

Oxygen-rich environment can keep senescent & zombie cells dividing to maintain homo-sapiens & mammals longevity

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Introduction

Breathe inside an *oxygen-rich environment* under an increased environmental pressure, like *a scuba diver carrying an abundant oxygen tank*, going down in the ocean bottom. Unfortunately, this scenario is difficult to do in any “*negative-control experiments*” with the lack of oxygen. Thus, we recourse to emulate such an situation by intersection of two really fascinating concepts in longevity science commenced seems early in *Israel experiments*, ref.1: (1) *HBOT (HyperBaric Oxygen Therapy)* and (2) the *Hayflick Limit* (the fixed number of times a normal human cell population will divide before cell division stops, around 50 to 70 times).

The so-called *Hyperopic-Hypoxic Paradox*: While we used to think the *Hayflick limit* was a hard, unbreakable biological truth.

However, recent clinical research *HBOT* protocols can essentially “add turns” back to that cellular clock. The mechanism comes down to how *HBOT* triggers a distinct molecular trick which directly targets the *main fuse* of the *Hayflick limit: telomeres*. Normally, if you put cells in a high-oxygen environment, you risk causing oxidative stress that actually speeds up cellular aging. However, clinical protocols (most notably popularized by research from *Shamir Medical Center* that utilize *intermittent hyperbaric oxygen*).¹

Procedure

One breathes 100% oxygen inside a pressurized chamber (usually around 2.0 atmospheres absolute, or ATA), and then the oxygen levels are periodically at every 20 minutes twice pressure & intermittent with 5 minutes dropped back to normal pressure, cf. Figure 1 *HBOT* Oxygen chamber about a man-size: This extra-large 40-inch diameter Hard Hyperbaric chamber is our largest hard-shell hyperbaric chamber provided with advanced touchscreen controls and integrated progressive controls that allow the selection of individual pressures up to 2.5 ATA.



Figure 1 Hard hyperbaric oxygen therapy (HBOT) chamber used to administer 100% oxygen under increased atmospheric pressure (typically 2.0–2.5 ATA).

The Illustration: this rapid drop from extreme high oxygen (hyperoxia) to normal oxygen levels is interpreted by your cells as a sudden shortage of oxygen (hypoxia).

The response: Even though your tissues aren’t actually starving for oxygen, this “trick” triggers a massive surge of cellular protective mechanisms without the destructive damage of real oxygen deprivation. How This Extends the Cellular “Clock” When you trigger this fake hypoxia response repeatedly over a course of treatment (typically 60 sessions), a couple of major shifts happen that directly affect cellular lifespans: (a) Elongation of Telomeres.

The ultimate governor of the *Hayflick* limit is the *telomere—the protective cap* at the end of our chromosomes. Every time a cell divides, these caps get a little shorter. When they get too short, the cell hits its *Hayflick* limit and permanently stops dividing.

HBOT stimulates the expression of *Sirtuins* (longevity proteins) and upregulates *telomerase*, the *enzyme* responsible for maintaining and adding length back onto telomeres. A landmark 2020 human trial showed that a 3-month HBOT protocol increased the telomere length of certain immune cells (like B-cells and T-cells) by over 20%. By lengthening the telomeres, you effectively reset the countdown, allowing the cell line to undergo more divisions (“turns”) before hitting its limit.

Clearance of senescent cells

When cells do hit their *Hayflick* limit, they don’t always die quietly. Often, they turn into “*zombie cells*” (*senescent* cells) that linger, secrete inflammatory signals, and damage neighboring healthy cells—speeding up the aging of the entire tissue.

The *hyperoxic-hypoxic protocol* acts naturally, meaning it helps the body identify and clear out these *zombie cells*. In the same human trials Ref.1, *HBOT* cleared out senescent *T-helper cells* by up to 37%. Clearing these cells makes room for younger, healthy stem cells to replicate and take their place.²

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Conflicts of interest

The author declares that there are no conflicts of interest.

References

1. Hachmo Y, Hadanny A, Abu Hamed R, et al. Hyperbaric oxygen therapy increases telomere length and decreases immunosenescence in isolated blood cells: a prospective trial. *Aging (Albany NY)*. 2020;12(22):22445–22456.
2. Hyperbaric oxygen therapy (HBOT) chambers manufactured for sports and affluent individuals worldwide; lower-cost units (~US\$60,000) manufactured in China.