Oxygen Therapy "How it Works"/ What the research says

· **The Hyperoxic-Hypoxic Paradox by Hadanny & Efrati, 2020 I Biomolecules**

This review explains why HBOT works at a cellular level. When you breathe high-pressure oxygen between 1.5ATA- 2ATA repeatedly over multiple sessions, you create fluctuations in tissue oxygen levels. These fluctuations trigger the same beneficial responses your body normally uses to adapt to low oxygen without actual oxygen deprivation. This activates HIF-1α, which promotes new blood vessel formation, turns on SIRT1 pathways that improve mitochondrial (cellular energy) function, upregulates your body's antioxidant defenses, and mobilises stem cells for tissue repair. These benefits only happen with repeated sessions to trigger protective adaptations.

Reference: Hadanny A, Efrati S. The Hyperoxic-Hypoxic Paradox. Biomolecules. 2020;10(6):958.

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- **Mitochondrial Recovery and Oxidative Stress by Schottlender et al., 2021 I Biomolecules**

This review explores why treatment duration is so important by looking at how mitochondria (your cells' energy factories) respond to HBOT. With just a few sessions (⩽5), mitochondrial function actually gets worse as oxygen levels spike, stress increases, and cells start showing signs of damage. But if you continue treatment (⩾20 sessions), there is a shift as mitochondria adapts, energy production improves, and your body's antioxidant systems upregulate to handle the oxygen challenge. By sessions 15-25, the transition from "harmful stress" to "beneficial adaptation" occurs.

Reference: Schottlender N, Gottfried I, Ashery U. Hyperbaric Oxygen Treatment: Effects on Mitochondrial Function and Oxidative Stress. Biomolecules. 2021;11(12):1827.

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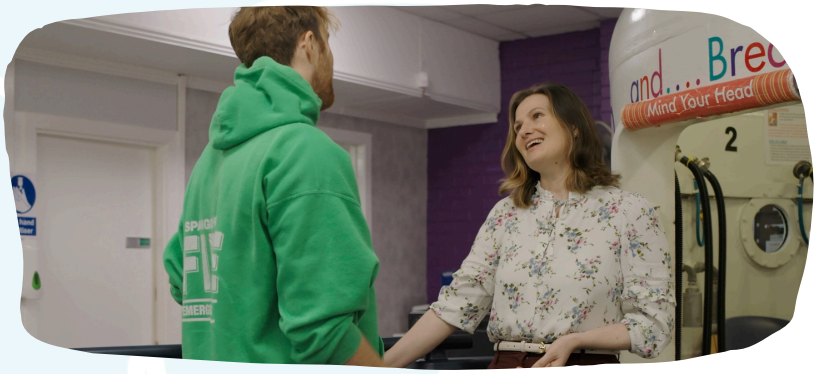

A General Overview on the Hyperbaric Oxygen Therapy: Applications, Mechanisms and Translational Opportunity by Ortega et al., 2021 I *Medicina*

This review covers how HBOT works and covers its clinical and emerging uses from wound healing (diabetic foot ulcers, skin grafts, radiation-damaged tissue), serious infections, and medical emergencies. It also discusses emerging uses including COVID-19, cancer, and inflammatory conditions (fibromyalgia, inflammatory bowel disease).
As discussed, HBOT delivers 100% oxygen at 2-3 times normal atmospheric pressure for 90-120 minutes per session. The pressure allows oxygen to dissolve directly in your blood plasma at up to 20 times more than normal independent of red blood cells. This creates a steep gradient that pushes oxygen into damaged, oxygen-starved tissues. Repeated exposure to high oxygen activates HIF-1α (promoting new blood vessel formation), turns on SIRT1 pathways that improve mitochondrial function, upregulates antioxidant defenses, reduces inflammation by downregulating TNF-α and IL-6, enhances immune cell killing of bacteria, and mobilises stem cells for tissue repair. Importantly, these benefits only happen with repeated sessions.

Reference: Ortega MA, Fraile-Martinez O, García-Montero C, et al. A General Overview on the Hyperbaric Oxygen Therapy: Applications, Mechanisms and Translational Opportunities. *Medicina*. 2021;57(9):864.