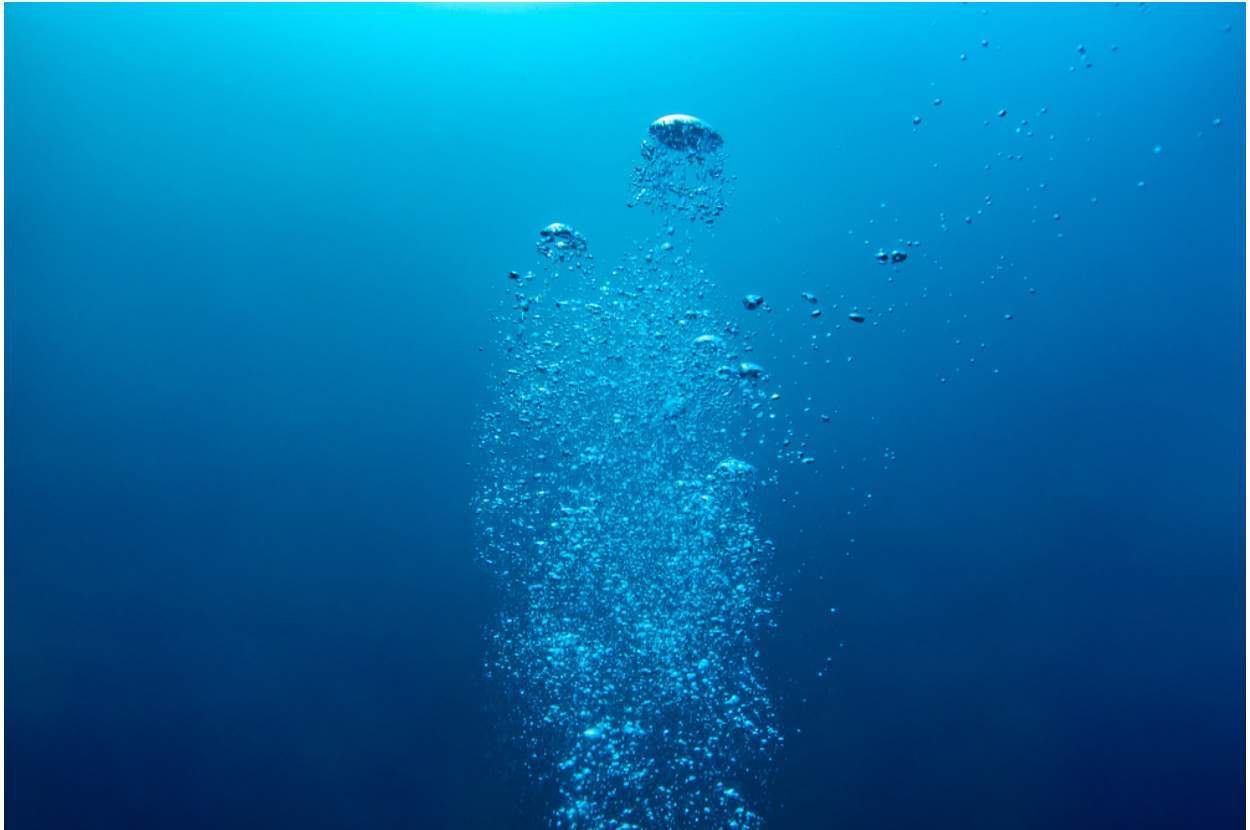


## Hyperbaric Oxygen Therapy (HBOT)



Let's talk about Hyperbaric Oxygen Therapy (HBOT) in a way that's easier to understand. Normally, our body tissues need around 60 milliliters of oxygen per liter to stay healthy. HBOT is a treatment that gives your body extra oxygen, which can be really beneficial.

But here's the interesting part: HBOT doesn't just provide more oxygen; it also triggers a process in your cells. It makes something called "oxidative stress," which sounds a bit fancy but is actually a controlled way to help your body heal. It activates certain processes in your cells and pathways to make you feel better.

Now, you might be wondering if HBOT is safe. Well, most of the time, it is. And if there are any side effects, they're usually not too severe and can be reversed. The two main things to watch out for are "barotrauma," which is pressure-related damage, and "oxygen toxicity." But here's the good news: in wellness clinics, they use lower pressures (1.3 Atmospheres versus 2.5 Atmospheres in most healthcare studies), so

you don't need to worry much about barotrauma. Oxygen toxicity is a concern if you have sessions very often at higher pressures, and it can cause symptoms like changes in your vision, ringing in your ears, anxiety, confusion, and dizziness. Again in the wellness setting, the pressures used are much lower than in research studies where a typical course of HBOT might be 40 sessions, one per day at 2.5 Atmospheres pressure.

So, in a nutshell, HBOT can provide extra oxygen to your body and help you heal. It's a safe treatment with just a few things to keep in mind.

## **Uses of hyperbaric oxygen therapy**

### **Injury and recovery**

hyperbaric oxygen therapy has become very popular around people with sports injuries however the evidence supporting this practise is quite low there are few clinical studies suggesting an advantage of hyperbaric oxygen therapy for sports injuries. Inflammation after injury increases inflammatory mediators, vascular permeability and oedema (Brancaccio, Lippi and Maffulli, 2010). Potential mechanisms for HBOT effects of delivering more oxygen without an increase in blood vessel permeability which could simultaneously reduce odema and hypoxia. Some studies have also shown increased in healing cells and muscle fibre regeneration and strength (Oyaizu *et al.*, 2018)

### **Cancer**

Hypoxia in cancer plays a major role in cancer and has been shown to increase genetic instability and activate tumour growth in some studies (Daruwalla and Christophi 2006). There have been studies combining HBOT with chemotherapy showing a decrease in odema and angiogenesis (blood vessel growth) within tumours, and HBOT may increase the uptake of chemotherapy drugs (Moen *et al.*, 2009) In hypoxic (low oxygen) conditions,,poor perfusion prevents chemotherapy reaching tumour cells

(Daruwalla and Christophi, 2006). Studies have shown improved drug delivery by improving oxygenation of cells Cho ref. A study of HBOT combined with 5-FU enhances the chemotherapeutic effect of 5-FU (Takiguchi *et al.*, 2001)

There have been a small number of randomised trials of combining HBOT and chemotherapy compared to chemotherapy alone. One trial (Aphale and Shah, 2021) showed a significant increase in reduction of tumour volume in the combination of HBOT and chemotherapy arm compared to chemotherapy alone. It is worth considering this evidence with caution as the sample sizes are small and reduction in ultrasound tumour size does *not always* correlate with pathological size and outcomes.

Overall it is likely that HBOT does not cause harm in the oncology setting when used alongside or after chemotherapy.

## **Radiotherapy side effects**

In the field of radiotherapy, the evidence is stronger with many trials and data suggesting a safe and effective therapy option for late radiotherapy effects caused by fibrosis such as pain. It is even licensed and covered for such use in the Netherlands. The combination of oxygen and increased air pressure induces neovascularisation (increasing blood flow) and stimulation of collagen by fibroblasts (Williamson, 2007) . In a study of 67 patients who received HBOT after breast radiation therapy 85% showed a reduction in pain, breast and arm symptoms at 12 months (Spruijt and van den Berg, 2020). Some studies have used PROM measures including the EORTC-QLC-C30 questionnaire | the same one we use routinely in our own practice with our VineHealth patient symptom tracking app (*Vinehealth | Supported self-management*, no date)

## **Lymphodema**

In the systematic review by Meier *et al.* seven studies were identified which evaluated lymphodema (Meier *et al.*, 2023) 3 out of 4 studies measuring lymphodema of the breast reported a reduction in lymphodema (Carl *et al.*, 2001) (Teguh *et al.*,

2016)(Spruijt and van den Berg, 2020). However three studies reported no significant benefit.

## **How much HBOT is needed to have an effect in these settings?**

This is an important question ask in most research studies in chemotherapy and in radiotherapy toxicities standard HBOT treatment protocols consist of 40 treatments (1 session/day 5 days per week at 2.5 atmospheres (ATA)).

## **What are the risks and side effects of HBOT?**

In research studies with daily therapies mild side effects are seen related to mild barotrauma (graded 0-2 on a 6 point MacFie Classification) and myopia, fatigue and other symptoms.

In the wellness arena, both the frequency and level of hyperbaric oxygen are lower (1.3 ATA versus 2.5 ATA typical in trials), and therefore we do not expect to see any significant side effects. For clinical purposes the Undersea and Hyerbaric Medical Society (UHMS) indicates that pressurisation should be 1.4 ATA or higher to be effective. Typically each session takes between 60 and 120 min. Approval of HBOT for medical indications varies between country. In the USA there are 14 medical indications for which HBOT is approved. In Europe the European Committee for hyperbaric medicine has accepted 30 indications (Mathieu, Marroni and Kot, 2017) in three catagories:

Category 1: Strongly indicated as primary method of treatment

Category 2: Where it is suggested and use supported with acceptable evidence

Category 3: Considered as possible use but not yet supported by evidence

There's no official approval for using Hyperbaric Oxygen Therapy (HBOT) to treat sports injuries. However, for some cases, like breast reconstruction with implants, it's considered a category 2 indication, which means it's a possibility. What's interesting is that the way HBOT works for category 1 and 2 indications, such as ulcers and slow-

healing wounds, can give us valuable insights. It suggests that this approach could be useful for injuries where there's a lot of inflammation.

We feel this provides enough evidence to confirm HBOT is a safe and possibly beneficial treatment as part of an integrated wellness programme.

## Contraindications?

- Pregnancy
- Significant ear conditions such as perforated eardrum

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