

Beaumont

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Laboratory Precautions and Control Measures for Handling Chemicals and Chemical Waste

Document Type: Guidelines

I. PURPOSE AND OBJECTIVE:

All chemicals are considered potentially hazardous. The guidelines presented here are to be followed whenever chemicals are handled. Specific procedures appropriate for each type of chemical hazard are included in the department specific training and procedures.

II. GENERAL HANDLING OF CHEMICALS:

- A. Read labels on stock bottles, solutions and manufacturers' reagents carefully.
- B. Wear gloves, goggles, masks, aprons or lab coats and use hoods as appropriate.
- C. Immediately wash hands or other areas of the skin which come in contact with any chemicals.
- D. Carry large jugs or bottles of chemicals with two hands or in special carriers, never by just the neck of the bottle.
- E. Pour solutions carefully to avoid splashing. Pour down the side of a container or a stirring rod, if solutions are corrosive or caustic.
- F. Use a funnel to pour into small necked vessels.
- G. Store chemicals safely in cabinets or on shelves so that they cannot easily fall.
- H. Clean up and report spills immediately according to the [Laboratory Spill Procedure](#).
- I. Do not work alone when working with potentially disabling chemicals.
- J. Do not mouth pipette any reagent or specimen.
- K. Do not pour from a large jug into a small beaker or flask. Pour into a larger beaker first.

III. PROGRAM FOR REDUCING HAZARDOUS WASTE:

In an effort to reduce the quantity of hazardous waste requiring disposal, the following guidelines are to be considered when selecting equipment, methods, procedures, etc. for use in the Laboratory, as well as when carrying out research investigations.

- A. Determine what hazardous waste will be produced by a procedure or piece of equipment, before instituting or selecting it.
- B. Determine what special disposal procedures, if any, will be needed for a particular hazardous waste, as well as the cost associated, before deciding on the procedure or piece of equipment. If other aspects of performance are equivalent, select the procedure or piece of equipment which will produce the least amount of hazardous wastes.
- C. When ordering a hazardous chemical, order the minimum amount necessary for the application so as to minimize disposal problems later on. Even if it is more expensive to purchase smaller amounts, the ultimate cost may be less if expensive disposal costs can be avoided.
- D. Lab personnel follow proper precautions and use appropriate safety equipment when handling hazardous materials, so as to minimize the risk of spills and their associated hazardous waste disposal problems.
- E. When preparing solutions of hazardous reagents, prepare the smallest amount needed so that disposal of unused reagent will be minimized.
- F. All waste containers are properly segregated and clearly marked regarding contents, hazards, and other pertinent information.

IV. PRECAUTIONS APPROPRIATE TO SPECIFIC HAZARDS:

- A. **ABSORBED THROUGH THE SKIN** - whether or not the chemical involved is a known hazard, nitrile or neoprene gloves are recommended whenever handling chemicals with this warning, avoid skin contact; wash immediately.
- B. **COMBUSTIBLE LIQUID** – Pour in a fume hood; wear eye protection when pouring; avoid sources of flame, spark or hot surfaces; avoid inhalation or skin contact; store in a cool place.
- C. **COMPRESSED GAS** - [Portable Medical Gas Cylinders](#)
- D. **EXPLOSIVE** - wear eye protection; avoid heat, shock or pressure; store in a cool place.
- E. **ORGANIC PEROXIDE** - avoid contact with combustible material or reducing substances; avoid heat or pressure; potentially explosive.
- F. **OXIDIZER** - avoid skin contact and inhalation if dusts are likely; avoid contact with reducing substances or combustible materials.
- G. **PYROPHORIC** (liable to ignite spontaneously on exposure to air) - refer to manufacturer's insert or material safety data sheet for specific handling instructions; consult with the manufacturer or with a clinical chemist before using; store refrigerated.
- H. **UNSTABLE (REACTIVE)** - wear eye protection; avoid heat, shock or pressure; store in a cool place.
- I. **WATER REACTIVE** - avoid contact with water except as part of a recommended procedure; use in well ventilated area or a hood if possible.
- J. **CARCINOGEN/MUTAGEN** - wear gloves/lab coat when weighing or transferring; if chemical is powdery, wear a dust mask and work in a hood, if available; wash hands after handling
- K. **CORROSIVE** - see Acids and Alkalis.
- L. **LACHRYMATOR** (substance that irritates the eyes and causes tears to flow) - avoid exposure to vapors, use in a hood.

- M. **IRRITANT** - wear eye protection; avoid skin contact or inhalation; work in a fume hood, if volatile or powdery.
- N. **RADIOACTIVE** - Refer to the procedure [Anatomic Pathology Radiation Safety](#)
- O. **SENSITIZER** - avoid ingestion, skin contact or inhalation.
- P. **TARGET ORGAN EFFECT** - avoid ingestion, skin contact or inhalation; work in a fume hood.
- Q. **TOXIC** - avoid ingestion, skin contact or inhalation; work in a fume hood, if volatile or powdery.

V. ACIDS AND ALKALIS:

Strong acids, alkalis and certain other chemicals such as iodine are corrosive and can produce severe burns or tissue destruction. Even in dilute concentration, these chemicals can be an irritant and therefore following the precautions listed below.

A. Transport

1. When transporting large jugs of concentrated acid or alkali, use a plastic or rubber bucket carrier.
2. Carry and handle small bottles with both hands.
3. Return bottles to a proper storage location.

B. Pouring

1. Safety goggles or a face shield must be worn when pouring concentrated acids or alkalis.
2. Hold bottle away from face.
3. Do not try to pour from a large container into a small necked vessel. Pour acid or alkali into a beaker first.
4. Use a funnel or pour down a stirring rod to pour into a small necked vessel.
5. Hold large jugs with one hand around the neck and one hand under the base of the jug. Hold smaller bottles with both hand around the middle of the bottle.
6. Wipe up drips and spills immediately and wash hands afterward.

C. Diluting

1. When diluting concentrated acids, add acid to water.

D. Reactivity

1. Perchloric acid is a strong oxidant and in concentrated form is not to be mixed with a reducing substance or an organic solvent.
2. Yellowish or brownish colored perchloric acid is potentially explosive and must be disposed of with extreme care. Notify a manager/supervisor or the Chemical Hygiene Officer if the color is not water clear.
3. Concentrated nitric, hydrochloric and sulfuric acids can release noxious fumes under certain circumstances. Pour or use under a fume hood when this possibility exists.
4. Brownish colored nitric acid is not explosive and represents no abnormal hazard.

E. Storage

1. Jugs of concentrated acid are to be stored in cabinets located near the floor.
2. Concentrated acids and alkalis are not to be stored in the same cabinet or in close proximity to one

another.

VI. LABELS AND SIGNS:

- A. Refer to the Hazard Labeling System section in the [Laboratory Chemical Hygiene Plan](#).

VII. SAFETY EQUIPMENT:

Appropriate safety equipment for the task must be available whenever chemicals with an associated hazard are used. Certain items, such as a fume hood, need not be available in every laboratory, but must be available within the Laboratory Department. If procedures require chemicals which necessitate frequent use of a piece of safety equipment, then it must be available in the area.

A. Gloves

1. Vinyl or Nitrile - recommended for handling specimens and dry chemicals. Vinyl or nitrile recommended for handling aqueous solutions of carcinogens, corrosives, irritants, oxidizers and sensitizers.
2. Chemical resistant neoprene or nitrile - recommended for handling concentrated acids or alkalis, organic solvents and chemicals absorbed through the skin.

B. Goggles or face shields

1. Must be worn whenever pouring concentrated acids or alkalis or organic solvents and when working with unstable or explosive chemicals.
2. Recommended when working with irritants and in situations where there is a risk of being sprayed by chemicals under pressure (reagent lines on analyzers, etc.).

C. Masks

1. Dust (disposable).
2. Recommended when transferring or cleaning up spills of dry chemical carcinogens, sensitizers and irritants if there is a risk of inhalation (e.g., chemical is very powdery).

D. Respirator

1. Not approved for use unless properly trained.

E. Lab coats, gowns, aprons or jackets

1. Must be worn over street clothes when handling specimens or working with hazardous chemicals in the laboratory.
2. Do not wear protective clothing worn in the laboratory while processing specimens or working with hazardous chemicals in areas of the hospital outside of the laboratory.

F. Fume hoods

1. Must be available in areas where organic solvents or noxious chemicals are being used.
2. Must be used when pouring flammable or volatile hazardous liquids.
3. Recommended when transferring dry chemicals with a significant risk of inhalation hazard.

G. Showers and eyewashes

1. A hand-held shower, sink-basin or faucet-mounted eye wash must be available in any laboratory in which caustic, corrosive, flammable or combustible liquids are used.

2. Bottle-type eye washes on which the seal has not been broken, are acceptable substitutes for rinsing the eye, but do not substitute for a hand-held spray nozzle when chemicals are spilled on other parts of the body.

3. Hand-held spray nozzles can substitute for an overhead shower.

H. Fire extinguishers

1. Must be available in any area in which flammable or combustible chemicals are used.

I. Tongs, hot pads or insulated gloves

1. Must be available where hot or cold vessels must be handled; such as, deep frozen or autoclaved materials, or liquid nitrogen.

J. Spill cleanup kits

1. Must be available in the area for the appropriate type of hazard (acid, alkali, flammable solvent, etc.).

K. Absorbent paper

1. Placed over all bench tops on which radioisotopes will be used.

VIII. CHECK SCHEDULES AND MAINTENANCE:

Certain safety equipment is checked periodically for proper function. It is the responsibility of the manager/supervisor to verify recommended checks and maintenance are done and documented according to the following schedules.

A. Fume hoods

1. Properly maintained and inspected annually by the selected vendor. Any hood not passing inspection are taken out of service immediately and not used until the hood has passed inspection.

B. Emergency Eyewash and Shower Equipment

1. Refer to [Laboratory Emergency Eyewash and Shower Equipment](#)

C. Spill clean-up kits (Locations identified with a posted sign)

1. Checked periodically for adequacy of supply and replaced as necessary.

D. Goggles

1. Cleaned with disinfectant cleaner after use before being used by another individual.

IX. DISPOSAL OF HAZARDOUS CHEMICALS:

A. Refer to [Hazardous Chemical and Waste Management](#) and the product Safety Data Sheet.

B. **NON-MISCIBLE ORGANIC LIQUIDS** (not soluble in water) whether flammable or not, **must not** be poured down the drain. Refer to the Flammable Liquids in the Laboratory procedure for specific details.

C. **WATER REACTIVE CHEMICALS MUST NOT** be poured down the drain. Contact manufacturer for disposal recommendations.

D. **CARCINOGENS, CORROSIVES, OXIDIZERS, IRRITANTS, SENSITIZERS AND TOXIC CHEMICALS** may generally be discarded into the sanitary sewer system in small amounts, if they are water soluble.

1. Dilute and flush with copious amounts of water after dumping.
2. If large amounts (for example, multiple jugs of concentrated acids) are involved, dispose of no more

- than 2 liters per day and spread the disposal over several days.
3. Wear goggles, gloves and a lab coat or apron if acid or caustic solutions are involved. Pour slowly with water running so as to minimize splashing.
- E. **WATER SOLUBLE DRY CHEMICALS** may go down the drain unless they are potentially toxic. In such cases, commercial disposal may be needed. Consult with the Chemical Hygiene Officer, a chemist or the manufacturer.
- F. **NON-TOXIC DRY CHEMICALS** may be discarded in the solid trash, if not water soluble.
- G. **TOXIC, NON-SOLUBLE DRY CHEMICALS** may require commercial disposal. Consult with the Chemical Hygiene Officer, a chemist or the manufacturer.
- H. **SODIUM AZIDE** - Refer to section Additional Chemical or Physical Hazards in the Laboratory in the [Laboratory Chemical Hygiene Plan](#)
- I. **MERCURY**-collect in a plastic bottle for commercial disposal through the safety department. Store the bottle in a fume hood if possible. Keep bottle tightly closed. For **BROKEN THERMOMETERS** refer to the [Hazardous Material Spill Response Plan](#).
- J. **SPILLS**. Refer to [Laboratory Spill Procedure](#)
- K. **FLAMMABLE LIQUID CHEMICAL WASTE TRANSPORT AND DISPOSAL TRAINING CHECKLIST**
1. Laboratory employees who transport and dispose of flammable liquid chemical waste in the facility's hazardous chemical waste room or in the flammable liquid chemical waste drums will complete training before performing this job duty. The Laboratory Flammable Liquid Chemical Waste Transport and Disposal Training checklist for Laboratory employees can be found in the attachment section of this policy.
 - a. The Laboratory department manager/designee will provide training following laboratory policies and document the training on the attached checklist. The department manager will also provide any facility specific training unique to their campus laboratory.
 - i. The department manager will retain the completed employee training checklist.
 - b. Laboratory employees will review the Safety Data Sheets (SDS) in the MSDSonline SDS application located on the Corewell Health Intranet for the chemicals that they are transporting for disposal.
 2. The Laboratory department manager will report discovered problems within the hazardous chemical waste room/ waste drums to their campus Facilities Management department and Environmental Services (EVS).
 3. Refer to [Flammable Liquids in the Laboratory](#) and the attached Risk Assessment Pouring Flammable Liquids.

X. CHEMICAL ACCIDENTS AND OVEREXPOSURES:

A. Eye Injury - Prevention and Treatment

1. Stir or shake all solutions, especially solvents and caustic or corrosive solutions resolutely, but not with undue vigor.
2. Vessels are to be well stoppered. Vessels should be pointed away from the eyes when vortexing,

- and the face is not be near the vessel when stirring by hand.
3. Pour liquids carefully at a reasonable distance away from the face, but not so exaggerated as to invite an accident.
 4. Wear safety goggles when pouring acids or alkalis, or working with solvents or on pressurized reagent lines. This is especially important for those who wear contact lenses because substances may seep behind the lens which prevents washing away of the injurious substance.
 5. If corrosive or other dangerous substances splatter into the eye, reach an eye-wash station, remove contact lenses if worn, and wash the eye for at least 15 minutes. Because an eye-injured person may be unable to reach an eye-wash without aid, the injured person should call for help in getting to an eye-wash. For that reason, it is best not to work alone when using a potentially disabling procedure.

B. Chemical Exposure

1. Accidents involving chemicals may be hazardous because of contact with the skin, eyes, or mucous membranes of the nose or mouth or due to inhalation of fumes. In the event of a spill or splash contact, the almost universal treatment is to IMMEDIATELY FLUSH THE CHEMICAL FROM THE AFFECTED AREA WITH WATER. A sink faucet, handheld shower, overhead shower, sink eyewash or bottle eyewash may be used depending on the location and size of the area affected. The only EXCEPTION WOULD BE A WATER REACTIVE CHEMICAL which could pose a greater hazard if mixed with water. Brush off or wipe off chemical with dry paper towels as much as possible first, then flush with water.
2. The following general guidelines and detailed procedures for specific types of chemicals are recommended in any accident or exposure involving chemicals. In all cases, inform the manager/supervisor and the online injury report filled out. Refer to [Work Related Injury and Illness](#). Refer to [MSDS](#) for specific chemical information.
3. The employee is referred to the Emergency Center (if immediate attention is needed) or the Employee Health Service. A report of the physician's evaluation must be made available to the employee, if requested. A record of the evaluation report must be kept for 30 years beyond the date at which the individual involved is no longer an employee.
4. Contact Exposure to Skin
 - a. Call for assistance.
 - b. Flush copiously with water.
 - c. Remove contaminated clothing so water has access to the skin.
 - d. If severe burns are involved, apply cold wet cloths, gauze or paper towels to the affected area.
 - e. Proceed, with assistance, to either the Emergency Center or the Employee Health Service for evaluation.
5. Contact Exposure to the Eye
 - a. Call for assistance.
 - b. Flush copiously with water for at least 15 minutes by:
 - i. Using a sink eyewash or handheld shower.
 - ii. Cupping your hand under a regular faucet and splashing water into the eye.

- iii. **IMPORTANT:** Be sure to keep the eye open enough to allow water to flood the surface. **DO NOT RUB THE EYE.**
- iv. If contact lenses are being worn, remove the lens.
- v. If acid or alkali is involved, **DO NOT** neutralize with the opposite type of solution since the heat of reaction may injure delicate eye tissue.
- vi. Apply cold, wet cloth or gauze to the eye.
- vii. Proceed, with assistance, to the Emergency Center for evaluation.

C. **Liquid Nitrogen Burn:** Refer to [Safe Use and Handling of Cryogenic Materials](#)

D. **Inhalation Exposure**

1. If during the course of working with any chemical, you begin to experience:
 - a. Dizziness or weakness
 - b. Nausea
 - c. Breathing difficulty
 - d. Vision difficulty
 - e. Headache
 - f. Heart palpitations
 - g. Call for assistance.
 - h. Leave the area and get some fresh air.
 - i. Proceed, with assistance, to the Emergency Center or Employee Health Service for evaluation.

E. **Spill Clean Up:** Refer to Laboratory Spill Response.

XI. REFERENCES:

- A. [Hazard Communication Program](#)
- B. [Laboratory Chemical Hygiene Plan](#)
- C. [MSDS online](#)
- D. [Personal Protective Equipment-MIOSHA](#)
- E. [Monitoring Hazardous Gases and Vapors](#)
- F. [Hazardous Chemical and Waste Management](#)
- G. [Laboratory Annual Safety Assessments](#)
- H. [Work Related Injury and Illness](#)
- I. [Laboratory Personal Protective Measures](#)
- J. [Formaldehyde](#)

Attachments

[Flammable Liquid Chemical Transport and Disposal Training Checklist - 11 2022](#)

Approval Signatures

Step Description	Approver	Date
CLIA Site Licensed Medical Directors	Muhammad Arshad: Chief, Pathology	5/7/2024
CLIA Site Licensed Medical Directors	Ann Marie Blenc: System Med Dir, Hematopath	4/23/2024
CLIA Site Licensed Medical Directors	Jeremy Powers: Chief, Pathology	4/17/2024
CLIA Site Licensed Medical Directors	Subhashree Mallika Krishnan: Staff Physician	4/12/2024
CLIA Site Licensed Medical Directors	Ryan Johnson: OUWB Clinical Faculty	4/12/2024
CLIA Site Licensed Medical Directors	Kurt Bernacki: System Med Dir, Surgical Path	4/11/2024
CLIA Site Licensed Medical Directors	Hassan Kanaan: OUWB Clinical Faculty	4/11/2024
CLIA Site Licensed Medical Directors	Masood Siddiqui: Staff Pathologist	4/11/2024
CLIA Site Licensed Medical Directors	John Pui: Chief, Pathology	4/11/2024
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	Sarah Britton: VP, Laboratory Svcs	4/11/2024
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Operations Directors	Christopher Ferguson: Mgr, Laboratory	3/19/2024
	Christopher Ferguson: Mgr, Laboratory	3/19/2024

Applicability

Dearborn, Farmington Hills, Grosse Pointe, Royal Oak, Taylor, Trenton, Troy, Wayne