The University Of Sheffield.

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Risk Assessment: DRY ICE

This assessment contains both a generic risk assessment of dry,

Properties:

- Dry ice is solid carbon dioxide and sublimes at approx. -79°C
- It is a white solid, similar in appearance to water ice
- It evaporates to carbon dioxide gas, which is colourless, odourless at low concentration and
- toxic.

Hazards:

a) Temperature related

- The extremely low temperature can cause severe burn damage to the skin, either by contact with the solid, surfaces cooled by the solid or evolving gases. The hazard is more severe when using traps where a liquid solvent (usually meths) is cooled with dry ice, as the liquid removes heat more efficiently. 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 even though skin may not be affected during short exposure.
- Skin can freeze and adhere to liquid cooled surfaces, causing tearing on removal.
- Soft materials e.g. rubber and plastics become brittle when cooled by dry ice and may shatter
- unexpectedly.

b) Vapour related

- Large volumes of carbon dioxide gas are evolved from small volumes of dry ice and this can easily increase CO2 concentrations in air to dangerous levels in poorly ventilated areas leading to the danger of carbon dioxide poisoning (which is rapidly fatal at CO2 concentrations >2.6%).
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Risks:

A) Persons at risk:

- Personnel using dry ice.
- Personnel involved in the transportation

B) Specific risks

- Dry ice must be stored in suitably insulated containers to minimise the production of CO2 gas.

C) Residual risk

- Residual risk is dependent on the competence and prior training of users, the application of the material, and the volumes handled and transported.

Control Measures:

a) Use

- DO NOT attempt to handle dry ice until you have read and fully understood the relevant risk assessments and instructions for use, and have been trained by a competent person in its use.
- Always use dry ice in a well-ventilated area, particularly when filling a warm container as large volumes of CO2 gas may be evolved.
- Ensure that containers of dry ice are suitably vented .
- Avoid skin contact with either dry ice or items cooled by it, as serious burns may occur. Beware of wearing gloves*, wristbands, watch straps or rings which may trap liquid from cold traps close to the skin

* The wearing of suitable gloves when handling liquid nitrogen is a useful precautionary measure when handling large amounts of solid dry ice. They should be loose fitting to facilitate rapid removal.

- Never dispose of large amounts of dry ice by tipping into water. It could generate enough CO2 to cause CO2 toxicity. The cloud that forms when dry ice is poured into water or when in contact with a warm object is condensed water vapour from the air, not CO2 gas.

b) Transportation & Handling

- Do not transport dry ice in closed vehicles. Carbon dioxide gas which is continuously being vented can accumulate to dangerous concentrations.
- Wear suitable heavy duty gloves and exercise caution when transferring dry ice from delivery bags to storage containers.

c) Storage

- Only store dry ice in suitably insulated containers to minimize production of CO2 gas.

d) Personal Protective Equipment

- Protective clothing in the form of lab. coat
- Open-toed shoes should not be worn under any circumstances.

Emergency Procedures:

a) First Aid

- If tissue comes into contact with the solid, cooled liquid or gas, it is important to restore that tissue to normal body temperature as rapidly as possible. This should be done by immersing the affected area in warm (40oC) water (NOT hot water), followed by protection of the injured tissue from further trauma or infection. On no account should the area be rubbed or massaged - this will destroy damaged cells completely. A First-Aider trained in frostbite treatment should be summoned and , if severe, the casualty taken immediately to hospital. The patient should neither smoke nor drink alcohol.
- Suffocation - If a person using or exposed to dry ice becomes dizzy or loses consciousness, or if they notice an increase in heart rate or “panicky” feelings, they should be removed immediately to a well-ventilated area and other personnel warned / evacuated. If breathing has stopped, artificial respiration must be applied. If breathing is difficult, oxygen should be given and the emergency services summoned. The casualty should be seen by a doctor regardless of recovery rate.

b) Spillage

- The main hazard from a major spillage of dry ice is the build up of CO2 gas. Areas affected should be immediately evacuated and personnel notified of the danger. Access to the affected area must be restricted and sufficient time given for the gas to disperse. It may be necessary to use a CO2 and breathing apparatus to establish the oxygen level in a poorly ventilated area affected by a spillage. The area should be ventilated only when safe to do so.

Level of Risk remaining

LOW: The majority of risks can be acceptably contained by the application of suitable precautions in use.