

Could an existing oxygen therapy treat Alzheimer's?

By Catharine Paddock PhD | Published Thursday 7 December 2017

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Breathing oxygen at a higher-than-normal air pressure might ease some of the symptoms of Alzheimer's disease, if recent research done in mice has the same results in humans.

Mice genetically engineered to develop some human features of Alzheimer's disease showed significant reductions in physical and behavioral symptoms after 2 weeks of daily treatment with hyperbaric oxygen therapy (HBOT).

This was the result that a team hailing from the University of Tel Aviv (TAU) in Israel reported in a paper that was published recently in the journal *Neurobiology of Aging*.



Could a treatment used in burn injuries and carbon monoxide poisoning work against Alzheimer's disease?

"This research is extremely exciting," notes lead investigator Uri Ashery, a professor in TAU's Faculty of Life Sciences, "as it explores a new therapy that holds promise as a treatment of Alzheimer's disease."

Alzheimer's is a progressive disease that gradually destroys brain tissue and people's ability to remember, think, communicate, and lead independent lives. It is the most common form of dementia.

The growing burden of Alzheimer's

Of the 47 million people worldwide living with dementia, around 65 percent are thought to have Alzheimer's disease.

In the United States — where an estimated 5.5 million people have Alzheimer's — the disease is the just one of the top 10 leading causes of death for which there is currently no cure or treatments to prevent or decelerate it.

The burden of the disease is growing as the population of the U.S. ages. While deaths from other major causes are falling, deaths from Alzheimer's are rising fast.

During 2000–2014, deaths from heart disease — the number one killer — fell by 14 percent, while deaths from Alzheimer's rose by 89 percent.

A classic hallmark of Alzheimer's disease is the presence of "plaques" of amyloid protein fragments and "tangles" of another protein called tau in the brain. Damage to cells by free radicals, known as "oxidative stress," is another hallmark, as is brain inflammation.

HBOT's potential in Alzheimer's disease

HBOT is a type of treatment during which the person breathes oxygen at a pressure that is greater than normal air pressure. The treatment, which is delivered inside a pressurized chamber, can cause the lungs to absorb up to three times more oxygen than usual.

It is thought that, by improving the blood's delivery of oxygen, HBOT helps affected tissue to fight infection or recover from injury by releasing stem cells and growth factors.

In the U.S., the Food and Drug Administration (FDA) have approved HBOT for the treatment of certain conditions, such as the "bends," or decompression sickness in divers.

The FDA have also approved HBOT for 13 other medical uses, including: treating burns caused by heat or fire; carbon monoxide poisoning; and embolism, a condition wherein bubbles of air or gas can block the bloodstream.

The researchers note in their study paper that, while HBOT "has been used successfully to treat several neurological conditions," its effects on Alzheimer's disease "have never been thoroughly examined."

HBOT reduced symptoms in mice

Therefore, for their investigation, the team used a mouse model of Alzheimer's disease to test the effects of HBOT on behavioral symptoms and physical hallmarks. This involved using "transgenic mice" that had been engineered to develop some of the hallmarks of Alzheimer's disease.

Although they do not fully replicate human Alzheimer's disease, transgenic mice are widely used in preclinical studies of potential new treatments and as "tools for developing insights into the biological basis" of the disease.

In a hyperbaric oxygen chamber that they custom-built for the small animals, the researchers gave the transgenic mice 1 hour of HBOT every day for 14 days. They also gave another group of normal mice (the controls) the same treatment.

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After this, the team observed the mice as they completed a number of behavioral tests. They also examined their brain tissue for effects of the treatment on the physical hallmarks of Alzheimer's. They compared the results with the control mice.

The researchers' analysis showed various biological and biochemical signs that HBOT had reduced inflammation in the brain.

Additionally, it revealed that HBOT reduced oxygen starvation, "amyloid burden," and the type of tau protein seen in Alzheimer's. There was also evidence of improvement in behavioral symptoms.

The results showed that, compared with the control mice, HBOT reduced both disease-related plaques and brain inflammation by 40 percent, and it also reduced "behavioral deficits" in the transgenic mice.

The team suggests that the findings show that HBOT shows promise as a treatment for Alzheimer's disease, especially given that it "is used in the clinic to treat various indications, including neurological conditions."

"We assume that the main challenge in human use will be to initiate the treatment at early stages before significant amount of brain tissue is lost."

– Prof. Uri Ashery

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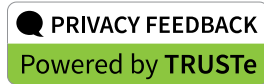
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