Laboratory Safety

Office of Environmental Health and Safety
Public Safety Building
(225) 578-5640
Yearly Training is Required

- Reduces risk.
- Puts everyone on the same page.
- Reduces confusion in an emergency.
- Results in an ability to react in a crisis without becoming part of the crisis.
- Increases your comfort zone and your ability to handle critical situations.
- Required for Lab Accreditation.
Training Goals Include

- Providing Laboratory Safety Basics
  - Biological Safety
  - Chemical Safety
  - General Lab Safety
- Providing Reference Sources
- Hazard Communication Requirements
Office of Environmental Health and Safety (EHS) Provides:

- Environmental and Safety Assistance
- Lab Inspections
- EHS Training
- Additional Resources
  - LSU Safety Manual
  - EHS Web Page (ehs.lsu.edu)
EHS Web Page

Contents Include

- Emergency Information
- Training
- Industrial Hygiene
- Environmental Compliance
- Documents & Policies
- Biological Safety
- Laboratory and Chemical Safety
Biological Safety
Contents

- Registration of Biohazard or Recombinant DNA Research
- Inter-Institutional Biological and Recombinant DNA Safety Committee
- Select Agents at LSU
Basics of Biosafety

- Controlling exposures relies on:
  - Application of standard (universal) precautions.
  - Use of engineering controls to minimize risk.
  - Consistent application of work practice controls.
  - Medical management of exposures.
The “universal precautions” were developed in the early 1980’s to protect health care workers from HIV infection.

The philosophy of universal precautions is that all patients, samples, and specimens should be treated as if infected at all times.

Barrier and procedural protections are used when handling all samples, specimens, or animals.
Strategies for Protection

- Strategies for protection against pathogens include the following:
  - Appropriate personal protective equipment (PPE) plus protective clothing and barriers.
  - Minimizing the use of sharps.
  - Practices that minimize the risk of infection are used in all manipulations.
  - Appropriate safety equipment and supplies are used when handling infectious materials.
  - Vaccination, serological testing or other medical management as appropriate to pathogen.
Safety Engineered Materials

- Glassware should be avoided if possible and replaced with plastic tubes, flasks, etc.
- Capillary tubes should be made of unbreakable plastic or glass coated with plastic.
- If needles are used, safety needles should be substituted for standard if possible.
- If other sharps are necessary, safety-engineered substitutes should be employed.
A properly maintained and certified BSC should be used for *all* open work with infectious materials in a research laboratory.

* Some procedures may not be feasible inside a cabinet; in such cases, extra PPE may substitute.
Cleaning and Disinfection

Work surfaces should be cleaned and disinfection after completion of each procedure and at the end of each work day.

Chemical agents effective against most pathogens: iodophors, phenolics, alcohol, diluted bleach (10% v/v).
Biosafety Work Practices

- No eating, drinking, smoking, storage of food or drinks, application of cosmetics or handling of contact lenses in lab.

- Procedures involving potentially infectious materials must be done in ways that minimize splashing and the production of droplets.

- PPE must be removed and replaced when contaminated, and removed before exiting the lab.
Working with Biologicals

- Always handle a microbial culture as if it is an infectious material, or pathogen.
- Know and follow your protocol.
- Know your materials and potential hazards.
- Wear personnel protective equipment.
- Whenever possible, use a biosafety cabinet.
- Be alert for hazards, pay attention.
- Wash your hands before leaving the laboratory.
Chemical Safety

CHEMICAL HAZARDS
Contents

- Chemical Safety
  - Chemical Inventory Management System
  - Chemical Hygiene Plan
  - MSDS Management
- Laboratory Safety
  - Fume Hoods
  - Standard Operating Procedures
- Compliance
  - Audits and Accreditations
  - Law and Regulations
Basics of Chemical Safety

- Avoid underestimating risks involved with working with chemicals.
- Provide adequate ventilation for your process.
- Control chemical exposures through engineering controls and safe handling processes.
- Institute a chemical hygiene program.
Regulations Applicable To Laboratory Safety

- NFPA 45, “Fire Protection for Laboratories using Chemicals”
OSHA Hazard Communication Standard

- Right To Know Law
  - Every Worker has the right to know the hazards of their workplace.

- Lab and Work Place Hazards
  - Material safety Data Sheets (MSDS)
  - Standard Operating Procedures

NOW WHERE DID I PUT THAT MSDS?
Material Safety Data Sheets

- MSDS is a detailed information bulletin prepared by the manufacturer.
- MSDS provides information to properly handle chemicals, and respond effectively to daily exposure situations as well as emergency situations.
- It the right of a lab worker to have MSDS available for all chemicals used.
- LSU must provide access to MSDS.
  - Labs have option to keep hard copies.
  - Computer access to MSDS are available via inventory program
MSDS Information Format

- Company Information
- Hazardous Ingredients
- Physical Data
- Fire and Explosion Hazard Data
- Health Hazard Data
- Reactivity (Instability) Data
- Spill or Leak Procedures
- Special Protection Information
- Special Precautions
Chemical Hygiene Plan

- Required under the OSHA Lab Standard.
- It is a written program that defines procedures for protecting personnel from the safety and health hazards presented by hazardous chemicals.
- EHS has provided a general Chemical Hygiene Plan for LSU Laboratories that defines the requirements of chemical use in the lab.
Chemical Inventory

- Every Laboratory must have a Complete and Accurate Chemical Inventory.

- LSU uses a Bar Code Based On-line Chemical Inventory Management System.

- The Inventory Provides Information on:
  - Chemical Hazards and Physical Properties.
  - Quantities and Storage Locations
  - Links to MSDS

- Labs are required to maintain inventory by adding new Chemicals and deleting Used Chemicals.
Chemical Labeling

- All Chemical Containers must be Labeled with either the original label or a new label.
- Includes Transferred Chemicals and Solutions
- New Labels must include:
  - Chemical Name
  - Hazard(s)
  - Date
  - Manufacturer or Lab Owner
Labs Have the Option to Use Preprinted Labels or Hand Written Labels as Long as the Required Information is Present.

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Product Label Information

E: TOXIC: May cause harm to the unborn child. Risk of serious damage to eyes. Inhaling to respiratory system and skin. Target organ: Blood. Central nervous system. Fugitive absorbed through skin. In case of accident or if you feel unwell, seek medical advice immediately (only know the label where possible). In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves and eye/face protection. Do not breathe vapor.

J: Toxic Gift Toxique Toxico Tossico Vergiftig

C: Deionized Minimum 99.5% (GC)

B: F-9037 100 ml Lot 119H1382

F: FORMAMIDE

G: Sigma

A: EC No 200-842-0

H: For laboratory use only. Not for drug, household or other uses

O: MSDS available

K: Store at 2 to 8°C

M: Sigma Chemical Co. P.O. 14508 St. Louis, MO 63176 USA 314-771-6750

L: Sigma Aldrich Chemical GmbH P.O. 1120, 6852 Reinheim, Germany 49-7226-870
Product Label Key

A. Product Name
B. Chemical Formula and Formula Weight
C. Descriptive Information
D. Handling & Storage
E. Hazard Statement
F. Lot Analysis
G. Package Size
H. Lot Number
I. Hazard Symbol
J. Further Hazard Information
K. CAS Number
L. Chemical Formula and Formula Weight
M. Factory Bar Code and Eye Readable Equivalent
N. Risk Code & Storage
O. MSDS Statement
P. EC Analysis
Engineering Controls

- Engineering controls are the primary means to minimize employee exposure to chemical and physical hazards in the workplace.
  - Laboratory Fume Hoods.
  - Gloves Boxes and Isolation Rooms.
  - Flammable Storage Cabinets.
Fume Hood Use

Plan Experiment
Lower Sash
Watch Activity
Make slow and deliberate motions
Do not block air flow with large equipment
Classification of Hazardous Chemicals

- Safe handling of chemicals is dependant on their properties and safe handling appropriate to those properties.

- The primary hazard classes of chemicals are:
  - Corrosive Substances
  - Flammables
  - Explosives
  - Irritants
  - Carcinogens
  - Toxic Agents
  - Sensitizers
Working with corrosives requires specific training or an established record of experience.

Lab worker is responsible for proper handling of materials and use of appropriate personnel protective equipment.

Lab worker is responsible for proper disposal of the material.
Add Acid to Water

Remember
Add acid to water!!
Not Water to Acid

Adding water to mineral acids produces an Exothermic reaction and may cause the Acid to splash.
Working With Flammables

- Store flammables in flammable storage cabinets and keep cabinets tightly closed at all times.
- Limit storage outside of cabinets to five gallons.
- Do not store flammables in a non-explosion proof refrigerator.
Working With Oxidizers

Oxidizers are reactive chemicals that promote combustion or evolve oxygen. They have the potential to form explosive mixtures when mixed. This class of chemicals includes peroxides, chlorates, perchlorates, nitrates, and permanganates.

- Be aware of the potential reactions when using oxidizers.
- Do not store oxidizers and flammables together.
- 30% Hydrogen Peroxide must be kept cold.
Potentially Explosive Chemicals (PIC)

PICs are materials that may oxidize, decompose, polymerize, become contaminated, dry out or destabilize and subsequently become explosive when subjected to heat, light, friction or mechanical shock.

- PIC’s Must be dated upon receipt and reviewed on a yearly basis. PIC’s include:
  - Peroxides and Peroxide Formers (Ether, THF)
  - Superoxides
  - Picric Acid
  - Organo Metallic Compounds
  - Nitro/nitrate Compounds
Chemical Storage

- Chemicals should be separated by the Hazard Classes shown below with secondary containment as required.
  - Inorganic mineral acids
  - Solvents
  - Bases
  - Oxidizers
  - Poisons
  - Explosives
Chemical Storage Can Be Complex

- Refer to EHS Web Page (ehs.lsu.edu)
- Laboratory Safety Section
- EHS Laboratory Standard Operating Procedure “General Guidelines for Chemical Storage”
Working With Chemicals

- Know your protocol / execute meticulously
- Plan your need for protective equipment
- Know your chemicals and potential hazards
- Date material when received and at disposal
- Use smallest quantity of material
- Consider safer substitutes
- Wear personnel protective equipment
- Whenever possible, use a fume hood
- Be alert for hazards, pay attention to your work.
Laboratory Safety Concerns
GOOD LABORATORY PRACTICES REQUIRE

- Chemical and Biological management
- Standard Operating Procedures
- Good Housekeeping
- Proper use of Laboratory Equipment
- Safety & Emergency Equipment
- Personal Protective Equipment (PPE)
Housekeeping

- A clean, well-maintained work area improves safety by preventing accidents.
- Good Housekeeping will enhance efficiency of work performed.
- Laboratory worker responsible
  - Cleanliness of personal workspace
  - Common areas of the laboratory.
Sinks should be kept clean and free of glassware. Hand washing items should be kept on hand.
Laboratory aisles should remain uncluttered from equipment storage.
Good Housekeeping?

Not Really!!
Housekeeping

- Refer to EHS Web Page (ehs.lsu.edu)
  - EHS Laboratory Safety Section
  - Laboratory Standard Operating Procedure
  - Housekeeping in Laboratory
Personal protective equipment (PPE) must be used as necessary.

Minimum Requirements for Entry Into Lab
Include:

Safety Glasses
Enclosed Shoes
Eye Protection

- Eye protection should be worn at all times in the lab
- Appropriate eye protection include safety glasses with side-splash protection, safety goggles or full face shield
- Prescription eyeglasses are not a substitute; safety glasses should be worn over eyeglasses
Protective Clothing

- Lab coats, gowns, or aprons are required at all times for lab work
- Enclosed Shoes are Required
- No Sandals or Flip Flops
- No Shorts
Protective Gloves

- Use gloves rated for the chemicals in use.
- Gloves offer protection from direct skin contact.
- Use for all procedures, cleaning of spills, and handling wastes.
- Removed inside out for discard.
- Remember to remove your gloves before answering phone.
- Take your gloves and lab coat off leaving the lab.
Hand Washing

ALWAYS WASH HANDS

- Anytime hands become visibly contaminated
- After removal of gloves
- Before leaving the laboratory
- After completion of work
- After leaving the lab, especially before eating or drinking.
Sharps Management

- Sharps are any item/tool that can penetrate the skin
- The use of sharps in labs is responsible for >90% of researcher exposures; mainly by needle-sticks.
- Discard used sharps immediately without recapping into hard-sided, leak-proof disposal containers.
Summary

- Know the location, and proper use of, safety and personal protective equipment.
- Know the properties and hazards of the materials that you are using.
- Plan your work and pay attention.
- Know what to do in an emergency:
  - Call LSU Police (578 – 3132).
  - Remain Calm.
EMERGENCY PHONE NUMBERS

- LSU Police
  - 578-3231
  - 911 (on LSU office phones)
- EHS 578-5640
- Radiation Safety 578-2747
- Facility Services 578-2327
Goodbye from the Happy Chemist

Questions or Concerns?
Office of Environmental Health and Safety
578-5640