

## Hypothesis

# How mild hyperbaric oxygen therapy works and why it is good for our children

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Physicists figured out years ago that a gas under pressure is more likely to dissolve into liquid—in mild hyperbaric oxygen therapy, the gas is oxygen and the liquid is blood. But under pressure, oxygen doesn't only hook up to red blood cells (the "traditional" way oxygen is delivered to tissues), it also dissolves into the plasma. When that plasma circulates near dormant or injured tissue such as an encephalopathic brain, a bruised muscle, a sprained tendon, or a surgical wound, the oxygen in the plasma can and does dissolve further into the damaged area than the oxygen that's attached to the red blood cell in that "traditional" delivery system.

When hyperbaric therapy was first used, higher pressures of 2-4 ATA (absolute atmospheres) of pressure and 100% oxygen were used. The world of hyperbaric medicine is learning that lower pressures (1.3 ATA in the portable chambers approved by the FDA for use in the home, 1.3-1.5 ATA in larger hospital and clinic based chambers) and less oxygen (often 21 to 40% FiO<sub>2</sub>) seem to have excellent effect on multiple systems of our bodies. In particular, lower pressure appears to be more beneficial for the injured brain than higher pressure.

We can look to apparent healing of the brain by monitoring its perfusion and activity. We can also monitor behaviors, response to stimuli (sensory function) and motor skills. Monitoring of cerebral brain flow can be done with a Brain SPECT (Single Photo Emission Computed Tomography) scan. SPECT scans before and after 40 sessions of mild hyperbaric oxygen therapy (MHBOT) have shown dramatic improvements in cerebral brain flow that is sustained over time. In addition, three recent small studies conducted independently at three different centers showed significant improvement in behavior ratings scales with mild hyperbaric therapy. This would seem to correlate with the improved cerebral brain flow that has already been documented. These results will need larger studies and ongoing research but initial findings are very promising.

In addition to impacting cerebral brain flow in injured brains, lower pressure hyperbaric therapy has been shown to positively impact natural killer cell function and thus, immune function. It has also been found to be of benefit in inflammatory conditions and has facilitated improvement in gut disease such

as Crohn's and ulcerative colitis. MHBOT has been shown to increase glutathione levels by 15% for at least 24 hours after therapy in previous studies. These areas are all of interest for parents of children with Autism Spectrum Disorders (ASD) as they are often impaired in their children.

One question that has not yet been answered is the endpoint for mild hyperbaric therapy. Families continue to report significant improvement with many more than 40 sessions. The ability, with a chamber approved for use at home by the FDA, to safely continue daily therapy at home is potentially of tremendous value to families involved in multiple hours of therapy and time out of the home on a daily basis. To be able to use a valuable tool before school or after dinner facilitates family life for those able to purchase a chamber for their children.

That being said, a family should consider initial therapy in a clinical setting. It is important that the child and the family become comfortable with the use of the equipment, the process of "clearing" the ears, and the maintenance of the chamber. Most importantly, habituating an ASD child to the chamber and the therapy process is probably best initiated with the assistance of experienced professionals. In addition, witnessing some benefit prior to making a significant purchase is a good idea. Our experience has shown, however, that after 10 to 20 sessions in an office setting, most families can achieve a level of comfort that allows them to successfully operate a mild hyperbaric chamber in the home. Families of children with ASD are often well versed in extensive research and independent function with medical therapies.

Opportunities for healing in the home setting where a family can function as a unit are few and far between in the world of ASD. A therapy that appears to be of value to the vast majority of children is similarly rare. Mild hyperbaric oxygen therapy appears to be both. Ongoing research will help to explain with greater precision how exactly MHBOT improves the health and well being of our children. The anecdotal reports from parents of significant improvement are being borne out by SPECT scans and behavioral ratings scales. We appear to have a significant addition to the tool box used in recovering our children.