

NDMRB-SOP-006 Use and Handling of Dry Ice (Solid CO₂)

1.0 Introduction

Dry ice is used throughout the NDMRB for various reasons, these include transport of cells from one location to another internally and across the campus and for sending samples in the post. The following SOP outlines the properties of dry ice and the precautions require for working with dry ice.

2.0 Properties of Dry Ice

- Dry ice is carbon dioxide in solid state – it has an expansion rate of a factor of 500
- Chemical formula is CO₂
- A translucent, white solid; at normal temperatures sublimates directly into a gas
- without passing through a liquid phase
- Non-flammable
- Temperature of dry ice is -78°C
- Asphyxiant
- Colourless gas with a slightly pungent odour which is only detectable in high concentrations

3.0 Hazards

- Asphyxiation due to the sublimation of carbon dioxide gas into the atmosphere leading to drop in ambient oxygen levels
- Inhalation of cold vapours which can cause lung damage and asthma attacks in asthma sufferers
- Cold burns from direct contact with the dry ice or equipment cooled by the material
- Cold damage to laboratory equipment leading to further hazards
- It is possible that air temperatures in the proximity of the dry ice may be lower than the general temperature, therefore hypothermia could be a hazard
- Pressurisation and rupturing of sealed systems
- The risk of asphyxiation if used or stored in a confined space.

4.0 Storage

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5.0 Handling

- No person may handle or use dry ice without being suitably trained in its safe use. It is the responsibility of laboratory supervisors / managers to ensure that all persons under their control using dry ice have been trained, and that full records of such training are maintained.
- When handling dry ice a lab coat, safety glasses and suitable insulated gloves must be worn.
- Water on solid CO₂ increases sublimation with a corresponding higher risk of asphyxiation
- As small a volume as possible should always be used
- When disposing of dry ice do not allow it to vaporise into enclosed areas such as laboratories, fridges, freezers, cold rooms, etc. Dry ice to be disposed of through vaporisation must be left in well-ventilated area e.g. a fume hood.
- Pregnant females and asthmatic workers must seek medical approval prior to working with dry ice.
- Low temperature damage to the insulation on electrical cables can lead to electrocution and equipment damage. Dry ice users must ensure that cables are not placed where they can be affected by dry ice.
- Lone working with dry ice should be avoided wherever possible. If required a Lone Working Risk assessment should be carried out.

6.0 Emergency Procedures

In the event of a cold burn from dry ice:

1. Remove any restrictive clothing - but not any that is frozen to the tissue
2. Flush the affected area with tepid water (not above 40°C) to return tissue to normal body temperature
3. Do not apply any direct heat or rub affected area
4. Cover with a loose, sterile dressing and keep patient warm
5. Obtain medical assistance immediately

- All users of dry ice should be aware of the symptoms of anoxia (physiological oxygen depletion). These include dizziness, a narcotic type affect; nausea, confusion, etc. Persons experiencing such symptoms should remove themselves to fresh air. Persons observing such symptoms in co-workers should remove

them to fresh air. In the event that breathing stops inform the local first aider and give artificial respiration.

- Do not attempt to rescue anyone from a confined space if they were working with dry ice and have lost consciousness - open the door and raise the alarm.

For minor spillages the following protocol should be followed:

1. Evacuate the area, open all windows and doors and allow the material to evaporate, ensuring adequate ventilation
2. Following return to room temperature, inspect area where spillage has occurred
3. If any laboratory equipment has been damaged following the spillage inform the laboratory manager / supervisor

For large spillages of dry ice (>1 kg) the following protocol should be followed:

1. Evacuate the immediate area
2. If safe to do so open all doors and windows.
3. Inform the DSO and Lab manager

Do not return to the area until it has been declared safe

7.0 Risk Assessment

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