

# Hyperbaric Oxygen Treatment of Traumatic Brain Injury, Post Traumatic Stress Disorder, and Spinal Cord Injury

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Thank you for allowing me to give some information to the Committee of Veteran's Affairs on hyperbaric oxygen treatment for neurologic injuries in veterans.

Hyperbaric oxygen treatment (HBOT) is the delivery of 100% oxygen to a person in a pressurized chamber and is used as a treatment for certain diseases and conditions. Oxygen levels 7 to 14 times that achieved by breathing room air are possible. The therapy affects more than 8100 known human genes and thousands of cellular processes and is effective in treating a variety of conditions from neurologic injury to chronic wounds.

Hyperbaric oxygen has been used as a treatment for brain and nerve injuries for 89 years since it was first described by Dr. Albert Behnke in the US Navy for the treatment of the brain and spinal cord injuries in decompression sickness. Since then, it has been used for a variety of brain and nerve injuries such as decompression sickness, carbon monoxide poisoning, stroke, post-concussion syndrome, traumatic brain injury, PTSD, depression, chronic pain syndromes, post COVID illness, and narcotic addiction recovery.

It is useful to think of the actions of hyperbaric oxygen treatment as occurring in four ways in brain and nerve injury.

- 1) Hyperbaric oxygen provides oxygen to damaged areas of the brain and spinal cord which don't have enough oxygen present to function or heal.
- 2) It promotes up-regulation and synthesis of growth factors which cause the ingrowth of new blood vessels, nerve axons to reconnect, and damaged tissue to heal.
- 3) It is a potent suppressor of inflammation which is a component of TBI, PTSD, depression, anxiety, and other neurologic disorders.
- 4) It acts directly on nerve cells in the brain and spinal cord to suppress pain and enhance normal function.

In treating TBI and PTSD, hyperbaric oxygen has had remarkable results over the past 20 years. It is universally effective – few, if any, recipients fail to improve, and many are made completely well from debilitating injuries. Brain function and cognition is improved, even after decades of TBI or PTSD. Depression scores are reduced by 39% and suicidal ideation is usually abolished. Quality of life and everyday function is improved, medication requirements are reduced, and chronic pain is also reduced. These results are long lasting or permanent after a single series of 40 treatments, though some veterans require more treatment depending on the severity and length of illness.

To date more than 30,000 individuals with TBI and/or PTSD have received hyperbaric oxygen treatment in the US, with nearly universal improvement. More than 12,000 of these individuals were veterans. Of all these people, we are only aware of two suicides in the last 15 years. That is a remarkable achievement. In Israel, more than 40,000 individuals have received hyperbaric oxygen treatment for TBI and PTSD with similar results. There it has become part of the standard of care. The use of hyperbaric oxygen treatment for spinal cord injuries is in its infancy in the US, but results so far have shown the similar benefits as in TBI and PTSD, as well as the halting of functional deterioration and the improvement in function in a few cases, especially early after injury.

As a solution, I propose that hyperbaric oxygen treatment be made immediately available to our veterans with TBI, PTSD, and spinal cord injuries. The huge quantity of case reports as well as numerous randomized controlled studies speak to the utility and safety of the treatment, as well as providing more than enough evidence of efficacy for approval as part of the standard of care. It would be well to ensure established safety protocols are strictly adhered to, and that all treatments are directed by properly trained physicians in approved chambers. Additionally good record keeping would validate the utility of these treatments. Finally, I recommend that a working group be established to design the implementation of this effort.