Risk Assessment Form

Procedure	Safe Handling and Transportation of Liquid Nitrogen Supply Tank (240L)

Name(s) of person performing the work	Users (Lab manager & Lab Technician & Tenants & Licensee's)		
Name & position of assessor	Khwaja Islam & Laboratory Manager	**Signature**	
Date of assessment	01/10/2018	**RA Number**	BioE 0034

Outline of procedure / activity:

Cryopreservation is the most effective way to preserve biological materials with minimal ageing and to snap freeze tissues. The method involves the freezing and storage at very low temperatures, down to -196°C (liquid nitrogen). The critical temperature at which biological activity ceases, -147°C. The boiling point of LN2 is -196°C, relative density of gas is 0.97 (air=1) but the gas/vapour heavier than air. May accumulate in confined spaces, particular at or below low ground level.

Properties of Liquid Nitrogen:

- A colourless, odourless liquid
- Extremely cold
- Boiling point is -196oC
- Nitrogen gas is evolved which is neither toxic nor harmful
- Small volumes vaporize to give large volumes of gas (1litre gives 0.7 m3 of gas) which will displace oxygen in air. i.e. 1 litre of liquid nitrogen produces 683 litres of gas.

Known or Expected Hazards:

a) Temperature Related:

- The extremely low temperature of liquid nitrogen can cause severe burn-like damage to the skin either by contact with the fluid, surfaces cooled by the fluid or evolving gases. The hazard level is comparable to that of handling boiling water.
- The low temperature of the vapour can cause damage to softer tissues e.g. eyes and lungs but may not affect the skin during short exposure.
- Skin can freeze and adhere to liquid nitrogen cooled surfaces causing tearing on removal.
- Soft materials e.g. rubber and plastics become brittle when cooled by liquid nitrogen and may shatter unexpectedly.
- Liquid oxygen may condense in containers of liquid nitrogen or vessels cooled by liquid nitrogen. This can be extremely hazardous because of the pressure rise on the slightest degree of warming above the boiling point of oxygen (**-183°C**) and the possibility of explosive reaction with oxidisable material.
- Thermal stress damage can be caused to containers because of large, rapid changes of temperature.

b) Vapour Related:

- Large volumes of nitrogen gas are evolved from small volumes of liquid nitrogen (1 litre of liquid giving 0.7 m3 of vapour) and this can easily replace normal air in poorly ventilated areas leading to the danger of asphyxiation. It should be noted that oxygen normally constitutes 21% of air.
- Atmospheres containing less than 10% oxygen can result in brain damage and death (the gasping reflex is triggered by excess carbon dioxide and not by shortage of oxygen), levels of 18% or less are dangerous and entry into regions with levels less than 20% is not recommended. (Notices are posted on the freezer room lab door alerting lab workers to the dangers in case of Oxygen deficiency alarm sounding).
- Oxygen condensed into leaking containers can explode on heating following resealing or blockage with ice.

Liquid nitrogen supply tank (240 L) is stored on Level 1 freezer room (696.20.23) (10 air change per hour at all times). The procedure for filling and transportation of liquid nitrogen supply tank (240 L) as follows:

1. Two people are required for the procedure (one as observer to help if necessary).
2. Collect the lift **calling** key from Lab manager's office (level 0) (Ext. 18801) for the goods lift.
3. Using the **calling** key to call the lift to level 1 where the lift door will open.
4. Place the supply tank (240L) into the goods lift. **Never** travel in the goods lift with the supply tank (240 l). Remove the lift **calling** key.
5. Take the passenger lift or stairs to ground floor.
6. Using the calling key to call the lift to ground floor where the lift door will open (Use the car park entrance in the car park).
7. Remove the supply tank (240L) from the goods lift and take it to designated area the loading bay (front of innovation building) where the BOC driver will fill the tank with liquid nitrogen. Appropriate PPE worn (i.e. safety glasses and cryogenic gloves).
8. BOC driver will put cones where filling is taken place and a warning sign displayed "**filling in progress**" to warn pedestrians.
9. Once the supply tank is filled and using the **calling** key to call the lift to ground floor where the door will open.
10. Place the supply tank (240L) into the goods lift. **Never** travel in the goods lift with the supply tank (240 L). Remove the lift **calling** key.
11. Take the passenger lift or stairs to level 1 floor.
12. Remove the supply tank (240L) from the goods lift and take it to the freezer room where it is stored.

Note: Staff must be trained on handling and transportation of dry ice. Cross reference to COSHH assessment BioE 009 Liquid Nitrogen. Refer to safety data sheet by BOC.

Only trained personnel are allowed to fill the supply tank (240 L) of liquid nitrogen.
NEVER TRAVEL IN THE LIFT WITH LIQUID NITROGEN SUPPLY TANK (240 L).

Potential hazards

Substance or item handled	Associated Hazard (s)	Existing Control Measures	Risk (L/M/H)	Further Action required	Risk (L/M/H)
Refrigerated Liquefied Nitrogen	Asphyxiation Cold burns or injury Frost bites H280-contains gas under pressure; may explode if heated. H281-contains refrigerated gas; may cause cryogenic burns or injury.	Container kept in well ventilated room with low level extraction in case of spillage. There is 10 air change per hour in the room all the time. Wear appropriate PPE. Face shield and Safety glasses (EN 166) worn when decanting liquid nitrogen. Cryogenic gloves (EN 511) worn when decanting liquid nitrogen. Suitable foot wear worn (open toed shoes must never be worn). Guideline: ISO 20345 PPE – Safety footwear. Appropriate warning signs on the lab door. Suitable protective clothing is worn when Only trained personnel are allowed to	M	No further action required if the existing control measures are adhere to.	M

		decant liquid nitrogen. Oxygen depletion alarm will sound and beacon will flash when oxygen level drops below 18%. Low level extraction in the room (30 air change per hour).			

Persons potentially at risk:

Only the user or others near by

Action in event of an accident or emergency:

1. **First Aid Measure**:
   Inhalation – In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Remove victim to a well-ventilated area. Rescuers should not put themselves at risk; contaminated area should not be entered unless considered safe. Breathing apparatus may be required but should only be used by trained personnel. The person should be kept warm and rested, whilst medical attention is obtained. If breathing has stopped then resuscitation should be commenced by trained first aider.
   Eye contact – Rinse the eye with water immediately. Remove contact lenses, if present and easy to do. Continue rinsing. Flush thoroughly with water for at least 15 minutes. Get immediate medical assistance. If medical assistance is not immediately available, flush an additional 15 minutes.
   Skin contact – Contact with evaporating liquid may cause frostbite or freezing of skin. If clothing is saturated with the liquid and adhering to the skin then the area should be thawed with lukewarm water prior to removing the clothing.
   Ingestion - Obtain medical attention immediately.
   Emergency procedure for a major spillage or leakage – Evacuate the area and contact the laboratory manager. Treat any individuals as above for skin, eye, and inhalation and ingestion exposure. Contact BOC (Tel. 0800 111 333) a 24-hour support service for serious emergencies and incidents.

Arrangements for monitoring effectiveness of control:

Weekly check of tank and connections for leaks.

Annual inspection of the Liquid Nitrogen Supply Tank (240 L) by BOC.

Six monthly inspection of oxygen depletion sensors by Pollution Monitors.

Review of the Risk Assessment:

Date of review		Name of reviewer	
Date of next review		Signature	

Have the control measures been effective in controlling the risk?

Yes	No

Have there been any changes in the procedure or in the information available which affect the estimated level of risk from the listed substances

Yes	No

What changes to the control measures are required?

Declaration by Tenants/Licensees/Technicians:

I confirm that I have read this Risk Assessment and that I understand the hazards and risks involved and will follow all of the safety procedures stated. Where PPE has been identified as a control measure, I will ensure that it is worn.

Declaration by Laboratory Manager (LM):

I confirm that the tenant/licensee/technician who has signed below is competent to undertake the work. My counter-signature indicates that I am happy for the work to proceed.

Name (Please print)	Signature	LM Countersignature	Date

Name (Please print)	Signature	LM Countersignature	Date