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Effective Date:	January 01,2015	**Author**	Steven Hayes
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Introduction

Cryogenic indicates extremely low temperatures. Cryogenic materials are those having a boiling
point below -90 degrees C. These materials, such as solid carbon dioxide (dry ice) or liquid nitrogen, 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 only granted upon the successful completion of an online training course.** The training course is available through the Learning Centre or through the link in the Biosafety page of the Research Facilities website.

Associated Procedure

Dry Ice Use

Personal Protective Equipment Required
Loose fitting insulated gloves
Closed toed shoes
Cuffless trousers worn outside the shoes
Lab coat
Safety glasses
Precautions

- Avoid contact with skin and eyes- severe frostbite can occur within seconds of direct contact. Never handle dry ice with your 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 can result in rupture or explosion of the container from over-pressurization. Avoid lowering their head into a dry ice chest; dry ice is heavier than air, and suffocation can result
- Do not use dry ice in confined areas- dry ice releases heavy carbon dioxide vapour 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

1. Bring an insulated container that is suitable for storing dry ice (e.g. Styrofoam box)
2. Use the service elevators to go to the basement
3. Before opening the dry ice freezer, make sure you are wearing the proper personal protective
equipment
4. Before leaving, make sure the lid on the dry ice chest is secured

Transport

Transporting samples in 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 gloves and tongs/scoop and return ina container

- Allow the dry ice to sublime in a well-ventilated area

Liquid Nitrogen

Cold Burns

Liquid Nitrogen is extremely cold (-196^{o}C) 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
which would be too brief to affect skin**.** Cold burns should be treated by running the area under TEPID water before seeking medical assistance
Unprotected body parts contacting objects cooled by liquid Nitrogen may stick fast. This may result
in injuries by flesh being torn whilst attempt to withdraw from the object.

It is often stated that small splashes of Liquid Nitrogen will run off bare skin due to a vapour layer
forming between the skin and the liquid. This must never be relied upon.

Asphyxiation

Liquid Nitrogen rapidly vaporises 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.

Transporting

The filling of Liquid Nitrogen storage vessels should only be undertaken during core business hours to minimise 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 specialised vessels (liquid Nitrogen capable Dewar flasks) and should never be done in glass bottles due to the high likelyhood 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 goods 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 trained workers can work with liquid Nitrogen
- Always wear the appropriate PPE when working with liquid Nitrogen
- Avoid breathing liquid Nitrogen vapours (the "smoke" associated with liquid Nitrogen is not Nitrogen, but condensed water from the air). Nitrogen is colourless and odourless
- Only use cryovials to store samples under liquid Nitrogen. Non-approved tubes are at 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 vacinity to evacuate the area and call 911

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