

Laboratory Safety

Presented for Bioengineering Laboratory
Courses

By

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Health & Safety at UCSD

- UCSD Policy
 - Provide a healthy & safe workplace (required by law)
 - Eliminate conditions that could result in personal injury or illness
 - Comply with applicable regulations
 - Apply “accepted” health, safety & environmental standards
- Safety program elements you need to know
 - Responsibility
 - Communication
 - Training & Recordkeeping

Responsibility

- **Each individual** is accountable for his/her own activities (knowing & following requirements)
- **Instructors & TAs** are responsible for providing training, implementing and enforcing lab safety requirements
- **EH&S** (campus Environmental, Health & Safety) is responsible for providing guidance & assistance in achieving a safer environment

Think Safety First

- Hazard Communication
- Risk Mitigation, a hierarchy of controls
 - Engineering Controls
 - Administrative Controls and Work Practices
 - Personnel Protective Equipment
 - Work Practices
- Laboratory Emergencies
- Hazardous Waste Management

Hazard Communication



Possible Routes of Exposure

- Routes of Exposure
 - Inhalation, Transdermal (through skin), Injection, Ingestion
- Acute toxicity
 - Highly toxic – $LD_{50} < 50$ mg/kg, oral, rat
 - Moderately toxic – $50 < LD_{50} < 500$ mg/kg, oral, rat
 - Occupational Exposure Limits (from OSHA)
- Chronic Toxicity
 - Confirmed, suspected or probable carcinogens
 - Cal-OSHA issues
 - Genotoxicity vs. Carcinogenicity vs. Mutagenicity, etc.
 - Reproductive Toxicity – harms fertility or pregnancies (Teratogens)

Engineering Controls

Ventilation

- 6 to 10 air exchanges/hour
- Single Pass Air Flow
- Air Flow Negative to Corridor



Laboratory Fume Hood

Provides Protection from Exposure do to Inhalation and/or Physical Damage

Administrative Controls

- Chemical Hygiene Plan
 - Online at <http://blink.ucsd.edu/safety/research-lab/chemical/hygiene.html>
- Material **Safety Data Sheets**
 - Chemical hazard recognition tool
 - Required for every chemical, liquid or material purchase by federal and state regulations
 - Contain critical safety, storage and fire-fighting information
 - On-line at www.ucmsds.com or a general search (Google)
- Standard Operating Procedures for Chemical Handling
- Standard Operating Procedures for Shop Equipment

Work Practices I

- Reduce the DURATION, FREQUENCY and INTENSITY of exposure to hazards!
 - Dispense all liquid chemicals in the Fume Hood
 - Store chemicals in the appropriate containers and locations (cabinets made for flammables, corrosives, etc.)
 - Think out what you want to do before you do it, and try a dry run if possible (or with water)
 - Label any newly filled tube or bottle (with tape) to keep track of what is in it and when it was created
 - Keep your work area neat
 - Dispose of wastes appropriately (more on this later)

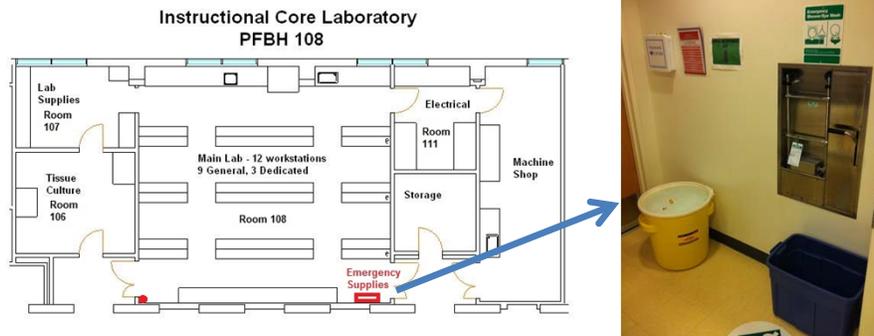


Work Practices II

- No eating or drinking in the lab!
- No answering cell phones with your gloves on!
- Wash hands frequently, before breaks/food (≥ 15 seconds of scrubbing with soap is current guideline)
- Ask instructors/TAs for the proper way to handle materials given for each lab
- Follow written instructions exactly
- When putting sharp objects down, always point them AWAY from you.



Introduction to the Instructional Core laboratory



Fires

- 4 THINGS YOU SHOULD DO

RACE

R – REMOVE yourself & others from harm

A – ALARM

C – CONFINE the fire

E – EVACUATE

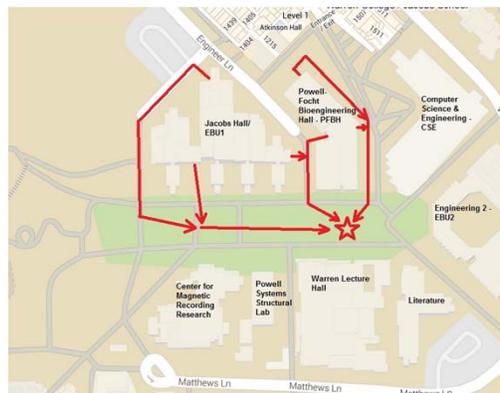
Evacuation Procedures I

- When you hear the emergency alarm you must leave! Turn off any gasses used and water valves, remove gloves and other PPE and **LEAVE!**
- Evacuate the building as shown via the South or East doors.



Evacuation Procedures II

- Meet on the Warren Mall (area in-between PFBH & Warren Lecture Hall).
- Do not leave the meeting area until we say you can! Look for building personnel (safety wardens) with orange vests!



Earthquake



- Standard “Duck, Cover & Hold”
 - Get under lab tables or computer tables as ceiling tiles/lights can come down – **DO NOT RUN OUTSIDE!**
- Assessment
 - If there was no or minimal damage (a few things tossed off of benches or tables) then we will begin clean up and continue
 - If there appears to be damage to the building, a departmental safety officer or senior manager will pull the fire alarm to signal evacuation
 - If it is major, you may be stuck on campus for up to 72 hours. Campus safety personnel will come by to coordinate where you need to go.

Response to Spills/Chemical Exposure

- Contact TA, Instructor or Dev. Engineer immediately after telling everyone to get back. If instructed, you may be asked to help clean up, otherwise stand back or leave the lab if ordered.
- If you have splashed a chemical in your eyes or on your skin you need to douse with water for 15 minutes under the emergency shower or eyewash. **DON'T** worry about flooding the lab.
 - Hold eyes open
 - Remove affected clothing
- Ambulance to Thornton UCMC E/R
 - Poison control – Instructors will bring MSDS
- Instructors/TA will report injuries immediately to EH&S or UC Police Department.

Recognizing Lab Hazards

- Chemical Hazards
 - Almost all of the chemicals used in the lab are potentially hazardous. Treat all chemicals with care.
 - For acid or base dilutions, add chemical to water, not the other way around.
 - Dispense liquid chemicals that may vapor in FUME HOODS designed to suck away the vapors to an appropriate filtration system.
 - TAs will show the proper use of fume hoods.

Recognizing Lab Hazards II

- Biological hazards
 - All biological materials are potentially sources of biological pathogens, even if you are not working on research involving such pathogens (this includes bovine or porcine materials)
 - Avoid skin, eye or other direct body contact with biological materials
 - Most of the time there is a greater risk of you infecting your materials and compromising your work, which is why you will do work in Biosafety Cabinets (BSCs) to limit the exposure of wild bacteria, etc to your samples and your samples from exposing you



Hazardous Waste Disposal – Liquid Waste

- Almost every chemical (even “household” items) is considered “hazardous” waste and can not be disposed easily
 - Sink disposal is only for the following:
 - Water
 - Salts in water solution
 - Bleach in water solution ($\leq 10\%$ of total volume)
 - Biological liquids after soaking with bleach (10% of total volume) for at least 20 minutes
- All other chemical wastes must be collected in glass jugs and disposed of through hazardous waste collection with appropriate labeling



Hazardous Waste Disposal II – Solid Waste

- Things that can go in the trash:
 - Used paper towels
 - Empty bottles of reagent or chemical if marked off (Instructors will handle this)
 - Dry soiled disposable lab coats
 - Gloves
- Chemical wastes need to be labeled and then collected by campus hazardous waste collection and include:
 - Batteries
 - Fluorescent light bulbs
 - Unused dry, powder or granular form chemicals

Hazardous Waste Disposal III – Biological Waste

- Biological wastes need to be placed in an appropriate Biohazard container for disposal:
 - Solid biological materials or labware without sharp edges or points
 - Pipette tips, pipettes, razor blades, scalpels, syringes, etc. Must be placed in a “sharps” disposal container.
 - All biohazard waste must be labeled with source information (to be handled by the instructor, TAs or Sr. Dev. Engineer)



Cyber Safety

- Students have brought in viruses that almost cost us \$thousands. The last one included a back door installer.
- Make sure your computer has all security updates installed and is running an anti-virus and firewall.
- A number of the computers in the lab are running no-longer supported operating systems that are necessary for software for specific instruments, so they are not connected to the web.
 - **Do not connect them to the web!**
 - **Only use lab provided USB flash drives for moving files from these computers!**
- We have safe, cleared USB flash drives for transferring files – here is the procedure.
 - **These flash drives are not to be connected to your laptop at any time!**
 - Work on your files where you need to and copy them to an online file repository.
 - Access your files via the ACMS computers in the Instructional Core
 - Save them to a provided USB drive.
 - Take them to the instrument computer you need to have them on.
 - This works in reverse for files you need to copy from an instrument.

In Summary

- These rules are here to protect you and your labwork
- If there is an emergency, get either the TAs, Instructor or Senior Development Engineer immediately
- If you have any questions, please ask!

Other Lab Rules

- The equipment is expensive, so if something is stuck or doesn't seem to be working correctly, ask for help instead of forcing it.
- Do not write on glassware. Write on tape and put tape on the glassware.
- Clean up after yourself when you are done.
- If you have questions, ASK!!!