Sustainable cryotherapy

There are two main sustainability issues with ophthalmic cryotherapy: the cryogenic gas used to drive the freeze, and the use of disposable instrumentation.

Cryogenic gases

Two alternative gases are widely used to drive cryotherapy units: Nitrous Oxide (N_2O) and Carbon Dioxide (CO_2). Pressurised gas passes through a tiny aperture within the cryo probe tip, allowing it to expand suddenly which results in a drop in temperature. This is known as the Joule-Thomson effect [1]. These particular gases are used because they are widely available in healthcare, and their thermodynamic properties are such that a relatively small drop in pressure across the Joule-Thomson aperture results in a relatively large drop in temperature. For one widely-used cryotherapy machine in the UK, CO_2 produces a freeze that is 2°C colder than that produced by N_2O [2].

N_2O has a Global Warming Potential (GWP) 273 times that of CO_2 over a 100-year period, and lasts in the atmosphere for over 100 years [3]. There is therefore a considerable carbon saving to be made by switching a cryotherapy machine from N_2O to CO_2. CO_2 is cheaper then N_2O when purchased as a pressurised cylinder, so there is a cost saving to be made. Additionally, N_2O is subject to COSHH regulations and requires controlled venting; CO_2 by comparison can be vented directly into the operating theatre.

Most cryotherapy consoles have the ability to operate using either N_2O or CO_2, and a switch can be very easily made by ordering the appropriate connector.

Disposable cryo probes

Single-use cryo probes are less sustainable than reusable probes, because of the higher carbon footprint of manufacture, packaging and transportation both to and from the hospital, compared with the sterilisation of reusable probes on site. There are additional environmental issues regarding specialist medical waste disposal and landfill, as these items are not designed to be recycled. A switch from disposable to reusable cryo probes will therefore represent a considerable carbon saving.

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