

November 16, 2012

**RESEARCH STANDARD OPERATING PROCEDURES (SOP)**  
**Decanting Liquid Nitrogen**

1. **PURPOSE:** The purpose of this procedure is to insure that adequate policies, procedures, and practices in place for the safe handling of liquid nitrogen in the Research Laboratories located at the STVHCS.
2. **POLICY:**
  - a. **Personal Protective Equipment (PPE)**
    1. Use of the following personal protective equipment is mandatory when decanting or entering an open container of liquid nitrogen:
      - o Loose fitting, insulated gloves made to withstand cryogenic liquids. The gloves should be loose enough so they can be thrown off easily and rapidly.
      - o Shield all or your skin with long sleeve shirts and trousers. Pant legs should go over the top of footwear so spills cannot get into footwear and cause extreme tissue damage before removal.
      - o Always wear chemical splash goggles AND face shield to guard against splashes and possible vessel rupture causing flying debris.
    2. The storage and use of all containers of liquid nitrogen must be only in well-ventilated areas.
    3. Store liquid nitrogen tanks in upright position in cool, dry, well-ventilated area away from emergency exits or heavy traffic areas. Do not store liquid nitrogen tanks in areas of refuge. If cylinders are involved in a fire, safely relocate or keep cool with water spray. Do not store in areas greater than 125°F (51°C).
    4. Do not drag, slide or roll storage cylinders. Use suitable hand truck to move vessels and always secure in upright position during movement and transport.
    5. The Material Safety Data Sheet for liquid nitrogen is available in the Administrative Officer's office and T202.
3. **ACTION:**
  - a. **Special Safety Precautions**
    1. Extreme temperatures of liquid nitrogen cause most solids to become brittle.
    2. Contact to eyes or skin can cause serious frostbite injuries or tissue damage resembling burns.
    3. Contact with a cryogenically cooled material is dangerous; do not touch cryogenically cooled material with bare flesh.
    4. To minimize chances of freezing material to skin, remove watches and jewelry from the hands and wrists before using liquid nitrogen.
    5. When liquid nitrogen warms to a gaseous state it displaces oxygen. Oxygen-deficient atmospheres can cause dizziness, nausea, vomiting, unconsciousness, confusion, and death. Unconsciousness could occur without any preceding signs of danger.
    6. Never plug or cover a cryogenic container, otherwise explosions or ruptures may occur.
    7. Use only containers designed specifically for cryogenic liquids such as Dewar flasks and cryogenic storage tanks. Fill slowly to protect from excessive stress that can damage the container. **DO NOT** fill containers past 80% capacity.

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8. Nitrogen is an asphyxiant. Rapid expansion of liquid nitrogen to gas is colorless, odorless, and tasteless and can lead to asphyxiation. Always work in well ventilated areas. Just one liter of gas can expand to 24.6 cubic feet, which is an expansion ratio of 1:696. Liquid nitrogen can rapidly fill small spaces causing very dangerous situations.

### **b. Decanting (Pouring) Liquid Nitrogen From a Liquid Nitrogen Dewar**

1. Bring approved container/vessel for collecting Liquid Nitrogen to the Liquid Nitrogen/Freezer room T202.
2. **DO NO ENTER THE LAB IF THE OXYGEN METER IS ALARMING.**
3. Do not enter the liquid nitrogen room if the ventilation is not working – to check that the ventilation is working go to the adjacent labs and check that there is movement in the streamers placed on the vents in the ceilings or upper portion of the walls.
4. Before opening any liquid nitrogen tank/Dewar, dress appropriately and wear the required personal protective equipment (PPE) as outlined above.
5. Cryogenic gloves are required to protect the hands from extreme temperature. NOTE: although gloves are worn, the wearer must not immerse gloved hands in liquid nitrogen.
6. Polycarbonate full face shield is required to prevent injury to face/eyes from potential splashes and to protect against injury from exploding vials.
7. Ensure the door to the room housing the liquid nitrogen storage tanks is open.
8. Remove the lid from the empty container (approved for holding liquid nitrogen).
9. The 10L Dewar which contains liquid nitrogen but no cell lines is the only Dewar to be used for the purposes of decanting liquid nitrogen – all other Dewars are too large.
10. Remove the lid from the 10L liquid nitrogen Dewar and place to the side on the lid of the unopened adjacent liquid nitrogen tank.
11. Slowly and steadily pour the required volume of liquid nitrogen from the 10L Dewar containing the liquid nitrogen into the empty vessel to minimize boiling and spluttering and being careful to avoid spilling the liquid.
12. Replace the lid of the 10L liquid nitrogen Dewar ensuring that it fits securely and secure the lid on the vessel that the liquid nitrogen has been added.
13. Return the PPE to the proper place for use by the next person.
14. Using two hands carry the vessel containing the liquid nitrogen to the lab where it will be used.

### **c. First Aid**

1. Signs and symptoms of exposure:
  - Nausea
  - Drowsiness
  - Blue coloration of skin and lips
  - Unconsciousness
  - Death
2. Remove an incapacitated worker from further exposure and implement appropriate emergency procedures and/or first aid. Immediately contact Urgent Care (Extension 1-5923) for medical assistance or call code blue (5911) if overcome by loss of oxygen.
3. The following procedures are recommended:

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- **EYE CONTACT:** Remove victim from source of contamination. Open eyelids, allowing liquid to evaporate. See medical attention.
- **SKIN CONTACT:** Exposed tissues should be restored to normal body temperature by running warm water (100-108°F or 37-42°C) over the affected part. **DO NOT USE AN OPEN FLAME FOR THIS PURPOSE.** Water should never be more than 112°F (44°C) and the affected part should not be rubbed at any time -this can cause further damage to the area. The victim should get emergency care as quickly as possible to minimize further damage and for damage assessment.
- **INHALATION:** If a person is overcome by loss of oxygen while working with cryogenic liquids, that person should be moved to a well-ventilated area immediately. A self contained breathing apparatus (SCBA) may be required for rescue so the rescuer does not also fall victim. Artificial respiration should be applied if breathing has stopped. If the person is having difficulty breathing, oxygen should be supplied. Emergency medical help should be summoned.

### 4. REFERENCES:

- College of American Pathologists. General Checklist and Commentary. July 2003.
- Retrieved May 25, 2010 from <http://www.labsafety.com/refinfo/ezfacts/ezf290.htm>
- Retrieved May 25, 2010 from <http://www.osha.gov/SLTC/healthguidelines/nitrogen/recognition.html>

5. **RESPONSIBILITY:** ACOS for Research and Development

6. **RECISSIONS:** Research Service Memorandum RAD-030-08-08-REV00-00, dated August 2008

7. **RECERTIFICATION:** November 2017

  
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