Hyperbaric Oxygen Treatment Reverses Signs of Aging

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STORY AT-A-GLANCE

- > Researchers from Tel Aviv University have been exploring the benefits of exposure to high-pressure oxygen at different concentrations inside a pressure chamber for years, with studies showing such treatments improved stroke, brain injury and brain function that was damaged by aging
- > A recent study suggests hyperbaric oxygen treatment (HBOT) targets two cellular hallmarks of aging — shortening of telomeres and cellular senescence, or the loss of a cell's ability to divide and grow — helping to reverse signs of the aging process in humans
- > After HBOT, telomeres at the end of chromosomes grew longer instead of shorter, at a rate of 20% to 38% depending on the type of cell
- Senescent cells decreased significantly, by 11% to 37% depending on cell type, after HBOT
- > The use of telomere length as a marker for aging is in itself controversial, and the study sample was small, with some suggesting the results should be interpreted with caution; however, other experts agree HBOT can have significant benefits for longevity and chronic conditions

Hyperbaric oxygen treatment may be a practical method for slowing down the hands of time. At its foundation, aging represents a progressive loss of physiological capacity, researchers from Tel Aviv University and the Shamir Medical Center in Israel explained in the journal Aging.¹

The biological deterioration leads to impaired functions and increased vulnerability to diseases, including cancer, heart disease, diabetes, Alzheimer's disease and others.

Hyperbaric oxygen treatment (HBOT), the Aging study suggests, may target two cellular hallmarks of aging — shortening of telomeres and cellular senescence, or the loss of a cell's ability to divide and grow — thereby reversing signs of the aging process in humans.²

Sixty Hyperbaric Oxygen Sessions Slow Down Aging

The research team has been exploring the benefits of exposure to high-pressure oxygen at different concentrations inside a pressure chamber for years, with studies showing such treatments improved stroke, brain injury and brain function that was damaged by aging.³

The current study looked at hyperbaric oxygen treatment on healthy adults aged 64 and over to determine its effects on the normal aging process at a cellular level.

Thirty-five subjects were exposed to a series of 60 hyperbaric oxygen sessions over a 90-day period. Blood samples, which were analyzed for immune cells, were collected before, during and after the treatments. Two exciting results were found:⁴

- Telomeres at the end of chromosomes grew longer instead of shorter, at a rate of 20% to 38% depending on the type of cell
- Senescent cells decreased significantly, by 11% to 37% depending on cell type

In a Tel Aviv University news release, study author Dr. Shai Efrati of the university's Sackler School of Medicine, explained:

"Today telomere shortening is considered the 'Holy Grail' of the biology of

aging. Researchers around the world are trying to develop pharmacological and environmental interventions that enable telomere elongation. Our HBOT protocol was able to achieve this, proving that the aging process can in fact be reversed at the basic cellular-molecular level."

Telomeres and Cellular Senescence: Keys to Aging?

Telomeres are repetitive nucleotide sequences at the end of each chromosome. Sometimes compared to the plastic tip on a shoelace, telomeres help protect DNA, preserving chromosome stability and preventing "molecular contact with neighboring chromosomes."⁵

Evidence suggests telomere length may predict morbidity and mortality, with shorter telomeres linked to an increased risk of premature death,⁶ but the link is controversial.

"This uncertainty is actually due to a kaleidoscope of biological and technical factors, including preanalytical issues (e.g., sample matrix), poor standardization of techniques used for their assessment, and dependence of telomere structure upon genetics, epigenetics, environment and behavioral attitudes, which may be present at a variable extent in various physiological or pathological conditions," researchers wrote in the Annals of Translational Medicine.⁷

Still, despite the controversy, telomere shortening has been associated with a 23% higher risk of all-cause death, along with increased risk of certain cancers, including glioma, neuroblastoma, ovarian, endometrial, lung, kidney, bladder, skin and testicular.⁸

Telomere shortening is also said to represent a "major measurable molecular characteristic of aging of cells in vitro and in vivo," which may have developed as a mechanism to protect against tumors in long-lived species.⁹

Dr. Amir Hadanny, chief medical research officer of the Sagol Center for Hyperbaric Medicine and Research at the Shamir Medical Center, an author of the featured study, added that lifestyle modifications and intense exercise have previously been found to slow telomere shortening, but HBOT appears to be another viable option:¹⁰

"In our study, only three months of HBOT were able to elongate telomeres at rates far beyond any currently available interventions or lifestyle modifications. With this pioneering study, we have opened a door for further research on the cellular impact of HBOT and its potential for reversing the aging process."

Cellular senescence is also known to play a role in cellular aging, and the accumulation of senescent cells is believed to be an integral part of the aging process, even potentially acting as a causal factor in age-related disease.¹¹

Research is underway to develop therapeutic strategies to interfere with cellular senescence, including eliminating senescent cells,¹² and HBOT has emerged as one potential strategy.

Not Necessarily a Clear-Cut Fountain of Youth

It's important to take the study's limitations into account when evaluating whether HBOT is truly a fountain of youth, as the researchers imply. It was a small study, which means the results should be replicated in a larger sample of subjects.

Also, as mentioned, the use of telomere length as a marker for aging is in itself controversial. The study also measured telomere length on immune cells called T cells, which may fluctuate depending on a number of environmental conditions, such as exercise.

It's a positive sign that HBOT also decreased cellular senescence in T cells, but as noted by Steve Hill, who serves on the board of directors for LEAF, a nonprofit

"The problem with interpreting these results as rejuvenation or age reversal is that T cells are a poor choice of cell type to use for this kind of thing due to their highly dynamic nature. Unfortunately, they are a popular cell type to use in these sorts of studies, due to the ease of collection from the bloodstream.

These particular immune cells can have large variance in their telomere length based on the demand for cellular replication at that particular time.

T cell populations replicate rapidly in the face of pathogens, and with each replication, the telomeres shorten, meaning that telomere lengths can vary in these cell populations from day to day. Infection and other environmental factors can play a key role in the status of T cell telomeres, and this is why they are not overly useful as aging biomarkers."

This isn't to say that HBOT isn't useful, as other experts agree HBOT can have significant benefits for **longevity**. One of the reasons I'm fascinated by HBOT, in particular, is because of its ability to improve mitochondrial function.¹⁴ However, it should be viewed as one component of healthy aging, not necessarily a magic bullet that will stop it in its tracks.

How Does Hyperbaric Oxygen Therapy Work?

HBOT has long been used as a treatment for decompression sickness that can occur among scuba divers. When you sit in a **hyperbaric oxygen therapy** chamber, you breathe air that has two to three times greater air pressure than normal, which allows your lungs to absorb more oxygen.

This, in turn, increases the amount of oxygen in your blood, which is transported throughout your body, fighting pathogenic bacteria and stimulating the release of healing growth factors and stem cells.¹⁵

In my interview in the video above with Dr. Jason Sonners, a chiropractor who has worked with HBOT for over 12 years, he explains that oxygen can be viewed as a nutrient. Your body needs it to carry out its regular functions and, when tissue is injured, it needs even more oxygen for healing.¹⁶

Most healthy individuals have somewhere between 96% and 98% oxygen in their hemoglobin, which means your capacity to increase your oxygen level is between 2% and 4%, were you to breathe medical-grade oxygen, for instance. However, you can increase your oxygen level far beyond that if your body is under pressure. According to Sonners:

"Two main laws govern how that works: Boyle's Law and Henry's Law. Basically, as you take a gas and exert pressure on it, you make the size of that gas take up less space. As a result of that pressure, you can then dissolve that gas into a liquid.

An easy example is a can of seltzer. They're using carbon dioxide and water. But basically, you can pressurize that can, so you can put carbon dioxide into that can. As a result of that pressurization, you can dissolve molecules of carbon dioxide into the water.

In the hyperbaric version of that, we're using oxygen, and the can is the chamber. But as a result of dumping excess oxygen inside that chamber, you can dissolve that into the liquid of your body ... directly into the tissue and the plasma of your blood.

The oxygen in your blood is carried by hemoglobin. The plasma that carries your red blood cells that holds the hemoglobin normally does not carry oxygen. We rely wholly on red blood cell oxygen-carrying capacity. But inside the chamber, you could literally bypass the red blood cell oxygen-carrying capacity altogether, and you can absorb oxygen directly into the plasma and tissue of the body."

HBOT Fights Mitochondrial and Oxidative Stresses, COVID-19

HBOT can be used to help speed healing of any inflammatory condition, and it's known to facilitate wound healing and cell survival.

A small study involving 10 healthy men also revealed that a single 45-minute HBOT session reduced levels of metabolic stress-related biomarkers, including attenuating mitochondrial and oxidative stresses and relieving metabolic burdens, which suggests it may be useful for treating metabolic diseases.¹⁷

The fact that HBOT protects against mitochondrial dysfunction¹⁸ is a major benefit, considering most chronic and degenerative diseases involve **mitochondrial dysfunction**. Unfortunately, conventional medicine still reserves HBOT for a limited number of conditions, such as certain brain injuries and serious wounds, as well as the following:¹⁹

Severe anemia
Brain abscess
Bubbles of air in your blood vessels
Burns
Carbon monoxide poisoning
Crushing injury
Deafness, sudden
Decompression sickness
Gangrene

Infection of skin or bone that causes tissue death
Nonhealing wounds, such as diabetic foot ulcer
Radiation injury
Skin graft at risk of tissue death
Traumatic brain injury
Vision loss, sudden

In the U.S., there are only 14 conditions for which insurance will pay for HBOT, whereas there are up to 100 approved indications for HBOT internationally, according to Sonners.

From my perspective, it's medically reprehensible and inexcusable for a doctor to not treat patients with diabetic neuropathy, infections in the distal extremities or peripheral vascular disease with HBOT, as it will in most cases prevent the need for amputation. Other conditions that may benefit from HBOT include:

All autoimmune conditions

Neurological conditions, including concussion, traumatic brain injury, dementia and post-stroke

Musculoskeletal injuries, including broken bones, disk herniations, and torn muscles and tendons

Any condition involving mitochondrial dysfunction

Any condition involving damaged microcirculation or that can benefit from

Chronic infections such as Lyme disease, and subacute infections that cause damage over time

Cancer co-management — As noted by Sonners, researchers are looking at HBOT in cancer treatments in a number of different ways. For example, doing it may allow you to use less radiation or chemo and still get the same outcome. Or, it may allow the patient to tolerate higher amounts of radiation by speeding the healing between sessions. A third avenue of investigation is the use of HBOT in isolation.

HBOT is also showing promise for treating COVID-19 via a number of beneficial effects, including reversing hypoxia, reducing inflammation in the lungs, increasing viricidal reactive oxygen species, upregulating HIF-increasing host defense peptides and reducing proinflammatory cytokines such as IL-6.²⁰

Typically, hospitals will only provide HBOT if you have one of the 14 approved indications. If you're interested in HBOT for other medical or longevity purposes, you'll need to look into the private sector for treatment. The International Hyperbaric Association²¹ (IHA) and Hyperbaric Medical International²² (HMI) are two organizations that may direct you to more local centers.

You can also learn more on HBOTusa.com, which is Sonner's primary education website where you can find a list of treated conditions, research, the benefits of HBOT in athletics, testimonials and much more.