

# LESSONS TO BE LEARNED

Generated from Actual Incidents - Written by EHSO

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*Type of Incident:* Liquid Nitrogen Splash

*What Happened:* As researcher began filling a dewar at room temperature, opened valve too fast causing over-boiling and subsequent splattering of Liquid Nitrogen (LN) causing burns on hand.



*Immediate Cause:* Not wearing proper PPE, specifically cryogenic gloves and opened valve too fast.

*Root Causes:* Inadequate awareness of liquid nitrogen hazards and proper PPE.

Hazards of cryogenic liquids include:

- ❄️ frostbite
- ❄️ pressure build-up
- ❄️ physical change of material properties
- ❄️ oxygen condensation from the atmosphere
- ❄️ oxygen deficient atmosphere



*Corrective Actions:*

When handling cryogenics, always:

- ❄️ Inspect & don Personal Protective Equipment (PPE):
  - safety glasses and face shield
  - waterproof, loose-fitting cryogenic gloves (Remove metal jewelry/watches on hands & wrists.)
  - cuffless pants and shoes made of nonabsorbent material
  - long-sleeved shirt and lab coat or cryogenic apron.
- ❄️ Inspect cryogenic equipment to verify:
  - dewar can withstand cryogenic temperatures
  - inner borosilicate liner is free of hairline cracks
  - dewar is dry (water expands upon contact with cryogenics and can crack the dewar)
- ❄️ Stand clear of cryogenic liquid boil off, vapors or splashes
- ❄️ Use tongs or tweezers to immerse or withdraw objects from the cryogen
- ❄️ Do not use a funnel in case it freezes and spews nitrogen upward into your face
- ❄️ Use pressure relief vessel or venting lid (or cork with a groove cut into the side) to prevent a pressure-causing condensation obstruction
- ❄️ Use open dewar flasks only in well-ventilated areas

Volume of vented N2 to displace ALL the air in a room		
Room volume ft <sup>3</sup>	liters LN2 after evaporating & achieving STP	Comment
640	42 L	8' x 10' x 8'
6,000	396 L	