



Cryogenic Materials

Description

This standard operating procedure outlines the handling and use of cryogenic materials. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls, personal protective equipment, and disposal techniques when handling cryogenic materials.

Cryogenic liquids have various uses in the laboratory including sample preservation, cooling of equipment, and handling and storage of biological samples.

Potential Hazards

Cryogenic materials are liquefied gases with boiling points less than -73°C (-100°F). They can cause tissue damage (frostbite) and asphyxiation due to oxygen displacement. They also pose a fire hazard if oxygen is condensed out of the atmosphere during the use of cryogenic liquids that have boiling points that are lower than oxygen – e.g. nitrogen, helium or hydrogen. There is a potential for explosion due to pressure buildup in closed containers. Materials intended for use with cryogenic liquids must be selected carefully as they can be weakened or fail due to embrittlement.

Engineering Controls

Use and store cryogens in well-ventilated areas. Closets, small rooms, and walk-in cold rooms (or similar small/unvented spaces) should be avoided to prevent buildup of the gas as the cryogen evaporates/sublimes. *If using large quantities of cryogens or if there are concerns about the adequacy of ventilation, contact EHS at (313) 593-4914 to determine if additional ventilation or an oxygen sensor/alarm is needed.*

Each part of a cryogenic system must have its own pressure relief system.

Work Practice Controls

- Cryogenic gases can condense oxygen out of the air, creating a localized oxygen enriched environment. Therefore they must be used and stored away from flammable materials, open flames and ignition sources.
- Do not put your head inside a liquid nitrogen freezer or other enclosed space containing a cryogen. Never allow people to travel in an elevator with cryogenic liquids.
- Do not use hollow rods or tubes as dipsticks. (When a warm tube is inserted into a cryogen, liquid will spout from the top of the tube.)
- When retrieving cryopreservation vials that have been stored in liquid nitrogen, raise the vials out of the liquid phase and store them in the gas above the liquid for 24 hours to allow any trapped liquid nitrogen to escape. After this period, the vials may be removed. Retrieving these vials directly from the liquid phase may cause the vials to rupture if liquid nitrogen has become trapped inside. This may expose the employee to flying bits of plastic, biological specimens or cryoprotective agents (such as dimethylsulfoxide) that were in the vial.

- Check the liquid levels of Dewars regularly. If the liquid evaporates more rapidly than normal, the Dewar may be losing its vacuum.
- Also follow the [SOP for asphyxiants](#).

Personal Protective Equipment (PPE)

- Wear loose fitting cryogenic gloves, safety goggles, face shield, lab coat, long pants and closed toe shoes when handling and transporting cryogenic materials.
- Lab coats should be knee length and have no pockets or cuffs to catch the liquid.
- Pants should not have cuffs and should be long enough to go over the shoe or boot.

Transportation and Storage

- Never store cryogenic liquids or dry ice in walk-in cold rooms.
- Use and store liquid hydrogen and helium away from flammable materials and ignition sources. (These gases can condense oxygen out of the air, creating a localized oxygen enriched environment.)
- For liquid helium and hydrogen storage systems, check the pressure relief and inspect the system for leaks regularly.
- These gases are cold enough to solidify atmospheric air; leaks in storage systems for these gases may become plugged with solidified air. If the pressure relief device becomes plugged, the container may over-pressurize and fail.
- Use and store liquid oxygen away from open flames. Post a “No Open Flames” sign in liquid oxygen storage areas.
- Store and transport cryogenic materials only in Dewars or cryogenic liquid cylinders designed for that particular cryogen. Inspect Dewars daily to insure that no air or ice plugs exist in the neck openings.
- Cryogens may be transported in elevators only in containers certified to leak at less than or equal to 1 liter of liquid (or 1 kilogram of solid) per day. Never allow passengers to travel in an elevator with cryogenic liquids.

Waste Disposal

If a cryogen (such as dry ice) has been mixed with a liquid that would normally be disposed of as hazardous waste (such as alcohol, as in a cold trap), follow disposal procedures for that liquid. Cryogens must not be dumped into sinks, as the thermal shock is likely to damage the sink and/or the plumbing.

As the unneeded cryogen is evaporating, good ventilation is essential to prevent hazardous air concentrations of the gas.

Do not put unneeded cryogen in a sealed container, as the build-up of pressure could cause an explosion.

Exposures/Unintended Contact



If the employee is in need of emergency medical attention, call 911 immediately.



For an actual chemical exposure/injury:

- Refer to SDS.

- Flush exposed eyes or skin with water with warm water for at least 15 minutes, then seek medical attention (see below).
- Do not rub affected area.

Report all work related accidents, injuries, illnesses or exposures to WorkConnections within 24 hours by completing and submitting the [Illness and Injury Report Form](#). Follow the directions on the WorkConnections website [Forms Instructions](#) to obtain proper medical treatment and follow-up.

Complete the [EHS Laboratory Incident and Near-Miss Report](#) form.

TREATMENT FACILITIES:

Midwest Medical Center -- *Campus Employees (including student employees)*

Mon-Fri 7:30 am - 4:30 pm

9301 Middlebelt Road

Romulus, MI 48174

Phone: 734-941-1000

After hours - go to:

Midwest Medical Center

Open 24/7

4700 Schaefer

Dearborn, MI 48126

Phone: 313-581-2600

Henry Ford Medical Center-Fairlane -- *University students (non-life threatening conditions)*

19401 Hubbard Drive

Dearborn, MI 48126

Phone: 313-928-8278

Click [here](#) for more information.

Spill Procedure

- When a spill occurs, ***personal safety should always come first.***
- Alert and clear everyone in the immediate area where the spill occurred.

Spills of cryogenic liquid can cause depletion of oxygen in the area. For spills over 1 liter (or smaller amounts in very small rooms), leave the area immediately and call the University of Michigan Police Department (UMPD) at 911.

Additional Spill Links:

- [Chemical Spill Control Information](#)

Report all emergencies, suspicious activity, injuries, spills, and fires to Public Safety by calling at (313) 593-5333 or 911 from a campus phone. Register with the University of Michigan-Dearborn [Emergency Alert System](#).

Training of personnel

All personnel are required to complete the ***Comprehensive Laboratory Safety*** session (BLS009 or equivalent) via [MyLINC](#). Furthermore, all personnel shall read and fully adhere to this SOP when handling cryogenic materials.

Certification

I have read and understand the above SOP. I agree to contact my Supervisor or Lab manager if I plan to modify this procedure.

Name	Signature	UM ID #	Date

Prior Approval required – Is this procedure hazardous enough to warrant prior approval from the Principal Investigator? ☐ YES ☐ NO

Principal Investigator _____

Revision Date _____