Safe Work Practice: Handling Liquid Nitrogen in Medical Clinics

Purpose

To establish a standardized procedure for the safe storage, handling, and use of liquid nitrogen at the clinic.

Scope

This procedure applies to all staff in the clinic who store, handle, or use liquid nitrogen.

Hazards

- **Cryogenic Burns:** Liquid nitrogen is extremely cold (-196°C). Direct contact with the liquid or surfaces cooled by it can cause severe frostbite.
- **Asphyxiation:** When liquid nitrogen warms to room temperature, it rapidly expands into a gas, increasing its volume by 700 times. This can displace oxygen in the room, creating a risk of suffocation. Nitrogen gas is colourless and odourless.
- **Explosion:** Liquid nitrogen naturally transitions to a gas at room temperature. If stored in a sealed container, this expansion can cause the container to explode.

Safe Work Practices

Storage

- Only store liquid nitrogen cylinders in cool, well-ventilated areas.
- Liquid nitrogen must only be stored in containers specifically designed for cryogenic liquids.
- Secure cylinders in an upright position. Protect cylinders from physical damage; do not drag, roll, slide or drop. Use a suitable hand truck for cylinder movement.

Decanting or Dispensing

- **Never handle liquid nitrogen with bare hands or without eye protection**. Use appropriate personal protective equipment (PPE):
    - Wear clothing that covers arms, legs, wrists, ankles, and feet.
    - Wear eye protection such as goggles, safety glasses, or face shields.
    - Wear cryogenic gloves when handling liquid nitrogen or any object cooled by it. For small amounts where high dexterity is essential (e.g., during a medical procedure), and there is low risk of direct contact with the liquid, medical gloves, such as nitrile gloves, may be used.
- Only handle and use liquid nitrogen in well-ventilated areas.

- Dispense less than 100 mL of liquid nitrogen into a properly insulated container in the designated area where the liquid nitrogen tank is stored. Never overfill the container.
    - The dispensing method depends on the liquid nitrogen container: either decant with a transfer vessel or pour directly. Follow equipment-specific procedures provided by the manufacturer.
    - Avoid dispensing above waist height. When pouring, place an appropriate receiving container on a stable surface and do not leave it unattended. Take extra precautions to prevent tipping and spills.
    - Liquid nitrogen must be stored, transported and dispensed only in containers designed for cryogenic liquids (e.g., cryogenic dewars, cryoguns, cryogenic foam cups). Other insulated containers, such as Styrofoam cups or double-walled insulated containers (e.g., Thermos), should not be used, as they are not designed for cryogenic liquids.
    - If using cryogenic foam cups with self-venting lids, ensure they are loose-fitting to allow gas to escape. To prevent tipping and spills, take extra precautions with these wide-opening containers during transportation and usage.
    - Paper, plastic, and glass containers are unsuitable for liquid nitrogen handling due to inadequate insulation properties.
- Dispense liquid nitrogen cautiously to avoid splashing and spillage.
    - If spilled, allow liquid to evaporate – a spill kit and WorkSafeBC incident report are not required for small spills that do not result in injury or equipment damage, but they should be reported to the employer as a near miss.

Disposal

- Allow remaining unused liquid nitrogen to evaporate in a well-ventilated area.
- If the liquid nitrogen container has not been contaminated with other chemical or biological hazards, it can be reused.
- Empty containers should be returned to the supplier for disposal.

Other Precautions

- Cryogenic gloves need to be loose-fitting so they can be readily removed if liquid nitrogen splashes into them.
- Ensure that all closed containers have a pressure release valve. **Never store liquid nitrogen in a sealed container, as this will create a major explosion hazard**.
- Never allow any unprotected part of the body to come into contact with the liquid.
- Never use hollow rods or tubes to scoop liquid nitrogen, as this can cause liquid splash from the top of the tube.

First Aid Treatment

- If liquid nitrogen gets between the PPE and the skin, immediately remove the PPE covering the area to let the liquid nitrogen fall out or evaporate.
- Do not rub frozen body parts to prevent tissue damage.
- Place the affected part of the body in a warm water bath (not above 40 °C).
- Never use dry heat.
- In case of eye contact, rinse the eye with water immediately.
- Refer to the Safety Data Sheet (provided by vendor) for further information on first aid and other response measures.

Training

Managers must ensure employees who use or are exposed to liquid nitrogen must review and understand this document before handling or being exposed to liquid nitrogen.

Annual Review

This policy and procedure will be reviewed annually and updated as needed.

References

- Workplace Hazardous Materials Information System 2015 (WHMIS)
- Nitrogen, refrigerated liquid: Safety Data Sheet E - 4630
- WorkSafeBC Occupational Health and Safety Regulation 30.24
- Occupational Safety and Health Association Laboratory Safety: Cryogens and Dry Ice

Approval

Employer/Manager:	Date: