THE INTERNATIONAL HYPERBARICS ASSOCIATION, INC.

The Pressure Point

Volume 7

Autism Issue

Special Summer 2006

Inside this issue:

The Powerful Voice of Testimonials

An issue dedicated to patient breakthroughs

There continues to be a higher incidence of Autism Spectrum Disorder in boys compared to girls.

This issue of the Pressure Point is dedicated to the hard work of clinics and patients as they persevere in their therapy goals.

Many patients have come upon hyperbaric medicine as a final choice in their medical quests. For many more, hyperbaric medicine is a piece of a larger puzzle that has allowed medical interventions to begin to work.

For doctors and the clinics pioneering new protocols and research, their works are full of the stuff of real life heroes.

Their stories follow. Their voices continue to be heard…

(Continued on page 4)

Autism Therapies in the Modern World

The Changing of the Guard

Since the early 90's, Dr. Jim Neubrander has been treating children with autism. However, early on there was little he could offer families to help their children. Now all that has changed, and changed in a very big way!

Dr. Neubrander states:

"I remember seeing my first child with autism in 1993 and thinking to myself that this must be the first of the 'two cases of autism I may see in my entire career' as I was taught in medical school. Since that time I have seen thousands of children on the autistic spectrum.

Initially I thought there was *no hope* for these children and their families. However, after beginning to use a few biomedical treatments I began to believe that there may be *some hope for a few children*. After my accidental discovery of methyl-B_{12} in 2002, I realized there was *much hope for many children*. And then, after starting to use HBOT in conjunction with methyl-B_{12} and other concurrent therapies, I realized that there was *undeniable hope for the majority of children* on the spectrum!"

"The once impregnable walls of *conventional thinking* are beginning to crumble and new structures of *enlightened thinking* are being built upon conventional thinking's very foundation—*solid science*.

However, these new structures no longer protect the 'old guard' from the people by using moats and drawbridges or books written in language only the royalty can read, and into whose dark and dank chambers only a few select souls are invited.

By contrast, not only do these new buildings have many windows to light their hallways and shine brightly on those that walk along them, they also have revolving doors that invite everyone to come in, stay awhile, and then return again some other day. Not only are their libraries open to the public and their books and journals written in the language of the parents, but on every workstation is a computer and a notepad with these instructions for the par-

(Continued on page 2)

Autism Therapies in the Modern World (continued)

The Changing of the Guard

(Continued from page 1)

ents, 'Search the Internet, formulate your questions and bring them to us to explore with you. Let's see if we can step beyond the small world of what's known into the much larger world of what we don't know so possibly we can figure something new out.'

This enlightened way of thinking represents a *paradigm shift* that combines the *knowledge* of previous science with a refreshingly new type of *wisdom*. This new type of wisdom comes by listening more closely to parents and then trying to validate their accounts before dismissing them as just anecdotal."

Dr. Neubrander goes on to say about biomedicine:

"With few exceptions, conventional scientists, clinicians, and educators do not believe biomedical treatments can help autism. They believe that such treatments are costly, unproven, do not work, and that the only treatments shown to be effective are those involving education and therapy—also costly, though not criticized.

" 'Convention' disregards what parents say as unscientific, anecdotal and the product of pacebo effect."

I firmly believe in the educational and therapeutic approaches and all that they entail. However, it is now *pure nonsense* to believe that biomedical approaches do not work. Anyone who hides behind the facts of science will likewise never admit that this belief *has nothing to do with whether one chooses to only believe facts but rather what facts one only chooses to believe!"*

"Unfortunately 'convention' disregards what parents say as unscientific, anecdotal, and the product of placebo effect. Therefore they totally invalidate what parents believe, and because of it, lose forever the vast wealth of information these keenly interested '24/7 on-site observers' see in their children.

They lose forever the 'slow or subtle changes' that will never be demonstrated 'statistically significant' in a typical double-blind placebo-controlled study that occurs for much too short a period of time, or because the standard evaluation tools required for scientific validity are too insensitive to document that 'slow and subtle changes' exist and that they are just as important as 'fast and obvious changes'.

Therefore when 'science' *demands* 'changes' to be 'too big' and 'too soon', science *loses* the ability to see approximately 20% to 50% of children that actually respond to certain biomedical treatments. This is what I call '*blind science*' and for this type of science to be given the authority to define what represents 20/20 vision for the children I treat is *ridiculous*!"

When discussing his treatment approach, Dr. Neubrander says:

"My colleagues and I use many of the same treatments. In my practice I start immediately with methyl-B_{12} subcutaneous injections. These are administered by the parents at home once every three days. After a 5-week methyl-B_{12} initiation phase, in which I do not allow parents to change any variables, I then recommend a specific diet plan along with a balanced compliment of supplements including adequate antioxidants.

Because the majority of children on the spectrum have gastrointestinal issues, I begin a program to heal the gut. In addition, I work to heal infections of all types by using natural products, and whenever necessary, pharmacologic agents.

At some point I evaluate my children for heavy metal toxicity and if heavy metals are present, I recommend the chelation protocol best suited for the specific child.

Because the majority of children on the spectrum have significant autoimmune biomarkers and allergies, I attempt to correct or control these problems by using desensitization techniques, low dose naltrexone, a PPAR like Actos, and an antiviral like Valtrex.

Because each child is an individual, these therapies are not started simultaneously, nor are they all used with every child. I use intravenous therapies when needed and make early referrals to Dr. Arthur Krigsman for a gastrointestinal workup and colonoscopy if I cannot control the GI issues by using more conservative methods. In addition, I recommend HBOT for all my patients."

Dr. Neubrander on HBOT:

"The reason I recommend HBOT for all my patients is because any concentration of oxygen under any increased amount of pressure will dissolve the oxygen into the extracellular fluids of the body: plasma, lymph, cerebrospinal fluid. Because dissolved oxygen is not confined to the hemoglobin molecule, it can reach 'deeper tissues' more easily and more consistently than ever before.

Therefore, because there is no test to definitively differentiate which child may respond and which child may not respond to extra oxygen (in contrast to excessive oxygen), I let nature take its course by prescribing a clinical trial for all my children. HBOT was something I began recommending for my patients over 2 years ago and since beginning this new 'unproven' therapy, I have observed the majority of children respond to some degree, especially if they continue the treatments long enough.

Autism Therapies in the Modern World (continued)

The Changing of the Guard

Essentially any of the symptoms common to autism have the potential to be helped by HBOT. However, certain ones seem to be more common than others or more intense when present. For example, in my practice, one of the most exciting findings I see is that a child not only becomes more aware, but what I describe as becomes more 'present'.

To be aware is primarily a 'mental knowing'. To be present takes awareness one step further. Here the child is not only aware of what he wants, but 'takes action' to have you help him get the thing he wants to have or the thing he wants to do. Additionally, he 'takes action' to make sure you notice him and include him in everyday family functions, activities, and social interactions.

Not only does he now know the world exists and that he is in it, he also realizes that he wants 'more of this brand new world'—including you: your presence; your being; your praise; your affection; your time! Basically he wants and demands more of you in his new world because he is now much more 'present'!"

Dr. Neubrander's other observations in patients:

"Other very common observations in my practice from HBOT include, but are not limited to:

- increased eye contact;
- more resilience, flexibility, less rigidity, and more normal acceptance of transition and changes in routine;
- increased language, first receptive language and then expressive language, (e.g. 2 to 3 word simple word combinations progress to 5 to 8 word combinations including pronouns, adjectives, etc.);
- improved socialization with siblings and peers as well as an increased ability to express emotions, not only those emotions that parents so much desire to have but also those emotions that are not always pleasant, but that demonstrate the child now has a mind of his own, the result often being more independence and self-assertiveness and a 4-year old going through 'the terrible twos';
- surprisingly, and much more frequently than expected, loose stools and gastrointestinal problems have improved or even normalized;
- increased appetite with the child spontaneously trying new foods and at times suddenly gaining weight when previously s/he could not; etc."

"However, with all the good things that I've described—things that every parent wants to hear about any treatment and wants to hope could be true for their child—I must offer a *strong word of caution,"* says Dr. Neubrander.

Dr. Neubrander offers advice for parents:

"During all the years that I have been refining my skills, no skill has become more important than the one that teaches parents how to be *patient and accurate in their observations*.

Therefore I tell every parent that the more inconvenient, the more costly, and the more 'hype' that surrounds any given treatment, HBOT or anything else, the more parents demand to see bigger changes than they would normally require before saying the treatment is valuable enough to continue.

This is unfortunate with any treatment, including HBOT. Not long ago my staff and I saw major improvements in a 4-year old boy who progressively was becoming more neurotypical in many ways including eye contact, using 7 instead of 3 word combinations, demanding my staff involve him in play, and stools that went from loose to consistently formed for the first time in his life.

However, after 40 HBOT treatments it was shocking and disappointing for us to hear the parent say, 'HBOT didn't work for my son because he still doesn't have conversational language so I am not going to continue treatment!'

To discontinue such a valuable treatment while the child was continuing to progress and to deem it ineffective is truly a tragedy, not only for the child himself, but also for other children who may have benefited from HBOT, but who will never get to try it because their parents have heard inaccurate and incomplete stories like this saying HBOT doesn't work.

One additional word of caution is in order, that being that there is 'no magic endpoint' to the number of dives one should receive. Some of my responders started late and therefore to assign a number, e.g. '40 dives as the goal and then we're done' denies children the opportunity to receive the maximum benefit by continuing their treatments."

The Doctor's Closing words:

"In closing I would also like to say that because we do not have all the answers at this time, it has been my experience that any oxygen concentration at any pressure will give some results to the majority of children.

Fortunately we are in the process of forming an *IHA Consensus Committee specific for Autism and HBOT* to help alleviate some of the misconceptions that abound and to tell you what we know, what we don't know, and what we are working on finding out by using the most powerful trio known today—*Science* joining hands with *Parents* and open-minded *Clinicians*!"

Editor's Note: *Dr. James Neubrander currently practices family medicine and has joined the International Hyperbarics Association Consensus Committee for Autism. The Consensus Committee has been charged with the task of issuing guidance statements for parents based on facts known about hyperbaric medicine as it relates to autism. These statements will be made public on the internet and on subsequent newsletters.*

His patients' testimonials follow…

Testimonials: The Power of their Voices

Stephen's Story
5 years old

Our loving son, Stephen, was diagnosed with PDD-NOS in August 2003 at age 2 1/2. He was non-verbal at that time and was felt to be the age equivalent of 18 months.

Since then he has received intensive ABA therapy and extensive biomedical intervention. Among the biomedical therapies he has shown the most major response to are methyl-B12, supplements, and the GFCF diet.

The initial methyl-B12 therapy was very encouraging because he suddenly became verbal and even now Stephen runs around in the playground rather than just walking from activity to activity. His physical strength and dexterity have also improved greatly on the supplement regimen.

The GFCF diet helped diminish his "brain fog." When methyl-B12 was increased from injections every three days to injections daily, there was an undeniable increase in his eye contact, speech, and overall "presence". It has continued to refine his progress.

With the exception of the diet, all of the most rewarding therapies were followed immediately by a period of roughly 2 weeks of hyperactivity. After the hyperactivity waned, we would begin to see huge gains.

So, you can imagine my delight when I arrived home in the evening after just his first 2 sessions of mHBOT and saw that he was hyperactive!

Although he has had only 12 sessions *in toto*, his command of vocabulary has increased, e.g., "I had an excellent sleep". His eye contact has improved and he now responds verbally when we call to him from another room. His speech seems clearer.

"As a physician, I approached mHBOT with healthy skepticism"

As a physician, I approached mHBOT with healthy skepticism, but as a parent I am thus far extremely gratified and feel blessed by his early response, with hope for continued progress.

Thank you very much. Sincerely,
Steven's father

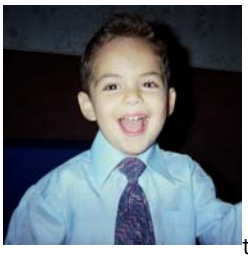
Doctor Neubrander's Note:

Key points: Side effects, e.g. hyperactivity may be seen early in treatment and will usually disappear within a short period of time thereafter.

"Healthy skepticism" is common, not only from physicians like Steven's father, but by all parents in general. Too many times parents have had their hopes built up, only to have them crashed to the ground when "the magic treatment" didn't work.

Well, there is no magic to HBOT, and none of us treating large numbers of children with autism will make any kind of promise except the promise that simply says, "Unless you try, you'll never know what HBOT may be able to do for your child."

Mike's Story
4 years old



Michael is a 4 ½ year old boy who was diagnosed with Autism at the age of 2. At the time of his 3rd birthday we started getting Michael biomedical therapy under the care of Dr. Neubrander.

At the onset of the therapy, Dr. Neubrander started Michael on methyl-B12 injections. He has been following this protocol for over eighteen months.

While Michael's response is "mild to moderate", he demonstrates a strong response in areas such as eye contact, gross motor skills and general awareness.

Prior to starting the methyl-B12 therapy, Michael did not show much reaction when mommy or daddy would pick him up from school. By contrast, after starting methyl-B12 therapy, Michael became "very happy" to see us and greeted us with hugs and kisses, running to us from a distance.

"Michael is displaying improvement are cognition, GI symptoms and imitation"

In April 2005, Michael started to receive treatment from Dr. Krigsman to treat his gastrointestinal issues. Michael was diagnosed with *Autistic Entrocolitis*, which is a condition that is typically found in children with Autism.

Prior to starting the treatments, Michael had chronic diarrhea which presented in a yellow mustard color, accompanied by an extremely foul odor. After several attempts using various medications, Michael finally responded to Orapred which improved his condition. At this time, his stool began to form and this correlated into improvement in his cognition. Unfortunately Orapred, is not a long term answer and Michael's condition remained inconsistent when it was removed from him.

At this time Michael is on a Gluten and Casein-free diet along with Pentasa to help treat his GI conditions.

In January 2006, Michael began HBOT therapy using a soft chamber with an oxygen concentrator. To date Michael has completed approximately 50 sessions, and we are pleased he is having a positive response.

The three areas in which Michael is displaying improvement are cognition, GI symptoms and imitation. First, shortly after Michael started the therapy (5-10 dives) he demonstrated an improvement in his ability to understand one step commands. On many occasions my wife and I would say, "He seems to understand what we said," and his reports from school and therapy were more consistently positive.

In addition, Michael's GI symptoms began to improve. For the first time, Michael had a formed stool with a proper brownish color. We were very excited at the prospect as we felt things were starting to happen.

The HBOT sessions were interrupted as Michael developed a cold and the bad stools would return. Once the HBOT sessions resumed, the improvement in stools followed.

Lastly, Michael's non verbal imitations have really blossomed. He will now imitate one step commands such as tap head, tap tummy, put your arms up etc. Historically Michael did not have this skill. WE ARE THRILLED ABOUT THIS! In addition, he is doing excellent in his music and movement class which requires imitation.

Overall, Michael's experience with HBOT has been positive and represents a therapy that we plan on continuing long term. It's the single therapy that we feel Michael had the most significant response.

Doctor's Note:
Key point: A very high percentage of children with autism have GI problems. Often such children rarely have normal stools. Mild HBOT has had a very positive influence on many of my children with these stool issues.

Andrew's Story
6 years old

Our son Andrew was diagnosed with Autism Spectrum Disorder at two years and eleven months of age.

At the age of two and a half, prior to his official diagnosis, we started Andrew on a gluten and casein-free diet. Within 3 weeks of implementing the diet, we noticed improved attention and focus.

Andrew received various educational therapies, including ABA, occupational therapy and speech therapy. During this time, Andrew made slow gains in language, cognition and social skills.

At 18 months he had a few words but no functional communication. With educational therapy, he could functionally use 2-3 word sentences, but his communication was all need-based, and much of it was prompted.

He had little interest in playing with other children. He would interact with adults, but very seldom demanded attention.

"After about 20 hours in the chamber, we have noticed an increased awareness in Andrew.

He has begun to be more aware of people and requests attention"

At age 4, Andrew became a patient of Dr. Neubrander, and we began adding biomedical treatments, one at a time, to his regimen. These included methyl-B12 injections, nutritional supplementation, allergy desensitization, chelation and low-dose naltrexone. He was also diagnosed with colitis and reflux by Dr. Krigsman and began treatments for those conditions as well.

With each treatment, we saw mild-to-moderate improvements in Andrew. Andrew was able to speak in full sentences, began using gestures, had an interest in playing with a greater variety of toys and showed significant improvement in motor skills.

His communication was still largely need-based, but he would occasionally comment on things he would see.

Andrew's picture of baby Einstein—one of many firsts

Today, at age 6, Andrew has come a long way, but still has much to accomplish. We began HBOT therapy in February 2006. We purchased a soft chamber for home use, and Andrew now typically spends about 7 hours per week in the chamber.

As with most of the biomedical therapies we have tried, I would classify Andrew's overall response to hyperbarics as mild-to-moderate.

After about 20 hours in the chamber, we have noticed an increased awareness in Andrew. He has begun to be more aware of people and requests attention. Previously, he had little interest in his younger sister and would rarely speak to her directly without prompting. He is now more frequently initiating communication with his sister and using her name. He often asks her to sit next to him on the couch to watch a movie.

Occasionally, Andrew asks for help with something. Increasingly, he will use a person's name to get attention, whereas before, he had a lot of trouble using names and differentiating people.

His therapists have all commented on how much happier he is in general, and they all felt he was relatively happy to start with. We noted all of these improvements at a time in which no new therapies had been introduced other than HBOT.

We had one "Eureka" moment after beginning HBOT. Andrew has always struggled with drawing. It is difficult for him to appropriately grasp a pencil and he has shown no interest in drawing pictures. When asked to draw, he would usually just scribble.

After working for a long time in occupational therapy, the only thing he could draw was the most rudimentary smiley face.

One day, without any prompting and without seeing the character, Andrew picked up his magnetic doodle pad and drew a recognizable picture - the logo character from the Baby Einstein movies. He repeated this multiple times and has been able to draw a picture of a mouse after seeing it on a video.

Andrew is now grasping a pencil correctly, has shown dramatic improvement in handwriting and has a real interest in writing. We are encouraged by the changes we have seen since beginning HBOT and plan to continue indefinitely with the treatment.

Doctor's Note:
Key points: Andrew was never able to draw or use fine motor skills the way he has been able to do after starting HBOT. [picture of child and picture of drawing included - last paragraph explains the significance

Sophia's Story

4 years old

Sophia and her twin sister, growing typically, were born in Reston, VA almost 4 years ago this time of year. We were a very excited couple being blessed with twin daughters after years of trying to have children and several failed IVF cycles.

When the kids were 4 months old, we moved to Florence, Italy, for approximately 1 year, during which time we also went to India for a few months. During the Italy/India trips, both kids received antibiotics from various doctors and were also kept up to date on immunizations

During the 11 month, Sophia (and of course her sister, Saisha) also got their Measles vaccination in India. We noticed that Sophia started to get more irritable after this point, but did not make much of this situation.

We moved back to the US just before their first birthday and were excited to be back home in VA. During her 1st year appointment in September, Sophia received another dose of the MMR and some other vaccinations from her pediatrician.

When she turned 16-17 months old, we started to notice that she was falling behind in development milestones, particularly in speech, as compared to her sister. We tried to bring this point to her pediatrician, but was of no use. We were reminded, "All kids are different and Albert Einstein started talking at 4."

We moved to Italy one more time, courtesy my job, again to Florence. This time round, the girls were 3 months short of being 2 years old. Within a few weeks, one of the doctor's in Florence noticed that Sophia was still not talking at all while Saisha had quite a few words. He suggested that Sophia be evaluated soon.

This upset us, because just before we left for Italy, one of the nurse practitioners in Sophia's pediatrician's office in VA had said the same thing. We were not able to do anything in the US because we were leaving the very next day.

In Italy, we started our saga of visiting doctors who specialized in this field. We must have met at least half a dozen doctors, but got nowhere with a diagnosis. According to them, she was too young.

Sophia also had an MRI scan performed, which was normal and some extensive blood tests. She had an episode of Epstein Barr virus that was suspicious to some of the doctors, but not enough to draw any conclusion. At this point, we had a hunch that something was not right. Sophia was now 2 years old.

We returned to the US during the month of August 2004 to get evaluations. Almost from the first meeting, the Children's Hospital in DC gave her the label of PDD. We were devastated. We received the same news from 2 other doctors and also the from the county clinic.

Not knowing what to do next, we started reading voraciously on the subject, both online and in books. We decided to permanently move back to the USA for the best treatment options for this disorder.

Traveling back to Italy to wind up our affairs, we came across a doctor in Switzerland who practiced Cranio-Sacral therapy. We saw him briefly and completed approximately 30 sessions of Cranio-Sacral therapy. We found that Sophia had better eye contact and was a little more alert after these sessions.

We moved back to the US in early January and started a whole new chapter in our pursuit for her treatment. We started slowly—traditional doctors, county personnel, etc., as was the norm. We quickly found that we were going nowhere with these interventions.

A few months later, we came across Dr. James Neubrander, whom we came to know about from watching a program on NBC about Autism. The doctor in the special explained about a connection between Autism recovery and Methylcobalamin (methyl-B12) Shots.

At first, we were skeptical, but eventually came around. In July of 2005, we started with methyl-B12 shots and followed Dr. Neubrander's other bio-medical treatment suggestions.

We also started a very aggressive home-based ABA program that at times was good and at other times, was spotty, mostly due to lack of availability of skilled personnel. We started seeing lots of little improvements in Sophia, including significant eye contact and alertness.

In March-2006, we started LDN (low dosage of Naltrexone). We saw significant improvements with this medication.

In November 2005, we first heard about Hyperbaric Oxygen chambers. We returned in April 2006 to Dr. Neubrander's clinic in New Jersey for 16 sessions of mHBOT. Within 10 days of Sophia starting this treatment, we saw some gains. She was "requesting" much more and also trying to engage us more frequently in the things she wanted.

"Within 10 days of Sophia starting this treatment, we saw some gains.

She was 'requesting' much more and also trying to engage us more frequently in the things she wanted"

These changes could have been a result of many things, but the timing was impeccable. Sophia started verbalizing her requests, again with more frequency, and the eye contact/engagement was clearly improved.

Sophia now brings us books she wants us to read, music she wants to hear and DVDs she wants to watch, all without crying or fussing. She is still far from being cured, but seems to be certainly on her way there.

We are taking the fight up a notch and will be trying several new techniques, but intend to stick primarily with Dr. Neubrander for his bio-med treatment—and more so now—for this mHBOT option.

We cannot categorically say which type of chamber worked better for Sophia, but it seems that we clearly saw results *immediately* after the mild chambers that were evasive after the hard chambers. For this very reason, we are going to his clinic next week for 25 more sessions and hope for the best.

Doctor"s Key Points: *For some children, soft chambers may be better than hard. I asked for this story to show that though I believe in hard chambers and that hard chambers with pure oxygen may be better at times for some children, possibly for many children, due to each child's unique physiological and biochemical individuality, mild chambers may be as good as, or at times even better than hard chamber. And, because treatments with mild chambers are more affordable, more available, and can even be used in the homes, all parents who have children with autism owe it to their child to begin a clinical trial of HBOT therapy.*

In addition, the use of a lower pressure chambers should not be dissuaded in its use by unproven statements saying hard is better than soft, because these statements cannot be substantiated by anything other than the feelings of the dissuader—their concept of "should be's, and their obvious enrollment in the belief that "more and bigger is better"!

It could be argued that this child's benefit was due to "hard" and that the child just didn't have enough treatments. Well, then it is quite amazing that it was the soft that was "good enough" to bring it all out so that argument is weak at best.

Please note that it is just as logical, if not more logical for those who can afford a chamber in their home to "feed the cells" oxygen on a daily basis than to feed it oxygen only a few times a week.

It is just as logical to state that a "dormant cell"—neuron or otherwise—can only be stimulated so much and therefore giving "more oxygen during a given period of time" will not allow those cells to produce any more "product" than less oxygen will produce if given on a more consistent and more frequent schedule.

Rafael's Story

4 years old

Let me start this letter by saying that we believe that Rafael is a significant responder to mHBOT. During the 40 days that we completed 38 hours in the chamber, we did not change anything in his protocol. We continued the daily methyl-B12 shots to which he also is a significant responder and which he has been taking since June 05, and we continued his normal schedule of supplements.

Our experience inside the chamber (or "the machine" as he calls it) was very good. We explained to him beforehand what we were going to do and the importance of wearing the mask. He did not have major complaints regarding ear pressure and wore the mask for about 85% of the time we were inside the chamber. We spent most of the time watching videos, playing board games and reading books. He enjoyed it so much that he would say, during the week, that he wanted to go back!

We made the decision not to tell his teachers or therapists about the mHBOT since we wanted to have some unbiased opinion about any, positive or negative, reaction he could have. After 14 hours of mHBOT we started to receive very positive feedback not only about his language ("his language is amazing!") but also related to motor skills ("improved dramatically").

"After 14 hours of mHBOT we started to receive very positive feedback not only about his language but also related to motor skills"

We were very fortunate that he had no negative reaction during the period (stimming or hyperactivity) and for us the only "negative" of the treatment was that it is very time consuming, but for sure it was worth the time.

We saw a significant improvement particularly in his expressive language, back-and-forth conversational skills as he started to ask all different types of questions (who, where, what etc). He began to demonstrate greater interest in other children and also started to spontaneously approach strangers and start short conversations with them. He became more assertive and started not only expressing his desires but also asserting his ideas of possessing toys and objects. He also started to make unexpected (but relevant) comments in several different situations.

It is difficult to explain his language progress over the period. It became more complex, diverse, descriptive and communicative and his use of pronouns improved significantly. Before the mHBOT his questions were not very frequent and limited to "what". Over the weeks during which we did the mHBOT, he started to ask all different types of questions (what is that, what is your name, why not etc). One additional interesting development was that he started to ask follow up questions, depending on the answer he got, allowing our first back-and-forth conversations ("what is that?" "passport", "what is a passport?").

Some of the examples of the improvement in his language during the period are:

- *"I think I should watch a video"*
- *"Are we there yet?" and "mom, are you done?"*
- *"Hey man, you did a great job playing the piano"*
- *"Hey Pat, I have an Animal Farm CD"*
- *"Travis, do you have a car?"*
- *"What is that?" à "A flashlight" à "What is a flashlight?"*
- *"Excuse me Lady…."*
- *"Do you promise me?"*
- *"Why we cannot go to the pool?"*
- *"I want to watch a video. I do not know which one…..let me see…"*
- *"I want everybody to go away. I want to play alone"*
- *"It is time for John and John's mom to go away"*
- *"I think I am going to do a lot of work at school"*
- *"Karen, do you have pointy ears?"*
- *"Mom, let's ask Travis if he wants to go eat spaghetti*
- *"Hey woman, I want food!"*
- *"Lisa, do you have my pajamas?"*
- *"If I break the chair, I cannot sit on it"*
- *"Mom, what (who) are you talking to?*
- *"I want it to be summer so we can go to the park"*
- *"Mom, does your leg hurt?"*

It now has been almost 60 days since our last mHBOT session and we believe that he has not "lost" any of the improvements we noticed during the period we did the dives. It is true that, as per the doctor's recommendation, we have made some adjustments to his protocol during this period, but he continues to show tremendous progress.

He now talks all day and is engaging in conversations (and enjoying calling people on the phone). He is reaching out to other children (even requesting to have play-dates and sleep-overs) and his ability to recall past events (like what he did at school) has also improved. Reports from

teachers and therapists continue to be very positive.

Although it is impossible for us to pinpoint how much of the recent improvement is due to the mHBOT alone or how different it would have been had we chosen a different protocol (number, length, periodicity of session), we are positive that it had a significant positive impact and we believe it should be considered by other parents.

Doctor's Note:

Key points: Some children can show remarkable improvement in a short period of time in many areas and then "hold" the benefits they've received, whereas other children may begin to lose them within variable periods of time.

This underscores the uniqueness that exists for these children—that there is no recipe for how many treatments a child may need before showing benefit, how many treatments the child will need overall, how long the benefits will last, or whether the child may need to return for more treatments at some point in the future.

Matthew's Story

4 years old

Matthew was diagnosed with Autism at 2 years old. I will never forget the day I was told that my 2 year old son was developmentally at a nine month old level. Matthew was an extremely happy baby. He had a great personality.

However, he was sick very often, had constant gastrointestinal problems and did not say a word. He seemed to be content in his own little world. I started doing my own research and networking with other parents.

At 2 ½ years old, Matthew had his first appointment with Dr. Neubrander. I will never forget the date June 27, 2004. It was the first time since he was diagnosed that I felt like a "doctor" actually listened to my concerns and instincts as a mother.

Matthew was started on Methyl B12 shots every 3 days. Immediately we saw changes in Matthew. It was like all of a sudden he woke up. We went from having a child who was a "go with the flow" kind of kid to having a child who refused to get in the bath tub and threw himself on the ground so he would not have to go to school. It was quite a difference.

We also began to notice that for the first time, Matthew started to begin to make sounds and say words. At that point, he was diagnosed with severe apraxia. He was trying to talk, but the words couldn't come out.

There were many other positive changes that came after beginning Methlyl B12—following directions, sitting and completing tasks better and longer. We knew we were on the right path.

Three months after starting Methyl B12, Matthew had a colonoscopy with another doctor and tested positive for Lymphnodular Hyperplasia. He was put on Colozal to help control the inflammation in his gastrointestinal tract. There were several times when it had gotten so bad that Matthew needed to be treated with rounds of steroids. With the help of this specialist and under a very strict diet and supplementation, we began to get his GI isssues under control. However, it was a constant battle, and Matthew would continue to regularly have diarrhea.

In May of 2005, Matthew began chelation with transdermal DMPS. Over the first six months we saw gradual improvements.

After 8 months of chelation, we had decided to start doing mild HBOT at Dr. Neubrander's office. Matthew had no problems at all getting into the chamber and tolerating it. We let him watch his favorite video while he was inside as long as he wore his mask.

After the first four dives, or first week, we saw a little bit of hyperactivity and more self-stimulatory behaviors than normal. After the second week, we began to see increased language, more awareness and an overall sense of him being "present".

I remember my husband and I looking at each other with amazement over simple things that we would ask Matthew to do, that he could never do without help before. Things like "get your shoes, get your coat, go on the potty," and many more simple commands with which he previously needed help. He was now doing those things...and all by himself.

The next major benefit from mild HBOT was for the first time ever Matthew was having consistently perfect poops! They were, as I like to say, 'beautiful'—to a parent who's child had had diarrhea since infancy—they were beautiful! After only two weeks of going in the chamber, Matthew's battle with diarrhea had been won. He continues to have wonderful poops.

Matthew has completed over 40 sessions of hyperbarics. He is making progress that I never thought was possible. At four years old, when I ask him who I am, he says "mommy".

"Matthew has completed over 40 sessions of hyperbarics.

He is making progress that I never thought was possible."

If you told me a year ago that Matthew would soon be able to call me mommy.... I would have said that if he never uttered a word again I would be happy with just that. To hear my child who was once nonverbal call me "mommy" is more than I could have ever hoped for. I guess you have to live this life to understand that.

Overall, Matthew's vocabulary has exploded, his personality has exploded, his awareness and his overall learning process have improved tremendously. Everyone in his life can not believe how well he is doing and how much he has changed. Our family, his teachers, therapist are constantly commenting on how much progress Matthew is making.

I purposely did not tell anyone at his school that we had started mHBOT. Within the first two weeks, his teacher was telling me "WOW, Matthew seems so different, he's getting things so much faster and he's talking so much more". *There was my proof.*

In conclusion, I had once referred to Matthew's journey through Autism as a dial. This is how I have viewed his progress: at the beginning, this dial was turned OFF!!! With the help of

Methyl B12, his dial slowly began to turn, and Matthew began to tune into the world around him. With chelation, the dial turned a little bit more.

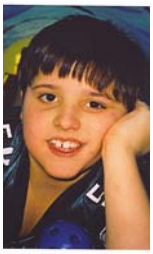
Then mHBOT began, and Matthew has made undeniable progress since starting mHBOT. Our family is looking forward to continuing mHBOT for Matthew along with all of his biomedical treatments.

We are so grateful for Matthew's progress. We are also so thankful for Dr. Neubrander's guidance and his compassion for these children. There are not enough doctors in this world like Dr. Neubrander.

Doctor's Note:

In addition to executive functioning, speech and language, and socialization, mild HBOT definitely can help the chronic diarrhea and bowel problems so common with autism.

Cole's Story
8 years old



Our son Cole was diagnosed in 2001 with Autism at the age of three and a half years old. He could have been diagnosed earlier but what a parent wants to be told is that there is a developmental delay and other problems with their child, not autism. We immediately started him with speech therapy and got him into the intermediate unit for school.

As a child he was very hyperactive, screamed constantly, and was very aggressive, especially with pinching. He totally ignored us and would prefer watching tapes from morning to night if we would let him. Eye contact did not exist.

"For years we felt like we were prisoners of our home because going anywhere was a nightmare."

By the time he was in kindergarten and first grade his aggression became more intense with pinching, biting, kicking, choking and throwing himself down. He was not easily redirected. The school had talked to us that it was possible that they would have to find another place for him outside the school district. I was completely lost as to what to do next. His diagnosis changed to Autism with hyperactivity with aggression, and he was treated with major medications for hyperactivity and aggression. These were not medications we wanted to use, but felt we had no choice because of his behaviors.

I went to my first Autism Society Meeting and the guest speaker was Dr. Neubrander talking about Methyl B12 injections. I immediately called after the meeting and waited for our first appointment. We started with the Methyl B12 injections and saw that Cole was a 'responder' in March of 2005. We have since then added Methyl B12 and folinic acid nasal spray, low dose Naltrexone, vitamin and mineral supplements, and we have done different testing.

We have seen that Cole is responding to everything that we have tried thus far, but to varying degrees.

However, in February of 2006 we started doing HBOT, Cole being eight years old. Since the drive was too far, we found a place closer to us and have been doing two dives per week at one-hour intervals. We have thus far observed increased speech, eye contact, interaction with peers and family, and just so much more awareness of what is going on around him.

Behavior issues have decreased so much that we lowered his major behavioral medications by half and feel that we could actually take him off of it completely at this time. His diagnosis was recently changed in June 2006 to Autism with HISTORY of AGGRESSION. Wow!! That's something to say right there.

For years we felt like we were prisoners of our home because going anywhere was a nightmare. So many times only one of us could go out with our other son, while the other stayed home with Cole. That's not the way it should be. Fortunately, we now have come out of that prison and can go out to eat, go visiting people at their houses, go to theme parks, etc.

In April we actually went to a hotel with an indoor water park, something that we could never before even think of doing with Cole. Cole was wonderful there, so well behaved, no screaming and he waited patiently in line for the slides. No one, other than us, probably noticed that Cole was different that day. We were all so proud that day when we left.

We would never have been able to do the things we are doing today without all the interventions we have tried since meeting Dr. Neubrander and HBOT. I have had so many people come up to me and say, "We can't believe how far Cole has come since last year and especially the last couple months with doing HBOT".

We are only able to do two dives per week at one- hour intervals because of the distance to get there. We are at thirty-four dives right now. Other things that we have noticed include:

- *Increased eye contact*
- *Awareness of everything around him*
- *Sociability increased*
- *Interacting more with family and others*
- *Aggression decreased dramatically*
- *Starting to try things he's never done before*
- *Speech increasing in all areas*
- *Able to be redirected more easily*

The other day he jumped off the diving board at a pool and swam to the ladder by himself three times. He's now trying to ride a scooter properly, pushing off with his foot.

Some of the things he has been saying lately make us realize how much he actually understands in life that we didn't realize. You can actually see him when he gets mad that he is trying to control it with a squeeze to the arm instead of a pinch. At school he is having more and more good days with no aggression.

His life is not perfect yet, but we do see so many possibilities for him down the road. He is slowly coming back to us in all areas. We will be continuing with HBOT, no doubt!

Doctor notes: *There are at least two beliefs that have become "iconized" by various groups and have made the rounds: a) the 40-treatment icon, and; b) the must-get-there-as-soon-as-possible-or-it-won't-work icon. Both of these beliefs are false and hurt children. The reason they hurt children is because many parents stop after 40 treatments when their child should receive more, and because parents who cannot do 5 or more treatments per week are often led to believe that they will only be wasting their money until they can commit to doing this number of treatments on a weekly basis. Once again, this type of thinking hurts children by delaying a treatment that is proving itself to valuable for most of them. Cole's story demonstrates very nicely that the second icon is definitely false!*

Chris' Story

6 years old

I am the parent of a 6.5 year old autistic boy. Our son was diagnosed as being severely autistic at the age of 3.5. He also suffers from extremely low muscle tone. We started biomedical interventions with Dr. Neubrander a week after Chris' 4th birthday. Over the course of trying many, many things there are three major players that have emerged in our effort to recover our beautiful child—Methyl B12 (MB12) injections, IV-EDTA chelation, and mHBOT.

"Christopher was really pleasant but also passive and frail.

We have witnessed an awakening with MB 12."

Almost three years ago, we started MB12 injections. Prior to the injections, our child was extremely passive—nothing seemed to phase him. He could be doing something he really enjoyed and I could walk over, pick him up and take him out of the room and he would act like he was never engaged in that activity. He never cried or laughed. He did not move much because he was so weak. I could come or go—it really did not matter.

Christopher was really pleasant but also passive and frail. I did not realize how frightened I was by his passivity until he started "waking up." We have witnessed an awakening with MB 12. Some of the major highlights with MB12 have been eye contact, awareness of others, emotions (and boy does he have them!) and an increase in receptive language.

He started doing better in school and was able to learn a picture communication system and a basic routine. His gross motor improved dramatically. Chris can finally walk up and down the stairs without assistance.

After the new year, we started IV EDTA chelation. We have been pulling significant amounts of lead out of his system. We have seen leaps in expressive language. Christopher is attempting new words and sounds on a daily basis. He is imitating signs more accurately and his receptive language has now soared. We can speak to him with more difficult descriptive terms such as over, around, behind, in, out. His apraxia is still there but he is constantly mastering new sounds and doing more on an oral motor basis.

"It's nice to be sharing in your child's joy instead of being thought of as a means to an end."

mHBOT has been another "player" added this spring. We have a chamber in our home and have completed approximately 27 hour-long dives. Without making other changes to Chris' program, we have seen some encouraging developments since the introduction of this intervention.

Specifically, Chris has a self awareness now. He is attempting socialization with classmates and his family. Chris' communicative efforts used to be limited to getting what he needed—we were all instrumental in his world.

"All his therapists have indicated that he is now ready to start handwriting skills using the Handwriting without Tears program.

This was not an option before hyperbarics."

The other day, he walked up to me with a flashcard of a dog. He looked at me smiling, pointed to the picture and said "og" then looked back and smiled. We had a little exchange. Then he left and came back with a flashcard of a cat. He pointed to the picture and said "ca" and smiled at me for my approval. We have moments of joint reciprocity like this all the time now. It's nice to be sharing in your child's joy instead of being thought of as a means to an end.

After a gym activity in school, Chris spontaneously 'high-5'ed' all his classmates. That is unheard of for him. He says 'hi' without prompting. He knows all his classmates in circle without any picture cues. He is recognizing patterns, letters and numbers. For example, he was doing an obstacle course in gym and after only two circuits he did the third without any prompting.

Chris is also starting pre-reading skills. He is starting the beginning of letter writing. Learning is coming more easily for him. He is doing so well. All of this started this spring. His speech therapist always says "Chris has really changed". The other day at his speech therapist's, he knocked on her door and she said "Who is it?", and our son answered "Chris!"

He is aware of my presence and absence. One day at school another parent came to get her child. When Chris saw the parent, he started calling out for me. He is starting to solve problems. He wanted to get in a swing at OT but it was too high. His OT just said, "Hmmmm, Chris, what should we do?" Chris found a small chair and pulled it over to the swing, climbed the chair and tried to get into the swing.

In school, Chris has much better attention and is sitting longer and completing tasks. Before, if he failed, he would try to get up and run away or stare into space. Now he is trying over and over again and very proud of his new found success. We are very happy to see his continued progress and excited that the future looks so much more promising for him.

We have seen advancements in fine and gross motor development as well as some advancements in spatial awareness. Specifically, Chris can now put his socks on. He is also using real scissors whereas before, he could only cut with spring release scissors. He is cutting fairly decent lines and using his free hand to stabilize the paper. He was not doing this before the mHBOT started.

In addition, Christopher is imitating block patterns and starting pre-buttoning skills and doing very well. He is now lacing lace boards. His hand (palm) strength is

increasing. He is starting to isolate his fingers (i.e. holding one finger up). All his therapists have indicated that he is now ready to start handwriting skills using the *Handwriting without Tears* program. This was not an option before hyperbarics.

His gross motor strength continues to improve. Chris can now ride a three wheeled scooter. He is climbing up slides and motor planning, throwing his leg over the top to climb down the stairs. He can now stand on a large therapy ball and march while holding his therapist's hands. Before, he would sit down real fast because it was so unstable he was afraid to shift his weight.

He can now climb out of the mHBOT chamber without assistance. In the beginning, I had to lift him out. Now he swings one leg over the side, holds the edge of the chamber and then swings the other leg over. He is becoming a very fast runner (much to his mother's dismay!).

We feel all of his interventions are helping, but it has been quite a dynamic spring since the mHBOT commenced!

Respectfully Yours,
Chris' Mom

Key points: *Mild HBOT therapy works for all degrees of autism, even children with severe cases. Importantly it works with all of the major areas of the brain to improve executive functions, speech and language, socialization and emotion, and motor skills and planning.*

Victor's Story
24 years old

Our son, who is now 24 years old, showed no signs or trace of any type of disorder in the initial years. In fact until he was five, he was perfectly normal like any other child of that age group, getting good grades in school etc.

Around the age of 5 though, we started to see that something was not right with our son. He was diagnosed as an ASD/ADD child. From that age on, until today, we have been through various doctors trying out different types of medication.

"These changes have been so obvious that we think the day will come in the not-so-distant-future when our son's diagnosis will be reverted forever and he will be an independent person"

To be fair to all these doctors, some of the approaches, i.e. acupuncture, NAET, biofeedback, etc., helped our son in varying degrees but it was difficult to conclude that the improvement was significant or substantial.

We started on the methyl-B12 regimen about 8 to 10 months back and Victor did well with this. Then we followed that course by introducing HBOT about 4 months back. This combination, along with the supplements Dr. Neubrander prescribed, has brought about undeniable changes. These changes have been so obvious that we think the day will come in the not-so-distant-future when our son's diagnosis will be reverted forever and he will be an independent person.

Twenty years ago when my son was first diagnosed, my wife lost her smile and for the first time in 20 years, she once again has a smile on her face! And my younger son says that the progress he has seen with his brother in the last few months since starting HBOT has been the most profound ever.

Some of the undeniable changes have been:

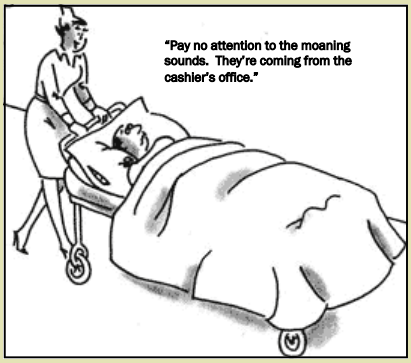
- *Very cheerful all through the day.*
- *Staying in the family room and watching TV and interacting with family members like a very normal person.*
- *Very responsive, alert and very friendly.*
- *Impeccable behavior.*
- *More connected.*
- *More normal speech patterns.*
- *Better eye contact that is sustained for longer periods of time.*

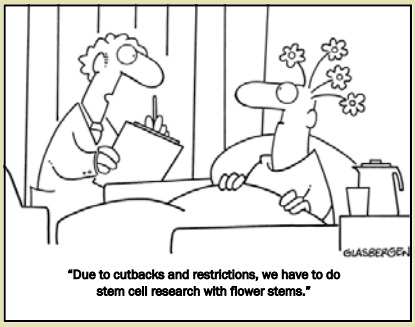
We want to continue with methyl-B12 plus HBOT for some more time and are hoping that we will `get back' our son soon.

'Thanks' to you from the Parents

Doctor's Note: *In the world of autism, it is a common but erroneous belief that older children cannot do well from biomedical treatments. Therefore many parents of older children stop trying and just give up. However, Victor's story is just one of many demonstrating that at least two treatments - methyl-B12 and HBOT -definitely can make a significant difference and that it is never too late to try.*

Laugh Attack!





Jack's Story

3 years old

Our story began 18 months ago when Jack was diagnosed with PDD at 28 months. It came as no surprise to us as he had lost all of his language for a few weeks and then began slurring a few old words again.

Almost completely silent, Jack would spend his days spinning, watching the wheels of his trains or trucks, throwing rocks or toys repeatedly for hours, tracing lines on walls, have tantrums several times per day. He possessed no eye-contact, would never turn or answer to his name, and sucked on a baby bottle full of milk, for which he would scream all day long.

He would run away from me and wouldn't care if I would enter or exit the room. He didn't hug or kiss. He lost his ability to wave and clap hands and had not learned to point. He would, however, drag us around by the finger to indicate what he wanted and spent hours at a leap frog alphabet pad.

Jack had a protruding belly and would fall to the ground or bang his belly against the furniture. Spending a day with Jack, as a very pregnant mother was depressing, devastating, exhausting, and angering. I would cry all the time and pray for his recovery. I would wake-up every morning wondering how I would make it through the day and longing for the dream of my son that I thought would be lost forever.

Since those initial days, Jack has been on gluten, casein-free diet for 18 months and receives daily methyl B-12 injections. He takes daily vitamins, omegas, calcium, enzymes, many organic raw fruits and vegetables and a good diet of whole foods without preservatives that I make myself or buy at a health food store.

In addition to PDD, Jack has also been diagnosed as having enterocolitis and is being treated with sulfasalazine. Jack has had cranial sacral therapy, ABA, speech, verbal behavior therapy, social interaction therapy, and occupational therapy. He attends a speech delay program in our township and will begin a typical pre-school in September.

Jack has always been an early responder to all of the DAN protocol biomedical approaches under the care of Dr. James Neubrander, especially to methyl-B12, and to Dr. Krigsman's treatment. Due to a combination of all these therapies, Jack has progressed remarkably and was nearly recovered from PDD by the time Dr. Neubrander recommended that we try mild hyperbaric oxygen treatments.

Initially I was somewhat skeptical but definitely hopeful. I can now say that immediately my skepticism turned into amazement as HBOT seemed to lift the veil that still enshrouded Jack.

"I couldn't wait to get in the 'space ship'…each time I would see him become closer and closer to typical"

Interestingly, I noticed an immediate improvement after our very first HBOT session. Prior to beginning HBOT, Jack's reciprocal language was still delayed and conversations wouldn't last for more than one or two exchanges before he would turn and then run off. In addition, he was not able to relax enough to sleep through the night.

Before HBOT, Jack was averaging about four to five wake-ups per night. As one can imagine, Jack's poor sleep patterns were wearing on both of us and because we both suffered from sleep deprivation, I believe it hindered Jack's ability to recover completely due to my inability to help him because I was so exhausted.

Today, while he is still active, his motivations have more purpose and his play style and reciprocal play with other children are now age-appropriate and he possesses an extraordinary exuberance and thirst for knowledge and life experiences that I had only wished for him in the past. I am utterly amazed with his overwhelming progress and am proud of him.

Jack is more patient and follows directions and finally answers to his name consistently, which had been one of the hardest things for us to achieve, even when most of his other autistic behaviors had disappeared. He has a group of friends and a best friend named Lindsay, a typical child age 3, who he asks to see every day.

Between late March and May, Jack, his one-year old brother Vaughn, and I completed 40 sessions of HBOT at a rate of 4 one-hour sessions per week. Honestly, I couldn't wait to get in the "space ship," as we called it, because each time I would see him become closer and closer to typical.

With every day that passed our son gained better communication skills. His reciprocal conversation with me expanded, at first to three or four exchanges, and now he just talks all day long, sings songs, asks questions, plays tag and hide and seek with his friends and just started a team sport, soccer.

We had been so excited back in early March and prior to HBOT, when Jack had already officially lost his diagnosis from his neurologist. However, today, just two months shy of his fourth birthday and after 40 HBOT sessions, Jack has come so much further than he was when his neurologist saw him! He now acts like a typical child and is an absolute pleasure to be with.

Even Jack's appetite has increased remarkably and he sleeps through the night—and so do I! He is so lovable, plays with me and his brother and father all day long, and he relates to everyone. He is so very happy and pleased with himself and even asks if things are gluten-free. He talks to me and says things like, "I need to have dinner now…I'm hungry…can you make me Mickey Mouse pancakes…no butter please but lots of syrup." And, "I love you mom…that's beautiful," Jack said about a necklace I was wearing one day. He is amazing!

Doctor's Notes:

There are many biomedical therapies that have been shown to be helpful for children on the spectrum, and some more than others. However, no matter "how close" a child is towards recovery, and no matter how high-functioning a child may be, it is my opinion that every child be allowed the opportunity to see how much farther HBOT may be able to take them.

Gabby's Story
7 years old

Our Gabriella Rose, born January 1999, appeared a healthy baby girl. At six hours old she could lift her head and watch as her Daddy walked and talked around the hospital room. Amazing! I didn't know a newborn could do this. Then one day, her life and ours changed. Within the first few days of life, she had seizures, became hypotonic and developed a severe intertrigo rash.

As the months went by, Gabby was not meeting developmental milestones. At 16 months old, she was evaluated at an Early Intervention exam and I was told she was functioning at about the level of a six month old.

We visited many doctors and diagnoses of hypotonia, static encephalopathy, global developmental delay, and severe mental retardation were given. Eventually, PDD, Cerebral Palsy, abnormal toxicology, gastro intestinal dysfunction and Autism Spectrum Disorder were added. In addition, Gabby had a severe sensory disorder, not knowing where she was in space, not able to feel touch or pain appropriately, and her vision and auditory processing were affected.

"Something was missing— something foundational that other therapies could build on or compliment"

Although Gabby received Early Intervention services, she did not seem to be able to respond to the occupational, physical and speech therapies. Something was missing— something foundational that other therapies could build on or compliment.

At about 2.5 years old, Gabby started an all natural, organic diet, including fresh vegetable juice. I saw a slight improvement in awareness with this diet, but I knew there must be more we could do to help her.

My sister sent me an article about Hyperbaric Oxygen Therapy and how it was being used to treat Cerebral Palsy. I believed this therapy could help Gabby's condition and give her the boost she needed to begin the healing process.

Gabby was 3 years old and we set out for our first round of 40 dives. The facility had two monoplace hambers.

Gabby's protocol was 100% 02 at 1.5 ATA for one hour two times per day for four weeks with a break on the weekends. We did not do a SPECT scan. I went into the chamber with Gabby the first week, after that she went in by herself and was perfectly comfortable. During those first dives, the chamber was brought to pressure very slowly to allow Gabby's ears to adjust and Gabby had no problems whatsoever. She really liked being in the chamber.

"We were awed at how quickly Gabby responded…

The cloudiness was disappearing from her eyes."

We were awed at how quickly Gabby responded. In the first 10 dives, we saw improvement in eye contact; after 20 dives, her gross motor skills and motor planning began to improve. She could push a small child's chair around the room without getting it stuck against the wall.

After 25 dives, she amazed us by walking to an artificial tree in the room and said 'tree.' She then walked to the window looked out at the parking lot and said 'car.' Before the 40 treatments were complete she was drinking through a straw and began to perspire for the first time in her life. Gabby continued to make progress up to 6 months after HBOT. When we returned home, she was able to get into a standing position from the ground with no assistance.

We went back two more times and Gabby completed 116 dives in total. We continued to see improvement in motor skills, eye contact, cognition, receptive and expressive language. Her balance and gait continued to improve as well as awareness of her surroundings. She was beginning to respond to simple requests and she was showing some signs of being affectionate!

The center also provided access to a wonderful occupational therapist trained in Neurodevelopment Techniques (NDT). She worked with Gabby three times a week. This OT-NDT really seemed to compliment the HBOT. Gabby was responding nicely to the occupational therapy now.

Gabby began bio-medical interventions including, vitamin/mineral supplements, cod liver oil, fish oil capsules and probiotics. She also began the gluten-free / casein-free diet. We were also doing a home-based intervention called the Son-Rise Program, including a lot of sensory integration things. She started therapeutic horse back riding and cranial sacral therapy.

We were told of a another hyperbaric center and Gabby began treatments there in 2004, she was 5 years old. Gabby continued to make gains in all the areas she had in the past, along with an increased awareness of her surroundings. The cloudiness was disappearing from her eyes.

Gabby's HBOT protocol was still 100% 02 at 1.5 ATA, but we did not always go every day. We went three times a week for a few weeks, and when we were able to do more, we did. Gabby continued to make gains in fine and gross motor skills along with motor planning. She stepped from the parking lot onto the sidewalk unassisted and was able to string two beads. In the past Gabby could only tolerate ten minutes outside on a cold day, and could now stay out for longer periods of time, even going sledding with her sister.

January 2005, just before Gabby turned 6 years old, she began methyl B-12 injections under the care of Dr. James Neubrander. She continued with her other bio-medical interventions and therapies. She began Celebrate the Children, a private school for children with special needs in April 2005, they follow the DIR (Developmental Individual Relationship), Greenspan model.

Gabby began HBOT again in June 2005. This time we saw a real leap in her interest in socializing with others, especially her peers. She would

say 'hello' to the children in the chamber before she had her treatment. Also, she began to respond to questions and requests in a more timely manner.

In the past, too, Gabby would constantly pull her sister's hair. We finally began to see this behavior begin to diminish. Between 2004 and 2005 Gabby received 86 HBOT treatments.

"This is not the same child that started HBOT at three years old.

Many layers have been peeled away…"

When Gabby returned to school in September 2005 the speech therapist stated that Gabby had a 'speech explosion.' Gabby was moving her mouth in new ways, she was verbalizing much more and making many new sounds. By October, Gabby was selected as 'Social Butterfly' of the month! Indeed, HBOT and bio-medical support compliment the traditional occupational, physical and speech therapies that have been recommended.

December 2005-January 2006: Gabby received HBOT again. When Gabby returned to school after the winter break, everyone commented on how she had gained weight, for the first time. The physical therapist was impressed with Gabby's gains as well.

To date, Gabby's digestion has improved and has fewer loose stools. She can now climb the playground equipment with minimal to no assistance. She will initiate play and is always thinking.

We have safety gates around the kitchen, but when Gabby wants to get in, she pulls a chair to the counter and proceeds to climb onto the counter top, looking in the cabinet for snacks. If I am in the kitchen she will go into the bathroom and turn the water on, which she knows will get me out of the kitchen leaving the gate open, and she quickly runs in!

Gabby has had a total of 243 hyperbaric oxygen therapy treatments over the past 4 years. She has been doing bio-medical interventions for about 3 years along with various other therapies that have helped her. Gabby is interested in life. She is affectionate and playful. Gabby loves to explore, have fun and enjoy life. She is very social and wants to be part of the action. She even participated in her sister's girl's softball team by hitting the ball off the T and running the bases.

She is concerned for others, and at school, is affectionately called 'the class mother'. Although Gabby's speech is apraxic, using approximations of words and gestures, she is able to tell us what she likes and dislikes. She can ask and answer questions; she has stories to tell; comments on what's going on; she wants to join in conversations.

This is not the same child that started HBOT at three years old. Many layers have been peeled away and Gabby is now able to participate and enjoy the world around her. She is becoming more self-regulated and growing into the beautiful girl she was meant to be.

That has been Gabby's journey from then to now! We look forward to continued progress and healing through prayer, HBOT, other bio-medical interventions with related and complimentary support.

Doctor's Notes:

I believe in HBOT, whether from hard or soft chambers, and whether done from my clinic or from other clinics. The pressures and protocols needed by some may not be needed by all. At this time it is impossible to know how many treatments a child will need, which children will do better on high or low pressure protocols, or if a child will need to be treated long-term or short-term. What is being demonstrated undeniably is that HBOT, whether hard or soft, is a valuable adjunctive therapy to autism and other developmental neurological conditions. Therefore it is my opinion that every child should be afforded the opportunity to try HBOT.

Joseph's Story

4 years old

Our Joseph developed normally, met all of his milestones, began speaking at 12 months and understanding language at 7 months. His regression into Autism was very gradual until the age of 15 months, when shortly after, that he was completely unreachable.

We noticed the changes taking place at about 12 months old when his bowel movements began to be less frequent, dry, hard and gritty like sand. He would tantrum and scream for no reason when he had to go to the bathroom. He also developed a chronic cough, which no doctor could conclusively answer *why* he had it or *what* was causing it.

He was obsessed with letters, numbers and puzzles. At 24 months he was completing puzzles (on his own) for ages 4-7. He was able to write every letter of the alphabet and knew numbers up to 40. He even could write 3 letter words and his name.

"He was completely unaware of anything going on around him."

Joseph had no interest in people, would not look at anyone, and it was impossible to get him to cooperate or notice me when I entered the room. He was completely unaware of anything going on around him. He stuck his finger in the vacuum cleaner while it was running, the vacuum brush peeled the skin off his finger and he hardly cried. I knew something was wrong.

He would not wear clothes and would take his clothes off out in our yard and run around naked. He would climb over a 4 foot chain-link fence just to get into our neighbors garage to push around his snow blower.

Joseph even ran away. Two blocks from our house a crossing guard grabbed him and called the police at the same time I was calling 911.

When he was 2 ½, he was diagnosed with Autism. Joseph had no receptive language, did not know his name, crashed into things all day long and would spin around until he fell on the floor. He had no expressive language and no eye contact. Worst of all, his diet was limited to

milk and baked goods (i.e.: breads, cakes, granola bars and cookies).

Desperate for a "cure", I searched the web—day and night—trying to find a solution to this Autism crisis in which I found my son. The first thing we tried was the gluten-free/casein-free diet. Joseph woke up one morning "cold turkey" from all dairy and gluten. It was so difficult but worth the efforts. My son's chronic cough (the one no one could figure out) disappeared after 2 weeks and he actually began to pass stool, not just pellets and sand. The stool wasn't formed, it was more like mush, but at least he was passing something more than pellets.

"Desperate for a 'cure', I searched the web—day and night—trying to find a solution to this Autism crisis in which I found my son."

I also read about a group of medical practitioners who formed a group called DAN! (Defeat Autism Now!). Fortunately for Joseph, there was a DAN! doctor right in our very own town. I called, set up an appointment and got the ball rolling. We met with Dr. Neubrander, and our first biomedical intervention was to start the methyl-B12 shots every 3 days.

We saw amazing things with the shots. His early intervention therapist immediately noticed that he was able to sit for longer periods of time during sessions. Shortly after that, we began adding supplements.

One thing that sticks out in my mind is a time when Joseph's older brother Nicholas offered Joseph one of 2 lollipops (a red and a purple). He asked Joseph, "Do you want the red or the purple?" and Joseph answered, "Give me blue!" This happened after Joseph's 3rd methyl-B12 shot. The fact that up until then, Joseph had no history of expressive language made this occurrence very exciting and made all of the efforts of the diet and the anxiety over giving shots well worth it.

In addition to the diet, methyl-B12 injections and supplements, Joseph started chelation therapy. When he began chelating, Joseph was not "dumping" high quantities of toxic metals, however, we noticed that with each round of chelation his body was beginning to let go of metals. We were noticing gains in socialization, language and communication.

Joseph began seeing a pediatric gastroenterologist familiar with the GI issues in ASD children. After upper and lower endoscopies, Joseph was diagnosed with lymphoid nodular hyperplasia. He was given a medication for bowel inflammation and the behaviors associated with his bowel movements faded; his posturing prior to going to the bathroom went as well. Gains we associated with the elimination of GI issues were better focusing ability, elimination of tantrums before bowel movements, and a happier overall disposition. After these initial gains we restricted his diet even more, eliminating starches, which also seemed to help his GI issues.

However, even with all these new treatments, many things were still amiss. We could not get our son to make eye contact, or to use appropriate social skills. He would not ride a bicycle, but would run alongside it while pushing it. He still would not acknowledge people as they entered the room. His GI symptoms were inconsistent, even though he was on the GI medicine, and his abstract thinking was not where it should have been for a 4-year old child.

"After 3 dives, we immediately noticed an increase in eye contact.

By the time Joseph completed 42 dives, his progress was amazing."

In December 2005, we began HBOT in the soft chamber at Dr. Neubrander's office. After 3 dives, we immediately noticed an increase in eye contact. By the time Joseph completed 42 dives, his progress was amazing.

We saw improvement in all of Joseph's most difficult issues. He began initiating play, following his older brother everywhere and imitating everything he did. Even now wherever Nicholas goes, Joseph is trailing right behind him. Joseph even began sharing toys with his little sister Erika. He gets 2 baby strollers, one for him and one for Erika and he tells her "Come on, let's race!", and they race around the house together sharing laughs.

His little sister Erika received a tricycle for her birthday. When Joseph saw it, he immediately got on the tricycle and started peddling. He is now riding a bicycle without training wheels! He tries to keep up with the big kids calling, "Wait for me!"

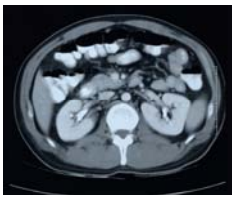
In addition, Joseph now responds to his name and gives direct eye contact when he is called. His teacher said every time someone enters the classroom Joseph greets them with "hello", followed by their first name or title.

His inconsistent bowel issues resolved, and he has formed normal regular daily bowel movements. His abdomen looks less bloated more often.

Joseph's abstract thinking has increased. When he was in his therapy session, he drew a picture of trees with swirls in the sky around the trees. His therapist asked him what he was drawing and his response was, "I'm drawing the wind."

Joseph's progress has been amazing and gives me hope for recovering my son. I have seen tremendous improvements and gains since beginning biomedical intervention for treating Joseph's Autism. The gains alone from using hyperbaric oxygenation have been the most dramatic. I look forward to the gains he'll make as we reintroduce HBOT therapy again.

Donna!



Doctor's Notes:

For years practitioners familiar with biomedical treatments for autism have believed there to be a "gut-brain connection". As you can see, HBOT is bridging the gap between this gut-brain disconnect and provides a valuable treatment option that not only works to heal the gut, but also works to heal the brain as it relates to executive functioning, speech and language, socialization and emotion, as well as motor skills and planning.

John's Story

4 years old

It certainly was not the world's easiest pregnancy when I was carrying John. I was in the process of moving, switching jobs, taking care of a sick dog, and completing a fellowship on the East Coast while my husband completed his fellowship on the West Coast. But the pregnancy was going well, in spite of the turmoil that was going on all around me. John's ultrasounds consistently looked great and he was growing like a little bean sprout.

I have Rh-negative blood, and Dan has Rh-positive blood, so I needed to be immunized to prevent my body from rejecting subsequent pregnancies. At the same time, my blood work was starting to come back with high concentrations of antinuclear antibodies (ANA). In addition, I had to go to physical therapy because my joints were in such bad shape I couldn't walk, and the disks in my back were starting to bulge from the connective tissues stretching around my spine.

My obstetrician started doing non-stress tests every few days or so to monitor John and make sure he was still thriving. At 35 weeks, I was really feeling awful and I went in for a non-stress test as usual. I sat down, did my job pressing the little button, and the nurse came in about 20 minutes later. She looked at the chart, frowned, and pulled out a can of orange juice. After three cans of juice, I was quite awake but John was non-reactive.

The nurse called in my doctor and she immediately took me into the next room for an ultrasound. The doctor spent at least 20 minutes looking for any signs of activity, but saw no movement at all, not even breathing motions, kicking or even a twitch. If his little heart had not been beating on the screen, I would have thought the worst.

The doctor admitted me to the hospital. I was monitored around the clock until they could get the two of us stabilized. My kidneys were starting to shut down; I was hypoglycemic, feverish, and retaining a tremendous amount of fluid.

After a couple days of intense watching and waiting, they were satisfied that John and I were on the right track and we were sent home. I went into labor two days later, and weighed 10 pounds more than the day before—all fluid. After 43 hours of labor, John was born with great Apgar scores (9 & 9) and a very robust cry. In fact, he cried, and cried, and cried some more. He didn't want to nurse—he just wanted to cry.

That evening, the nurse came into my room, and gently informed me that she was taking John out of my room and into the nursery because he was going to keep me awake (translation: he was keeping everyone on the entire floor awake with the constant high-pitched wailing). John had to be kept under the warmer for two days because he couldn't regulate his body temperature, and he was jaundiced, although apparently not badly enough to warrant attention.

"After 43 hours of labor, John was born with great Apgar scores… and a very robust cry.

In fact, he cried, and cried, and cried some more."

In spite of the ominous beginning, John's development of language and motor skills was nothing less than astounding. He was rolling over from stomach to back at 21 days of age, spoke his first word ("hello") perfectly at 11 weeks, stood alone holding on to furniture at 15 weeks, sat unassisted at 20 weeks, and started walking the day after his 9-month birthday. John cooed, smiled interactively, babbled and made raspberries.

Shortly after 6 months, John had the first of six successive bouts of asthma, respiratory infections and otitis media during the spring and summer months of 2003. He was treated with antibiotics for each of these illnesses, and after the sixth ear infection, John's otolaryngologist performed a myringotomy and placed bilateral pressure equalization tubes in his ears.

For a while, we believed that his language acquisition abilities were adversely affected by his hearing deficit from the otitis, and we were encouraged when he started speaking again soon after the placement of the ear tubes. He learned to say words that approximated "fish" and "diaper," although none were as clearly enunciated or articulated as his first words.

In the meantime, John's motor skills continued to progress. At 10 months, he was able to go up and down stairs, run, kick a ball, and walk forwards, backwards and sideways. His balance, hand-eye coordination and concentration were quite impressive; he could ride his scooter and tricycle with ease, jump, walk (not crawl) up and down stairs unassisted, run through shopping malls, get in and out of laundry baskets, boxes and beds, build elaborate towers with his blocks, swing on his "big boy" swing and go up and down a slide, and play fetch with our dog.

John could play various rhythms on his toy drum and hum familiar tunes like "Old McDonald Had a Farm" with us. On one occasion, John drew two pictures of an airplane on his Magnadoodle while watching "Jay Jay the Jet Plane" on television. He mastered every puzzle and shape sorter we gave to him, some within a matter of minutes. He also knew how to turn on (and turn off) and operate all of his electronic toys and our electronic equipment including the VCR, television and radio. One of his speech therapists reported that in over twenty years of working with children, she had never seen a child as young as John master puzzles and spatial games as quickly and precisely as he did.

John was always interested in the tactile, concrete world. When we would hand John a new toy, he would initially approach the item like a little scientist or engineer given a specimen to study, rather than a child playing with a toy. Later, however, he would enjoy playing with his toys in an appropriate manner (i.e. pressing buttons to make animals pop up, turning the handle to open the cash register drawer, pushing cars and making car noises, etc.). He rarely

threw or broke his toys or ripped pages in his books; he has always been gentle and contemplative when at play. If permitted, John was intrigued by taking things apart to see how they work; his favorite toy as a very young infant was an old dissembled remote control.

Since he was an infant, John enjoyed constant intellectual stimulation became bored with routine. Each new experience or activity we introduced was met with excitement, and his curiosity for the world around him was insatiable. During his infancy, he tended to move from toy to toy during the course of the day, never staying with any toy for any length of time. A friend commented that he "managed" his toys rather than played with them. His ability to recall specific places, pictures, and songs was exceptional.

Many who were getting to know John characterized him as spirited, adventurous and independent, always going after what he wanted rather than waiting for an adult to get it for him. Early on when John was hungry or thirsty, he would simply whine and cry until we figured out what he wanted, which initially took quite a long time. While other children might ask for or make the sign for a sippy cup, John walked into the kitchen and looked back and forth between me, the sippy cups and the microwave to indicate that he wanted me to make him something to drink.

John experienced feeding problems with oral aversion from a young age, and refused to put anything in his mouth (unless we were feeding him). He seemed to be afraid of anything that might potentially choke, gag or hurt him if ingested, and he had great difficulty learning to eat lumpy food. Since he was 12 months old, however, John has enjoyed feeding us crackers, cookies, and other stuff that he has refused to eat; thus, he understands that he is supposed to put those things in his mouth, but simply will not do so. When presented with a straw from which to drink, John had a tendency to bite the straw instead of suck fluid into it. John would drink from a regular cup, but he would only drink from sippy cups that did not have spill-proof valves. His diet was limited to soft, mashed and pureed foods since he swallowed his food without really using his tongue or chewing. I had difficulty nursing John when he was young, and he would not take a pacifier.

"John experienced feeding problems with oral aversion from a young age, and refused to put anything in his mouth…"

I believe these profound feeding problems stemmed dually from oral/verbal dyspraxia and from the gastrointestinal problems he experienced since birth. Even when he was an infant, he was irritable after every meal of breastmilk; he weaned himself early, and we were forced to replace breastmilk with formula. John was the type of kid that would rather starve to death than eat. We were not, able to get rid of the irritability, even after weaning from the breastmilk and supplementing with formula and solids. He would cry excessively and arch his back in pain; he was started on Zantac at four months for acid reflux. He was later switched to Prevacid, which only exacerbated his symptoms.

John's routine hemoglobin test at his 12-month check- up indicated mild anemia, so he began taking Poly Vi-Sol and ferrous sulfate iron supplements, with the thought that too much milk had prevented the absorption of iron from his formula. When his hemoglobin level was down even more after several months of iron, we conducted guaiac smear tests, which were positive for occult blood, meaning that he was bleeding internally, and nobody knew where or why.

Subsequently, John went in for an endoscopy and colonoscopy when he was 18 months old. The evaluation from the scope was unremarkable, and probably would have missed everything, but biopsies later revealed chronic gastritis and prominent lymphoid aggregates in his terminal illeum. Bloodwork conducted in tandem with the colonoscopy indicated neutropenia and elevated counts of lymphocytes and eosinophils.

We retested the stool several months later, and the smear tests were still positive, presumably because nothing had been done to actually treat the underlying problem. In May 2004, John had an upper GI series and small bowel follow through with barium contrast, which was normal. At this point, his gastroenterologist offered a diagnosis of lymphonodular hyperplasia, although again, no course of treatment was suggested.

John was getting sicker by the day, and his subsequent blood reports were showing even more decreased levels of neutrophils, very low glucose (57 mg/dl), and elevated levels of lymphocytes, eosinophils, platelets, and thyroglobulin. His sedimentation rate was also elevated (15 mm/hr). All of this pointed to some substantial inflammatory process going on somewhere in his body.

At the same time that all of this mess was going on with his gut, John's developmental skills were starting to suffer. He was referred by his pediatrician for a developmental evaluation when his language development failed to keep pace with the development of his gross and fine motor skills. He was evaluated at 21 months by a developmental pediatrician for being socially withdrawn and failing to progress in his language development.

"John was not given a formal diagnosis by the developmental pediatrician;

he did not demonstrate a full range of autistic-like behaviors during the evaluation."

John was not given a formal diagnosis by the developmental pediatrician; her evaluation notes indicate that John had some features of autism, including social aloofness and poor language development, but he did not demonstrate a full range of autistic-like behaviors during the evaluation.

A few weeks later, he was re-evaluated by a speech language pathologist in the home to establish recommendations for speech and augmentative communication therapies, and she noted that he has understood language better than his speech and language difficulties have allow him to express, and that he needs structured practice and

expectations to use speech, signs and symbols to communicate in his daily routines. Ultimately, her diagnosis was a speech and language disorder with some atypical language and social behaviors, but not autism per se. John's occupational therapist believed John had significant issues with praxis and motor planning, and all of his speech therapists have stated unequivocally that John struggles with oral/verbal dyspraxia.

John started direct speech language therapy at 24 months (two times per week) with a focus on speech and language and use of signs, symbols and voice output to help increase his language and functional communication skills. He also started working with an occupational therapist to address his oral aversion and feeding issues, including brushing his teeth, feeding himself with a spoon, and chewing of solid food. His occupational therapist started by using the Wilbarger Protocol (deep pressure and proprioceptive techniques with oral tactile stimulation) to help decrease John's sensory defensiveness regarding his mouth, including his pattern of food avoidance, fear, and anxiety about eating. This technique made visible improvements in John's overall anxiety level, and he demonstrated greater use of eye contact and increased his attention span, but he was still not talking or interacting normally, nor was he eating, chewing, or using his tongue in any functional way.

John started attending a wonderful structured playgroup at the TEACCH (Treatment and Education of Autistic and Related Communication Handicapped Children) Center at 26 months. In the beginning, he could only say a handful of words, none perfectly. He could make a sound like a cow, sheep and horse, and could point to the animals to identify them. He didn't know how to share, made little eye contact, and could not sit for any length of time to perform a simple task. Everything was on his terms, and he was not interested in interacting with any other people other than Mommy and Daddy. But by the time the first semester ended, he knew all of his letters (upper case and lower case), colors, shapes, and numbers up to 10. He doubled his vocabulary and mastered many tasks that required complex fine motor and planning skills. He became interested in animals, pretend play, and singing with the group.

At 28 months, I hired a wonderful young woman to come to the house for 10 hours per week to work with John intensively, one-on-one, on social skills and communication. Within a month he was sharing his toys, drawing pictures with his Magnadoodle, and increasing his vocalizations. She worked on two-word combinations, and by Christmas he could say "thank you," "big truck" and "push please." Those two played games together, took turns, made choices, and sounded out words together several days per week. She also designed a series of games tailored for John's interests and worked on creative projects, including painting, drawing and coloring.

Nobody around here knew how to fix John's tummy, so I started searching all over the world to find an expert in lymphonodular hyperplasia. At the beginning of December 2004, John's new doctor put him on anti-inflammatory medications to get the colitis to calm down and start healing. He also adjusted John's diet to eliminate a variety of foods, including glutens and caseins, although at that point we didn't know yet exactly what we should avoid. We also started supplementing with probiotics (to replenish the good bacteria that were depleted during multiple courses of antibiotics), DMG, and essential fatty acids.

"And then the most wonderful, beautiful, fantastic thing in the world happened…John started to feel better."

And then the most wonderful, beautiful, fantastic thing in the world happened…John started to feel better.

When we got the next round of bloodwork back in January, we thought they had mixed up his file with someone else's. It was like looking at a completely different kid—not one of his numbers was off, not even the blood sugar. We also noticed that John had not had an asthma attack or ear infection since October.

In January 2005, John continued to do speech therapy, occupational therapy, the communication therapy at home, and we started him on hippotherapy one day a week to strengthen his abdominal muscles, which had atrophied since John avoided any activities that would engage his tummy area. Everyone we knew was starting to remark about his progress. He was counting to twenty, and we could now understand much of what he was saying. Up to then, he had been counting with one-to-one correspondence. He was adding more shapes and colors to his repertoire, and attempting to say every word he heard. He wasn't just making his toy animals walk around—now, they were having fun, eating snacks, taking baths, and chasing each other. He was performing song games, like "itsy-bitsy spider" and "head, shoulders, knees and toes." He was suddenly absorbing information faster than we could feed it to him.

Three months before he turned three, we discovered quite haphazardly that John was, in fact, able to read. Although he could not say the words, he matched pictures of animals perfectly with the corresponding words, and was able to repeat the feat consistently, much to the amazement of everyone in the room. I started testing to see how much he could actually read, and it was truly amazing. I went right up to our computer and made a spelling activity for him, and he could spell most preschool three- and four-letter words with ease. The great thing about this is that it was not hyperlexia; he understood what he was reading. Even now he sits down and reads by himself, and when he doesn't know a word, he sounds it out. Many people look at John and smile, thinking that he's merely pretending to read. In reality, he is reading, although what's coming out of his mouth doesn't always make sense to those around him.

In the fall of 2005, John started school with neurotypical kids at a Montessori school near our house. It seemed like a good plan; he could move at his own pace, and since academically John is way ahead but socially behind, that self-paced strategy might have just worked. And so,

he was scheduled to attend every morning of every day for three hours like the other kids, although for the first month, that didn't work out at all. He was easily exhausted and started acting out after only an hour, and was ready to come home and collapse for the rest of the day.

His diet had been completely overhauled to accommodate the results of a series of highly sensitive allergy tests that revealed he was allergic or sensitive to nearly forty different foods, many of which he ate on a regular basis, so he also could not eat the same foods as the other children (nor could he chew yet).

"By injecting kids with additional methyl-B12, we're giving them the chance to jump-start this process and relieve the oxidative stress of inflammation to detoxify"

In late August, we began giving John shots of methylcobalamin (methyl-B12) every three days in an attempt to boost his immune system and give him some help getting through the day. We all need that vitamin to be able to complete the methylation process and get rid of nasty toxins in our bodies. In autistic kids, this process gets jammed up because of the exposure to heavy metals and environmental insults. By injecting kids with additional methyl-B12, we're giving them the chance to jump-start this process and relieve the oxidative stress of inflammation to detoxify.

Almost immediately after starting the shots, everyone noticed a big change in John. He was happier, more alert, laughed at jokes, etc. His teachers at school began to guess (correctly) the day of the shot cycle by his demeanor in class. After evaluating his progress, Dr. Neubrander determined that he was a "class 5 responder," meaning that he had the potential to benefit greatly from high dose, high frequency methylB12 shots. He started him on shots every day at Thanksgiving and recommended that we begin hyperbaric oxygen treatments.

In the meantime, his gastroenterologist began John on a course of prednisone to see if this would have a cognitive effect; in kids with autism, sometimes calming the neuroinflammation is enough to pull them off the spectrum. It was worth a try, but it could not be a long-term solution because of the side effects.

"...the increased [hyperbaric] pressure decreases swelling and inflammation.."

Up to that point, those six weeks on the prednisone were the best weeks of John's life—he was like a different kid, and his teachers were astounded. This was enough to make a believer out of his doctor—he put John on a low dose of 6MP, a drug that was designed to combat leukemia, but is also useful for calming severe cases of inflammation without the side effects of corticosteroids. All we could do was wait and see if it worked...

We started hyperbaric oxygen therapy (HBOT) in January 2006. This is a treatment that has been used for years to speed healing in burn victims and athletes, but has only recently been found to be of help to autistic children—this is probably because researchers only recently discovered the substantial amount of neuroinflammation in children diagnosed with autism.

The increased pressure in the HBOT chambers allows blood plasma to absorb additional oxygen (Henry's Law of Physics—under pressure, gas dissolves in liquid) and greatly increase the uptake of oxygen by cells, tissues, and glands in the body. This allows for greater circulation to areas with swelling or inflammation, including the brain. At the same time, the increased pressure decreases swelling and inflammation.

After the first HBOT session, we noticed some subtle, but very real differences in John—better articulation, more interaction, etc. After the second round in early February, John was a different kid. His thought processes were faster, he was asking questions, pointing out things of interest, not just counting to 100, but recognizing all the numbers; starting to tell time, reading without hesitation, etc. It was truly amazing to watch.

Following the second round of HBOT, we had a very interesting (and wonderful) encounter with his pediatrician, who had not seen John since October 2005. She walked into the room, and John gave her a hug—she looked at me, stunned, and said jokingly, "Who is this child?" I said, "You don't know the half of it."

Then, she looked him over and started talking to him about clocks, squirrels, cats, colors, numbers, anything and everything. He was playing nicely with the toys in the office, paying attention to our conversation, and attentively responding to her requests to breathe deeply and open his mouth. At the end of her exam, she said, "How did you do this?"

I said, "You don't want to know," but she emphatically replied that she did. I looked her right in the eye and said, "I spent the past two years treating him for heavy metal poisoning and neuroinflammation and now he's finally recovering." She took a deep breath and said, "I've never seen anything like this. John's functioning completely within normal limits for a three-year old. Wait here."

"[John's pediatrician] took a deep breath and said, "I've never seen anything like this.

John's functioning completely within normal limits for a three year old."

Five minutes later, every member of the staff who was in the medical office that day was in that tiny room taking notes and asking questions about John and our treatment regimen. After they had cleared out, she told me she wanted every book, every article, the name of every specialist, every treatment protocol, EVERYTHING so that she could give the other kids in her practice a chance. She could not bring herself to believe that an entire generation of children suffering from similar symptoms could be helped...until that day when she saw John laughing and talking to her, and realized that the cure for "autism" in many children was simply to get rid of the oxidative stress caused by the neurotoxins that were

stuck in their brains.

Since starting hyperbaric oxygen therapy, John has been physically and emotionally able to successfully attend preschool for the full morning session, every day. He is amazing. He reads, writes, counts, sings, draws, spells, pretends, tells stories, speaks in complete sentences, chews food (!!!!), and generally gives his teachers a run for their money. His teachers have said repeatedly that each time he returns from the HBOT sessions, a "new child" walks through the door.

I can't express the joy that we are feeling now that John is truly on the road to recovery; we are so relieved and excited to see what will be in store for him next! We still have work to do, and he'll probably have to be on the various therapies for quite some time, but that is all minor compared to the happiness we are experiencing.

Doctor's notes:

Key point 1: This child had significant autistic characteristics though not an official diagnosis of autism. However, HBOT does not know the difference between "traits of" and "definite diagnosis" of autism so it is my opinion that any family whose child has some of the symptoms of autism owes it to their child to do a clinical trial of HBOT.

"though science has not yet performed the studies necessary to 'prove' that methyl-B12 or HBOT works for children with autism… parents and teachers can see 'undeniable proof'."

Key point 2: The father is a world-renowned scientist and very famous. As a scientist he must say that everything he sees is anecdotal. However, as a parent he says there is no doubt what he has seen happen for his child is undeniably real. First methyl-B12 made significant and undeniable changes, and later mild HBOT also made remarkable and undeniable changes. Therefore, though science has not yet performed the studies necessary to "prove" that methyl-B12 or HBOT works for children with autism or autistic tendencies, parents and teachers can see "undeniable proof".

More hyperbaric testimonials from Member Centers

Ben's story, 3 years old

Hello, I am a mother of a 3 year old autistic child. We have been receiving Hyperbaric Oxygen Therapy (HBOT) since February 2006 and have undergone 22 treatments. Thus far, I have seen incredible changes in my son.

We have noticed that he has improved his verbal language, has more eye contact, and has been able to self-regulate more quickly. My son has also been able to recognize things by pointing and labeling objects spontaneously, and engages in activities for longer times. I have also noticed that he is able to jump on the trampoline with his feet clear in the air, being that prior to HBOT he wouldn't attempt to jump, but instead, run in place.

Now, I don't know if this is due to HBOT, but in the last month I have noticed so many changes in my son. I've heard him say "Mama" with intent and now he spontaneously says "Hi". Another important thing that I have noticed in him is that he has been able to follow simple direction. Last but not least, lucky for me, he spontaneously cleans.

I am only half way through our 40 treatments with Hyperbaric Oxygen Therapy. We all hope to see more improvements.

Michael's Story
9 years old

Eight years ago, we started our journey with autism. Our road has been much like many others' journeys—years of therapies that worked for a while, but then became stagnant.

The biggest challenges that have made progress impossible are that Michael has been a non-sleeper, and more recently, a screamer. Last year during October and November, Michael screamed continuously, except for when he slept. At times he would lay in my arms and sob even as he kept screaming. He wanted to stop, but couldn't.

"Last year during October and November, Michael screamed continuously, except for when he slept…

He wanted to stop but couldn't."

I had been researching Hyperbarics for about 6-8 months at the time, and knew I had to do something to help both Michael and the rest of our family.

And so, this past January, we started Hyperbarics. The road was not always smooth. Michael continued to scream well into his first 40 treatments. However, after 54 treatments we saw a profound change in Michael's life, which has made our family life exponentially better.

His scream is now a whine that goes away when I remind him to stop. Play is no longer a foreign concept to Michael. He has shown progress both in social and toy play with an increase in the length of play. He is stunning us by being the initiator of interaction. I am getting notes home from school stating what great progress he is making and how much fun they are having with him.

But best of all, Michael now greets me with full smile, glowing eyes and the sheer recognition that I am Mom and not just a person meeting his needs. He is healthier and he is happier.

It is because of Hyperbaric Oxygen that instead of waking to screams every morning we now awake, after a full night of sleep, to his laughter.

Amanda's Story

4 years old

There is a universal desire for parents to want what is best for their children. From the moment a newborn comes into the world, a pledge is made by parents to do all that is possible to protect, nurture, and care for the young life. For us, our promise to our daughter Amanda has been no different.

At two years, 7 months old, our Amanda was diagnosed with Autism Spectrum Disorder—Progressive Developmental Delay, Not Otherwise Specified (PDD, NOS) after she experienced a rapid decline following a routine doctor's visit.

Following is an account of our experience over the course of the past two years, contained within it a hopeful message for all those currently living the nightmare we have and continue to experience.

Words cannot properly convey the pain, worry, fear and frustration felt every day as parents of a sick child. When Amanda was first diagnosed, we were told that PDD is a "fairly common" form of Autism. And in so many words, we were told, by both our pediatrician and county-appointed child psychologist to be prepared for a life of Applied Behavioral Analysis therapy (ABA) and special education programs. We were told Amanda could, with these therapies, have the chance of someday leading a productive life.

This did not sit well with us because up until two years of age, Amanda was speaking in two languages (English and Spanish), making eye contact, laughing, interested in reading, singing along to nursery rhymes and engaging in creative play. We knew that her ability to speak and communicate was buried deep within her, and we vowed to do everything possible to bring her back.

Let us explain of what "everything" consisted. Within three days of Amanda's diagnosis, we immediately began intervention. We hired an ABA therapist to come to our home while awaiting services to be provided through the school district. Although we knew the growing costs associated with health care, we could have never imagined the true capitalism in medicine. In a short amount of time, we have found that many practitioners have placed their own Hippocratic oaths second to exploiting an area of medicine that is not usually covered by insurance.

For example, our first appointment with one of the foremost New York experts treating adolescent autism was nothing short of disappointing. We were charged $650 for a 25-minute consultation, and were given less advice than we received browsing the Internet.

"…our first appointment with one of the foremost New York experts treating adolescent autism was nothing short of disappointing."

Being New York City Detectives, my husband and I spent countless hours investigating all available evidence for a change of recovering our Amanda. After researching the subjects of autism, autism spectrum disorder, basic biological principles, nutritional background—and even mercury poisoning—we became well–acquainted with the Autism Research Institute (ARI), Defeat Autism Now! (DAN!) and its many practitioners.

We followed their many protocols, Regimens, and new approaches to the letter, with no improvement. My husband became well-versed on these subjects, often educating Amanda's many doctors on the new studies conducted, the effects of these studies, and many times requesting prescriptions in an effort to rule out different types of viruses, genetic disorders and diseases.

All the while, Amanda endured countless laboratories' analyses, consisting of regular blood, urine, hair and stool sampling.

By this time, my husband Michael had been attending several physician conferences to listen to the many panels of doctors, who were debating the causes of autism and unveiling new treatments in the fight for recovery.

After almost two years of following various, highly recommended biomedical regimens—which consisted of an extremely strict gluten/ casein/ yeast/ egg/ soy-free diet, oral DMPS chelation, probiotics, cod liver oil, routine B-12 injections, daily glutathione therapy (IV and nebulizer mist), anti-viral medication, Actos (for anti-inflammatory purposes), weekly cranial-sacral therapy, infa-red sauna, consumption of every supplement available from AK A to Zincs, 36 hours weekly of ABA therapy—there was still not "dramatic" or "significant" improvement.

Amanda continued to regress, losing the little bit of language she had left, no longer repeating, and showing less interest in her therapies. Her sleep pattern also began worsening by the day and her mood consisted of daily crying. Our Amanda was an extremely unhappy child.

Then, by a stroke of grace, at a recent Long Island, NY conference in April 2006, our situation changed when we met an IHA spokesperson, Shannon Kenitz, who shared with us her own experience as a "mom in the dark". She told us about her daughter Grace and about the only treatment—after having tried many—that saved her daughter, Hyperbaric oxygen Therapy.

On behalf of the IHA, we were invited to bring Amanda to the Wisconsin Integrative Hyperbaric Center (WIHC) in Fitchburg, Wisconsin, where Amanda could try this new form of therapy—commonly referred to as 'dives'. Within 6 days, and no hesitation, we packed and relocated to Wisconsin.

When we arrived at the WIHC, Amanda was four years old. She was no longer imitating sounds. She rarely engaged in creative play, her eye contact was poor, and she rarely laughed or smiled. Amanda suffered crying episodes that sometimes lasted for hours, with no visible known explanation. She could not jump off the ground clearing both feet.

Above all these things, she virtually never slept. She slept through the night one or two nights per week at most. The rest of the nights were spent screaming, crying for hours, or just sleepless from 1 am to 7am in the morning. This new dark world was taking a tremendous toll on us: affecting our jobs—to which it was

becoming difficult to get, and if we did manage to make it to work, we were running late; affecting our finances—we have taken every possible loan available and have begun dipping into our retirement funds; and affecting us emotionally—we were slipping further and further into depression with no sign of hope. We were truly desperate.

Today, we are pleased to share that after 80 sessions— 'dives' of Hyperbaric Oxygen therapy in a steel wall chamber at 1.5 atmospheres of pressure, Amanda now sleeps through the night. She imitates sounds. She is repeating or is eagerly attempting to repeat what is asked of her. She clearly understands what we tell her.

She can jump off the ground clearing both feet. She can climb in and out of her car seat as well as the car itself. She does not mind having her little brother, Michael around, or having him touch her, and at times she smiles with him. She is smiling a lot, laughing appropriately.

The most significant breakthrough we have witnessed since all of this began happened during a trip to the indoor playscape at the local mall—*after* the completion of 80 HBOT sessions.

When we arrived at the play area, Amanda's face lit up. She had a big gleaming smile. She ran independently towards the playscape, and just like the other children there, Amanda began climbing on and off the various stations, running, crawling—engaging in play for hours with laughter, smiles and wonder. We couldn't believe our eyes. My Husband and I were truly amazed. The dark could of Autism is starting to lift.

"…you have to trust your instincts and question treatment providers, who may not place your child's interest first."

As I write this, we are preparing to leave Wisconsin, continuing on our journey for Amanda's recovery. Before our visit to the center, we were slowly losing hope. But, seeing the improvements in Amanda over the course of the past two months has given us a new found sense of faith, belief in others, and has reassured us of what we knew all along: Amanda was deep down inside that little body—and she's finally healing, showing herself to us again.

For those parents experiencing the world of autism, I have some advice, as my husband and I have learned several things through this journey. First, we have learned to be our own advocates, because you have to trust your instincts and question treatment providers, who may not place your child's interest first.

Second, we learned that anyone, regardless of education, could learn about biological science, autism and other developmental disorders through the vast articles, resources and information available in textbooks and over the internet.

Lastly, after going through a very dark time, we have learned that there is hope, there is faith, and there are good people in the world who want to help our children and who are not driven by the mighty dollar. With persistence, perseverance, and the help of people like those at the Hyperbaric Center, you can improve your child's situation. We are living proof.

Thank you IHA and WIHC for your generosity, unconditional devotion, and friendship. God bless you for your kindness and compassion. You have done more for us than you will ever know.

Simon Bruce

7 years old

We recently started HBOT with our son Simon, diagnosed with autism at the age of two and a half. Now, seven years old and with the options of therapies running out, we have come across hyperbarics.

My son is currently on medications for aggression and anxiety. At a walk for autism last summer in Madison, while my husband was busy waiting in line for the jumpolene, I saw a vendor for hyperbarics.

On the way home, I read about some of the success stories and was definitely intrigued and curious if this could work for our son. The stories of hyperbaric improvements impressed me profoundly, and I would read them on occasion, hoping we would be able to try this for our son.

We were concerned about what was going to happen—this was so new to us. We went for a consultation, and the staff at the center gave us a tour and made our son feel comfortable. The technicians offered suggestions to help with transitioning Simon into the chamber. We were able to see other people in the chambers. I think this made Simon feel more at ease. Needless to say, Simon was in the chamber within 5 minutes or so on our first visit.

"We are only on our 11th dive.

At school, they are noticing less refusal to do his work."

Simon definitely slept well the first night; he went to bet at 10 p.m. In the past, some nights he wouldn't' go to bed until midnight, waking for school at 8 am, which would be a challenge to wake him up after a long night of being up late.

After the third dive, Simon said 'spaceship' as he watched Star Wars. This was spontaneous, unprompted and never mentioned to him by us. As clear as a bell, he said 'spaceship'.

We are only on our 11th dive. At school, they are noticing less refusal to do his work. At our last IEP meeting, they were talking about decreasing his day or to try to place him at another school. I was losing hope about him even attending school. I believe the small amount of hyperbarics has helped at school.

Self-stimulatory behaviors are starting to decrease as well. Simon would slap the TV, and although he still does it, it is not to the same degree.

I can only foresee improvements with continued HBOT.

Colleen Bruce

Jack's Story

11 years old

My son started on a new program this summer of B-12 shots, 3 grams of omega-3 essential fatty acids a day, and hyperbaric oxygen treatments (100% oxygen at 1.5 atmospheres). After 30 treatments we have noticed several positive changes. His issues with hypoglycemia have improved. It was common for him to "get in a mood"—sometimes significant—before breakfast or when hungry. The number and severity of these episodes has decreased by about 3/4. His outbursts are now infrequent.

An unusual change has been his "handedness." My son began switching his dominant hand from left to right. This appeared in his writing and athletics. Writing used to be a chore, but recently he began writing stories and letters just for fun. His illustrations are somewhat improved, while his letters are more legible and his writing follows a fairly straight line on a blank page.

For years my son played the piano—mostly by ear and struggled with reading music. My son's piano teacher recently noted that he seems to be finally connecting to the music on the page—really reading the notes.

In general, my son is now noticing more. He said, "Have you ever noticed how weird some people are?" He picked up on what people were doing in their cars and walking around. He also seems much more aware of the opinions of his peers.

"His issues with hypoglycemia have improved…

The number and severity of these episodes has decreased by about 3/4."

Organizationally, he has improved. He is able to keep track of his gear for swimming, baseball and golf. He knows where he put things and remembers to hang up wet swim gear without reminders. He put together his own golf bag (using an old bag for a collapsible chair) and filled it with his glove, balls, tees and a book.

We're very pleased with what has happened thus far, and we're looking forward to seeing even more positive changes. The friendly staff at the center made the treatments a fun addition to my son's day, and he repeatedly commented on how he liked the way he felt after hyperbaric.

M.S., Madison, WI

Call USAAA at 1-866-381-7733

USAAA International Conference in Utah August 9-12

If you are not able to attend the **US Autism and Asperger Association 2006 International Conference in Park City, UTAH,** there is a way you can still see the conference LIVE. You can now view live web-casts in the comfort of your own home. With USAAA WebTV LIVE®, you have an upfront seat to the conference wherever you are.

Please log on to www.usautism.org for more details.

Of Special Interest are IHA Spokesperson and Providers:

All on Thurs, Aug 10, 2006

8:00am - 9:00am

Methylcobalamin's Rise from Pauper to Prince

James Neubrander, MD, FAAEM

Methylcobalamin (methyl-B12) was essentially unknown to the clinical world until the 1980's when it found its way into the test tube world of science by way of rat brains and human lymphocytes. By the 1990's methyl-B12 started to be seen in a few clinical studies using human subjects. Then in March of 2002, Dr. Neubrander administered his first dose of methylcobalamin to a child with autism and the child showed remarkable clinical improvements. Today, only four years after this amazing discovery, methyl-B12, in concert with methionine synthase, and possibly in some way acting independently of this enzyme, has powerfully changed tens of thousands of children's lives! Key protocol components are necessary for clinicians and parents to optimize their results. Critical factors include the proper route and frequency of administration, the use of the most concentrated stock solution possible, the disallowance of confounding variables to be introduced during the initiation phase of methylcobalamin treatment, and the utilization of the most sensitive and specific evaluation tool available. There are 135 commonly reported responses that methyl-B12 is associated with, the three primary ones being higher executive function, increased speech and language, and greater socialization and emotion. Scientific validation for methyl-B12's clinical benefit is obvious from Dr. Richard Deth's work with methionine synthase and methylation pathways, and from Dr. Jill James' work with methylation–transsulfuration biochemistry and oxidative stress biomarkers. Though science is not yet willing to crown methyl-B12 the king of biomedical treatments for autism, it definitely holds the status of Prince.

9:15am - 10:45am

Autism Intensive Care

Jeffrey Bradstreet, MD, featured Speaker

Just like a heart attack needs critical care - so does the neuroimmune system in a child experiencing developmental delays. Dr Bradstreet explores the various techniques that when combined appear to be generating the best chances for recovery. Upon completion participants will be able to (1) review the prevalence of autism; (2) compare and contrast our previous and current understanding of the cause of autism; (3) discuss recent peer-reviewed literature and other data describing the neuro-immunotoxicological abnormalities of Autism Spectrum Disorders (ASD); (4) describe current interventions in the treatment of ASD including possible side effects from alternative and 'off-label' interventions; and (5) recognize that there is a possibility to improve, and in some cases, reverse autism.

11:00am - 12:00pm

'Hope and Possibilities' Keynote Presentation

Shannon Kenitz, MS

Kenitz knows firsthand the heartbreak and struggles of having a child with a disability. Her youngest daughter, Grace, was diagnosed with a very rare mitochondrial disorder that kept her in the hospital virtually for the first three years of her life. Grace more recently has been diagnosed on the autism spectrum. Hear from a mother, Shannon, who did not accept the recommendation to cease life-prolonging measures. And because of that, Grace progressed to feed herself, recover from blindness, and at almost 7-years old, walk for the first time on January 20, 2006. Shannon was a guest on The Montel Williams Show May 1st and has a book and movie forthcoming.

The Pragmatism of Mild Hyperbaric Oxygen Therapy in Autism Spectrum Disorders:

Lessons from the Hopson Quadruplets

Jeff Bradstreet MD, FAAFP
with
Debbie & Allen Hopson

At left:

The Hopson Quadruplets (Philip, Elizabeth, Katherine, Caroline), their mom Debbie and big sister Sarah

Jeff Bradstreet MD

What can the experiences of family with a set of quadruplets and an older daughter teach us about hyperbarics and autism? If you ever get a chance to meet the Hopson family you will immediately be struck by the tremendous love and enthusiasm this family shares. Most of us would be overwhelmed by the idea of having quadruplets. I know I was amazed with the work load this family was experiencing when I first met them 2 years ago. At that time, two of the quadruplets were moderately to severely autistic.

"Traditional medical thinking presumes the disorder is life-long and not reversible.

Typically parents are told to 'cope with it' and offered no hope."

But if quadruplets teach you anything, they teach you patience and perseverance, and this is a family where mom and dad draw upon their strong faith to help them with both autism and parenting quadruplets and another daughter. It requires patience and perseverance to implement a mild HBOT (1.3 atmospheric pressure) program for any child with autism—let alone two children—when there are three other children to care for.

There is no longer any doubt that autism prevalence has increased dramatically in the last decade. Traditional medical thinking presumes the disorder is life-long and not reversible. Typically parents are told to 'cope with it' and offered no hope. Yet the combination of behavioral and biomedical intervention clearly improves, sometimes dramatically, many children with autism.

The Hopson family has experienced the benefits of this integrated approach, and gives mild HBOT significant credit for helping their children. The International Child Development Resource Center (ICDRC) was able to provide the Hopson family with the free use of a mild HBOT chamber for home use early in 2006. The credit for this blessing really goes to Doctor Dave Weldon, a US Congressman from Florida, whose advocacy for autism on Capital Hill helped ICDRC receive a very significant Federal grant. But now for the parent's story from mom's perspective.

Debbie Hopson (Mom)

My husband, Allen, and I have five children, Sarah, who is 11 years old, and five-year-old quadruplets—Elizabeth, Phillip, Caroline, and Katherine. Almost three years ago, two of the quadruplets were diagnosed with autism. We started almost immediately doing Applied Behavioral Analysis (ABA) under the direction and design of a Board Certified Behavior Analyst (BCBA).

In addition, for the past two years, we have been doing biomedical treatments designed and prescribed by Doctor Bradstreet. For the past four months, we have been blessed to have been able to use a hyperbaric chamber and have been very pleased with the results!

Phillip had been on methyl B-12 shots for the past one-and-one-half years. We had several instances when Phillip had missed several consecutive doses which proved to us without a doubt that the shot was definitely helping him. We learned he had to have it on a daily basis. However, after using the hyperbaric chamber twice-a-day for about five weeks, we realized that he did not need the shot in addition to the chamber. We have now been without the shot for two months and he has done terrific!

"...after using the hyperbaric chamber twice-a-day for about five weeks, we realized that he did not need the shot in addition to the chamber. "

Prior to mild HBOT, Elizabeth was significantly farther behind Phillip in most areas, especially in expressive language. Her gains after using the chamber for these past four months have exceeded her brother's. She now has better communication skills with much more self-control in her aggressiveness, and is proving to be much more social than her brother! We have also been able to stop both her methyl B-12 shots and all of her supplements. The only thing we are still using is a digestive enzyme.

She loves going in the hyperbaric chamber and loves telling people about it. When we have visitors in our home, she meets them at the door, grabs their hand,

and tells them to "come and see my spaceship." She considers it serious business and will not rest until they go upstairs to see the "spaceship"!

I send pictures out frequently to family and friends and one of my best friends just last week told me that both she and her eighteen year old daughter noticed a huge difference in how Elizabeth looked compared to when they saw her last, which was about a month before we received the hyperbaric chamber. She told me that the look in Elizabeth's eyes was totally different!! It was as if she had awakened from a slumber.

We are so excited about the changes that are happening in our children and are so blessed to have been able to borrow a hyperbaric chamber to help our children!!!

Jeff Bradstreet MD

Obviously this is not a controlled study, but when a family is carefully evaluating their children's progress with an ABA program and a sudden increase in skills and improvement in behaviors occurs immediately following the introduction of mild HBOT, it is reasonable in a disorder like autism to attribute the improvements to the new intervention. And these are not unusual reports from families using mild HBOT for autism.

Still it is important to note the FDA has not approved the use of mild HBOT for autism. It is considered an "off-label" use of this equipment. Physicians are allowed to prescribe both medications and therapies "off-label" if they believe it is warranted and if they provide informed consent about its use.

"We typically see improvements in:

- *bowel function,*
- *better sleep,*
- *increased eye contact,*
- *more focus,*
- *improved connectedness to family members,*
- *increased rate of acquisition of new skills and*
- *better language skills"*

There are several active research programs looking at the application of mild HBOT to autism and soon we will enjoy much better data. At this time, however, my clinical observations are that the majority of children with autism respond favorably to mild HBOT. We typically see improvements in bowel function, better sleep, increased eye contact, more focus, improved connectedness to family members, increased rate of acquisition of new skills and better language skills.

Exactly what mild HBOT is doing in autism is unknown, but these improvements speak to a significant degree of reversibility within what was once considered an untreatable disorder. *Stoller* observed similar and impressive changes in a 15-year old child with fetal alcohol syndrome **(1)**. *Rossignol and Rossignol* also observed improvements in some children with autism **(2)** and they further presented the favorable response of a larger population of children with autism to the national *Autism One conference in May, 2006* **(3)**.

Taken together the perspective of mild HBOT in autism remains quite optimistic and represents a safe option to be considered by families and clinicians.

References:

1. Stoller KP. Quantification of neurocognitive changes before, during, and after hyperbaric oxygen therapy in a case of fetal alcohol syndrome. Pediatrics. 2005 Oct;116(4):e586-91. Epub 2005 Sep 15.

2. Rossignol DA, Rossignol LW. Hyperbaric oxygen therapy may improve symptoms in autistic children. Med Hypotheses. 2006;67(2):216-28. Epub 2006 Mar 22.

3. Rossignol, DA. http://autismone.org/download 2006.cfm

For More Information:

Jeff Bradstreet, MD, FAAFP
International Child Development Resource Center
1688 West Hibiscus blvd
Melbourne FL 32901
(321) 953-0278

FOR IMMEDIATE RELEASE
JUNE 2, 2006

CONTACT: DAN ROSSIGNOL, MD
(434) 263-4000

HYPERBARIC OXYGEN THERAPY IMPROVES SYMPTOMS IN AUTISTIC CHILDREN. Dan Rossignol*, Elizabeth Mumper, Jill James, Lanier Rossignol. *Department of Family Medicine, University of Virginia, Charlottesville, VA.

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.

The Proposed Mechanism of HBOT in Autistic Children

By Daniel Rossignol, MD

1. **Numerous studies demonstrate that children with autism have cerebral hypoperfusion**, especially in the bitemporal regions. This decreased blood flow has been correlated with many of the autism core symptoms such as impairments in communication, social behaviors and unusual activities. Furthermore, not only do they have decreased blood flow at baseline, but when autistic children need to pay attention to a task they do not have a compensatory increase in blood flow like typical children and instead sometimes demonstrated decreased blood flow. HBOT can overcome cerebral hypoperfusion by providing more oxygen to the brain.
2. **Children with autism have neuroinflammation and GI** inflammation and HBOT is strongly anti-inflammatory. Children with autism have high levels of cytokines which HBOT has been shown to decrease. The decrease in inflammation is caused by the increased pressure provided by HBOT, not by the increased oxygen tension.
3. **Children with autism have increased oxidative stress** and HBOT can decrease oxidative stress through up-regulation of antioxidant enzymes and increased antioxidant production.
4. **Children with autism have a relative mitochondrial deficiency.** HBOT increases oxygenation to mitochondria and also increases the production of mitochondria.
5. **Children with autism have impaired production of porphyrins** which are involved in heme synthesis, which carries oxygen in the body. Therefore, the ability to deliver oxygen on hemoglobin could be compromised in autistic children and HBOT may overcome this.
6. **Children with autism have overgrowth of abnormal bacteria** and treatment of this bacteria leads to improvements of symptoms. HBOT has been shown to decrease the amount of bacteria in the gut.
7. **Autism is a neurodegenerative disease.** Stem cells are produced in bone marrow, but are also produced in the brain. HBOT has been shown to increase the production of stem cells which may aid in reversing "irreversible" brain disorders. H
8. **HBOT and chelation.** Theoretically, HBOT may help the body get rid of petrochemicals and inorganic mercury. Organic mercury has a positive charge (it is oxidized) and in the body is eventually reduced (loses the positive charge) by binding to negatively charged particles. Petrochemicals also exist in the body in a reduced form (without the positive charge). HBOT may be able to oxidize both petrochemicals and inorganic mercury, giving them a positive charge. Chelators have a negative charge and thus will bind positively charged chemicals.

Article in Press

Hyperbaric oxygen therapy may improve symptoms in autistic children

Available online at
www.sciencedirect.com

Daniel A. Rossignol [a,b,*], Lanier W. Rossignol
[a] Blue Ridge Medical Center, 4038 Thomas Nelson Highway, Arrington, VA 22922, USA
[b] University of Virginia, P.O. Box 800729, Charlottesville, VA, USA
Received 26 January 2006; accepted 7 February 2006

Summary Autism is a neurodevelopmental disorder that currently affects as many as 1 out of 166 children in the United States. Recent research has discovered that some autistic individuals have decreased cerebral perfusion, evidence of neuroinflammation, and increased markers of oxidative stress. Multiple independent single photon emission computed tomography (SPECT) and positron emission tomography (PET) research studies have revealed hypoperfusion to several areas of the autistic brain, most notably the temporal regions and areas specifically related to language comprehension and auditory processing. Several studies show that diminished blood flow to these areas correlates with many of the clinical features associated with autism including repetitive, self-stimulatory and stereotypical behaviors, and impairments in communication, sensory perception, and social interaction. Hyperbaric oxygen therapy (HBOT) has been used with clinical success in several cerebral hypoperfusion syndromes including cerebral palsy, fetal alcohol syndrome, closed head injury, and stroke. HBOT can compensate for decreased blood flow by increasing the oxygen content of plasma and body tissues and can even normalize oxygen levels in ischemic tissue. In addition, animal studies have shown that HBOT has potent anti-inflammatory effects and reduces oxidative stress.

Furthermore, recent evidence demonstrates that HBOT mobilizes stem cells from human bone marrow, which may aid recovery in neurodegenerative diseases. Based upon these findings, it is hypothesized that HBOT will improve symptoms in autistic individuals. A retrospective case series is presented that supports this hypothesis.

Abbreviations: **SPECT**, single photon emission computed tomography; **PET**, positron emission tomography; **HBOT**, hyperbaric oxygen therapy; **MRI**, magnetic resonance imaging; **ATA**, atmosphere absolute; **CP**, cerebral palsy; **SOD**, superoxide dismutase.

Corresponding author. Tel.: (434) 263 4000;
fax: (434) 263 4160.
E-mail addresses: dlross7@hotmail.com (D.A. Rossignol), dlross7@hotmail.com (L.W. Rossignol).

Background

Overview of autism

Autism is a neurodevelopmental disorder currently affecting as many as 1 out of 166 children in the United States [1] that is characterized by impairments in social interaction, difficulty with communication, and restrictive and repetitive behaviors [2]. It affects children from all socioeconomic and ethnic backgrounds [3]. Autism was considered a rare condition before the 1990's with a prevalence of approximately 1 in 2500 children [4]. However, according to the US Department of Developmental Services, the prevalence of autism spectrum disorders increased 556% from 1991 to 1997 [5]. Autism is now more common than childhood cancer, cerebral palsy, Down's syndrome, spina bifida, or cystic fibrosis [6,7]. In addition, autism is found throughout the globe and the prevalence worldwide is increasing 3.8% per year [8]. Autism is an incompletely understood disorder [3,5], but new clinical research is beginning to unravel some of its mysteries.

Overview of hyperbaric oxygen therapy

Hyperbaric oxygen therapy (HBOT) involves inhaling 100% oxygen at greater than one atmosphere absolute (ATA) in a pressurized chamber [9]. HBOT has been used successfully in humans at varying pressures to treat a range of conditions. Many clinical applications of HBOT are at higher pressures (over 2.0 ATA) including treatment of decompression sickness, arterial gas embolism, carbon monoxide poisoning [10], amyotrophic lateral sclerosis [11], and complex regional pain syndrome [12]. However, HBOT has also been used at lower pressures (1.5 ATA or less) with clinical success in conditions including fetal alcohol syndrome [13] and ischemic brain injury [14]. HBOT at 1.5 ATA was utilized in a prospective trial of 168 patients with closed head trauma with a significant reduction in mortality (32% versus 17%) [15].

HBOT has been shown to increase the oxygen content of plasma [16] and body tissues [17] and can even normalize oxygen levels in ischemic tissue [18]. In fact, the amount of oxygen delivered by HBOT at 3.0 ATA and 100% oxygen is able to keep tissue viable even without oxygen input from circulating hemoglobin [17]. In rat models, HBOT has been shown to reduce the effects of hypoxia and ischemia on the neonatal brain [19]. Human studies demonstrate that HBOT causes mild vasoconstriction resulting in decreased blood flow [20,21] but at the same time causes increased oxygen delivery and levels in target tissues [16,17,20]. By causing mild vasoconstriction, HBOT can reduce edema in ischemic tissue [22] including the brain [20,23], which results in lowering intracranial pressure [20].
HBOT is generally considered safe [17] at oxygen pressures below 3.0 ATA and with treatment durations of less than 120 min [10,13,24]. The use of HBOT in children appears generally safe, even at pressures of 2.0 ATA for 2 hours per day for up to 40 sessions [25]. The most common side effect of HBOT is middle ear barotrauma, which occurs in approximately 2% of patients. The incidence of such barotrauma is decreased with pseudoephedrine treat-

ment before HBOT. Less common side effects in descending order include sinus squeeze, serous otitis, claustrophobia, and reversible myopia. Seizures may occur infrequently in about 0.01–0.03% of patients [9].

Hypothesis

Multiple studies have revealed that autism is a neurodegenerative disease characterized by cerebral hypoperfusion, neuroinflammation, and increased oxidative stress. HBOT helps overcome hypoperfusion, has potent anti-inflammatory effects and reduces oxidative stress. Furthermore, HBOT mobilizes stems cells from human bone marrow. Therefore, HBOT will improve symptoms of autism.

Improving cerebral hypoperfusion in autism

Evidence of decreased cerebral blood flow in autism and possible mechanisms of hypoperfusion

Even in the presence of normal magnetic resonance imaging (MRI) findings, focal areas of decreased cerebral blood flow occur in children with autism [26]. Multiple independent single photon emission computed tomography (SPECT) and positron emission tomography (PET) research studies have demonstrated hypoperfusion to several areas of the autistic brain, most notably the temporal lobes [26–39]. Several studies show that reduced blood flow to the temporal regions and other brain areas correlates with many of the clinical findings associated with autism including repetitive, self-stimulatory and stereotypical behaviors, and impairments in communication, sensory perception, and social interaction [27,29,31,39–42]. Furthermore, a correlation between decreased IQ and hypoperfusion of the temporal and frontal lobes has been described in autistics [36].

The cause of this decreased blood flow is not known but may be secondary to changes in cerebral arterial resistance. Under normal conditions, cerebral blood flow increases when local brain tissue metabolic rate and functioning increases [43,44]. However, this response may be reversed in autistic children. One of the first studies measuring cerebral blood flow in autistic children utilized transcranial Doppler ultrasound and showed decreased blood flow and concomitantly increased middle cerebral arterial resistance upon auditory stimulation. Conversely, control neurotypical and mentally retarded children showed opposite results[45].

The mechanism of this abnormal change in cerebral arterial resistance in autistic children is unknown. However, several studies have shown that astrocytes can regulate cerebral blood flow. Astrocytes can directly cause arteriole vasoconstriction through a calcium mechanism [46] and arteriole vasodilatation through a cyclooxygenase medium [47]. Neurons, astrocytes, and vascular cells compose a functional unit that maintains proper blood flow and oxygenation for the brain [48]. Neural activity normally causes increased cerebral blood flow thus delivering increased oxygen [44]. However, a recent study found evidence of neuroin-flammation and astroglial activation in autism [49]. It is possible that astroglial inflammation may affect the control of blood flow regulated by astrocytes and lead to the abnormal changes in cerebral artery resistance and hypoperfusion seen in some autistic children.

Furthermore, inflammation is a known cause of decreased blood flow and several inflammatory conditions have associated cerebral hypoperfusion including lupus [50,51], Sjo¨gren's syndrome [52], Behc¸et's disease [53], viral encephalitis [54,55], and acute Kawasaki disease [40]. One SPECT study of 27 children with echovirus meningitis demonstrated decreased cerebral blood flow in 74% of the children [55] and two recent SPECT studies revealed impaired cerebral perfusion in 81% of patients with Sjo¨gren's syndrome [52]. In one SPECT study of patients with systemic lupus erythematosus, 59% had evidence of cerebral hypoperfusion [51]. Furthermore, treatment of the inflammation found in lupus with iloprost [56] and methylprednisolone [57] normalized cerebral blood flow on follow-up SPECT scans. It is conceivable that the cerebral hypoperfusion found in autistic children may be triggered by neuroinflammation and therefore may be reversible with anti-inflammatory modalities.

Zones of the autistic brain affected by decreased blood flow and symptom correlations

Cerebral hypoperfusion may play a role in some of the more unusual characteristics of autistic behavior. Diminished blood flow to the thalamus has been correlated with the autistic clinical features of repetitive, self-stimulatory, and unusual behaviors including resistance to changes in routine and environment [29]. Hypoperfusion of the temporal lobes has also been linked with increased autism symptom profile scores including "obsessive desire for sameness" and "impairments in communication and social interaction" [31]. Another study on "high functioning" autistics demonstrated decreased blood flow to areas of the temporal lobe and amygdala, which was correlated with clinical impairments in processing facial expressions and emotions [42]. This was confirmed by a recent study of autistics demonstrating diminished blood flow to the "fusiform face area" responsible for recognizing familiar faces [58].

In addition, decreased perfusion of the temporal lobes is a consistent finding in many studies of autistic children. Two larger controlled studies (21–23 autistic children) using SPECT and PET scans confirmed significant bitemporal hypoperfusion [31,34]. In both of these studies, the control group was mentally retarded; therefore, the hypoperfusion could not be attributed to mental retardation alone [33,34]. Another SPECT study of 31 autistic children, 16 of whom had epilepsy, also demonstrated reduction of cerebral blood flow to the temporal lobes. Of note, cerebral blood flow was not different between those with and without epilepsy, suggesting that epilepsy itself was not associated with hypoperfusion in these individuals [37]. A more recent PET study of 11 autistic children revealed diminished blood flow to the left temporal area, including Wernicke's area (which is involved in language comprehension) and Brodmann's area 21 (involved in auditory processing and language), when compared to age-matched mentally retarded children [39]. Interestingly, an association beween temporal lobe abnormalities [59] and the subsequent development of secondary autism has been described in tuberous sclerosis [60], infantile spasms [61], herpes simplex encephalitis [62,63], and an acute en-

cephalopathic illness in children [64].

The relative amount of cerebral hypoperfusion in autistic children can vary by age. In one study, hypoperfusion of the prefrontal and left temporal areas worsened and became "quite profound" as the age of the autistic child increased. This diminished perfusion correlated with decreased language development. The authors concluded that hypoperfusion "subsequently prevents development of true verbal fluency and development in the temporal and frontal areas associated with speech and communication" [27].

Hypoperfusion of the temporal and other brain regions has been correlated with many of the clinical findings associated with autism including self-stimulatory behaviors and impairments in communication, sensory perception, and social interaction [33,34]. This diminished blood flow may be mediated by neuroinflammation. Further studies on the effects of inflammation on blood flow in the autistic brain are needed, especially studies involving the temporal lobes where hypoperfusion is common. Whatever the cause of the hypoperfusion, the possibility exists that the enhancement of oxygen delivery to the brain accomplished by HBOT may improve some of the symptoms found in autistic children.

The use of HBOT in cerebral hypoperfusion disorders

The oxygen delivered by HBOT can reverse hypoxia in brain tissues caused by hypoperfusion [65,66]. Cerebral hypoperfusion causes hypoxia, which triggers electrical failure in brain cells. Worsening hypoxia then eventually results in ion pump failure, which ultimately leads to cell death [67]. Cells that have electrical failure but retain ion pump ability have been described as "idling" because they remain alive but non-functional [68]. SPECT studies have confirmed the presence of these "idling cells," which surround areas of focal ischemia and comprise what is termed the "ischemic penumbra" [69]. Restoration of oxygenation, sometimes even years after the ischemic insult, can salvage these cells, which may explain why the acute findings of a stroke are poor predictors of ultimate clinical outcomes [67].

Even though HBOT causes decreased cerebral blood flow through vasoconstriction [70], it simultaneously causes increased cerebral oxygen tension [20] and may accelerate brain recovery from ischemia [71]. In one case report, 80 sessions of HBOT at 1.5 ATA increased oxygenation to the ischemic penumbra on SPECT scans and significantly improved cognitive and motor function in a patient with an ischemic brain injury from a near drowning episode 12 years earlier [14]. Another study of three patients with brain injuries showed areas of "dormant" neurons in the ischemic penumbra on SPECT scans prior to the commencement of HBOT at 1.5 ATA. All three patients had improvement in the oxygenation of these areas as seen on post-HBOT SPECT scans, which was correlated with clinical improvement [65].

HBOT has been used with clinical effectiveness in some cerebral hypoperfusion disorders including lupus [72] and traumatic midbrain syndrome [73], and may be beneficial in acute ischemic stroke [74] and acute myocardial infarction [16]. In addition, HBOT has been used in several studies on children with cerebral palsy (CP). Some children with CP due to perinatal asphyxia have focal areas of cerebral hypoperfusion on SPECT scans [75]. Significant clinical improvements were found in one study of children with CP after 20 sessions of HBOT at 95% oxygen and 1.75 ATA [76].

Other studies using HBOT in cerebral hypoperfusion disorders have been performed at lower pressures (1.5 ATA or less). Stoller recently reported on one pediatric case of fetal alcohol syndrome, which is considered "irreversible and incurable" [13] and is characterized by cerebral hypoperfusion on SPECT studies [77]. Using HBOT at 1.5 ATA, the child had statistically significant improvements in verbal, memory, reaction time, impulse control, and visual motor scores [13]. In addition, Heuser et al. [78] treated a four year old autistic child using lower pressure HBOT at 1.3 ATA and reported "striking improvement in behavior including memory and cognitive functions" after only ten sessions.

Furthermore, the child had improvement of cerebral hypoperfusion as measured by pre-HBOT and post-HBOT SPECT scans [78]. These case reports are notable because they demonstrate that some "irreversible" and permanent neurological conditions can have clinical improvements with HBOT.

The number of HBOT sessions needed to produce full clinical improvements from cerebral hypoperfusion or ischemia is unclear. In one study combining the use of SPECT and HBOT, an average of 70 treatments was needed to show a significant increase in cerebral blood oxygenation and metabolism in patients with chronic neurological disorders including CP, stroke, and traumatic brain injury. Of note, the rate of improvement in cerebral blood oxygenation was more profound during the last 35 treatments compared to the first 35 [79]. In addition, reports from some HBOT researchers indicate that younger patients tend to have improvements more quickly than older patients [79]. Therefore, older patients may need more treatments.

Since many autistic children experience at least a mild degree of cerebral hypoperfusion, this decreased blood flow could lead to an element of brain hypoxia. Multiple SPECT studies have shown evidence of relative brain hypoxia in certain cerebral hypoperfusion syndromes, including autism [78], which improved after HBOT [14,65,78,79]. It is certainly plausible that the increased oxygen delivery by HBOT could overcome any hypoxia caused by hypoperfusion and thus lead to improvements in the symptoms of autistic children.

Improving neuroinflammation in autism

Evidence of neuroinflammation in autism

Recent studies reveal that autism is characterized by neuroinflammation. Autopsy brain samples of autistic patients demonstrate an active neuroin-flammatory process in the middle frontal gryus, anterior cingulate gryus, and cerebellar hemispheres including increased microglial and astroglial activation and increased proinflammatory cytokines. Furthermore, cerebrospinal fluid obtained from living autistic patients also "showed a prominent proinflammatory profile" [49]. Previous studies of autistic children have shown circulating serum autoantibodies to brain elements including neuron-axon filament protein and glial

fibrillary acidic protein [80], the caudate nucleus, cerebral cortex and cerebellum [81,82] and neuron-specific antigens including myelin basic protein [83,84].

Inflammation in autistic children is not limited to the brain. When compared to typical children, autistic children make significantly more serum antibodies against gliadin and casein peptides [85], produce more pro-inflammatory cytokines [86], and have an imbalance of CD4+ and CD8+ cells [87]. Furthermore, some patients with autism have mucosal inflammation of the stomach, small intestine and colon characterized by ileo-colonic lymphoid nodular hyperplasia [88]. In these children, the gastrointestinal mucosa has evidence of pro-inflammatory cytokines [89], increased lymphocytic density, and epithelial IgG deposits mimicking an autoimmune lesion [90].

Several different therapies have been employed in treating the inflammation found in autistic children with some clinical success, including intravenous immune globulin [91]. Further research is needed to clarify the role of inflammation in autism and to investigate potential therapies [92]. However, HBOT may be useful in decreasing inflammation found in autistic patients and may thereby improve symptoms.

HBOT use in inflammatory conditions

Several animal studies have revealed that HBOT has potent anti-inflammatory tissue effects [93,94] with equivalence to diclofenac 20 mg/kg noted in one study using HBOT at 2.4 ATA and 100% oxygen [95]. HBOT has also been shown to decrease the symptoms of advanced arthritis in rats [96] and attenuates the inflammatory response in the peritoneal cavity caused by injected meconium [97]. In addition, one animal study using HBOT at 2.5 ATA showed increased survival and decreased proteinuria, anti-dsDNA antibody titers, and immune-complex deposition in lupus-prone autoimmune mice [98]. Furthermore, HBOT has been used in animal studies to improve colitis [93]. Interestingly, thirty sessions of HBOT at 2.0 ATA has been used in humans to achieve remission of ulcerative colitis not responding to conventional therapies [99]. This may be relevant in autistic children given the higher prevalence of gastrointestinal mucosal inflammation described previously. Given the results of these studies, it is certainly plausible that HBOT can decrease both neuroinflammation and gastrointestinal inflammation in autistic children and thereby potentially lead to improvements in symptoms.

Improving oxidative stress in autism

Evidence of increased oxidative stress in autism

Recent studies have shown that autistic childrenhave evidence of increased oxidative stress including lower serum glutathione levels [100]. Sogut et al. [101] demonstrated that autistic children had increased red blood cell nitric oxide, which is a known reactive free radical and is toxic to the brain [101]. James et al. [100] recently showed that total serum glutathione levels were 46% lower and oxidized glutathione was 72% higher in autistic children when compared to neurotypical controls. This was reflected in a lower redox ratio of reduced glutathione to oxidized glutathione, which presumably led to decreased antioxidant ability in these autistic children [100]. Lower serum antioxidant enzyme, antioxidant nutrient, and glutathione levels, as well as higher pro-oxidants have been found in multiple studies of autistic children [102]. Furthermore, treatment with anti-oxidants has been shown to raise the levels of reduced glutathione in the serum of autistic children and appears to improve symptoms [100]. It is speculated that treatment with hyperbaric oxygen may also help reduce oxidative stress in autistic children.

The effect of HBOT on oxidative stress

Multiple studies have shown neutral effects on oxidative stress with HBOT use [103]. In one study on horse platelets, measures of oxidative stress were not increased after HBOT; in fact, a rise in the antioxidant enzyme superoxide dismutase (SOD) was found 24 h after HBOT without a fall in glutathione levels [104]. In another study on dogs, following 18 min of complete cerebral ischemia, HBOT at 2.0 ATA reduced brain damage without increasing oxidative stress [105]. Furthermore, in a rat model of reperfusion, HBOT extended skin flap life without evidence of oxidative stress [106].

In addition, numerous studies have shown improvements in oxidative stress with HBOT including increased production of antioxidants and antioxidant enzymes and decreased markers of oxidative stress such as malondialdehyde [105,107,108]. An improvement in the survival rate of skin flaps and an increase in SOD levels were found in one study when rats were exposed to hyperbaric oxygen at 2.0 ATA [109]. In another study, HBOT at 2.5 ATA induced the production of antioxidants and decreased malondialdehyde levels in rats [107]. Furthermore, in a study of rats with pancreatitis, HBOT at 2.5 ATA decreased oxidative stress markers including malondialdehyde, and increased the levels of the anti-oxidant enzymes glutathione peroxidase and SOD [108]. HBOT has also been shown to acutely raise the levels of reduced glutathione in the plasma and lymphocytes of some humans after just one treatment session at 2.5 ATA [110]. Finally, ischemia-reperfusion injuries usually cause oxidative stress through decreases in glutathione levels and activities of catalase and SOD. However, in one rat study of ischemia, pretreatment with 1–3 doses of HBOT caused an increase in liver glutathione and SOD levels and protected against liver injury; control animals not receiving HBOT actually had drops in glutathione and anti-oxidant enzyme levels and had concomitant liver damage [111].

HBOT, reactive oxygen species, and anti-oxidants

Concerns have been raised that HBOT may cause increased oxidative stress through the production of reactive oxygen species [112]. This concern is controversial as studies have shown mixed results. Contrary to the studies discussed previously, several studies using HBOT at 2.5 ATA or greater have found evidence of increased oxidative stress [113–115]. Support for this higher pressure effect was found in one study, which demonstrated that HBOT at 2.0 ATA increased SOD levels whereas HBOT at 3.0 ATA caused SOD levels to decrease, presumably because the SOD had to neutralize more free radicals at the 3.0 ATA pressure [116]. Thus, from an oxidative stress and SOD production standpoint, there might be an optimal HBOT pressure, which falls somewhere below 2.5 ATA.

Along a similar line of thought, some authors have speculated that a limited quantity of reactive oxygen metabolites may actually have beneficial effects in the human body [117–119]. The production of small amounts of oxygen radicals may confer protection from future hypoxia and this effect has been termed "ischemic tolerance." In one animal study, pre-treatment with HBOT at 2.0 ATA prior to an ischemia insult induced ischemic tolerance whereas pre-treatment at 3.0 ATA did not, possibly because this higher pressure may have generated too many oxygen radicals [116].

Nevertheless, many studies demonstrate that HBOT lowers oxidative stress. Furthermore, oxidative stress appears to be less of a concern at pressures under 2.0 ATA, which are often used clinically [116]. In spite of this, therapies to raise glutathione levels [100] and the use of antioxidants [120] may be beneficial in patients with conditions of increased oxidative stress before HBOT is contemplated. Several antioxidant supplements have been found to attenuate oxidative stress induced by high pressure HBOT including a-lipoic acid [112], melatonin [121], N-acetylcysteine [111,122], vitamin E [123], riboflavin [124], selenium [123,124], and glutathione [125]. Based upon these findings, a combination of antioxidants and HBOT may help reduce oxidative stress in autistic children and lead to improvements in symptoms.

Improving stem cell mobilization in autism

Recently, HBOT at 2.0 ATA and 100% oxygen for 2 h was shown to mobilize stem/progenitor cells from the bone marrow of humans. Elevations were found in the number of colony-forming cells as demonstrated by an increase in the number of CD34+ cells by almost 2-fold [126]. This finding is relevant because autism and hypoxic brain injuries are considered by many to be permanent conditions.

However, new research is revealing that even long-standing brain disorders may be partially reversible [13,14]. Recently, stem cells have been isolated in the adult brain. This leads to the possibility of neuropoiesis, or regrowth, of certain brain cells. A possible scenario for inducing brain repair through the use of existing mature brain stem cells has been described and is dependent on an intact vascular supply and adequate oxygen [127], both of which can be enhanced by HBOT.

Testing the hypothesis

There is a strong possibility that HBOT could play an integral role in improving brain disorders associated with hypoxia, hypoperfusion, inflammation, and/or oxidative stress, including autism, through the improvement of oxygen supply, decreased inflammation and oxidative stress, and/or the recruitment of new stem cells (see Table 1).

Table 1 Summary of HBOT use in autism

Autism	HBOT
▼ Cerebral perfusion	▲ Perfusion to brain tissue
▲ Inflammation	▼ Inflammation
▲ Oxidative stress	▼ Oxidative stress
Neurodegenerative disease	▲ Stem cells

This in turn should lead to improved clinical outcomes.

Some physicians have begun using HBOT in autistic children and anecdotal reports indicate that HBOT has improved symptoms in autistic children including enhancements in socialization, language, and repetitive behaviors [78,128]. A recent retrospective case series also indicates that low pressure HBOT may improve symptoms in autistic children (see Appendix A). Further research in this area, including HBOT trials in autistic patients, is urgently needed to test this hypothesis.

Acknowledgments

The authors thank the following for reviewing this manuscript and offering advice: Dr. John Battiston, Dr. Bentley Calhoun, Mr. Michael Haynes, Dr. Elizabeth Mumper, Dr. David Slawson, and Dr. Kyle Van Dyke. Written consent was obtained from the children's parent(s) for publication of case series data.

The authors have two autistic sons who participated in the case series.

Appendix A. Low pressure hyperbaric oxygen therapy[1] improves symptoms in autistic children: A retrospective case series

Background

Since low pressure HBOT (under 1.5 ATA) improved symptoms in some patients with cerebral hypoperfusion disorders [13–15,65], it was hypothesized that low pressure HBOT would also help autism, a disease in which cerebral hypoperfusion is an integral component [31,32]. Recently, evidence has accumulated that low pressure hyperbaric therapy at 1.3 ATA and less than 100% delivered oxygen may improve symptoms in some diseases associated with cerebral hypoperfusion. For instance, one study using hyperbaric therapy at 1.3 ATA and room air demonstrated clinical improvements in some children with CP [129,130], a disease shown to have evidence of diminished cerebral blood flow [75]. Furthermore, one case report indicated "striking improvement" in a 4 year old child with autism after using hyperbaric therapy for 10 sessions at 1.3 ATA and room air. The child also had improvement of cerebral hypoperfusion as measured by pre-HBOT and post-HBOT SPECT scans [78]. Based upon these findings, it was hypothesized that low pressure HBOT would improve symptoms of autism. A retrospective case series was examined to evaluate this hypothesis. A review of the medical literature was performed using MEDLINE and Google Scholar and no clinical studies were found on the use of HBOT in autistic children.

Methods

This study is a retrospective analysis of 6 autistic children who underwent low-pressure HBOT. All 6 children had a

1 Hyperbaric oxygen therapy (HBOT) normally refers to inhaling 100% oxygen at greater than 1 ATA in a pressurized chamber [9]. However, for the purposes of this case series, the treatment with hyperbaric pressure at 1.3 ATA augmented with 28–30% oxygen is referred to as HBOT. Hyperbaric pressure at 1.3 ATA and room air is simply termed hyperbaric therapy.

Table 2 Patient characteristics and scores[a]

Child	Age	Sex	ATEC before HBOT	ATEC after HBOT	CARS before HBOT	CARS after HBOT	SRS before HBOT	SRS after HBOT
A	2	M	40	22	21	17	98	44
B	4	M	91	55	37.5	30	154	110
C[b]	3	M	75	64	45	38	135	121
D	7	M	35	32	27	25	94	62
E	6	F	88	80	41.5	39.5	139	121
F	7	F	24	22	23	22	54	67

[a] Declining scores indicate improvement on these scales.
[b] Received only 25 HBOT treatments.

Table 3 Average score changes[a] by age

Age	ATEC before HBOT	ATEC after HBOT	CARS before HBOT	CARS after HBOT	SRS before HBOT	SRS after HBOT
4 and under	68.7	47.0	34.5	28.3	129.0	91.7
5 and older	49.0	44.7	30.5	28.8	95.7	83.3
All children	58.8	45.8	32.5	28.6	112.3	87.5

[a] Declining scores indicate improvement on these scales.

prior diagnosis of autism (DSM-IV 299.00) by an outside physician and none of the children had previously received HBOT. In the normal course of treatment, parent-rated scales were obtained pre-treatment and post-treatment. The University of Virginia Institutional Review Board for Health Sciences Research approved our retrospective examination of cases in this study and for the use of this data for publication.

Informed consent was obtained from each child's parent(s) prior to starting HBOT. All 6 children started and 5 completed 40 1 h sessions of low pressure HBOT at 1.3 ATA and 28–30% oxygen (after adjustment for the pressure effect) over a three month period. One child (Child C) only finished twenty-five sessions due to scheduling conflicts and was included in the analysis. All 6 children were taking multiple antioxidant supplements before starting HBOT. Children were allowed to continue all current therapies and to add new ones during HBOT. The characteristics of the children, including age and sex, are found in Table 2.

A low pressure hyperbaric chamber was used. Room air mixed with oxygen from an oxygen concentrator was pumped into the pressurized chamber, resulting in a final chamber oxygen concentration of 28–30% by direct oximetry measurement using a Moxy™ oxygen monitor and after adjustment for the pressure effect. Multiple random oximetry measurements were taken on different treatment days to verify the consistency of the chamber oxygen concentration, which uniformly remained 28–30%. Parent rated pre-treatment scores and post-treatment scores were calculated for each subject (see Table 2) using the Autism Treatment Evaluation Checklist (ATEC), Childhood Autism Rating Scale (CARS), and Social Responsiveness Scale (SRS). ATEC is a scoring system of verbal communication, sociability, sensory/cognitive awareness, and health/autistic behaviors published by the Autism Research Institute [131]. CARS is a widely used scale for screening and diagnosing autism and has been shown to correlate very well with the DSM-IV criteria for autism diagnosis [132]. SRS is a recently validated test of interpersonal behavior, communication, and stereotypical traits in autism [133].

Results

Low pressure HBOT was well tolerated by all 6 children with no adverse effects noted. More dramatic improvements were found in children age 4 and under when compared to those in the older group (Table 3).

ATEC score results

The average improvement in all children on ATEC was 22.1% ($p = 0.0538$) (Fig. 1). ATEC scores improved by 31.6% in the younger group compared to 8.8% in the older group (Fig. 2).

CARS score results

The average improvement in all children on CARS was 12.1% ($p = 0.0178$) (Fig. 3). CARS improved 18.0% in the younger group and 5.6% in the older group (Fig. 4).

SRS score results

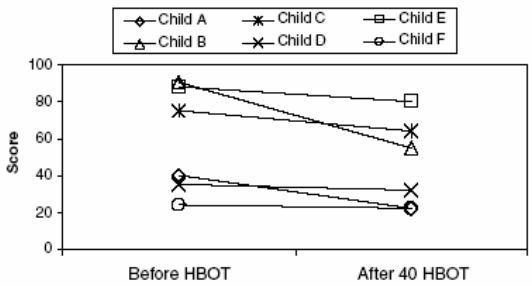


Figure 1 ATEC scores for all children.

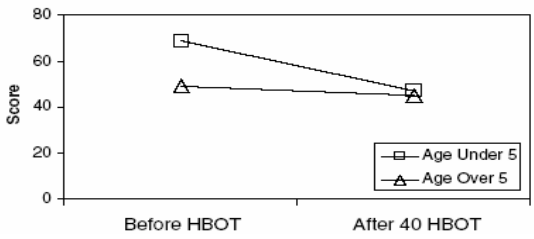


Figure 2 ATEC scores by age.

The average improvement in all children on SRS was 22.1% ($p = 0.0518$) (Fig. 5). SRS improved 28.9% in the younger group and 13.0% in the older group (Fig. 6).

Discussion

Autism is characterized, in part, by decreased cerebral blood flow [31,32]. Low pressure HBOT has been used in some cerebral hypoperfusion conditions including CP. Recently, a study demonstrated that some children with CP had clinical improvements using hyperbaric therapy at 1.3 ATA. In this study, 111 patients with CP and a history of hypoxia in the perinatal period had statistically significant clinical improvements in gross motor function, memory, attention, and language production after hyperbaric therapy. One group received lower pressure hyperbaric therapy at 1.3 ATA and room air while the other group was given higher pressure HBOT at 1.75 ATA and 100% oxygen. Interestingly, the improvements in symptoms were statistically equivalent in the two groups [129]. Most of the improvements continued for 3 months after treatment and some of the children from the study began walking, speaking, and sitting for the first times in their lives [130]. However, it must be noted that this study was controversial, as children in the lower pressure group improved equally with children in the higher pressure group. However, based on these findings, it was hypothesized that low-pressure HBOT could potentially improve symptoms in autistic children.

This case series suggests that low pressure HBOT may indeed be beneficial in the treatment of autism. An interesting finding from this case series was that the younger children had more significant improvements in clinical outcome scores than the older children. This is congruent with reports from some HBOT researchers indicating that younger patients tend to have improvements more quickly than older patients [79]. This effect may be partially explained by the findings of a previous study, which showed that autistic children aged 3–4 years experience diminished frontal lobe blood flow compared to age-matched neurotypical children [41]. It is possible that HBOT in younger autistic children can improve cerebral oxygenation and thus overcome the effects of hypoperfusion and aid these children in "catching up" with their neurotypical peers. Furthermore, the younger children in this case series may have had less overall hypoperfusion to surmount because decreased cerebral blood flow to areas associated with communication has been shown to worsen with increasing age in autistic children [27]. It is likely that the older children in this case series need more than 40 HBOT sessions to show further improvements, especially since some HBOT researchers have noted that 50–80 HBOT sessions are typically needed to show significant clinical gains [79]. In addition, the chamber was augmented with only 28–30% oxygen instead of 100% oxygen. It is possible that the children in this case series may have experienced more improvements if 100% oxygen and/or a higher pressure had been used. These speculations certainly warrant further testing.

This case series did have several inherent limitations. Children were allowed to continue all other therapies for autism and also add new ones, such as supplements. Therefore, other therapies could have contributed to the some of the clinical gains. Parents were not blinded to the fact that their children received HBOT and evaluation of the children was through parent-rated scales, either of which could lead to bias. There was no placebo or control group. Thus, the improvements could have been due merely to the natural development of the children, although none of the parents reported their child as undergoing developmental spurts of similar or greater magnitude in the recent past. Finally, this series lacked power because the sample size was small. Despite these limitations, the analysis of this case series suggests substantial clinical benefits were produced, and therefore, this hypothesis needs to be tested in a formal prospective study.

Conclusions

HBOT has been shown to increase oxygen delivery to hypoperfused or hypoxic tissues, decrease inflammation and oxidative stress, and mobilize stem cells from human bone marrow. The mechanism of clinical improvements in ATEC, CARS, and SRS scores in the children studied may be secondary to increased oxygenation of underperfused areas of the autistic brain, reduced neuroinflammation, decreased

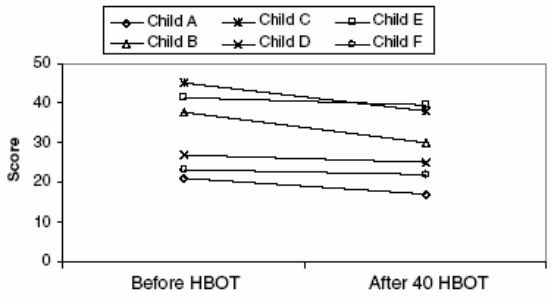


Figure CARS scores for all children.

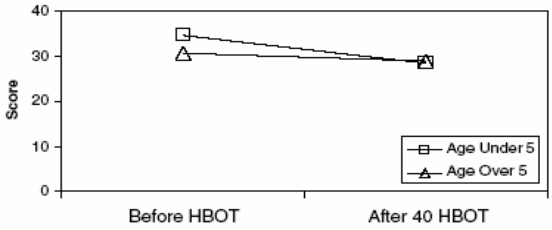


Figure 4 CARS scores by age.

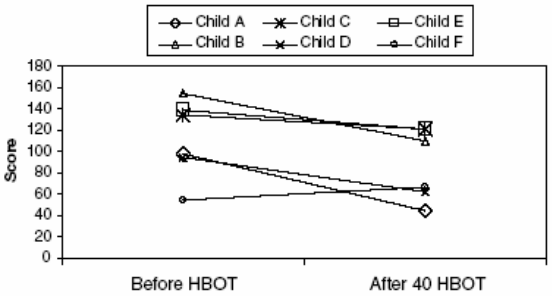


Figure 5 SRS scores for all children.

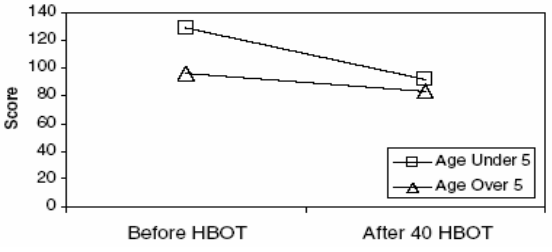


Figure 6 SRS scores by age.

oxidative stress, or a combination of these. This case series suggests that low pressure HBOT improves symptoms in autistic children. Further research in this area, including HBOT trials in autistic patients, using observers blinded to the intervention, is now needed to test this hypothesis.

References

[1] Singh N (contact). Press release: CDC launches "Learn the signs. Act early." Campaign, http://www.cdc.gov/od/oc/media/pressrel/r050222.htm; February 22, 2005 [accessed 21.01.06].

[2] Kanner L. Autistic disturbances of affective contact. Nervous Child 1943;2:217–50.

[3] Rapin I. Autism. N Engl J Med 1997;337(2):97–104.

[4] Wing L, Potter D. The epidemiology of autistic spectrum disorders: is the prevalence rising? Ment Retard Dev Disabil Res Rev 2002;8(3):151–61.

[5] Stokstad E. New hints into the biological basis of autism. Science 2001;294:34–7.

[6] Muhle R, Trentacoste SV, Rapin I. The genetics of autism. Pediatrics 2004;113:472–86.

[7] Centers for Disease Control and Prevention. How common is autism spectrum disorder? www.cdc.gov/ncbddd/autism/asd_common.htm; February 17, 2005 [accessed 21.01.06].

[8] Gillberg C, Wing L. Autism: not an extremely rare disorder. Acta Psychiatr Scand 1999;99(6):399–406.

[9] Feldmeier JJ. Chairman and Editor. Hyperbaric oxygen 2003: indications and results: the hyperbaric oxygen therapy committee report. Kensington, MD: Undersea and Hyperbaric Medical Society; 2003.

[10] Leach RM, Rees PJ, Wilmshurst P. ABC of oxygen: hyperbaric oxygen therapy. BMJ 1998;317:1140–3.

[11] Steele J, Matos LA, Lopez EA, et al. A phase I safety study of hyperbaric oxygen therapy for amyotrophic lateral sclerosis. ALS 2004;5:250–4.

[12] Kiralp MZ, Yildiz S, Vural D, Keskin I, Ay H, Dursun H. Effectiveness of hyperbaric oxygen therapy in the treatment of complex regional pain syndrome. J Int Med Res 2004;32:258–62.

[13] Stoller KP. Quantification of neurocognitive changes before, during, and after hyperbaric oxygen therapy in a case of fetal alcohol syndrome. Pediatrics 2005;116: 586–91.

[14] Neubauer RA, Gottlieb SF, Miale A. Identification of hypometabolic areas in the brain using brain imaging and hyperbaric oxygen. Clin Nucl Med 1992;17(6):477–81.

[15] Rockswold GL, Ford SE, Anderson DC, Bergman TA, Sherman RE. Results of a prospective randomized trial for the treatment of severely brain-injured patients with hyperbaric oxygen. J Neurosurg 1992;76(6):929–34.

[16] Shandling AH, Ellestad MH, Hart GB, et al. Hyperbaric oxygen and thrombolysis in myocardial infarction: the "HOT MI" pilot study. Am Heart J 1997;134:544–50.

[17] Gill AL, Bell CAN. Hyperbaric oxygen: its uses, mechanisms of action and outcomes. Q J Med 2004;97:385–95.

[18] Ackerman NB, Brinkley FB. Oxygen tensions in normal and ischemic tissues during hyperbaric therapy. JAMA 1966;198(12):1280–3.

[19] Calvert JW, Yin W, Patel M, et al. Hyperbaric oxygenation prevented brain injury induced by hypoxia-ischemia in a neonatal rat model. Brain Res 2002;951:1–8.

[20] Sukoff MH, Ragatz RE. Hyperbaric oxygenation for the treatment of acute cerebral edema. Neurosurgery 1982;10(1):29–38.

[21] Bird AD, Telfer AB. Effect of hyperbaric oxygen on limb circulation. Lancet 1965;13:355–6.

[22] Nylander G, Lewis D, Nordstrom H, Larsson J. Reduction of postischemic edema with hyperbaric oxygen. Plast Reconstr Surg 1985;76(4):596–603.

[23] Veltkamp R, Siebing DA, Sun L, et al. Hyperbaric oxygen reduces blood-brain barrier damage and edema after transient focal cerebral ischemia. Stroke 2005;36: 1679–83.

[24] Nuthall G, Seear M, Lepawsky M, Wensley D, Skippen P, Hukin J. Hyperbaric oxygen therapy for cerebral palsy: two complications of treatment. Pediatrics 2000;106(6): E80.

[25] Ashamalla HL, Thom SR, Goldwein JW. Hyperbaric oxygen therapy for the treatment of radiation-induced sequelae in children: the University of Pennsylvania experience. Cancer 1996;77(11):2407–12.

[26] Ryu YH, Lee JD, Yoon PH, Kim DI, Lee HB, Shin YJ. Perfusion impairments in infantile autism on technetium-99m ethyl cysteinate dimer brain single-photon emission tomography: comparison with findings on magnetic resonance imaging. Eur J Nucl Med 1999;26(3):253–9.

[27] Wilcox J, Tsuang MT, Ledger E, Algeo J, Schnurr T. Brain perfusion in autism varies with age. Neuropsychobiology 2002;46:13–6.

[28] Chiron C, Leboyer M, Leon F, Jambaque I, Nuttin C, Syrota A. SPECT of the brain in childhood autism: evidence for a lack of normal hemispheric asymmetry. Dev Med Child Neurol 1995;37(10):849–60.

[29] Starkstein SE, Vazquez S, Vrancic D, et al. SPECT findings in mentally retarded autistic individuals. J Neuropsychiatry Clin Neurosci 2000;12:370–5.

[30] Mountz JM, Tolbert LC, Lill DW, Katholi CR, Liu HG. Functional deficits in autistic disorder: characterization by technetium-99m-HMPAO and SPECT. J Nucl Med 1995;36(7):1156–62.

[31] Ohnishi T, Matsuda H, Hashimoto T, et al. Abnormal regional cerebral blood flow in childhood autism. Brain 2000;123:1838–44.

[32] George MS, Costa DC, Kouris K, Ring HA, Ell PJ. Cerebral blood flow abnormalities in adults with infantile autism. J Nerv Ment Dis 1992;180(7):413–7.

[33] Boddaert N, Zilbovicius M. Functional neuroimaging and childhood autism. Pediatr Radiol 2002;32:1–7.

[34] Zilbovicius M, Boddaert N, Belin P, et al. Temporal lobe dysfunction in childhood autism: a PET study. Am J Psychiatry 2000;157:1988–93.

[35] Kaya M, Karasalihoglu S, Ustun F, et al. The relationship between 99mTc-HMPAO brain SPECT and the scores of real life rating scale in autistic children. Brain Dev 2002;24:77–81.

[36] Hashimoto T, Sasaki M, Fukumizu M, Hanaoka S, Sugai K, Matsuda H. Single-photon emission computed tomography of the brain in autism: effect of the developmental level. Pediatr Neurol 2000;23:416–20.

[37] Gillberg IC, Bjure J, Uvebrant P, Vestergren E, Gillberg C. SPECT (single photon emission computed tomography) in 31 children and adolescents with autism and autism-like conditions. Eur Child Adolesc Psychiatry 1993;2(1):50–9.

[38] Boddaert N, Belin P, Chabane N, et al. Perception of complex sounds: abnormal pattern of cortical activation in autism. Am J Psychiatry 2003;160:2057–60.

[39] Boddaert N, Chabane N, Belin P, et al. Perception of complex sounds in autism: abnormal auditory cortical processing in children. Am J Psychiatry 2004;161: 2117–20.

[40] Ichiyama T, Nishikawa M, Hayashi T, Koga M, Tashiro N, Furukawa S. Cerebral hypoperfusion during acute Kawasaki disease. Stroke

1998;29:1320–1.

[41] Zilbovicius M, Garreau B, Samson Y, et al. Delayed maturation of the frontal cortex in childhood autism. Am J Psychiatry 1995;152(2):248–52.

[42] Critchley HD, Daly EM, Bullmore ET, et al. The functional neuroanatomy of social behaviour: changes in cerebral blood flow when people with autistic disorder process facial expressions. Brain 2000;123:2203–12.

[43] Fox PT, Raichle ME. Focal physiological uncoupling of cerebral blood flow and oxidative metabolism during somatosensory stimulation in human subjects. Proc Natl Acad Sci USA 1986;83:1140–4.

[44] Parri R, Crunelli V. An astrocyte bridge from synapse to blood flow. Nat Neurosci 2003;6(1):5–6.

[45] Bruneau N, Dourneau MC, Garreau B, Pourcelot L, Lelord G. Blood flow response to auditory stimulations in normal, mentally retarded, and autistic children: a preliminary transcranial Doppler ultrasonographic study of the middle cerebral arteries. Biol Psychiatry 1992;32:691–9.

[46] Mulligan SJ, MacVicar BA. Calcium transients in astrocyte endfeet cause cerebrovascular constrictions. Nature 2004;431:195–9.

[47] Zonta M, Angulo MC, Gobbo S, et al. Neuron-to-astrocyte signaling is central to the dynamic control of brain microcirculation. Nat Neurosci 2003;6(1):43–50.

[48] Iadecola C. Neurovascular regulation in the normal brain and in Alzheimer's disease. Nat Rev Neurosci 2004;5: 347–60.

[49] Vargas DL, Nascimbene C, Krishnan C, Zimmerman AW, Pardo CA. Neuroglial activation and neuroinflammation in the brain of patients with autism. Ann Neurol 2005;57:67–81.

[50] Huang WS, Chiu PY, Tsai CH, Kao A, Lee CC. Objective evidence of abnormal regional cerebral blood flow in patients with systemic lupus erythematosus on Tc-99m ECD brain SPECT. Rheumatol Int 2002;22:178–81.

[51] Postiglione A, De Chiara S, Soricelli A, et al. Alterations of cerebral blood flow and antiphospholipid antibodies in patients with systemic lupus erythematosus. Int J Clin Lab Res 1998;28:34–8.

[52] Lass P, Krajka-Lauer J, Homziuk M, et al. Cerebral blood flow in Sjo¨gren's syndrome using 99Tcm-HMPAO brain SPET. Nucl Med Commun 2001;21:31–5.

[53] Caca I, Nazaroglu H, Unlu K, Cakmak SS, Ari S, Sakalar YB. Color Doppler imaging of ocular hemodynamic changes in Behc¸et's disease. Jpn J Ophthalmol 2004;48:101–5.

[54] Wakamoto H, Ohta M, Nakano N, Kunisue K. SPECT in focal enterovirus encephalitis: evidence for local cerebral vasculitis. Pediatr Neurol 2000;23:429–31.

[55] Nishikawa M, Matsubara T, Yoshitomi T, Ichiyama T, Hayashi T, Furukawa S. Abnormalities of brain perfusion in echovirus type 30 meningitis. J Neurol Sci 2000;179: 122–6.

[56] Mathieu A, Sanna G, Mameli A, et al. Sustained normalization of cerebral blood-flow after iloprost therapy in a patient with neuropsychiatric systemic lupus erythematosus. Lupus 2002;11:52–6.

[57] Liu FY, Huang WS, Kao CH, Yen RF, Wang JJ, Ho ST. Usefulness of Tc-99m ECD brain SPECT to evaluate the effects of methylprednisolone pulse therapy in lupus erythematosus with brain involvement: a preliminary report. Rheumatol Int 2003;23:182–5.

[58] Pierce K, Haist F, Sedaghat F, Courchesne E. The brain response to personally familiar faces in autism: findings of fusiform activity and beyond. Brain 2004;127:2703–16.

[59] Bachevalier J. Medial temporal lobe structures and autism: a review of clinical and experimental findings. Neuropsychologia 1994;32(6):627–48.

[60] Bolton PF, Griffiths PD. Association of tuberous sclerosis of temporal lobes with autism and atypical autism. Lancet 1997;349:392–5.

[61] Chugani HT, Da Silva E, Chugani DC. Infantile spasms. III. Prognostic implications of bitemporal hypometabolism on positron emission tomography. Ann Neurol 1996;39(5): 643–9.

[62] Gillberg C. Brief report: onset of age 14 of a typical autistic syndrome. A case report of a girl with herpes simplex encephalitis. J Autism Dev Disord 1986;16(3): 369–75.

[63] Ghaziuddin M, Tsai LY, Eilers L, Ghaziuddin N. Brief report: autism and herpes simplex encephalitis. J Autism Dev Disord 1992;22(1):107–13.

[64] DeLong GR, Bean SC, Brown FR. Acquired reversible autistic syndrome in acute encephalopathic illness in children. Arch Neurol 1981;38(3):191–4.

[65] Neubauer RA, James P. Cerebral oxygenation and the recoverable brain. Neurol Res 1998;20(Suppl. 1):S33–6.

[66] Sheffield PJ, Davis JC. Application of hyperbaric oxygen therapy in a case of prolonged cerebral hypoxia following rapid decompression. Aviat Space Environ Med 1976;47(7): 759–62.

[67] Astrup J, Symon L, Siesjo BK. Thresholds in cerebral ischemia—the ischemic penumbra. Stroke 1981;12(6): 723–5.

[68] Neubauer RA, Gottlieb SF, Kagan RL. Enhancing "idling" neurons. Lancet 1990;335(8688):542.

[69] Olsen TS, Larsen B, Herning M, Skriver EB, Lassen NA. Blood flow and vascular reactivity in collaterally perfused brain tissue. Evidence of an ischemic penumbra in patients with acute stroke. Stroke 1983;14(3):332–41.

[70] Jacobson I, Harper AM, McDowall DG. The effects of oxygen under pressure on cerebral blood-flow and cerebral venous oxygen tension. Lancet 1963;18:549.

[71] Kapp JP, Phillips M, Markov A, Smith RR. Hyperbaric oxygen after circulatory arrest: modification of postischemic encephalopathy. Neurosurgery 1982;11(4):496–9.

[72] Wallace DJ, Silverman S, Goldstein J, Hughes D. Use of hyperbaric oxygen in rheumatic diseases: case report and critical analysis. Lupus 1996;5(1):84.

[73] Holbach KH, Wassmann H, Kolberg T. Improved reversibility of the traumatic midbrain syndrome using hyperbaric oxygen. Acta Neurochir (Wien) 1974;30(3–4): 247–56.

[74] Nighoghossian N, Trouillas P, Adeleine P, Salord F. Hyperbaric oxygen in the treatment of acute ischemic stroke. Stroke 1995;26:1369–72.

[75] Kao CH, Wang SJ, Yeh SH. The relationship among the quantitative perfusion-defect indices in Tc-99m HMPAO brain SPECT, IQ test, and involved extremities in children with cerebral palsy due to perinatal asphyxia. Clin Nucl Med 1994;19(4):309–13.

[76] Montgomery D, Goldberg J, Amar M, et al. Effects of hyperbaric oxygen therapy on children with spastic diplegic cerebral palsy: a pilot project. Undersea Hyperb Med 1999;26(4):235–42.

[77] Riikonen R, Salonen I, Partanen K, Verho S. Brain perfusion SPECT and MRI in foetal alcohol syndrome. Dev Med Child Neurol 1999;41:652–9.

[78] Heuser G, Heuser SA, Rodelander D, Aguilera D, Uszler M. Treatment of neurologically impaired adults and children with "mild" hyperbaric oxygenation (1.3 ATA and 24% oxygen). In: Joiner JT, editor. Hyperbaric oxygenation for cerebral palsy and the brain-injured child. Flagstaff Arizona: Best Publications; 2002. p. 109–15.

[79] Golden ZL, Neubauer R, Golden CJ, Greene L, Marsh J, Mleko A. Improvement in cerebral metabolism in chronic brain injury after hyperbaric oxygen therapy. Int J Neurosci 2002;112:119–31.

[80] Singh VK, Warren R, Averett R, Ghaziuddin M. Circulating autoantibodies to neuronal and glial filament proteins in autism. Pediatr Neurol 1997;17(1):88–90.

[81] Singh VK, Rivas WH. Prevalence of serum antibodies to caudate nucleus in autistic children. Neurosci Lett 2004;355:53–6.

[82] Vojdani A, O'Bryan T, Green JA, et al. Immune response to dietary proteins, gliadin and cerebellar peptides in children with autism. Nutr Neurosci 2004;7(3):151–61.

[83] Singh VK, Lin SX, Newell E, Nelson C. Abnormal measlesmumps-rubella antibodies and CNS autoimmunity in children with autism. J Biomed Sci 2002;9:359–64.

[84] Vojdani A, Campbell AW, Anyanwu E, Kashanian A, Bock K, Vojdani E. Antibodies to neuron-specific antigens in children with autism: possible cross-reaction with encephalitogenic proteins from milk, Chlamydia pneumoniae and Streptococcus group A. J Neuroimmunol 2002;129: 168–77.

[85] Vojdani A, Pangborn JB, Vojdani E, Cooper EL. Infections, toxic chemicals and dietary peptides binding to lymphocyte receptors and tissue enzymes are major instigators of autoimmunity in autism. Int J Immunopathol Pharmacol 2003;16(3):189–99.

[86] Jyonouchi H, Sun S, Le H. Proinflammatory and regulatory cytokine production associated with innate and adaptive immune responses in children with autism spectrum disorders and developmental regression. J Neuroimmunol 2001;120:170–9.

[87] Gupta S, Aggarwal S, Rashanravan B, Lee T. Th1- and Th2- like cytokines in CD4+ and CD8+ T cells in autism. J Neuroimmunol 1998;85:106–9.

[88] Wakefield AJ, Ashwood P, Limb K, Anthony A. The significance of ileocolonic lymphoid nodular hyperplasia in children with autistic spectrum disorder. Eur J Gastroenterol Hepatol 2005;17:827–36.

[89] Ashwood P, Anthony A, Torrente F, Wakefield AJ. Spontaneous mucosal lymphocyte cytokine profiles in children with autism and gastrointestinal symptoms: mucosal immune activation and reduced counter regulatory interleukin- 10. J Clin Immunol 2004;24(6):664–73.

[90] Torrente F, Ashwood P, Day R, et al. Small intestinal enteropathy with epithelial IgG and complement deposition in children with regressive autism. Mol Psychiatry 2002;7:375–82.

[91] Gupta S. Immunological treatments for autism. J Autism Dev Disord 2000;30(5):475–9.

[92] Zimmerman AW. Commentary: immunological treatments for autism: in search of reasons for promising approaches. J Autism Dev Disord 2000;30(5):481–4.

[93] Akin ML, Gulluoglu BM, Uluutku H, et al. Hyperbaric oxygen improves healing in experimental rat colitis. Undersea Hyperb Med 2002;29(4):279–85.

[94] Luongo C, Imperatore F, Cuzzocrea S, et al. Effects of hyperbaric oxygen exposure on a zymosan-induced shock model. Crit Care Med 1998;26(12):1972–6.

[95] Sumen G, Cimsit M, Eroglu L. Hyperbaric oxygen treatment reduces carrageenan-induced acute inflammation in rats. Eur J Pharmacol 2001;431:265–8.

[96] Warren J, Sacksteder MR, Thuning CA. Therapeutic effect of prolonged hyperbaric oxygen in adjuvant arthritis of the rat. Arthritis Rheum 1979;22(4):334–9.

[97] Tokar B, Gundogan AH, Ilhan H, Bildirici K, Gultepe M, Elbuken E. The effects of hyperbaric oxygen treatment on the inflammatory changes caused by intraperitoneal meconium. Pediatr Surg Int 2003;19:673–6.

[98] Chen SY, Chen YC, Wang JK, et al. Early hyperbaric oxygen therapy attenuates disease severity in lupus-prone autoimmune (NZB X NZW) F1 mice. Clin Immunol 2003;108:103–10.

[99] Buchman AL, Fife C, Torres C, Smith L, Aristizibal J. Hyperbaric oxygen therapy for severe ulcerative colitis. J Clin Gastroenterol 2001;33(4):337–9.

[100] James SJ, Cutler P, Melnyk S, et al. Metabolic biomarkers of increased oxidative stress and impaired methylation capacity in children with autism. Am J Clin Nutr 2004;80:1611–7.

[101] Sogut S, Zoroglu SS, Ozyurt H, et al. Changes in nitric oxide levels and antioxidant enzyme activities may have a role in the pathophysiological mechanisms involved in autism. Clin Chim Acta 2003;331:111–7.

[102] McGinnis WR. Oxidative stress in autism. Altern Ther Health Med 2004;10(6):22–36.

[103] Feldmeier J, Carl U, Hartmann K, Sminia P. Hyperbaric oxygen: does it promote growth or recurrence of malignancy? Undersea Hyperb Med 2003;30(1):1–18.

[104] Shaw FL, Handy RD, Bryson P, Sneyd JR, Moody AJ. A single exposure to hyperbaric oxygen does not cause oxidative stress in isolated platelets: no effect on superoxide dismutase, catalase, or cellular ATP. Clin Biochem

2005;38:722–6.

[105] Yatsuzuka H. Effects of hyperbaric oxygen therapy on ischemic brain injury in dogs. Masui 1991;40(2):208–23.

[106] Zamboni WA, Roth AC, Russell RC, Nemiroff PM, Casas L, Smoot EC. The effect of acute hyperbaric oxygen therapy on axial pattern skin flap survival when administered during and after total ischemia. J Reconstr Microsurg 1989;5(4):343–7.

[107] Ozden TA, Uzun H, Bohloli M, et al. The effects of hyperbaric oxygen treatment on oxidative and antioxidants levels during liver regeneration in rats. Tohoku J Exp Med 2004;203:253–65.

[108] Yasar M, Yildiz S, Mas R, et al. The effect of hyperbaric oxygen treatment on oxidative stress in experimental acute necrotizing pancreatitis. Physiol Res 2003;52:111–6.

[109] Kaelin CM, Im MJ, Myers RA, Manson PN, Hoopes JE. The effects of hyperbaric oxygen on free flaps in rats. Arch Surg 1990;125(5):607–9.

[110] Dennog C, Radermacher P, Barnett YA, Speit G. Antioxidant status in humans after exposure to hyperbaric oxygen. Mutat Res 1999;428:83–9.

[111] Yu SY, Chiu JH, Yang SD, et al. Preconditioned hyperbaric oxygenation protects the liver against ischemia-reperfusion injury in rats. J Surg Res 2005;128:28–36.

[112] Alleva R, Nasole E, Di Donato F, Borghi B, Neuzil J, Tomasetti M. a-Lipoic acid supplementation inhibits oxidative damage, accelerating chronic wound healing in patients undergoing hyperbaric oxygen therapy. Biochem Biophys Res Commun 2005;333(2):404–10.

[113] Dennog C, Gedik C, Wood S, Speit G. Analysis of oxidative DNA damage and HPRT mutations in humans after hyperbaric oxygen treatment. Mutat Res 1999;431:351–9.

[114] Benedetti S, Lamorgese A, Piersantelli M, Pagliarani S, Benvenuti F, Canestrari F. Oxidative stress and antioxidant status in patients undergoing prolonged exposure to hyperbaric oxygen. Clin Biochem 2004;37:312–7.

[115] Chavko M, Harabin AL. Regional lipid peroxidation and protein oxidation in rat brain after hyperbaric oxygen exposure. Free Radic Biol Med 1996;20(7):973–8.

[116] Wada K, Miyazawa T, Nomura N, Nawashiro H, Shima K. Preferential conditions for and possible mechanisms of induction of ischemic tolerance by repeated hyperbaric oxygenation in gerbil hippocampus. Neurosurgery

2001;49:160–7.

[117] Hink J, Jansen E. Are superoxide and/or hydrogen peroxide responsible for some of the beneficial effects of hyperbaric oxygen therapy? Med Hypotheses 2001;57(6):764–9.

[118] Barja G. Oxygen radicals, a failure or a success of evolution? Free Radic Res Commun 1993;18(2):63–70.

[119] McCord JM. The evolution of free radicals and oxidative stress. Am J Med 2000;108:652–9.

[120] Patel V, Chivukula IV, Roy S, et al. Oxygen: from the benefits of inducing VEGF expression to managing the risk of hyperbaric stress. Antioxid Redox Signal 2005;7(9-10): 1377–87.

[121] Pablos MI, Reiter RJ, Chuang JI, et al. Acutely administered melatonin reduces oxidative damage in lung and brain induced by hyperbaric oxygen. J Appl Physiol 1997;83:354–8.

[122] Pelaia P, Rocco M, De Blasi RA, et al. Assessment of lipid peroxidation in hyperbaric oxygen therapy: protective role of N-acetylcysteine. Minerva Anestesiol 1995;61(4):133–9.

[123] Hollis AL, Butcher WI, Davis H, Henderson RA, Stone WL. Structural alterations in retinal tissues from rats deficient in vitamin E and selenium and treated with hyperbaric oxygen. Exp Eye Res 1992;54(5):671–84.

[124] Boadi WY, Thaire L, Kerem D, Yannai S. Effects of dietary factors on antioxidant enzymes in rats exposed to hyperbaric oxygen. Vet Hum Toxicol 1991;33(2):105–9.

[125] Weber CA, Duncan CA, Lyons MJ, Jenkinson SG. Depletion of tissue glutathione with diethyl maleate enhances hyperbaric oxygen toxicity. Am J Physiol 1990;258(6 Pt 1): L308–12.

[126] Thom SR, Bhopale VM, Velazquez OC, Goldstein LJ, Thom LH, Buerk DG. Stem cell mobilization by hyperbaric oxygen. Am J Physiol Heart Circ Physiol 2005; in press.

[127] Steindler DA, Pincus DW. Stem cells and neuropoiesis in the adult human brain. Lancet 2002;359:1047–54.

[128] Harch PG, Small T. Interview with Dr. Paul Harch: the application of hyperbaric oxygen therapy in chronic neurological conditions. Medical Veritas 2005;2:637–46.

[129] Collet JP, Vanasse M, Marois P, et al. Hyperbaric oxygen for children with cerebral palsy: a randomised multicentre trial. Lancet 2001;357:582–6.

[130] Marois P, Vanasse M. Letter to the editor: "Hyperbaric oxygen therapy and cerebral palsy". Dev Med Child Neurol 2003;45:646–8.

[131] Autism Research Institute. Autism Treatment Evaluation Checklist (ATEC) Internet Scoring Program, http://www.autismeval.com/ari-atec/ [accessed 25.01.06].

[132] Rellini E, Tortolani D, Trillo S, Carbone S, Montecchi F. Childhood autism rating scale (CARS) and autism behavior checklist (ABC) correspondence and conflicts with DSM-IV criteria in diagnosis of autism. J Autism Dev Disord 2004;34(6):703–8.

[133] Constantino JN, Davis SA, Todd RD, et al. Validation of a brief quantitative measure of autistic traits: comparison of the social responsiveness scale with the autism diagnostic interview-revised. J Autism Dev Disord 2003;33(4):427–33.

Healing with Hyperbarics

How does hyperbarics heal?

Hyperbaric Therapy is a specialized therapy that uses an increase in the atmospheric pressure to allow the body to incorporate more oxygen into its blood cells, blood plasma, cerebral-spinal fluid, and other body fluids.

At sea level we have 1ATA (14.7psig) which allows our lungs to absorb oxygen from the air. If we go to higher altitudes, the pressure drops and we the lungs would not be able to absorb the oxygen from the air. This is why oxygen masks drop in an airplane at high altitudes – to increase the O_2 content due to the lack of pressure. The exact opposite happens when you go to lower altitudes (below sea level). There the pressure is greater (above 1ATA) and now the lungs can more easily absorb the oxygen.

Consider this analogy. A bottle of soda-pop is a pressurized vessel. In the bottle we have a liquid. We then have 'carbonation' (the gas) and also pressure. When the bottle is sealed we do not see bubbles. The moment we twist off the cap and break the seal, we hear the 'swish' and the pressure is released in the bottle. Now, all of a sudden we see the formation of bubbles in the bottle and as time goes they grow and float to the top of the liquid. Certainly the pressure in the bottle is quite high and the nature of the gas (carbonation) is a different than the 21% O_2 in the ambient air. However the concept is the same. In the hyperbaric chamber, as the pressure goes up, more O_2 from the air is 'pushed' into the fluids of the body.

The healing occurs when a severely compromised tissue in the body begins to receive oxygen, and blood circulation to the tissue resumes. Note: A damaged tissue may not have been receiving enough blood for it to heal, due to a lack of blood circulation caused by the initial trauma.

***The Gas Laws of Physics** state that more gas is dissolved in a liquid by increasing the pressure of the gas.*

Here lies the healing magic of Hyperbaric Therapy. Inside the pressurized chamber, the story changes. The injury site now begins to receive a healing dose of oxygen through the surrounding body fluids and plasma—even if the blood supply to the tissues are compromised.

Furthermore, to boost the oxygen concentration in the chamber, supplemental oxygen may be added into the chamber during treatment. As explained before, this oxygen will become infused into the numerous types of liquids in the body—blood, plasma, cerebral fluids.

And like the soda-pop in our analogy, the oxygen-uptake will remain in the body for a time after treatment.

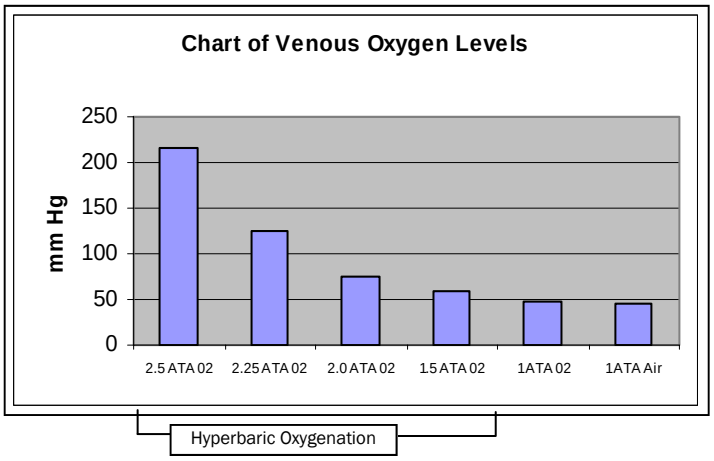
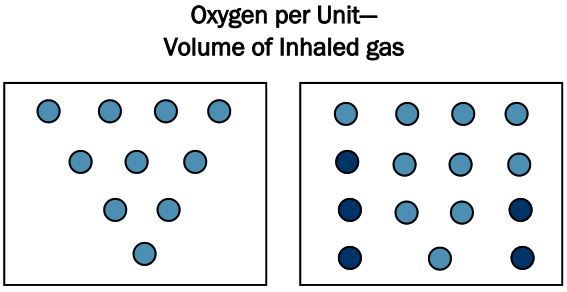


Chart: The goal here is to increase tissue oxygen delivery above 50mmHg. Notice in the graph, that even 100% O_2 at one atmosphere has little effect on increasing the level of deliverable oxygen to the tissue level. You need pressure to do this (especially if circulation is compromised).

Note: Breathing pure oxygen at 2 Atmospheres, gives 10 times the regular amount of oxygen (2 x 100% vs. 21%). In one hour, humans can inhale 2.4 pounds of oxygen! (Normal is 6 pounds/ day). Red blood cells instantly fill with oxygen and the extra oxygen dissolves directly into the blood fluid. In a few minutes, this extra oxygen builds up tissue oxygen levels far above normal.



The Principle of Hyperbaric Oxygen Therapy is simple. Increase the atmospheric pressure and get a *directly proportional* increase in available oxygen.

In other words, a two fold increase in the pressure would equal twice the available oxygen *molecules* to breathe. [Half that, would yield half more, as shown].

15810 East Gale Avenue #178 Hacienda Heights, CA 91745

International Hyperbarics Association, Inc.

On the web: www.ihausa.org

1.877.IHA.USA1

Application for Membership

Provider Member ⬭ **New Member** ⬭ **Renewal** ⬭ Member No. _____

Date: _____ Referred by: _____

Name Dr. Mr. Mrs. Ms. _____

Business Address:

_____

_____

_____

Telephone(_____) _____

Fax (_____) _____

E-mail _____

Home Address:

_____

_____

_____

Telephone(_____) _____

Fax (_____) _____

E-mail _____

CERTIFICATION

In making this application to the **International Hyperbarics Association, Inc.,** and if I am accepted, I agree to abide by all of its rules, regulations and policies as these may be promulgated from time to time.

My membership fee of is attached to this application.
*(Please make checks payable to **International Hyperbarics Association, Inc.**)*

Executed on _____ at _____
Date *City and State*

Name (*print*)_____

Signature_____

IHA use only	Membership No.

"Mundo vitam dare"

15810 East Gale Avenue #178
Hacienda Heights, CA 91745

Toll free: 877.IHA..USA1
(877.442.8721)

pressurepoint.newsletter@ihausa.org
hyperbarics@ihausa.org
www.ihausa.org

The International Hyperbarics Association, Inc., is a coalition of doctors, parents, patients, corporate chamber-industry professionals, hyperbaric center owners, and above all members who are committed to the cause of medical hyperbarics.

Our members come to us from all geographical areas with one common goal— to share their knowledge and information regarding the latest hyperbaric news. Our driving force is our members, who are committed to do all we can "to give life to the world."

— "Mundo vitam dare"

Medical Advisors

Jeff Bradstreet, MD
Giuseppina Feingold, MD
Gunnar Heuser, MD
James Neubrander, MD
Francisco Morales, MD
Daniel Rossignol, MD
Michael Uszler, MD
Joseph Rich, MD
John Zhang, MD

Provider Member Clinics

James Neubrander, MD
15 S Main Street Suite 6
Edison, NJ 08837
(732) 906-9000

Bruce Rind, MD
Center for Holistic Medicine
5225 Wisconsin Avenue NW
4th Flr. Washington DC 20015
(202) 237-7000

Giuseppina Feingold, MD
Valley Health
311 Clock Tower Commons
Brewster, NY 10509
(845) 278-6363

Joseph Rich, MD
Ctr. For Envir. & Integr. Med.
9217 Parkwest Blvd.
Knoxville, TN 37923
(865) 694-9553

Daniel Rossignol, MD
ICDRC
1688 West Hibiscus Blvd.
Melbourne, FL 32901
(321) 953-0278

Julie Buckley, MD
Pediatric Partner Ponte Vedra
5270 Palm Valley Road
Ponte Vedra Beach, FL 32082
(904) 543-1288