Laboratory Safety

University Safety Requirements

Presented by

Environmental Safety Specialist

University of Northern Iowa

Environmental Health and Safety

Departmental Safety Information

- Building Evacuation Plans
  - In case of fire
    - Close all gas jets
    - Students in the laboratory should move immediately to assigned exit
    - Make sure all doors are closed
    - Leave building as quickly as possible

Departmental Safety Information

- Building Evacuation Plans
  - Evacuation in Case of Fire and Tornado
    - Ensure evacuation routes (fire) and shelter locations (tornado) are posted in obvious locations
    - Ensure faculty, staff and students are familiar with them

OSHA LABORATORY STANDARD 29 CFR 1910.1450

- Chemical Hygiene Plan
  - Applies to all employers engaged in use of hazardous chemicals in a laboratory (http://www.vpaf.uni.edu/ehso/programs/chemhyg08.pdf)
  - Sets forth University Procedures and Guidelines for all aspects of dealing with chemical hazards.

OSHA Laboratory Standard

- Chemical Hygiene Plan (cont.)
  - NRC recommendations
    - Components of the Chemical Hygiene Plan
      - Basic Rules and Procedures
      - Chemical Procurement, Distribution and Storage
      - Environmental Monitoring
      - Housekeeping, Maintenance and Inspections
      - Medical Program
      - Personal Protective Apparel and Equipment
      - Records
      - Signs and Labels
      - Spills and Accidents
      - Training and Information
      - Waste Disposal

Rules and Procedures

- Laboratory Safety Rules
  - Posted on inside of doors of labs
    - Always wear eye protection.
    - Wear appropriate clothing (Lab coats recommended)
    - Confine long hair
    - Never work alone.
    - Never perform unauthorized experiments.
    - Never bring food or drink into the lab (includes research labs).

Rules and Procedures

- Laboratory Safety Rules
  - Never engage in pranks or horseplay.
  - Always know the properties of the materials used in your work.
  - Always deposit waste materials as instructed.
  - Never remove chemicals or equipment from lab without permission.
  - Never pipet by mouth.

Rules and Procedures

- Additional Rules and Guidelines for Working the in Labs
  - Always read the label and any prep instructions
  - Make sure all chemicals are appropriately labeled
  - Make sure chemicals are stored properly (Only five gallon cans belong on the floor).
  - Chemicals should be dispensed from 5 gallon containers with appropriate pail pumps.
  - Ensure all hazardous wastes are disposed of according to UNI requirements (Check with Environmental Safety Specialist)

Rules and Procedures

- Additional Rules and Guidelines for Working the in Labs
  - Do not use your fingers to get chemicals out of a jar and do not identify chemicals by smell.
  - If water is shut off to the building, work will cease regardless of its urgency.
  - Transport chemicals in safety containers and use only safety bottles for concentrated acids and bases.
  - Do not use glass stopper bottles for storage of bases.

Rules and Procedures

- Additional Rules and Guidelines for Working the in Labs
  - Recommend a proper diet (lessen the chance of passing out in the laboratory)
  - Add acid to water never water to acid.
  - Pay absolute attention to what you are doing.
  - Absolutely no sleeping in the research labs

Rules and Procedures

- Eye and Face Protection
  - Chemical splash goggles are to be worn if harmful chemical splash is possible (Vented goggles).
  - Safety glasses can be worn to protect eyes if no chemical splash is possible and if meet Z87.1 ANSI standard.
  - Face shield to prevent splashes to face and neck. Must be worn in conjunction with safety glasses or goggles.

Rules and Procedures

- Gloves
  - Different types: nitrile, latex, vinyl and neoprene, etc. Catalogs should tell you what chemicals the gloves are suitable for
  - Inspect upon each use. Look for cuts and tears.
  - Remember gloves will eventually break down.

Rules and Procedures

- Clothing
  - Aprons to be worn in conjunction with corrosive or irritating chemicals.
  - Lab coats should be worn to prevent minor splashes or spills and contact with dirt.
  - No worn, torn or skimpy clothing. Shorts and sandals not allowed.

Rules and Procedures

- Housekeeping Practices
  - Condition of sinks and hoods.
    - No paper, solids, or refuse should ever go into the sinks. Fume hoods should be free for work. Only chemicals being used during the experiment should be in the hood.
  - Bench tops
    - Benches tend to attract books, paper towels, book bags, and other things that interfere with work.
  - Balances
    - Clean after use
  - Broken glass
    - Damaged glassware will be placed in designated broken glass containers. Not to be used for disposal of dirty glassware or general garbage.

Rules and Procedures

- Housekeeping Practices
  - Chemical storage/Incompatible materials
    - Accumulation of chemical in labs create dangerous combinations. Incompatibles should not be stored in the same location.
    - Ethers will be used no later than 6 months after opening and 12 months after purchase.
  - Conditions of labels
    - Every container of chemicals or solutions in the lab should carry a clear label of contents. Labels should not have just initials, sample numbers or dates. These are not legal and COULD RESULT IN A HUGE FINE FOR THE UNIVERSITY.

Rules and Procedures

- Fume Hoods
  - Operating height for hood sash is no more than 18”. Sash should be closed when hood is not in use.
- Refrigerators
  - Never store food or beverages in laboratory refrigerators or freezers
  - Flammable refrigerators are required for storage of those chemicals listed as highly flammable.

Safety Equipment

- Familiarization with Facilities
  - Faculty, staff and students should familiarize themselves with all safety equipment and their use.
    - Eyewash fountains
    - Safety showers
    - Fire Blankets
    - Fire extinguishers
    - Nearest telephone

Hazard Communication

- Emergency Phone Numbers
  - Public Safety- 3-4000
  - Ambulance or Hospital 9-911
- Poison Information:
  - Allen Hospital 9-235-3893
  - State of Iowa 9-1-800-272-6477

Hazard Communication

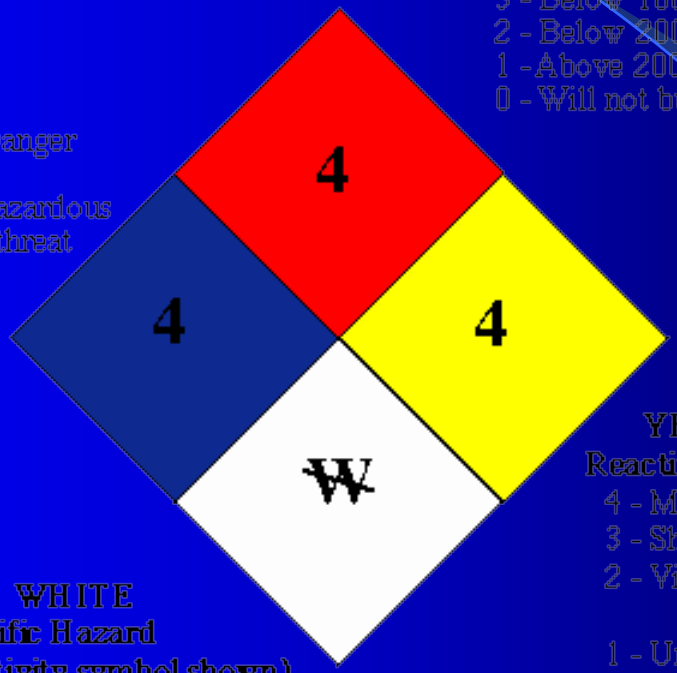
- Material Safety Data Sheets
  - MSDS provides
    - MSDS name and synonyms
    - Information on ingredients
    - Emergency data and potential health effects
    - First aid measures.
    - Chemical Stability data
    - Spill information
    - Can be found online
      - Vermont siri (http://hazard.com/msds/)
      - Fisher Scientific (https://new.fishersci.com)
      - UNI (http://209.252.168.4:85/search.asp)
    - Hard copies found in MSH 256

Hazard Communication

- Labeling for Hazardous Materials
  - Labels are often used to communicate level of hazard in handling certain chemicals. May identify individual containers or doors of areas that contain hazardous materials. The most common method for such labeling is called the “704M system” devised by the National Fire Protection Association.
  - Segregated by four colors
  - Blue-Health; Fire-Red; Reactivity-Yellow; White-Special (W-Water Reactive, OXY-Oxidizer)
  - Rated 0-4 0 is essentially harmless to 4 which is extremely hazardous

RED
Fire Hazard
Flashpoints
4 - Below 73 F
3 - Below 100 F
2 - Below 200 F
1 - Above 200 F
0 - Will not burn

BLUE
Health Hazard
4 - Deadly
3 - Extreme Danger
2 - Hazardous
1 - Slightly Hazardous
0 - No health threat



YELLOW
Reactivity Hazard
4 - May detonate
3 - Shock or heat may detonate
2 - Violent chemical reaction; water reactive
1 - Unstable if heated
0 - Stable

WHITE
Specific Hazard
(Water Reactivity symbol shown)
OX - Oxidizer
ACID - Acid
CORR - Corrosive

Hazard Communication

- Labeling of Hazardous Materials
  - Corrosive 
  - Irritant 
  - Harmful 
  - Toxic 
  - Oxidizer 

Hazard Communication

- Labeling of Hazardous Materials
  - Flammable 
  - Explosive 
  - Environmental 

Hazard Communication

- Proper Storage of Chemicals
  - Red-Flammables solvents such as acetone
  - Blue-Health hazards such as naphthalene
  - Yellow-Reactives such as peroxides and nitrates
  - White- Caustic compounds such as Hydrochloric Acid and Sodium Hydroxide
  - Gray-Chemicals with no designated hazards such as sodium bicarbonate

Hazard Communication

- Proper Storage of Chemicals
  - Restocking shelves (Green)
    - Chemicals should be returned to their proper location by qualified personnel only.

Hazard Communication

- Chemical Labels
  - Chemical Name
  - Chemical Formula
  - Molarity/Grade
  - Date
  - Prepared by
  - Hazards
  - Advisor

Hazard Communication

- Secondary Containment
  - Chemicals will be transported by either cart capable of containing it in case it is spilled or a designated carrier
  - Waste containers are to be placed in secondary containment capable of holding the volume of that container.

Hazard Communication

- Compressed Gases
  - Inspect cylinder for deformities upon receipt.
  - Transport with approved cart, never drag cylinder.
  - Students should not be transporting cylinders.
  - Transport with valve cap on.
  - Should always be secured in an upright position

Hazard Communication

- Compressed Gases
  - Inspect valve assembly. Look for broken parts and clean inside of valve with finger to inspect for dirt

Hazard Communication

- Regulator Safety
  - Attach regulator to cylinder using proper CGA connection
  - Properly connect equipment downstream of regulator
  - Turn pressure knob counterclockwise until it feels free
  - Open supply valve slowly until full pressure indicated
  - Turn pressure knob to obtain desired pressure
  - Test for gas leaks at this time
  - Open downstream valves

Chemical Waste Disposal

- All waste must be properly labeled
- Lids must be closed when the lab is over
- Minimize mixing of incompatibles
- Notify Environmental Safety Specialist when the containers are full
- Nonhazardous solid waste must never go in trash receptacles
- All waste must be taken care of prior to end of research

Chemical Waste Disposal

- Acids and bases
  - The Cedar Falls Sewage Treatment Plant only allows solutions between pH 4 and 10 in the sewage system.
  - Acidic and Alkaline Solutions are hard on the drainage system in the University

Chemical Waste Disposal

- Nonhazardous Waste
  - Compounds containing copper, nickel, zinc and cobalt cannot go into the sink as per CF sewage treatment plant
  - All solid non hazardous waste does not go into the garbage can. Put in separate container labeled as Nonhazardous Waste
- Hazardous Inorganic Substances
  - Mercury, Silver, Chromium all are placed in their respective containers
  - Barium, Lead and Cadmium can be mixed together

Chemical Waste Disposal

- Halogenated Organic Waste
  - Waste containing chlorine, bromine, iodine or fluorine
    - Compounds such as methylene chloride, chloroform or trifluoromethane
- Nonhalogenated Organic Water
  - All other types of organic waste
    - Includes alkanes, alkenes, alcohols, amines etc.

Chemical Waste Disposal

- Rules for Waste Disposal
  - Mix by compatibility and type
  - Ensure containers are labeled
  - Containers should be placed in secondary containment
  - Caps must always be on bottles when container is not in use

Hazard Communication

Hazardous Waste container

Name of Product:_____

University of Northern Iowa, Cedar Falls, IA 50614

EPA : 984568584

Date:_____

Department:_____

Campus address:_____

Phone:_____

Box no:_____of_____

Department accumulation date:

HW storage facility start date:

Blood Borne Pathogens

- Pathogenic microorganisms are present in human blood and can cause disease in humans
  - Hepatitis B, C and HIV (Human Immunodeficiency Virus)
- University Exposure Control Plan
  - Plan to eliminate or minimize exposure (http://www.vpaf.uni.edu/ehso/programs/bloodborne2009.pdf)

Blood Borne Pathogens

- University Policy (cont)
  - Injured personnel (if possible) should effect own treatment
  - Those assisting should wear gloves until emergency personnel arrive
  - Blood soaked towels, gauze, bandages and rags should be discarded in biowaste bags.
  - Cleanup must be accomplished by Custodial staff only. Call Dispatch at 3-4400 to arrange for a custodian.
  - Incident reports are maintained at Environmental Health and Safety Office

First Aid

- Basic Rules
  - Check the scene and victim
  - Call for help either 9-911 or 3-4000, public safety
  - Care for the victim

First Aid

- Bleeding
  - If victim is able, have them hold dressing to alleviate contact with blood borne pathogens.
  - If victim is unable to hold dressing, person administering first aid should ensure they are wearing proper protective gloves and clothing.

First Aid

- Secure the scene
  - Chemical accidents
    - Prevent others from entering the area of the spill
  - Bleeding
    - Do not touch blood unless performing emergency first aid and then only with gloves
    - Prevent others from touching or walking through an area where bleeding has taken place
    - Notify supervisor or call 3-4400

First Aid

- Treatment of Chemical Burn
  - Always protect yourself first to ensure you do not become a casualty. Remove source first.
  - If substance is water reactive wipe with dry cloth.
  - In case of eye splash- Subject must immediately be taken to an eye fountain for immediate irrigation that must continued for 15-20 minutes.
  - In case of body splash- Remove outer clothing and rinse under drenching station for 15-20 minutes.
  - If transport necessary send MSDS sheet with them.

First Aid

- Poisoning
  - Call 9-911
  - Administer as MSDS commands
    - generally 2-4 cups of water or milk if victim is conscious. (never give anything to someone that is not conscious)
- Inhalation
  - Administer as instructed
  - Remove victim to fresh air
  - Call 9-911 if necessary

First Aid

- Shock-Condition caused by loss of circulating body fluids such as bleeding, or loss of plasma through burns.
  - Victim may become weak, giddy, restless, may be sick and vomit.
  - Treatment
    - If conscious make victim lie down. If pale raise their legs, and loosen clothing. Keep warm. Call 9-911.

Chemical Spill Procedure

- Large or Toxic Spills
  - Immediately contact Public Safety
- Small Spills
  - Contact essential personnel [Professor in charge and Environmental Safety Specialist)]
  - If Spill is less than 50 ml use adsorbent such as paper towel or other absorbent material capable of absorbing material without reacting with it
  - Larger Spills-surround spill area with adsorbent to keep it contained then add to spill itself until liquid absorbed. Sweep or push material to center of spill.
  - Using dust pan from containment kits pick up spill and place into plastic container
  - Contact Environmental Safety Specialist for disposal
  - Wash affected area with soap and water

Sources of Safety Information

- Department of Transportation; *2000 Emergency Response Guidebook*; Labelmaster: Chicago, Illinois.
- Furr, A. Keith; *CRC Handbook of Laboratory Safety;* 4th ed.; CRC Press; Boca Raton, New York, 1995.
- Hall, Stephen K.; *Chemical Safety in the Laboratory;* Lewis Publishers: Boca Raton, New York, 1994.

Sources of Safety Information

- *Safety in Academic Chemistry Laboratories*; 6th ed.: American Chemical Society: Washington D.C, 1990.

Sources of Safety Information

- Laboratory Safety available from the University of Calgary
- The Laboratory Safety Institute (labsafety.org)
- Occupational Health & Safety Magazine online (oshaonline.com)