Occupational Health Program
Safety Training Series

Safe Handling and Use of Liquid Nitrogen

LN2 in the IVF workplace

- LN2 is used to store gametes and embryos.
- Scientists are the main profession that uses LN2 but nurses may in some clinics be required to access stored gametes.
- Previous experience with LN is usually very limited or non-existent.
- This presentation is designed to introduce you to the hazards and protocols when handling.
- Remember, when contained, LN2 is explosive and capable of causing injury!

General Information

- **Hazards**
- **Liquid Nitrogen is extremely cold: -320F**
- **Can cause severe frostbite or eye damage upon contact**
- **Substances may become brittle upon contact with liquid nitrogen and shatter, sending pieces flying**

- **On vaporization, Liquid Nitrogen expands by a factor of almost 700 (1 cu.ft. LN2 = 700 cu.ft. N2)**
- **May cause an explosion of a sealed container.**
- **Displaces oxygen and may cause asphyxiation.**

- **Oxygen may condense on surface of LN2**
- **Highly reactive with organic materials**

Characteristics of Nitrogen

- Nitrogen = 78% of atmosphere
- It is Colorless, Odorless, Tasteless, and Nontoxic
- Boils at -320 degrees Fahrenheit ((--196 C)
- NonNon—Flammable
- WILL NOT SUPPORT LIFE
- Gas is slightly lighter than air

Hazards

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Oxygen Deficiency Precautions

- **LN2 should be used and stored in well-ventilated areas.**
  - **High concentrations of nitrogen reduce the breathable oxygen in the air**

- **LN2 release can cause oxygen deficiency:**
  - **When transferring between containers**
  - **From leaking valves**
  - **From liquid tank venting**
  - **From open containers**

- **Consider installing Oxygen monitors in all areas where LN2 ins handled or where dewars are stored.**

Transporting LN2 Containers

- Containers must always be stored in the upright position
- LN2cylinders vary in weight and size. They are all heavy and cumbersome
- Do not roll, either vertically or horizontally
- Always use the specially designed cylinder cart when moving LN2 cylinders
- If the container tips over, let it go

Handling *Transferring LN2 from Primary Container*

- Always wear safety equipment including heavy loose fitting leather or cryogenic gloves, and eye and face protection -
- Prior to use, ensure the fittings on the regulator match the fittings on the liquid container
- Never use unregulated adaptors on liquid containers
- Open valves slowly to minimize thermal effects and control gas escape
- Do not fill Dewars or secondary containers to more than 80% of capacity; expansion of gases may cause pressure build-up

Handling *: LN2 Bench top Containers*

- Bench top containers are utilized for small scale use in labs
- Transfer LN2 only from Dewars or secondary containers, never from primary pressurized tank
- Never dispense liquid into an unapproved container, such as a Thermos®bottle. It will shatter.
- Transfer of LN2can cause splashing
  - Utilize specialized withdrawal devices instead of pouring (LN2Pump)
- Transfer liquid slowly to prevent thermal shock, pressure build-up, and splashing.
- Always where appropriate PPE.

Liquid Withdrawal

- Transfer LN2 can cause splashing
- Use caution when inserting open -ended pipes or tubes. Cold liquid/gas may spurt through warm end.
- Ensure that withdrawal hose is equipped with a phase separator to prevent splashing
- Transfer liquid slowly to prevent thermal shock, pressure build-up, and splashing
- Always where appropriate PPE

Safe Use in Labs

- **When handling LN2 in labs, ALWAYS REMEMBER**
- Only trained personnel should work with LN2
- Have a plan
  - Inform others in lab
  - Use in well vented and low traffic areas
- Wear appropriate PPE
- Instruments and withdrawal devices in contact with LN 2 become extremely cold
- LN2 should only be handled in approved containers
  - Do not transport in uncovered containers
- Avoid breathing LN2 vapors
- Carry transport containers away from body and face
- Do not leave open containers unattended

Handling Cryotubes/Straws

- **Cryotubes or freezing straws are used to contain samples stored under liquid nitrogen may explode without warning when handling and thawing**

- **When thawing cryotubes, take the following protective steps:**
  - **Wear a face shield and safety goggles,**
  - **whenever handling cryogenic liquid.**
  - **Wear appropriate insulated gloves.**
  - **Wear a buttoned lab coat and pants and closed toed shoes.**
  - **Place the cryotube in a heavy-walled container (e.g., a dessicator) or behind a safety shield while thawing**

Warning!

- Never plug, restrict, or remove any relief device.
- Never attempt to cap or seal a venting relief device in any way.
- Ice or frost build-up on a pressure relief valve should be removed with a damp cloth. (Wear proper Personal Protective Equipment (PPE) when removing the frost.)

Personal Protective Equipment (PPE)

- When working with LN2, the recommended PPE includes:
  - Eye Protection
    - Full Face Shield with safety goggles is best
  - Heavy, Loose-Fitting leather or Cryogenic Gloves
  - Lab Coat
  - Long Pants --cuff-less to avoid spill collection
  - Closed toe shoes
  - Do not tuck pants into shoes/boots

Emergencies

- If there is a large spill or rupture of a container, call Emergency and warn others in building.
  - **Evacuate. There may be oxygen deficiency in the area of the spill.**
- Cold burns should be immediately flushed with tepid water or placed in a warm water bath.
  - Notify Supervisor
  - Seek medical evaluation
  - DO NOT RUB SKIN —may damage tissue

Refer to your own policy manual.

- Finally, the information in this presentation is general in nature and browsers are encouraged to refer toy our own policy manual.