

Three main hazards of liquid nitrogen (LN) are asphyxiation, explosion, and frostbite.

Nitrogen is not toxic but can displace the oxygen in an enclosed room or elevator such that the level is no longer sufficient to sustain life. **Never get in an elevator with more than 20L of LN.** If you need to transport a large dewar of LN using an elevator, place a sign on the dewar warning people not to enter the elevator, "Do Not Enter - asphyxiation hazard!". If possible, post someone on every floor to prevent people from entering the elevator until it reaches the destination. Meet the elevator on that floor and remove the dewar. Always ensure you are using proper containers and transfer vessels for the LN – a regular thermos is not designed to contain LN. Vessels for LN have release valves to allow pressure to escape or vent ports – LN is always evaporating as its steady state is a gas – not a liquid. For this reason, if you have large volume (200L for example) dewars in a lab, you should consider oxygen sensors in the lab or wearing personal oxygen monitors when working in the area. Ensure all areas where LN is used in large quantities is well ventilated – labs are typically designed with enough air exchanges to maintain excellent air quality.

As noted above, LN wants to return to the gaseous state – if you place it in a sealed or closed container, it can, and will, explode. There are various types of vessels that can be purchased for LN use, choose the appropriate ones for your use. If you need to transport LN to a destination off campus, limit the volume to less than 20L and ensure you are using proper dewars designed for this purpose. **Ensure proper ventilation** in the vehicle (remember, it is an asphyxiation hazard in small spaces) and secure the dewars in an upright manner such that tipping is not possible. Securing the LN in an open bed of a pickup truck is the preferred way of transporting.

Finally, the temperature of LN is -196C and it will freeze flesh in less than a second causing frostbite. Usually when LN hits your skin it evaporates immediately leaving no ill effects, but if it gets trapped in the sleeve of a glove, sock, or soaks into clothing next to your skin, it will freeze the skin and can cause severe burns. Proper attire should be worn when working with LN. Always wear goggles or a face shield, cryogenic gloves (loose fit to easily cast off if LN splashed inside), lab coat, long cuff less pants that fit over the shoes (skinny pants not allowed), and closed toed shoes – preferably leather – when working with LN. Avoid clothing that LN can soak into such as canvas shoes. Next, remember that your skin will stick to anything that has been cooled by or placed in LN if you touch it – use tongs or cryogenic gloves to handle anything that has been immersed in LN. Finally, when pouring LN into any vessel, remember that it will immediately evaporate when hitting a surface at room temperature and will often splash back at you as it boils. Pour slowly and carefully to avoid vigorous splashing.

If you do come in contact with LN you will notice a stinging pain and the area will go white. Immerse the area in warm (not hot) water and seek medical attention if it is over a significant area of your skin and/or has made contact for a significant amount of time. Blistering and tissue damage can occur if the burn is severe (frostbite).