

<b>Title:</b>	<b>Cryogenics Handling</b>		
<b>Document Type:</b>	Procedure	<b>Document #:</b>	UHT0001957
<b>Program:</b>	Research Facilities	<b>Effective Date:</b>	January 05, 2015
<b>Executive Sponsor:</b>	Vice President, Research and Innovation	<b>Last Reviewed:</b>	October 14, 2022
<b>Owner/Lead:</b>	Director, Research Facilities; Research Biosafety Officer	<b>Last Revised:</b>	October 14, 2022
<b>Approval Body:</b>	Director, Research Facilities	<b>Review Cycle:</b>	3 year
<b>Applicable Sites:</b>	<input type="checkbox"/> <b>Unity Health</b> <input type="checkbox"/> <b>Providence</b> <input type="checkbox"/> <b>St. Joseph's</b> <input checked="" type="checkbox"/> <b>St. Michael's</b>		
<b>Keyword(s):</b>	Cryo, liquid nitrogen, dry ice		

### 1.0 PURPOSE

Cryogenic indicates extremely low temperatures. Cryogenic materials are those having a boiling point below -73° C. The cryogenics materials commonly used in Keenan Research Centre for Biomedical Sciences are solid carbon dioxide (dry ice) or liquid nitrogen. They are useful for quick freezing of biological samples, maintaining unstable materials for long periods of time and also for transportation of perishable materials. The primary hazard in working with cryogenic materials is their extreme coldness. They, and surfaces they cool, can cause severe burns if allowed to contact the skin. Secondary hazards may present when the cryogenic material vaporizes, with the gases becoming a potential asphyxiant.

The liquid nitrogen tank and dry ice storage container is located in a secured area in the basement and access to them is provided only after watching an instructional video on cryogenics safety and a hands-on demo with a Research Specialist. The training course is available through the Learning Centre or through the link in the Biosafety page of the Research Facilities website.

## 2.0 PROCEDURE

### *Dry Ice Use*

- *Personal Protective Equipment Required*- Loose fitting insulated gloves, closed toed shoes, cuff less trousers worn outside the shoes, lab coat and safety shield
- *Precautions*
  - Avoid contact with skin and eyes - severe frostbite can occur within seconds of direct contact. Never handle dry ice with bare hands. Always wear personal protective equipment.
  - Use the scoop to handle dry ice.
  - Do not ingest dry ice.
  - Do not store dry ice in glass or other sealed (air-tight) container or coolers. Storage in a sealed container will cause pressure to build inside the container resulting in rupture or explosion of the container.
  - Avoid lowering your head into a dry ice chest; dry ice is heavier than air, and can result in suffocation.
  - Do not use dry ice in confined areas - dry ice releases heavy carbon dioxide vapor that can cause rapid suffocation.
  - Do not place dry ice directly on a tile or laminated counter top since it may destroy the bonding agent holding the tile or laminated material. Instead, keep it in its container or use a solid surface such as a wooden board or a piece of plywood.
- *Procedure*
  - Bring an insulated container that is suitable for storing dry ice (e.g. Styrofoam box).
  - Use the service elevators to go to the basement.
  - Before opening the dry ice freezer, make sure you are wearing the proper personal protective equipment.
  - Before leaving, make sure the freezer door is shut.
  - Do not throw left over/un-used dry ice in the lab sink. Allow the dry ice to sublime in a well-ventilated area or the chemical fume hood.

- *Transport*
  - Transporting samples on dry ice via car is considered transporting dangerous goods.
  - Please contact Research Facilities for Transport of Dangerous Goods Training.
- *Spill response*
  - In case of a spill, do not handle with bare hands, use insulated gloves and tongs/scoop and return the spilled dry ice to a container
  - Allow the dry ice to sublime in a well-ventilated area.

### **Liquid Nitrogen**

- *Cold Burns*- Liquid Nitrogen is extremely cold (-196°C) and can freeze flesh very rapidly. When spilled on a surface the liquid tends to cover it completely and intimately, cooling a large area. The gas issuing from the liquid is also extremely cold. Delicate tissue, such as eyes, can be damaged by an exposure to cold gas alone.  
Unprotected body parts contacting objects cooled by liquid Nitrogen may stick fast. This may result in injuries by flesh being torn whilst attempting to withdraw from the object.  
Skin contact with liquid nitrogen can result in severe burns, blistering, and frostbite injury, which can occur within seconds of exposure. Skin damage from exposure to liquid nitrogen may be extensive enough to require surgery or amputation.  
Cold burns should be treated by running the area under TEPID water before seeking medical assistance.
- *Asphyxiation*- Liquid Nitrogen rapidly vaporizes to gas with about 700 times the liquid volume. Gaseous Nitrogen will rapidly displace Oxygen within an area, leading to the potential for a person to be rendered unconscious or even be killed by asphyxiation. Inhaling the liquid nitrogen cold vapors can trigger breathing problems, especially among people with baseline respiratory illnesses like asthma.
- *Transporting*
  - The filling of Liquid Nitrogen storage vessels should only be undertaken during core business hours to minimize the risk to researchers in the event that they are injured during the transportation of the vessel.
  - Transporting small (1-2L) of liquid Nitrogen should be done in specialized vessels (liquid Nitrogen capable Dewar flasks) and should never be done in glass bottles due to the high likelihood that the glass will crack due to the extreme temperature. The vessels should not be sealed.

- When transporting larger volumes of liquid Nitrogen (e.g. when needing to re-fill a Cryogenic Storage Unit for samples), vessels must be transported to the storage area in the service elevator (never in the passenger elevators).
  - It is recommended that 2 people be involved in the transport, to help with maneuvering the vessel.
- *Safe Working Practice*
  - Only authorized workers can work with liquid Nitrogen.
  - Always wear the appropriate PPE when working with liquid Nitrogen.
  - Avoid breathing liquid Nitrogen vapors (the "smoke" associated with liquid Nitrogen is not Nitrogen, but condensed water from the air). Nitrogen is colorless and odorless.
  - Only use cryovials to store samples under liquid Nitrogen. Non-approved tubes have a greatly increased risk of exploding when thawed.
  - If there is a large scale release or spill of liquid Nitrogen, inform anyone in the immediate vicinity to evacuate the area and call 911.

Version	Approval/Sub-approval body	Approval date
01	Director, Research Facilities	October 14, 2022
02		
03		

This document is the property of Unity Health Toronto. This material has been prepared solely for internal use. Unity Health Toronto does not accept responsibility for the use of this material by any person or organization not associated with Unity Health Toronto. No part of this document may be reproduced in any form for publication without permission from Unity Health Toronto.