. The first paragraph states: "Environmental Health and Safety provides environmental, health and safety leadership, expertise, guidance and service in support of the University's teaching, research, and clinical mission." The second paragraph describes the team's work: "We work as a team with the faculty, staff, students and the administration of Saint Louis University to proactively incorporate and manage health and safety in all endeavors. These efforts range from basic fire and life safety to general workplace safety to biological, chemical and radiation safety, to hazardous materials removal and disposal." The third paragraph discusses regulatory challenges: "In an increasingly dynamic and complex regulatory world, our health and safety programs are designed to facilitate safety by reducing regulations to best practices that can be efficiently and effectively implemented through well defined policies, safety and security procedures, routine training, and friendly professional oversight." The fourth paragraph states the university's commitment: "We are here to help assure the health and safety of all students, employees, patients and visitors to Saint Louis University, and as stewards of the environment within the Saint Louis University campus and the surrounding community." Below the text is a section titled "Our Goals". The browser's taskbar at the bottom shows the time as 3:27 PM on 1/6/2020.

Contact Us!

▶ Christopher Eickhoff

- Biological Safety Officer & Responsible Official (RO)
- Phone: (314) 977-6888
- christopher.eickhoff@health.slu.edu

▶ Tammy Blevins

- Assistant Biological Safety Officer & Alternate Responsible Official (ARO)
- Phone: (314) 977-6870
- tammy.blevins@health.slu.edu

▶ Patricia Osmack

- IBC Manager & Alternate Responsible Official (ARO)
- Phone: (314) 977-6897
- patricia.osmack@slu.edu



Reminder!

1. Complete the [Lab Safety Training Quiz](#)
2. Retain a copy of the LST quiz results sent by email. The email serves as proof of training.

Note: Training certificates are no longer issued.