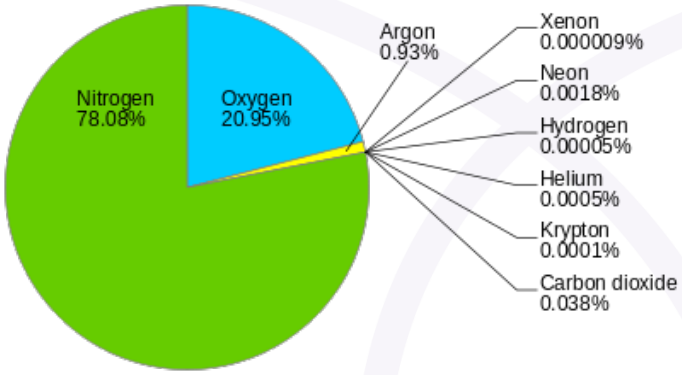
## How does the addition of Hydrogen gas impact the effective O2 concentration within the AirPod?

At any time, the air around us is a mixture of different molecules at a fairly consistent concentration.




The molecules exist at these concentrations due to their different densities - this is where they equilibrate.

By infusing more hydrogen gas into the environment, it forces the other elements to equilibrate again. The hydrogen gas effectively displaces the nitrogen gas, and so we see the concentration of nitrogen decrease. This decline in concentration is filled by the next most abundant molecule: Oxygen.

The benefit of this process is that, in a Hydrogen enriched environment such as the AirPod Hydroxy, the Oxygen concentration is increased from 35 to up to 50%. This is comparable to the oxygen concentration delivered at 1.5ATA.

## What are some of the other benefits of a Pressurised Environment Below 1.40ATA?

Studies show that once the pressure within an environment exceeds 1.40ATA, the risk of oxygen toxicity and middle-ear barotrauma increase. These are rare side effects of Hyperbaric Therapy above 1.40ATA and need to be carefully managed.

To mitigate these risks, the AirPod therapy does not exceed 1.35ATA. At this pressure, the partial pressure of oxygen is 0.28. After infusing hydrogen gas into the chamber, the partial pressure of oxygen increases to ~0.31, which is comparable to operating the AirPod chamber at a pressure of 1.5ATA1 without all the negative risks commonly associated with it.

[1] Partial pressure of oxygen at 1.50ATA is 0.315

**Address**
Neowell Headquarters
359 Clarendon Street
South Melbourne, Victoria,
Australia 3205

**Email**
dennis@neowell.co

**Call**
1800 836 657 (AU) +61 3 9108 5900 (INT)

## Additional benefits of Hydrogen to the therapy.

Research shows that high levels of HBOT result in the accumulation of free radicals in the blood (Narkowicz, Vial, & McCartney, 1993). Whilst our treatment, at pressures of <1.30ATA, does not classify as a 'high level' of HBOT, by being proactive to reduce this risk we can set ourselves apart from other alternative treatments.

Reactive Oxygen Species (ROS) are one such group of free radicals that exist in the body. Whilst some ROS have an important physiological function in the body, others in excess can pose a threat to healthy cells. The body has its own mechanism to deal with the accumulation of toxic ROS, however in some cases it is simply not enough.

When ROS production within our body increases due to lifestyle stressors, illness, or other events, so too does the number of unhealthy cells in our body. In this way, the build-up of ROS in the body is a characteristic precursor to several non-communicable diseases such as Diabetes, Alzheimer's, and Parkinson's.

The inclusion of Hydrogen gas in our AirPod Hydroxy treatment allows us to proactively
manage this risk due to Hydrogen's proven benefits as a powerful antioxidant.

As stated, not all ROS are bad for our bodies. This is why it is beneficial that Hydrogen will only react with the hydroxyl radical; the most toxic free radical in the body (Ohsawa, et al., 2007). Hence it is more selective, and thus safer for use as a treatment. The study also highlighted the versatile benefits of hydrogen in other fields such as increased perfusion of tissues to neuro-protective effects.

The use of hydrogen for therapeutic benefits is an exponentially expanding field. Tyler LeBaron, the founder of the Molecular Hydrogen Institute speaks to its growing prominence:

*"Hydrogen has therapeutic potential in over 170 different disease models and inessentially every organ of the human body".*

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## Hydrogen and Reperfusion Benefits

There are many exciting papers currently being published about the benefits of hydrogen in more clinical settings. The main premise of HBOT is to increase the perfusion of tissue.

A study by Zhou et al., (2013) touches on the benefit of hydrogen in this aspect. Following thorax surgery, many post-operative complications stem from inadequate reperfusion of tissue. In this clinical trial they look at the ability of hydrogen to ameliorate this risk, with very positive results.

This study provides an important clinical application and independently illustrates the incremental benefit of incorporating hydrogen in treatment protocols.

Figure 1:

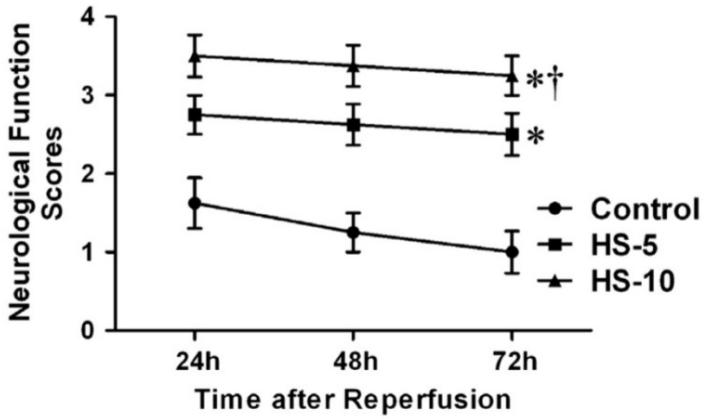


*Figure 1. The use of hydrogen-rich saline (HS) to aid the reperfusion of tissue following thorax surgery. HS was administered in two doses; 5ml (HS-5) and 10ml (HS-10)*

One of the other risks of HBOT at higher degrees is the possibility of developing oxygen toxicity. Oxygen toxicity has a variety of negative physiological consequences, mainly damage to the mitochondria and supporting cells.

A study conducted in 2017 looks at the use of H2 gas to offset this oxygen-overload (Yu, Yu, Liu, Zhang, & Xue, 2017). The data showed that H2 promoted cell viability and inhibited the damage in the cell and mitochondrial membrane.

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