



Safety Information

Prepared by the Safety Advisory Group

Safety Info 19/08/E

Asphyxiation Risk in Open Cryo Cabins with Cooling by Means of Direct Liquid Nitrogen Injection

Introduction

EIGA has received reports of concern that there may be unacceptable asphyxiation risks to occupants of open cryo cabins used in cryotherapy where they are cooled by the direct injection of Liquid Nitrogen and if proper precautions are not taken.

Suppliers of liquid nitrogen should ensure, that their own organizations as well as their customers are aware of this Safety Information and the EIGA documents referenced on asphyxiation risks and the hazards of inert gases, to determine and implement appropriate safety measures.

This information sheet is intended to raise awareness of the asphyxiation risks associated with this application and does not address the other aspects of the design, installation, operation and maintenance of open cryo cabins.

Open cryo cabins should not be confused with cryo chambers which are cooled down by:

- indirect cooling with LIN using heat exchangers
- compressor cooling (fridge type); or
- Synthetic Liquid Air cooling.

This safety information does not apply to cryo chambers.

What is cryotherapy?

Cryotherapy is used to define several techniques and procedures in the medical community. The most general definition is the local or general use of low temperatures in medical therapy or the removal of heat from a body part to decrease pain and promote circulation. It is commonly used to treat pain conditions.

A growing market for whole body cryotherapy is as an increasingly popular treatment for rejuvenating and revitalising the body and it is being promoted as a fitness/wellness application that aims to *increase fitness and beauty, improve the immune system and metabolism and prevent skin ageing*.

Cryotherapy involves exposure to an atmosphere of minus 120°C and below.

Risks associated with open cryo cabins cooled by the direct injection of Liquid Nitrogen

At present certain suppliers and retailers in the fitness industry and some hospitals offer open cryo cabins.

Some of these open cryo cabins are cooled by directly injecting Liquid Nitrogen into the cabin. Inside the cabin the oxygen concentrations then decrease drastically. The low oxygen concentrations could endanger the life of the occupants due to the risk of asphyxiation. If not properly extracted, the vaporising liquid nitrogen can result in a depletion of the oxygen concentration in and around the cryo cabin.

The cold nitrogen vapour is heavier than air and will accumulate from the bottom of the cabin upwards. Nitrogen has no odour. Therefore if an occupant slips, submerges or faints while in the cabin the risk will be not recognized by the occupant or anybody who goes to his aid. The occupant will feel well in this oxygen depleted atmosphere, but may lose consciousness and could die.

Effects of oxygen depleted atmospheres

The normal concentration of oxygen in the air we breathe is approximately 21%. Any depletion of oxygen below 21% must be treated as hazardous and relevant precautions taken.

It is not unusual for the person suffering from asphyxia to be totally unaware of the symptoms and may even feel euphoric. It can take as little as two breaths in an oxygen deficient atmosphere to cause unconsciousness death occurs within minutes.

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Asphyxia – Effects and Symptoms of Reduced O₂ Concentration (Vol %)*

18-21%	No discernible symptoms can be detected by the individual.
11-18%	Reduction of physical and intellectual performance without the sufferer being aware.
8-11%	Possibility of fainting within a few minutes without prior warning. Risk of death below 11%.
6-8%	Fainting occurs after a short time. Resuscitation possible if carried out immediately.
0-6%	Fainting almost immediate. - Brain damage, even if rescued.

* Reference SAG NL No 77/xx/E Campaign Against Asphyxiation

Hazard Considerations and Concerns with Cryo Cabins

If properly designed and installed, the cryo cabins can be operated safely. However, there are a number of hazards that must be considered.

Within 15cms of the occupants face, the device produces depleted oxygen levels. There is no barrier to prevent the occupant dipping down further into the low oxygen atmosphere.

If there is no monitoring of the oxygen levels anywhere in the device and should something go wrong there will be no warnings that oxygen levels have dropped near the occupants' face.

The systems normally operate with an extract fan to ensure that the occupant is breathing normal air. Should the fan fail, then the extract will stop and the nitrogen gas could possibly engulf the occupant's head.

For these reasons it is necessary that there is close and constant visual observation of the occupant by personnel properly trained to safely operate the equipment and respond correctly to any emergencies that may occur.

The likely locations for these units are within buildings such as hotel spas and fitness gyms. The location of the unit within the confines of a building may well cause reduced oxygen levels in the surrounding area if the area is not designed with proper extract.

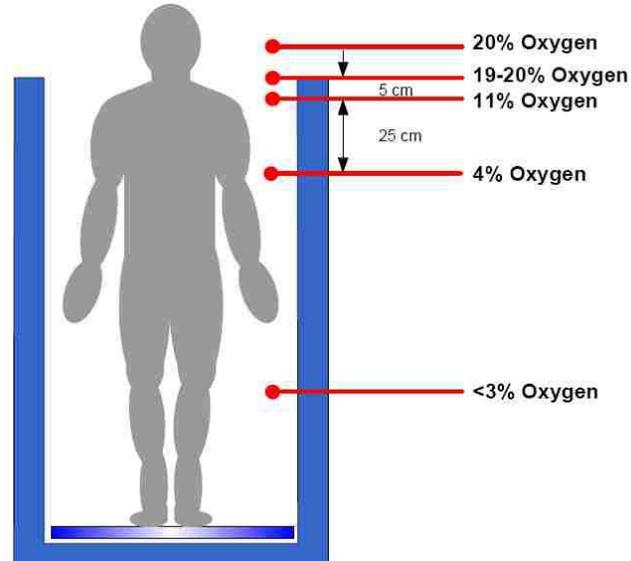


Figure 1: Example of oxygen concentrations measured in a properly designed and operated open cryo cabin.

Safe Operations

Open cryo cabins can be used safely if suitable and sufficient engineering controls are fitted to the cabin to prevent any possibility of nitrogen reaching the airways of the cabin occupant.

These engineering controls must be properly designed, installed, maintained and operated by suitably qualified personnel.

The supervisory personnel must be fully trained in the operation of the equipment and in the hazards of reduced oxygen levels through nitrogen enrichment.

References

IGC Doc 44/xx Hazards of Inert Gases

SAG NL 77/xx Campaign Against Asphyxiation

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