



TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER EL PASO
Operating Policy and Procedure

Title: Clinical Procedure for Safe Handling of Liquid Nitrogen (LN2)	Policy Number: 75.29
Regulation: Reference:	Original Approval Date: 09-2012 9-2014 Revised: March 2018

Procedure Statement:

This policy has been designed to provide an approved method to dispense and transport Liquid Nitrogen (LN2) in order to protect Texas Tech University Health Sciences Center El Paso (TTUHSC EL PASO) Employees from injury. This procedure is intended to serve as the minimum guideline for how LN2 will be handled in the Clinical Divisions. This is based on risk mitigation and best practices. Divisions can implement their own procedure and can be more stringent; however, they should not be more lax than this procedure.

Scope and Distribution:

All TTUHSC EL PASO Clinical Personnel

This policy will be reviewed and updated every two years by the Sr. Director for Safety Services, with recommendations and revisions will be forwarded through the Managing Director for Physical Plant and Support Services to the Chief Operating Officer and Vice President for Operations.

Procedure:

Introduction

Always follow all of the procedures prescribed by the manufacturer for operating and maintaining the manufacture's equipment. Everyone working with cryogenic liquids shall be properly trained for the job and be supervised by experience personnel. Any suspicion of faulty equipment should be recorded and the use of the equipment discontinued.

Liquid Nitrogen is a colorless, odorless, non-toxic, inert, and non-flammable liquid. It has an extremely low boiling point of 196°C, at atmosphere pressure.

- The most important safety concern when handling LN2 is that it creates an **asphyxiation hazard**. Nitrogen expands by a factor of almost 700 when changing from liquid to gaseous state; this in turn displaces ambient breathable oxygen. To avoid such situations, liquid nitrogen should only be handled in areas with good ventilation.
- When vaporized LN2 is not allowed to vent, it can cause the storage vessel to build pressure and even explode violently. When dispensing or using LN2 in a small enclosed room, the door to the room must remain propped open.
- Inhalation of LN2 in excessive amounts can cause dizziness, nausea, vomiting, loss of consciousness, and death.
- Frostbite can occur on skin when in contact with LN2 causing a variety of symptoms including change in skin color to greyish yellow and torn flesh.
- The cold temperature of LN2 can cause oxygen to condense from ambient air into liquid nitrogen. This creates a potential fire hazard when it contacts organic materials that include, but not limited to paper, clothing, and cardboard.
- Many contents become brittle upon contact with LN2 and may shatter like glass, sending shards of material flying. Using proper cryo-containers is crucial.
- Contact the DSS (215-4820) to evaluate work space requirements for ventilation, or other safety concerns.

Personnel Protective Equipment (PPE)

Protective clothing serves mainly to avoid frost burns.



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1. Insulating gauntlet style gloves must be worn at all times when handling LN2 to avoid cold burns. The gloves must be loose-fitting in order to remove easily at the time of need. **Gloves must not be made of materials that will absorb liquids.**
2. To protect face and eyes from a LN2 splatter or a shattered container, a face shield over safety glasses must be worn during the time of dispensing of LN2. Safety glasses must be worn during the time LN2 is being used during a procedure.
3. Closed-toed, non-fabric shoes must be worn while handling LN2 for protection from accidental spills.
4. A cryogen apron over a lab coat or lab coat must be worn to eliminate skin contact.



Cryogen Gauntlet Gloves



Cryogen Apron

Storage and Transfer

Use only containers specially designed to hold cryogenic liquids. Although these containers (Dewar flasks) are made from materials, which can withstand the very large and rapid change in temperature, it is important that they should be filled slowly in order to minimize the thermal shock, which occur when any material is cooled. This also reduces splashing and avoids a too rapid build-up of pressure. Follow these recommendations:

1. Use LN2 with double walled evacuated container called Dewar flask.
2. Dewars flask are non-pressurized, vacuum-jacketed vessels, having a loose fitting plug or cap to prevent air and moisture from entering. At the same time, allowing excess pressure to vent.
3. The use of LN2 will only be in the clinic where the Dewar flask is located.
4. In the event of a minor spill of LN2 follow the "Hazardous Material Spill Response Procedure." If capable to remediate the spill use spill kit absorbents to contain the spill. Notify your Department Unit Safety Officer (USO) and call DSS.
5. In the event of a major spill, evacuate the area to allow the liquid to evaporate. There may be oxygen deficiency in the area of the spill. DO NOT attempt to remediate the spill. Follow the "Hazardous Spill Response Procedure" and notify your Department USO and call DSS.

First Aid and Emergency Procedure

1. If any liquid LN2 comes into contact with skin, immediately place that body part in a water bath of cool water, never hot and protect the area with sterile loose dressings. DO NOT rub the affected body parts. Seek immediate medical attention.
2. In case of damage to the eye or skin blisters, go immediately to the ER for medical treatment.
3. All employees are to report all incidents to their Supervisor. Immediately contact your department USO or DSS.

Dispensing Transferring of LN2

Normal operations requires for Staff to dispense LN2 from a Dewar flask into a cryogenic liquid container. If an employee has been trained to dispense LN2, they will follow these procedures at a minimum. LN2 can either be dispensed using a dipper (Fig. A) or an automatic spigot/pump (Fig. B).



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1. Prior to dispensing LN2, the receiving container must be inspected for cracks or damage and the overall integrity of the casing should be verified. If questionable, DO NOT use. Instead place it "Out of Service" and dispose of it according to state, federal regulations. Call DSS for disposal.
2. DO NOT utilize containers that were not engineered for use with LN2.
3. Prior to installing the dispensing spigot/pump, check for damages. If there is damage, place the unit "Out of Service".
4. Used approved PPE; LN2 gloves, goggles, face shield, apron, and lab coat while dispensing.
5. Follow the dispensing directions as instructed in the dispensing spigot/pump user manual.



Figure A



Figure B

LN2 Attachments:

1. Airgas Safety Data Sheet (SDS) for Liquid Nitrogen



airgas ln2 msds.pdf

2. Airgas Appendix - Cryogenic Liquid Containers



appendix for
cryogenic containers.p

3. Airgas Appendix - Safe Handling and Use of Specialty Gases



ap09.pdf