

## Capillary growth and mHBOT/HBOT

<http://www.autismweb.com/forum/viewtopic.php?t=7173&start=0&postdays=0&postorder=asc&highlight=>

Posted: Tue Aug 01, 2006 11:51 am

From another board - Dr. Rossignol's replay about capillary growth and mHBOT/HBOT

Forgive me for the length of this post, but I felt compelled to write this, given some of the recent posts on this board. A lot of information comes up on this board stating that 1.5 atm causes angiogenesis, or growth of new blood vessels, but that 1.3 atm does not. However, Dr. Efrain Olszewer from South America had data demonstrating that 1.2 atm causes angiogenesis. He had used this pressure for peripheral atherosclerosis (claudication) and has found growth of new arteries by using pre- and post-angiogram. Certainly, autism is characterized by cerebral hypoperfusion (decreased blood flow) and angiogenesis probably is one way that HBOT helps autism, but this may not even be the primary way. The amount of cerebral hypoperfusion in autistics compared to controls is about 8%, so a small increase in oxygen delivery may be all that is needed to overcome this.

Other possible mechanisms include:

1. In several recent studies, autism has been shown to be characterized by neuroinflammation and gastrointestinal inflammation. There are multiple studies demonstrating the beneficial effect of HBOT in inflammation. Children with autism have high levels of cytokines which HBOT has been shown to decrease. Furthermore, one study in particular demonstrates that the anti-inflammatory effect from HBOT appears to be due to the pressure effect and not the oxygen effect (I have these references if you want).
2. Autism is characterized by multiple problems in the immune system, and HBOT has been shown to have beneficial effects on the same type of problems (again, to keep this brief I am leaving out references, but can give them upon request).
3. Several recent studies have shown abnormalities in producing and using serotonin properly in the autistic brain. In some new studies, HBOT has been shown to work like an anti-depressant and can increase serotonin levels in the brain.
4. A recent study has shown that children with autism have impaired production of porphyrin, which is necessary to make the heme in hemoglobin that carries oxygen. This may impair the delivery of oxygen in autism, and obviously HBOT will help.
5. HBOT recently has been shown to increase the mobilization of stem cells from bone marrow. Other studies have shown that these stem cells can cross into the CNS and form new brain cells. Also, areas in the brain can make stem cells. I think this is a very exciting finding!
6. Children with autism have increased oxidative stress and HBOT (especially under 2.0 atm) can decrease oxidative stress through up-regulation of antioxidant enzymes and increased antioxidant production.
7. A good number of children with autism have overgrowth of abnormal bacteria in their gut and several studies show that treatment of this bacteria with antibiotics leads to improvements of autistic symptoms. HBOT has been shown to decrease the amount of abnormal bacteria in the gut. HBOT can also kill viruses as evident by studies showing decreased HIV viral loads with HBOT. As you know, viruses are one of the problems that children with autism can have difficulty with, mainly caused by the immune dysfunction listed above.
8. Multiple studies are beginning to reveal mitochondrial dysfunction in autism. I am beginning to think that this may be the major mechanism of action of HBOT in autism. Certainly, different children may have different levels of dysfunction, which may explain why different children respond clinically to different pressures. HBOT increases the amount of work mitochondria can do (mitochondria are the energy producing areas of the body) and also recently has been shown to increase the production of mitochondria.

In my clinical experience, we have seen good results in about 80% of children with treatment at 1.3 atm/24% oxygen. A similar experience has been found with several other physicians treating autistic children. However, some children do

need higher pressure. I think it is reasonable to start at 1.3 atm if that is what someone can do/chooses, and then move up to a higher pressure if results are not seen. It is also reasonable to start at 1.5 atm if that is what someone can do/chooses. However to say that "you are cheating your child" if you give 1.3 atm instead of 1.5 atm is an inconsiderate and unnecessary statement. We have just finished a study on 18 children with autism in which we compared 1.5 atm/100% with 1.3 atm/24% oxygen. I am in the process of submitting this for publication. The outcomes in the two groups were fairly similar, however, since the numbers were small, more studies need to be done.

Respectively,  
Dan Rossignol, M.D.

NOTE:

- 1) For the latest information please refer to <http://www.icdrc.org/rossignol.html>.
- 2) mHBOT stands for *mild Hyperbaric Oxygen Therapy*. Whereas pressures in conventional, hospital-based HBO units can go as high as 4 atmospheres, in mHBOT, pressures are limited to between 1.3 to 1.5 atmospheres. These lower pressures, while offering significantly enhanced tissue oxygenation, do not require the elaborate and expensive technology and other measures necessary in higher pressure treatment situations. Thus, mHBOT is ideally suited for the treatment of less serious wounds, infections, and other conditions where increased oxygen availability would be beneficial (<http://www.bobyongmd.com/hyperbaric.htm>).

<http://www.icdrc.org/rossignol.html>

## HYPERBARIC OXYGEN THERAPY IMPROVES SYMPTOMS IN AUTISTIC CHILDREN

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**Jun 02, 2006** Autism is a neurodevelopmental disorder currently affecting as many as 1 out of 166 children in the United States. Multiple studies have found that some individuals with autism have diminished cerebral blood flow, especially of the temporal lobes. This cerebral hypoperfusion has been correlated with many of the core features associated with autism including repetitive, self-stimulatory and stereotypical behaviors, and impairments in communication, sensory perception, and social interaction. Autistic individuals also evidence gastrointestinal and neuro-inflammation, increased markers of oxidative stress, and a relative mitochondrial deficiency. Hyperbaric oxygen therapy (HBOT) has been used to treat conditions marked by diminished cerebral blood flow to overcome hypoperfusion through the increased delivery of oxygen. HBOT also demonstrates strong anti-inflammatory properties, might decrease oxidative stress, and can increase the production of mitochondria and circulating stem cells. Based upon these research findings, we hypothesized that HBOT would improve symptoms in autistic children.

**Methods:** 18 children with autism underwent 40 1-hour HBOT sessions at either 1.5 atmosphere absolute (ATA) and 100% oxygen, or 1.3 ATA and 24% oxygen. Results were calculated using the Aberrant Behavior Checklist, Social Responsiveness Scale, Autism Treatment Evaluation Checklist, and 2 other scales. Blood was drawn for inflammatory and oxidative stress profiles.

**Results:** Improvements in symptoms were noted on all 5 scales with significant improvements noted in lethargy, communication, motivation, mannerisms, speech, sensory and cognitive awareness, and overall health.

**Conclusions:** HBOT ameliorates some symptoms in autistic children in this prospective open label study. Further evaluation with a placebo-controlled study to verify these findings is indicated.

Dr. Dan Rossignol has accepted a position with the International Child Development Resource Center (ICDRC), <http://www.icdrc.org>, and has also recently joined the [USAAA Scientific Advisory Board](#)