

# LINCOLN MEMORIAL UNIVERSITY



**LMU**

*School of Mathematics & Sciences*  
LINCOLN MEMORIAL UNIVERSITY

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# What is Biological and Chemical Safety?



- Biological hazards are biological substances that **pose a threat** to the health of living organisms, primarily that of humans.
- **BSL-1**
  - Well characterized agents. Agents not known to cause disease.
- **BSL-2**
  - Agents associated with disease. Treatment for disease available.
- **BSL-3**
  - Agents associated with disease. Treatment does NOT exist.
- **BSL-4**
  - Unknown agents. Unknown treatment.

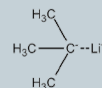


# Laboratory Accidents



- **Sheri Sangji**

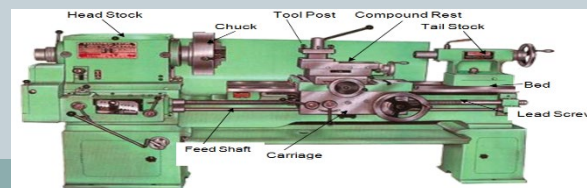
- December 29<sup>th</sup>, 2008 23 year old research assistant burned by lab fire @ UCLA while working with t-butyl-lithium.



- ✦ Died 18 days later.
- Laboratory was run by chemistry professor Patrick Harran.
- In audio recordings submitted as evidence in the criminal case Harran was interviewed by investigators.
  - ✦ **Investigator:** "And when Sheri arrived, do you know if she received any general lab safety training from the university?"
  - ✦ **Harran:** "I don't believe she received generalized safety training. I believe my assistant was told that it was not offered for her category per se."

- **Michele Dufault**

- 2011 22 year old undergraduate student at Yale tangled her hair in a lathe. Died of Asphyxiation.



# Laboratory Accidents



May 9<sup>th</sup>, 2018- Hendersonville, TN

A high school science experiment caused a **flash fire**, injuring 17 students and a teacher

**boric acid** and **ethyl alcohol**

"It didn't stay on the body long. Any time you have any kind of chemical injury you do want to safely get your clothes off, and try to wash off and irrigate as quickly as possible"

# How do we ENSURE safety?



- Education
- LMU Laboratory Safety Training
  - Occurs twice a month.
  - Includes a PowerPoint presentation and detailed tour of research facility.
    - ✦ Pointing out hazards and laboratory equipment.
  - Certificate at the end if participant gets 90% or better on the quiz.
  - Safety training is **MANDATORY** for all personnel working in the laboratory.



# What does the training include?



- General Laboratory Safety
- How to Report an Incident
- Housekeeping
- What is an SDS Sheet?
- PPE
- How to choose the right glove
- How to handle/dispose of sharps
- First aid kits
- Eye wash and safety showers
- Fire extinguishers
- Hazardous Waste Management
- How to properly handle liquid nitrogen
- Autoclave Safety
- EMERGENCY EVACUATION
- Fume hoods and Biological safety cabinets
- Professional Respect Protocol
- Creating a Respectful environment



# POLICIES



- Lincoln Memorial University follows the guidelines set in **OSHA's Standard 1910.1020** for safety.
- Policies are set in compliance with University-wide standards, as well as, **State of Tennessee Regulations.**





# GENERAL LAB SAFETY



- General laboratory safety rules are as follows:
  - (VIDEO)
  - Do **NOT** eat, drink, or chew anything in the lab.
    - × Leave food and **drinks** outside the lab door.
    - × You may exit the lab to consume drinks in the hallway if necessary.
  - **Wear eye protection** every time indicated and/or when you believe your eyes should be protected.
    - × This may be purchased in the bookstore and used in every lab as needed.
  - Hair that is long enough to hang in your face will need to be tied back.
  - **Close-toed shoes must be worn.**
  - Never work in the laboratory alone.
  - Pants, skirts, or dresses will be worn to cover the thighs and knees.
  - Biohazard materials include body fluids and microorganisms.
    - × Any items contacting these are to be deposited in the containers provided and treated with bleach and/or heat sterilization by approved personnel.
  - Some instruments in the labs emit **UV light** which may harm skin and eyes.
    - × These instruments may not be operated without all shields in place and without **eye protection**.



<https://www.youtube.com/watch?v=3oJDXvOxTdY>





# How to Report an Incident



- Steps to reporting an incident are as follows:
  1. Notify immediate supervisor
  2. Fill out an incident report, **within 24 hours.**
  3. Report incident information to Erick Moberg
  4. Report incident information to Dean.
  5. If applicable, report incident information to Risk Assessment.



# HOUSEKEEPING



- (VIDEO)
- Good housekeeping habits are crucial to an accident-free laboratory.
- Always be aware of your surroundings!
  - Keep an eye out for water on the floor, broken glass, or any other obstacle that may cause someone harm.
- **Never walk away from a hot plate or Bunsen burner when it is turned on!**
- Always return things to the appropriate place, and clean up after yourself before leaving the lab.
- <https://www.youtube.com/watch?v=0oX4Kvw39W8>

# Fall, Slip, and Trip Prevention



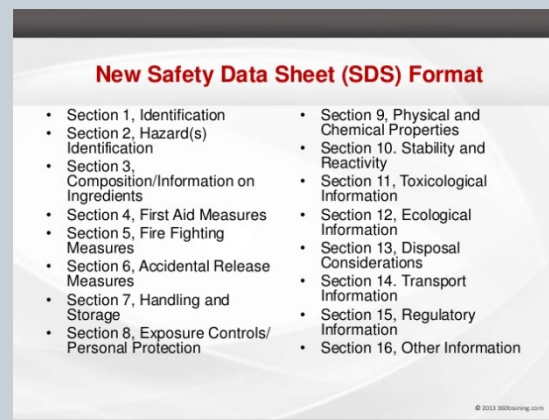
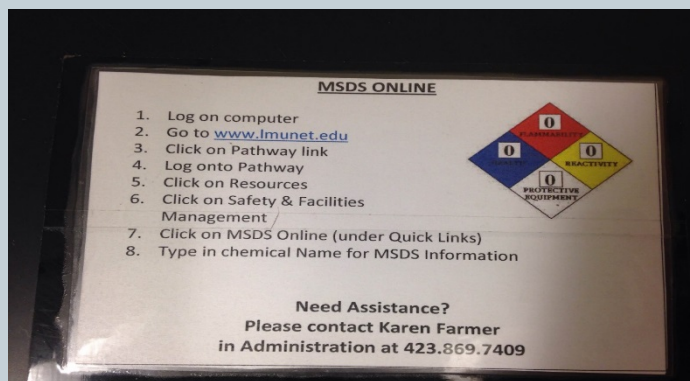
- Pay attention to your surroundings!
- Wear proper footwear!
- Avoid multitasking!



# What is an SDS (Formerly known as MSDS) sheet?



- A SDS (Safety Data Sheet) contains information on **physical** and **chemical properties** of the material, its acute or chronic **health effects**, along with exposure limits and **handling instructions**.
- SDS for chemicals are now **online** at each workstation.



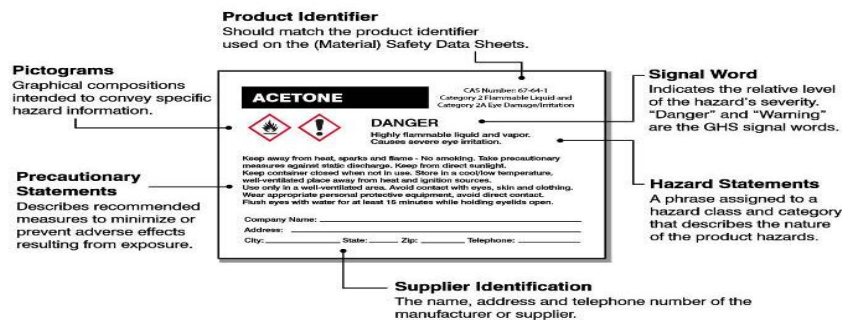
# GHS LABELS



## Globally Harmonized System (GHS)

### GHS Labels

The illustration below identifies the components of a GHS label. Actual label design and layout may vary and are subject to the discretion of the competent authority.



### GHS Pictograms



Pictured are the standard hazard symbols used in the GHS. Symbols can be used individually and in combinations to define the specific hazard(s) of the chemical.



#### 1.4.10.5.4.1 Location of GHS information on the label

"The GHS hazard pictograms, signal word and hazard statements should be located together on the label. The competent authority may choose to provide a specified layout for the presentation of these and for the presentation of precautionary information, or allow supplier discretion."

For more information, please consult the United Nations Economic Commission for Europe (UNECE) and the Occupational Safety & Health Administration (OSHA).

Note: The information included in this poster is believed to be accurate and current. However, Acasiform makes no warranty to that effect and is not liable for how this product is used. Users are responsible for determining the product's appropriateness for their respective applications. R-2011.

# Unknown Chemical



- What should you do?



## Unknown Chemicals

- Containers holding chemicals that cannot be identified by chemical name, chemical constituents, or process generating the waste *must* be labeled as "Waste Unknown" with the date that they are considered to be no longer needed.

# Chemical Spill



- What should you do?



**MATERIAL SAFETY DATA SHEET**

U.S. INTEC

**SECTION 1 - MATERIAL IDENTIFICATION AND INFORMATION**

Product Name	MSDS No.	Revision	Other Name
HAZARD	1000	1.0	

**SECTION 2 - PHYSICAL CHEMICAL CHARACTERISTICS**

Property	Value	Unit
Appearance	White	
Color	White	
Odor	None	
Boiling Point	100	°C
Melting Point	0	°C
Density	1.0	g/cm <sup>3</sup>
Specific Gravity	1.0	
Flash Point	None	
Autoignition	None	
Decomposition	None	

**SECTION 3 - FIRE AND EXPLOSION HAZARD DATA**

Property	Value	Unit
Flammable	None	
Explosive	None	
Reactivity	None	
Stability	None	

DATE 1/1/00



# PERSONAL PROTECTIVE EQUIPMENT (PPE)

<http://safety.dow.com/en/safety-courses/safety-orientation-and-training/ppe-basics>



- Personal Protective Equipment (PPE) is **critical** in the laboratory setting.
- PPE includes: gloves, goggles, respirators/face masks, lab coats, long pants, and lab appropriate shoes.
- Never reuse disposable **gloves**.
- <https://www.youtube.com/watch?v=wbuo9BL3ITg>





# Glove Removal



# HOW TO HANDLE/DISPOSE OF SHARPS



- A “**sharp**” is defined as any object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, glass pipets and broken capillary tubes.
- Always **wear appropriate gloves** when working with sharps. Also, use tongs to pick up a sharp, especially if it may be contaminated.
- Dispose of sharps in the designated red “sharps” container, **ONLY**.
- **NEVER** dispose of sharps in the regular trash!



# BLOOD-BORNE PATHOGENS



- Blood-borne Pathogens are infectious microorganisms found in human blood that may cause diseases, such as, Hepatitis B, Hepatitis C, and Human Immunodeficiency Virus (HIV)
- Although these diseases are mostly found in blood, they are communicable through contact with ANY body fluid. **ALWAYS** wear the proper PPE when dealing with body fluids of any type! This includes: gloves, mask, and lab apron.
- Blood-borne Pathogens can be transmitted the following ways:
  - Accidental puncture from contaminated needles, broken glass, or other sharps
  - Contact between broken or damaged skin and infected body fluids or
  - Contact between mucous membranes and infected body fluids
- Infected blood can **enter your system** through any of the following means:
  - Open sores
  - Cuts
  - Abrasions
  - Acne
  - Any sort of damaged or broken skin, such as sunburn or blisters



# FIRST AID KITS



- First Aid Kits are located in **EVERY** laboratory (Research & Teaching).
- First Aid Kits contain the necessities for an accident in the laboratory, including: bandages, gauze, antiseptic towelettes, antibiotic ointment, analgesics, and a wrap.
- First Aid and CPR Certification. LMU-DCOM.



# Eyewash & Safety Showers



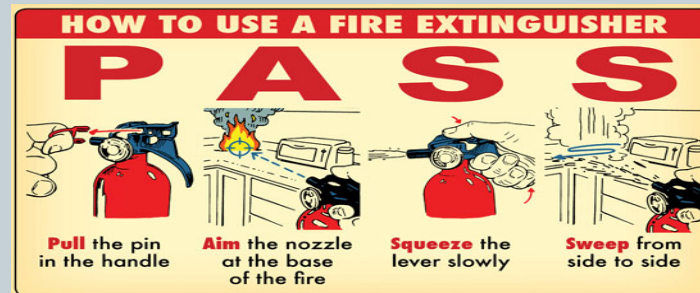
- There are **eyewash/ shower stations** located in every lab.
- Should your skin or eyes come in to contact with an irritant or hazardous material, go directly to the station and rinse with copious amounts of water for at least **15 minutes**.
- Removal of contact lenses



# FIRE EXTINGUISHERS



- Fire Extinguishers are located in each of the teaching laboratories, prep rooms, and research areas.
- The fire extinguishers located in the Math and Science Building are classified as **ABC extinguishers**. This means the extinguishers may be used on (A) trash, wood, and paper (B) liquids and (C) electrical equipment.



# HAZARDOUS WASTE MANAGEMENT



- By working in the laboratory, you may come in contact with hazardous chemicals. It is important to dispose of them properly.
- In the organic lab, separate chemical waste as follows: acidic aqueous waste, aqueous waste, halogenated organic waste, and non-halogenated organic waste.
- In the biology lab, pour fluid off the preserved specimens into the appropriately labeled carboy.
- **NEVER** pour chemicals down the drain!

# Hazardous Waste Management



- By working in the laboratory, you may come in contact with hazardous chemicals. It is important to **dispose of them properly**. Not down the sink.
- Chemical waste should be labeled:
  - Date of Addition
  - Composition of waste
  - Total volume
- Once the waste is labeled a chemical company will come and collect.
- <https://www.youtube.com/watch?v=gTWpyGw9abs>







# Liquid Nitrogen Usage & Safety

Liquid nitrogen is nitrogen that is cold enough to exist in liquid form. It is used for many cooling and cryogenic applications.

The liquid to gas expansion ratio allows liquid nitrogen to boil to fill a volume with nitrogen gas very quickly.

Nitrogen is non-toxic, odorless, and colorless. It is relatively inert. It is not flammable.

## Liquid Nitrogen Safety

Liquid nitrogen is cold enough to cause severe frostbite upon contact with living tissue. Wear proper safety gear when handling to prevent contact.



# Liquid Nitrogen Continued



## Safety con't:

- Liquid to gas expansion can generate a lot of pressure very quickly. **Do not enclose liquid nitrogen in a sealed container, as this may result in bursting or an explosion.**
- Use liquid nitrogen in a well-ventilated area.
- Liquid nitrogen containers may accumulate oxygen which is condensed from the air. As the nitrogen evaporates, there is a risk of violent oxidation of organic matter.
- Again, use proper PPE when handling Liquid Nitrogen!

## Liquid Nitrogen Uses:

- Freezing and transport of food products.
- Cryopreservation of biological samples.
- Coolant for superconductors, vacuum pumps, and other materials and equipment.
- Cryotherapy to remove skin abnormalities.
- Shielding materials from oxygen exposure.
- Cooling materials for easier machining or fracturing.

# FORMALDEHYDE AWARENESS



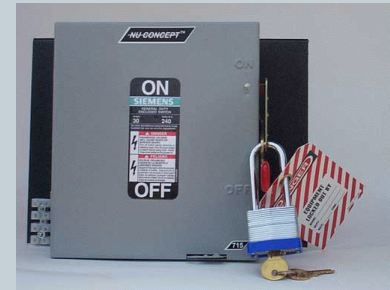
- Although the preserved specimens used in lab contain little to no formaldehyde, some people may experience sensitivity or an allergic reaction to the fumes.
- One way to avoid this, is to wear the proper PPE, including gloves and a face mask, and to work with specimens under a fume hood.
- Skin rashes, burning of the eyes, nose, and/or throat, or difficulty breathing should be immediately reported to your instructor.



# Autoclave Safety



- Only trained personnel should be using the Autoclave.
- Wear **gloves** at all times.
- Please log your cycles.
- Report and malfunctions.
- Spore tested.
- **LOCK OUT/TAG OUT**
  - if a tag is out on a power supply, **DO NOT** turn the power on! **ALWAYS** better to be **SAFE**, than **SORRY!**
  - <http://safety.dow.com/en/safety-courses/safety-orientation-and-training/basic-electrical-safety>



EXIT

# EMERGENCY EVACUATION

EXIT

- Familiarize yourself with the Emergency Evacuation plans provided by LMU.
- In case of fire or bomb threat: Please proceed to the nearest exit, taking the most direct route.
- Follow the green illuminated signs labeled “Exit” and proceed outside the building.
- **NEVER** stand close to the building in the event of it collapsing or exploding.
- In case of dangerous weather, find an **area of refuge**. These areas are located on the mountain side of the building by the service elevator. Restrooms are also designated areas of refuge. Elevators are not.
- In the event of a shooter in the building, have a place in mind to hide that is out of direct line of sight. Turn off lights in the room and lock all doors. Do not exit until you receive the “all clear” signal from e-campus alerts.

EXIT



# Fume Hood and Biosafety Cabinets



- All work with hazardous materials must be conducted in the appropriate fume hood or biological safety cabinet.
- Fume Hoods
  - Checked annually for adequate flow.
  - Drager tested bi-annually for aldehydes, HCl, acetone, and ammonia.
- Biological Safety Cabinets
  - Inspected and certified annually by professional company.

# Professional Respect Protocol



- Honesty, integrity, and fair and collegial professional conduct are expected. All students and faculty are expected to adhere to the highest standards of expectations and policies regarding intellectual property, plagiarism, and group work.
- Students should be fully aware of the ethical, legal, health, and safety implications of their education and research, in both the academic community and the public setting.
- Students should take personal responsibility for understanding, practicing, and promoting appropriate safety procedures.
- It is the responsibility of the student to monitor progress in research, consult with appropriate individuals when difficulty arises, and cooperate in efforts to resolve these difficulties.
- The research student should consult the supervising faculty mentor at appropriate intervals regarding progress and should openly discuss relevant technical problems.

# Professional Respect Protocol



- The student should honor commitments relating to research, and should recognize that the faculty member devotes significant time and effort to classroom teaching, supervision of research, and other professional activities. The commitment by the faculty member should be matched by the student.
- Students should maintain open lines of communication with other students and with faculty members.
- Students should clearly understand their rights and obligations related to intellectual property and authorship, keep accurate and complete laboratory notebooks and records to document their work and ideas, and communicate their results as appropriate.



# Creating a Respectful Environment



You can demonstrate respect with simple, yet powerful actions, and it will help you avoid needless, insensitive, unmeant disrespect.

- Treat people with courtesy, politeness, and kindness.
- Encourage others to express opinions and ideas.
- Listen to what others have to say before expressing your viewpoint.
- Never purposely insult, name call, disparage or put down people or their ideas.
- Be aware of your body language, the tone of voice, and your demeanor and expression in all of your interactions.
- Treat people the same no matter their race, religion, gender, size, age, or country of origin.
- The golden rule always applies.

Implemented consistently, these respectful actions help ensure a respectful, professional work setting.

# Communication



- Communication is vital.
  - Should you ever come across anything that you are uncertain about, please do not hesitate to contact me!
  - **Erick Moberg**
    - ✦ Natural Science Lab Coordinator
    - ✦ 423-869-6214
    - ✦ [Erick.moberg@lmunet.edu](mailto:Erick.moberg@lmunet.edu)

# Questions?



# Congratulations!



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has completed the Lincoln Memorial University  
Laboratory Safety Training, with a score of  
\_\_\_\_\_ %

Supervisor: \_\_\_\_\_

Date: \_\_\_\_\_