January 2021

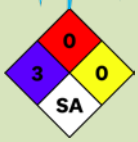
UNDER THE MICROSCOPE

The Dartmouth College laboratory safety newsletter

DARTMOUTH Environmental Health & Safety

Specific questions? Ask EHS: 603-646-1762 or ehs@dartmouth.edu

LIQUID NITROGEN



LN_2 is a common cryogen with three main hazards:

- **Extreme cold** (near-instant frostbite)
  You don't want this making skin contact…
- **Oxygen displacement** (asphyxia)
  Depends on rate of release and ventilation
- **Pressure buildup** (in closed unvented vessels)
  Vessels must be able to passively vent

Required minimum PPE

- Face shield
- Lab coat or apron
- Cryogloves

Thermal gloves for hot objects, leather gloves, nitrile gloves, and cryogloves with holes are *not* adequate. EHS has seen all of these being used with liquid nitrogen.

Systems

Burke has a relatively small liquid nitrogen system by the loading dock. That's the tank visible from the road.

A catastrophic containment failure of a much larger and brand-new system in Georgia last week resulted in 6 fatalities and 12 hospitalizations. LN_2 has a 696:1 expansion ratio which lets it build pressure and displace oxygen.

Dewars

These semi-portable vessels are used to supply instruments or cryotanks. Relief valves vent at 22 psi and produce a normal hissing sound. Make sure these are working and not clogged with ice.

In 2006, a dewar at Texas A&M exploded and severely damaged windows, walls, and the two floors above it. Luckily, nobody was injured. Faulty relief valves had been removed instead of replaced so there was no vent.

Cryotanks

These are used for long-term storage of cells and tissues. The cap and plug do not fully seal, allowing pressure relief. Vials inside should be stored in vapor phase, not submerged in liquid.

At least one serious eye injury has occurred here at Dartmouth from a biological sample tube that exploded after being removed from liquid nitrogen. The researcher was not wearing eye protection.

Other cryogens: liquid helium, argon, and neon are also on campus and have the same hazards as LN_2. Liquid oxygen is not an asphyxiant but has other risks and must not be used without EHS consult. Some condensers that use liquid nitrogen can produce liquid oxygen as a byproduct and should be avoided.

EHS Staff: Bree, Caitlyn, Erik, Jason, Jeff, Mark, Matt, Molly, Ryan