Basic Laboratory Safety

Objectives: Upon completion of the lecture, accompanying video, required readings and clinical rotations, the student will be able to:

1) List and describe the appropriate safety procedures practiced in the clinical laboratory that pertain to general laboratory safety and awareness:
   a) personal safety
   b) eye safety
   c) handling of biologically hazardous material
   d) handling of needles and sharps

2) Discuss the significance of OSHA to the regulation of safe practices within the clinical laboratory.

3) Define the term 'Universal Precautions' and state its importance in the handling of potential biohazardous materials.

4) Discuss appropriate safety procedures practiced in the clinical laboratory when handling all chemicals, flammables, ether and compressed gases.

5) Discuss the information provided by and the appropriate use of the Material Safety Data Sheet (MSDS).

6) Discuss appropriate safety precautions practiced in the clinical laboratory when handling radioactive materials.

7) Discuss appropriate procedures practiced in the clinical laboratory for fire, electrical, and severe weather safety.

READING:
Linne & Ringsrud, Clinical Laboratory Science – The Basics and Routine Techniques, 4th ed., 1999, C. V. Mosby, pp 23-42.

SAFETY IN THE LABORATORY

Purpose: Faulty technique is one of the chief causes of accidents and, because it involves the human element, is one of the most difficult to cope with. The purpose of this discussion is to help the student understand proper laboratory safety, to increase his awareness of the possible risks or hazards involved with laboratory work and to realize the laboratory is generally a safe place to work if safety guidelines are properly followed.

I. Standard Operating Procedures

A. General Personal Safety

1. Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in areas where specimens are handled.

2. Food and drink are not stored in refrigerators, freezers, cabinets, or on shelves, countertops, or bench tops where blood or other potentially infectious materials are stored or in other areas of possible contamination.

3. Long hair, ties, scarves and earrings should be secured.

4. Keep pens and pencils OUT OF YOUR MOUTH!!

5. Appropriate Personal Protective Equipment (PPE) will be used where indicated:

   Lab coats or disposable aprons should be worn in the lab to protect you and your clothing from contamination. Lab coats should not be worn outside the laboratory.

   Lab footwear should consist of normal closed shoes to protect all areas of the foot from possible puncture from sharp objects and/or broken glass and from contamination from corrosive reagents and/or infectious materials.

   Gloves should be worn for handling blood and body fluid specimens, touching the mucous membranes or non-intact skin of patients, touching items or surfaces soiled with blood or body fluid, and for performing venipunctures and other vascular access procedures. Cuts and abrasions should be kept bandaged in addition to wearing gloves when handling biohazardous materials.

   Protective eyewear and/or masks may need to be worn when contact with hazardous aerosols, caustic chemicals and/or reagents is anticipated.

6. **NEVER MOUTH PIPETTE!!** Mechanical pipetting devices must be used for pipetting all liquids.

7. Frequent hand washing is an important safety precaution, which should be practiced after contact with patients and laboratory specimens.

   Proper hand washing techniques include soap, running water and 10-15 seconds of friction or scrubbing action. Hands should be dried and the paper towel used to turn the faucets off.

   Hands are washed:

   a. After completion of work and before leaving the laboratory.
   b. After removing gloves.
   c. Before eating, drinking, smoking, applying cosmetics, changing contact lenses or using lavatory facilities.
   d. Before all other activities which entail hand contact with mucous membranes or breaks in the skin.
   e. Immediately after accidental skin contact with blood or other potentially infectious materials.
   f. Between patient contact and before invasive procedures.

8. Laboratory work surfaces must be disinfected daily and after a spill of blood or body fluid with a 1:10 dilution of Clorox in water.

B. Eye Safety

1. **KNOW WHERE THE NEAREST EYE WASH STATION IS LOCATED AND HOW TO OPERATE IT.**

2. **Eye goggles should be worn:**

   a. When working with certain caustic reagents and/or solvents, or concentrated acids and bases.
   b. When performing procedures that are likely to generate droplets/aerosols of blood or other body fluid.
   c. When working with reagents under pressure.
   d. When working in close proximity to ultra-violet radiation (light).

3. Wearing contact lenses in the laboratory is discouraged and requires extra precaution if worn. Gases and vapors can be concentrated under the lenses and cause permanent eye damage. Furthermore, in the event of a chemical splash into an eye, it is often nearly impossible to remove the contact lens to irrigate the eye because of involuntary spasm of the eyelid. Persons who must wear contact lenses should inform their supervisor to determine which procedures would require wearing no-vent goggles.

C. Safe Handling of Biologically Hazardous Material

1. **YOU SHOULD HANDLE ALL PATIENT SAMPLES AS POTENTIALLY BIOHAZARDOUS MATERIAL.** This means UNIVERSAL PRECAUTIONS should be followed at all times!!

2. **When working in the laboratory:**

   a. Wear protective closing (lab coat, gloves. If you have a cut/abrasion, also wear a band-aid.
   b. Avoid spillage and aerosol formation.
   c. Hands should be washed immediately and thoroughly if contaminated with blood or other body fluids.
   d. Gloves should be removed before handling a telephone, computer keyboard, etc., and must NOT be worn outside the immediate work area. Hands should always be washed immediately after gloves are removed.
   e. You should wash your hands after completing laboratory activities and before leaving the area. All protective clothing should be removed prior to leaving the lab.
   f. All biohazardous material should be discarded in a biohazard bag to be autoclaved.
   g. All counter and table tops should be disinfected with a proper disinfecting solution:
      1) At the beginning of the day.
      2) If you should spill a patient sample.
      3) At the end of the day.

3. **When performing venipuncture:**

   a. Wear clean gloves for each patient you draw.
   b. Wash your hands whenever you change gloves.
   c. Dispose of contaminated needle, syringe and test tubes in a proper biohazardous receptacle.
   d. When drawing blood from a patient in an isolation room.

      1) All material taken into this room must remain in the room.
      2) Label all tubes drawn from this patient with isolation stickers.

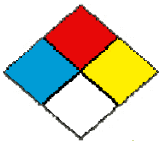
4. **Proper handling of SHARPS:**

   a. Contaminated needles and other sharps are never broken, bent, recapped or re-sheathed by hand.
   b. Used needles are not removed from disposable syringes.

c. Needles and sharps are disposed of in impervious containers located near the point of use.

II. Chemical and Gas Safety

To provide a safe working environment, all personnel should be aware of potentially hazardous materials and the proper way of handling this material. Avoid unnecessary exposure to chemicals. Occupational Safety and Health Administration (OSHA) requires any necessary information in the form of MATERIAL SAFETY DATA SHEETS (MSDS) concerning the handling of hazardous materials to be available to all laboratory personnel, so that they may achieve and maintain safe working conditions.



Flammable (Red); Instability (Yellow); Health (Blue) and Special Notice (White)

NFPA Chemical Hazard Sign

A. Toxic and Corrosive Materials (acids and alkali):

Toxic or Poison Hazard

Corrosive Hazard

1. To avoid dangerous splatter, **ALWAYS ADD ACID TO WATER!**
2. Toxic materials should be labeled with special tape when used in compounded reagents and stored in separate containers. These materials should be handled carefully and kept in the hood during preparation.
3. Acids and alkali should be carried by means of special protective carriers when transported.
4. Acid and alkali spills should be covered and neutralized by using the material from the 'spill bucket'. All material, spill and compound, should be swept up and placed in a plastic bucket for proper disposal.
5. In case of spillage, wash all exposed human tissue (including eyes) generously with water and notify your supervisor for proper reporting of the incident.

B. Carcinogens

1. All laboratory chemicals identified as carcinogens must be labeled **CARCINOGEN**.
2. When working with these substances, protective clothing and gloves should be worn.

C. **Flammable Compounds**

1. All flammable reagents should be kept in the flammable storage facilities (closet or refrigerator) at all times when not in use.
2. Any solutions compounded from these reagents should be labeled as flammable.
3. Flammable substances should be handled in areas free of ignition sources.
4. Flammable substances should never be heated using an open flame.
5. Ventilation is one of the most effective ways to prevent accumulation of explosive levels of flammable vapors. An exhaust hood should be used whenever appreciable quantities of flammables are handled.
6. Flammable compounds should be placed in proper receptacle for disposal.

D. **Ether Precautions (flammable compound)**

1. These compounds tend to react with oxygen to form explosive peroxides. When ether containers are opened they are to be dated and all material remaining after six (6) months must be disposed of immediately.
2. Disposal of ether compounds is through the Hazardous Materials Office.
3. Ether compounds will be stored in an explosion-proof refrigerator. (boiling point of ether is approximately room temperature)

E. **Compressed Gases**

1. The storage of all compressed gases shall be in containers designed, constructed, tested and maintained in accordance with the U.S. Department of Transportation Specifications and Regulations.
2. In the laboratory, gas containers are to be limited to the number of containers in use at any time. Low pressure (LP) gases shall also be limited to the smallest size container.
3. Containers shall be securely strapped, chained or secured in a cylinder stand so they cannot fall.
4. Oxidizing gases should be separated from flammable gasses.

III. Radiation Safety

A. No eating, drinking, smoking permitted!
B. Radioactive material should be labeled as radioactive and stored in a proper container so as to prevent spillage or leakage.
C. These materials must be handled carefully. Remember: **the amount of radiation exposure decreases with distance.**
D. Radioactive spills should be absorbed with absorbent toweling. The area should be cleaned with soap and water and then decontaminated with a product such as

'count-off'. The area of the spill is then monitored for any residual radioactivity. If the area is not decontaminated, the above regimen is repeated and re-monitored.

E. In the case of a radioactive spill in a high traffic area, the area will be 'roped off' until proper decontamination has been achieved.

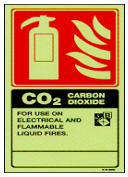
F. In the case of a major radioactive spill, all personnel in the area must be notified. The appropriate safety officer must be notified and all attempts to keep contamination at a minimum must be used.

IV. Fire Safety

A. KNOW WHERE ALL FIRE EXITS, FIRE EXTINGUISHERS AND FIRE ALARMS ARE LOCATED!

B. **KNOW HOW TO PROPERLY OPERATE APPROPRIATE FIRE ALARMS AND FIRE SAFETY EQUIPMENT!**

Portable fire extinguishers are classified by their ability to handle specific classes of fires:



For burning combustible materials (wood, paper, clothing, trash). **GREEN TRIANGLE WITH THE LETTER 'A'**, uses water or an all-purpose dry chemical.

For burning liquids: **RED SQUARE WITH THE LETTER 'B',** uses foam, a dry chemical or carbon dioxide.

For electrical fires: **BLUE CIRCLE WITH THE LETTER 'C'** uses non-conducting extinguishing agents (carbon dioxide or a dry chemical).

Multipurpose: Recommended for all types of fire. Most common extinguisher found in most clinical laboratories.

C. Know the proper procedure for notifying colleagues and proper personnel of a fire.

R A C E

1. **R**escue those in danger
2. **A**larm
   a. Activate the fire pull station
   b. Notify switchboard operator of the location, your name and the type of fire, if known
3. **C**ontain the fire by closing all doors and windows
4. **E**xtinguish the fire, if possible. Do not re-enter a room that has already been closed.

   Evacuate

V. Electrical Safety

A. The use of extension cords is prohibited.
B. All equipment must be properly grounded.
C. Never operate electrical equipment with fluid spillage in the immediate are or with wet hands.
D. Never use plugs with exposed or frayed wires.
E. If there are sparks or smoke or any unusual evens occur, shut down the instrument and notify the manager or safety officer. Electrical equipment that is not working properly should not be used.
F. If a person is shocked by electricity, shut off the current or break contact with the live wire immediately. Do not touch the victim while he is in contact with the source of current unless you are completely insulated against shock. If the victim is unconscious, call **911 (at UTMB)** to report the incident and request assistance.

VI. Severe Weather Safety

A. When the tornado-warning message is heard on the hospital public address system, all personnel should move to a safe area. Safe areas are considered to be:
    1. below ground level if possible
    2. inside, interior halls in an east/west corridor, away from windows
    3. inside, interior windowless rooms
B. Stair towers should be used for evacuation
C. Elevators should be used only in emergency
D. No one will leave the building until the 'all clear' is announced

VII. General Procedures and Equipment

A. Cracked or chipped glassware should not be used.
B. Centrifuges should not be used without the covers completely closed.
C. When removing tops from evacuated test tubes, care must be taken to prevent aerosol formation.

VIII. In Case of Accidents

A. Accidental Needle Stick
    1. Bleed wound.
    2. Wash wound thoroughly with soap.
    3. Notify the supervisor of the incident and report to Student Health with an incident report form.
    4. May need to get blood tested for hepatitis.

B. If you should wound yourself in the laboratory:
    1. Any type of accident should be brought to the attention of the Teaching Supervisor of the area.

IX. Summary…….USE COMMON SENSE!!!