**I. Purpose**

To familiarize the laboratory staff with the types of hazardous chemicals and to provide guidelines for proper handling, storage and safe work practices. All stains, and chemicals and solutions are properly labeled, as applicable and appropriate, with the following elements.

1. Content and quantity, concentration or titer

2. Storage requirements

3. Date prepared or reconstituted by laboratory

4. Expiration date

**II. DEFINITIONS:**

**1. Classification:**

 **a. Caustic/Corrosive**

Acids and Alkalines cause burns of the skin, mouth, or eyes as well as damage to equipment and storage areas.

 **Strong Acids** Sulfuric Acid H2SO4

Hydrochloric Acid HCL

Perchloric Acid HCL04

Hydrobromic HBr

Trichloracetic Acid

Nitric Acid

 **Strong Bases** Ammonium Hydroxide NH CH

Sodium Hydroxide NaCH

Potassium Hydroxide KOH

 **Corrosives** are substances that destroy skin, mucous membranes or other surfaces.

All strong acids and bases are considered corrosives. In addition, several other substances that are considered corrosives may be encountered in the laboratory:

Acetic Acid (glacial)

Household bleach

Phenolics

Organic solvents

**Poisons** Almost anysubstance in quantity can be poisonous. For our define-tion, a poison is classified as a substance (solid, liquid, or gas) that may cause death or serious side effects if relatively small amounts are inhaled, ingested, or come in contact with the skin.

**Cyanides** Cyanides are acutely toxic themselves and will form deadly hydrogen

cyanide (HCM) gas on contact with strong acid. Cyanide containing wastes must be separated from acidic waste streams.

**Fluorides** All forms of fluorine are poisonous. Contact with strong mineral acid causes inorganic and some organic fluorine compounds to produce gaseous hydrogen fluoride, which is both poisonous and corrosive. If fluoride or organic fluorine compounds enter cuts, scratches, sores or lacerations, healing will be greatly prolonged.

 **Hexane** Besides being an organic solvent hexane is probably metabolized

2, 5,-hexanediol and 5-hydroxy-2 hexane which are both neurotoxins. Avoid breathing vapors.

**Mercury** Metallic mercury, mercuric salts, and organomercury compounds are all toxic. The primary routes of absorption of mercury are respiratory, and gastrointestinal. All mercury spills must be cleaned up immediately and completely. Organomercury compounds are NOT encountered in routine hospital laboratory work.

 **Methanol** An organic solvent, methanol can cause blindness and death if ingested or if sufficient methanol vapors are inhaled.

 **Organic Solvents** All organic solvents¸ regardless of theirother toxic properties, are simple asphyxiants. Every attempt must be made by employees to keep organic solvent vapors to a minimum. Use under a fume hood and keep containers closed when not in use.

**Sodium Azide** Besides forming explosive salts, the azide anion is a powerful cyto-chrome poison, like cyanide, and a producer of hypotension and cardiac failure. Upon contact with strong acid, sodium azide produces hydrazoic acid gas, which has all the physiologic actions of the azide anion and is also explosive.

**Oxalates** Swallowing of oxalic acid or any of its common salts will result is

severe internal pain, collapse, and possible death.

**IF YOU ARE NOT CERTAIN ABOUT A CHEMICAL OR MATERIAL,**

**CONSULT THE SDS- SAFETY DATA SHEET.**

 **b. Carcinogens and Teratogens:**

Substances designated by OSHA as Carcinogens require special handling and labeling. Carcinogens have the ability to induce tumors by increasing the incidence of a tumor type, causing tumors earlier than in controls, developing tumors not normally seen in controls, and causing an increased multiplicity of tumors. Teratogens are substances that cause defects in fetal development

All carcinogens must be clearly marked CANCER SUSPECT AGENT, and routine use must be carried out in a designated area of the laboratory clearly marked CAUTION CANCER HAZARD-AUTHORIZED PERSONNEL ONLY. Protective gloves must be worn, and employees must wash their hands and forearms thoroughly after using carcinogens in any form.

During pregnancy teratogenic chemicals may cause defects in the developing fetus. Consequently, pregnant employees must avoid completely, or at least minimize, their exposure to the following:

 Actinomycin D Methylene Chloride (dichloromethane)

 Chlorambucil Nicotinic acid (excess)

 Chloropropamide Nitrogen mustard

 Colchicine Organic solvents

 Cortisone Phenylmercuric acetate

 Ethyinyl Testosterone Tetracyclines

 Evans Blue Thalidomide

 Lead Thiiouracil

 Thallium Vitamin A (excess)

 Urethane

Additionally, pregnant employees must avoid asphyxiating conditions (excess oxygen displacing gases, poorly ventilated rooms, and excessive solvent vapors)

 **c. Flammables:**

Materials that ignite easily, burn or serve as fuel for a fire are a prime safety concern. Safe storage and handling of flammable chemicals can the hazard they pose.

Organic solvents

Organic solvent vapors

Flammable gases

Flammable solids

 **d. Explosives:**

Materials that may explode under certain circumstances, either by themselves or in combin-ation with other chemicals

**Picric Acid** Dilute, aqueous solution is not dangerous; old bottles with crystalline growth around the cap, and old bottles of solid picric acid are extremely dangerous. Do not attempt to unscrew the cap of old bottles of solid picric acid, or caps with evidence of crystal of picric acid around them. Never mix picric acid with lead (Pb), mercury (Hg), copper (Cu), or zinc (Zn).

 **Perchloric Acid** Dilute, 85% aqueous solution is not explosive unless heated strongly.

 Exposure to dehydrating agents may form an unstable mixture. Contact

with organic or oxidizable inorganic compounds may cause fire or produce an easily detonatable mixture. When perchloric acid must be mixed with nitric acid, always add the nitric acid first to remove organic material by oxidation. Perchloric acid hoods should be used for the storage and handling of this substance. If no hood is available, make all transfers of the acid over a sink.

**Nitric Acid** Mixed with many organic compounds nitric acid form explosive or detonable **concentrated** compounds. Contact with combustible materials may cause fires

**Hydrogen** Unstable inorganic compound; avoid contact with metal, dust, clothing, **Peroxide** and organic materials.

**Sodium Azide** Contact with acids yield a poisonous, explosive gas (hydrozoic acid).

 Rapid heating may cause explosive decomposition of sodium azide.

 Contact with heavy metals form explosive salts.

**Carbon Disulfide** Extremely flammable. May ignite spontaneously. Avoid contact with

azides, rust, metal powders, and oxidants.

**Iodine** Forms ahighly explosive addition compound with ammonia solutions.

Forms explosive mixtures with some solvents and metals.

**Alkali Metals** Na, K, Li metals all react violently with water and methanol. Reaction

forms explosive hydrogen gas.

**Ethers** Ethers such as diethylether, tetrahydrofuran, and dioxane form explosive peroxides to some extent. Old or outdated containers should not be disturbed; check with Network Safety Department.

 **IF YOU ARE NOT CERTAIN, DO NOT MIX CHEMICALS OR SOLUTIONS**

 **e. Respiratory Irritants:**

Some chemicals or materials irritate the nasal passageways, bronchial tree, and lung tissue. These compounds in the form of aerosols, dust, or vapors may cause acute irritation (coughing, spasms, wheezing, or excessive secretions in the affected areas) or chronic disorders (bronchitis or fibrosis). Minimize exposure by handling these compounds in a fume hood.

 **Aluminum** Forms hydrogen chloride fumes in moist air, reacts violently on contact

 **Chloride** with water. (Open bottles only in a fume hood, with protective face shield and rubber gloves).

 **Ammonium**  (Ammonium solution) vapors are acutely irritating to eyes and res-

 **Hydroxide** piratory tract. Keep containers tightly capped. Handle in hood when possible.

 **Concentrated** Nitric Acid and Hydrochloric acid vapors are extremely irritating.

 **Acids** Handle in a hood whenever possible.

 **Silica Gel** Dust may cause pulmonary fibrosis. Do not blow excess dust off of

chromatography plates.

 **f. Lacrimators** Compounds whose vapors induce ear secretions. Although not commonly used in hospital laboratories, they must be handled in a fume hood. Lacrimators are clearly identified by the manufacturers

 **g. Stench** Some compounds produce an overpowering, sickening odor that may lead to nausea, vomiting, sweating, tremors, and/or headaches. Organic amines are the most common stench compounds and should be handled in a fully functional hood.

 **h. Incompatibles** A number of substances are unsafe when stored in the presence of, used around, or mixed with other substances. Some of these substances have been mentioned previously.

##  2. Labeling:

 Hazardous Material Classification labels are present on hazardous material (type of hazard and rating e.g., slight)

 a.

* + 1. Health
		2. Flammability
		3. Reactivity
		4. Specific Hazard
		5. SDS’s are on-line for additional information / instructions for immediate actions following accidental contact

b. If a liquid is transferred from the original container to other containers all precautionary information must be transferred to the newly labeled container (e.g. staining dish)

**III. PROCEDURE**

**1. Storage:**

a. **Caustic / Corrosives:**

 **Do Not store under a sink were contamination by moisture may occur.**

1. Caustic and corrosive materials (acids, bases) are stored in a cabinet near the floor to minimize the danger of bottles falling from shelves.
2. Separate containers to facilitate handling. Organic acids (acetic acid, and acetic anhydride) should be stored separately from strong oxidizing agents (sulfuric, nitric or perchloric) to prevent interaction of fumes and corrosion of storage cabinets.
3. Acid bottle carriers must be used for containers over one (1) quart in volume.
4. Bases are stored in a separate cabinet

 b**. Flammables:**

**The laboratory is equipped with automatic fire suppression system (AFE) sprinklers.** Supplies of flammable and/or combustible liquids are reasonable for laboratory needs and are stored properly.

1. No more than four approved safety cabinets are allowed in the entire laboratory. Flammables and combustible materials will not be stored in refrigerators unless designated and approved for that purpose. If vented, storage cabinets must be vented to the outside of the hospital. If not vented, storage cabinet vent plugs must remain in place.
2. Class I,II,IIIA liquids: The total capacity of flammable or combustible liquids stored outside approved safety cabinets or safe storage areas must not exceed 2 gallons per 100 square feet of working laboratory space. Total capacity of flammables and combustibles in all approved storage cabinets must not exceed 4 gallons per 100 square feet of laboratory work space.
3. Do not store ether in a closed area such as a refrigerator.
4. Do not store flammables in areas exposed to direct sunlight.
5. Flammables or combustible liquids or gas cylinders are not positioned near a heat source open flames or in a corridor.

 **2. Handling Chemicals in the Laboratory:**

Each section has a list of the hazardous chemicals that are in the immediate area. Safety can storage is available for use instead of glass bottles for volumes of flammable solvents larger than one quart/one pint of highly volatiles.

 **Note:** Most chemicals are received in the specialized plastic containers

a. Bottle carriers are to be used for transporting glass containers larger than 500ML

b. If quantities of acids or alkalis are being used, use a shield or barrier of some kind or work in a sink so that breaks and spills can be controlled.

c. Be aware of fume hazards, and work under a fume hood when indicated (e.g. volatiles).

d. Do not pipette by mouth.

e. Do not sniff, inhale, or taste reagents, or touch skin, mouth and eyes with chemicals on hands.

 **Protect yourself. Be aware of hazards of each reagent you are using.**

f. IF YOU ARE NOT SURE PLEASE LOOK IT UP. Improper handling of chemicals in the laboratory is an unnecessary safety risk.

g. When making dilutions use great care and add reagents slowly.

* + ALWAYS ADD ACID TO WATER, **NEVER** WATER TO ACID.
	+ Allow acid to run down the side of the container and mix slowly by gentle rotation.
	+ Avoid overheating.

**3. Disposal:** See safety policy Disposal of Hazardous Waste SA01-025.1

**V. References**

 **Guide to Laboratory Safety -** Handling Chemicals in the Laboratory

**Approval Signatures:**

|  |  |  |
| --- | --- | --- |
| **Date:** | **Printed Name:** | **Signature:** |
| 2/29/2016 |  Nancy A. Young, MD., FCAP Medical Director  |  |
| 2/29/2016 | Jaclene KokoszkaQuality Manager |  |

**Review History**

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