

The Liver Connection: How a Healthy Liver Impacts Children on the Autism Spectrum While Doing Heavy Metal and Chemical Detoxification

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Research within the field of Autism Spectrum Disorder (ASD) illustrates that biomedical interventions contribute to a measurable decrease in autistic symptoms.¹ These children have high levels of heavy metals, chemicals, viruses, yeast, bacteria and/or parasites.^{2,3,4} ASD kids are typically put on detoxification protocols which can have adverse effects on their sensitive systems, frequently resulting in a "healing crisis" or worsening of their symptoms.

Each child is biochemically unique, requiring an individual approach to detox. One thing that remains consistent among all ASD children is the significant role a healthy liver plays in rebuilding overall health and increasing neurological function. Studies show that their liver function is impaired^{5,6,7,8} prior to a detoxification protocol and becomes further compromised when given western medications.⁹

This paper discusses the benefits of preparing the liver, in particular, Phase I and Phase II liver detoxification pathways prior to initiating detox. Restoring liver metabolism significantly increases the utilization of other biomedical treatments leading to a greater quality of life for ASD children and their families.

Environmental Toxins Cause an Imbalance in Phase I and II Function Making the Detox Process Much More Challenging

Research shows that when Phase I detox pathway is more efficient than Phase II, lead to a higher risk for adverse health effects when exposed to environmental toxins.¹⁰ When there is an imbalance or the liver is overburdened, the liver's ability to filter becomes impaired. Many of these toxins, heavy metals & chemicals are fat soluble and incorporate themselves

into adipose tissue where they may stay for many years. The brain and the endocrine glands are fatty organs, and are common sites for fat-soluble toxins to accumulate. Symptoms may include brain dysfunction, hormonal imbalances and adrenal gland exhaustion.

Phase I Liver Detox Pathway Converts a Toxic Chemical Into a Less Harmful Chemical

This is achieved by various chemical reactions; such as oxidation, reduction and hydrolysis. Excessive amounts of toxic chemicals such as pesticides can disrupt the P450 enzyme system of this pathway by causing over activity or 'induction'. The metabolites from this incomplete detoxification process are potentially more harmful than their original toxic compounds. It is important for health that these toxic compounds are not allowed to build up as they contribute to oxidative stress.^{11,12} For children with ASD, oxidative stress can present as low levels of glutathione and metallothionein, hypersensitivity to environmental toxins, food sensitivities, immune dysfunction, low stomach acid, increase in candida, and inflammation in the gastrointestinal tract and brain. Substances that cause over activity during Phase I are caffeine, dioxin, saturated fats, organophosphorus pesticides, paint fumes, sulfonamides, exhaust fumes, and pharmaceuticals.

Phase II Liver Detox Pathway

This is called the conjugation pathway, where the liver cells add another substance such as cysteine, glycine or a sulfur molecule to a toxic chemical or drug, to render it less harmful. The conjugation molecules

¹ Parent Ratings of Behavioral Effects of Biomedical Interventions (ATEC) <http://autism.com/treatable/form34qr.htm> ² A Case-Control Study of Mercury Burden in Children with Autistic Spectrum Disorders <http://www.generationrescue.org/pdf/bradstreet.pdf> ³ http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Edelson%20SB%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DiscoveryPanel.Pubmed_RVAbstractPlus ⁴ Edelson SB, Cantor DS. Porphyrinuria in childhood autistic disorder: implications for environmental toxicity. 2006 Jul 15;214(2):99-108. Epub 2006 Jun 16. PMID: 16782114 ⁵ Edelson SB, Cantor DS. Autism: xenobiotic influences. Toxicol Ind Health. 1998 Jul-Aug;14(4):553-63. PMID 9664646 ⁶ Altern Med Rev. 2002 Aug;7(4):292-316. PMID: 12197782 ⁷ Autism, an extreme challenge to integrative medicine. Part: 1: The knowledge base. ⁸ Toxicol Ind Health 1998 Jul-Aug; 14(4):663-63 ⁹ Autism: xenobiotic influences. PMID: 9664646 ¹⁰ Horvath K, Perman JA. Autistic disorder and gastrointestinal disease. Curr Opin Pediatr. 2002 Oct;14(5):583-7. PMID: 12352252 ¹¹ Med Hypotheses. 2000 Sep;55(3):215-7. PMID: 10985911 ¹² A possible link between beta-carboline metabolism and infantile autism. ¹³ Jessica A. Hellings, Jennifer R. Zarcone, Kurt Crandall, Dennis Wallace, Stephen R. Schroeder. Journal of Child and Adolescent Psychopharmacology. September 1, 2001, 11(3): 229-238. doi:10.1089/1044546015259555 ¹⁴ Environ Health Perspect 105(Suppl 4):755-758 (1997) Combinations of Susceptible Genotypes and Individual Responses to Toxicants ¹⁵ Chauhan A, Chauhan V. Pathophysiology. 2006 Aug;13(3):171-81. Epub 2006 Jun 12. Oxidative stress in autism. PMID: 16766163 ¹⁶ James SJ, Cutler P, Melnyk S, Jernigan S, Janak L, Gaylor DW, Neubrandner JA. Am J Clin Nutr. 2004 dec;80(6):1611-7 Metabolic biomarkers of increased oxidative stress and impaired methylation capacity in children with autism. PMID: 15585776

are acted upon by specific enzymes to catalyze the reaction step. Through conjugation, the liver is able to turn drugs, hormones and various toxins into excretable substances. The toxin or drug becomes water-soluble, so it can then be excreted from the body via watery fluids such as bile or urine. When Phase II is slower than Phase I, as found in ASD children,¹³ these children experience cold or flulike symptoms, rashes, irritability, increase in anxiety, OCD, regression in skills when they initiate detoxification protocols without preparing their liver for detoxification.

"Leaky Gut", Yeast, Bacteria and the Liver

Additional pressure is put on the liver when "leaky gut" is present. Large food molecules, bacteria, fungi, parasites and their byproducts can pass straight into the bloodstream and be presented to the liver for detoxification. The overload of toxins and heavy metals in the environment increases the processing of metabolic wastes created by cell and organ activity which contributes to further stress on the liver.¹⁴

When the dumping of intestinal toxins occurs on a regular basis, the liver becomes saturated. It can no longer detoxify the poisons, and they are returned to the blood for circulation. This leaves the door open for yeast and bacteria to become systemic. Symptoms of "leaky gut" in ASD children include: food sensitivities, bloating, rashes, irritability, poor concentration, malabsorption, and undigested food in stools, mental and behavioral regressions after eating certain foods.

Immune System

Most children with autism have a substantial immune abnormality of some type.¹⁵ "Leaky gut" activates the immune and autoimmune systems. The immune system makes antibodies against the larger molecules because it recognizes them as invading substances. Due to this hyper-stimulated state, excessive inflammatory chemicals like histamine are produced, and in some cases, auto antibodies. When the immune system is overloaded on a regular basis, it is spread thin over a wide array of territory defending the gut, cleaning the blood, fighting inflammation, and warding off pathogens. If histamines become too high, ASD children present with some of the following: hyperactivity, compulsive behaviors, depression, intense mood swings, perfectionism, strong wills, explosive anger, anxiety, hair pulling, lack of focus, scripting, high libido, inappropriate giggling, aggression, change in bowel move-

ments, a craving for salt, frequent urination and rashes. From here the lymphatic system will attempt to collect and neutralize the toxins, but unable to send the toxins to the liver, the body essentially becomes toxic.¹⁶

Ammonia and the Liver

Liver failure is associated with high ammonia levels.¹⁷ A wide range of the toxic substances produced in a toxic bowel is sent on to the liver, which is the body's primary detoxification site. During the digestion of proteins, a number of harmful bacteria, including Clostridia, Eubacteria, and Peptostreptococci, produce toxic ammonia in the gastrointestinal tract. It is the result of a perfectly normal process. A healthy liver detoxifies the ammonia by turning it into urea, which is passed out of the body into the urine. When leaky gut syndrome is present, the ammonia remains unprocessed and enters the bloodstream, invading the central nervous system. This is the causal factor of many dangerous symptoms, such as minimal hepatic encephalopathy and the brain is affected.¹⁸ In children on the autism spectrum we see these signs of excess ammonia; lethargy, seizures, ataxia, unclear thinking, extreme sleepiness, "Spinning Thoughts" i.e. repeating thoughts, OCD type behavior, forgetfulness, trouble concentrating, confusion, and agitation.

Multi strain probiotics are helpful in treating an unhealthy liver by preventing the absorption of ammonia from the colon; once again indicating the strong relationship between the liver and the gut.¹⁹ When probiotics reach the intestines, they are welcomed by the friendly bacteria as a good food source. Through fermentation, the bacteria turn probiotics into lactic and acetic acids. This has the natural effect of reducing the pH level of the large intestine, making it far more acidic. When a high level of acidity is present in the intestines the ammonia remains in its ionized form. In this form, it is not passed on to the liver or diffused into general circulation through the blood. This reduces the toxic load on the liver and reduces ammonia levels throughout the body, including the brain.

pH

An acidic condition robs the body of oxygen and enables harmful pathogens to thrive. If young patients are too acidic, they can not assimilate nutrients efficiently from the foods they eat or the supplements they take. The body will be forced to pull essential minerals like calcium, magnesium, potassium and sodium from the organs and bones to neutralize the acids.

¹³ Toxicol Ind Health 1998 Jul-Aug;14(4):553-63. Autism: xenobiotic influences. PMID: 9664646 ¹⁴ Lindros KO, Järveläinen HA. Metab Brain Dis. 2005 Dec, 20(4) 393-8. Chronic systemic endotoxin exposure: an animal model in experimental hepatic encephalopathy. ¹⁵ Studies done by Reed Warren Ph.D. at Utah State University, Sudhir Gupta MD Ph.D., a clinical immunologist at the University of California at Irvine Medical School, and others indicate ¹⁶ Dr Ron Grisanti <http://www.drgrisanti.com/Mucosal%20Barrier.htm> ¹⁷ Limited capacity for ammonia removal by brain in chronic liver failure. Laboratory of Neurobiology, Centro de Investigación Principe Felipe, Fundación Valenciana de Investigaciones Biomedicas, Avda del Saler, 16, Camino de las Moreras 46013, Valencia, Spain. ¹⁸ Comparison of probiotics and lactulose in the treatment of minimal hepatic encephalopathy in rats. Jia L, Zhang MH. Department of Digestive Diseases, Affiliated First People's Municipal Hospital, Guangzhou Medical College, Guangdong, China. ¹⁹ Comparison of probiotics and lactulose in the treatment of minimal hepatic encephalopathy in rats. Jia L, Zhang MH. Department of Digestive Diseases, Affiliated First People's Municipal Hospital, Guangzhou Medical College, Guangdong, China.

As children drain acidic waste through their urine the inner terrain comes into balance. A healthy first morning urine pH should be within the range of 5.5-6.2 with a healthy saliva pH of 6.8 – 7.2²⁰ Saliva pH represents what the body is holding or pH homeostasis. The first morning urine pH represents the metabolic waste we are able to excrete. An alkaline first morning urine pH indicates liver congestion; or a holding onto toxins. Testing the first morning urine pH is an effective way to see if the body is able to get rid of acidic waste efficiently.

At the beginning of therapy, the majority of ASD children test consistently with high first morning urine pH, over 6.2, and low saliva pH, less than 6.8, which indicates liver congestion and an over acidic condition. Sulfhydryl group chelators and several western medicines have been noted to alkalize first morning urine.²¹

Vitamin & Minerals

Deficiency of vitamins and minerals are prevalent within the autism community with vitamin B-6, B-12, zinc, magnesium and calcium being discussed the most. As OAT, (Organic Acid Urinary Tests)²² show, when liver function improves and the pH have come into healthy range many children are able to utilize nutrients from food and supplements more efficiently. Parents report a need to reduce certain mega doses of vitamins and minerals when this occurs.

Cholesterol, Fatty Acid Metabolism and the Liver

Two common factors in autism spectrum disorder are low levels of cholesterol and an impaired fatty acid metabolism.²³ Studies show children with autism, are low in cholesterol -not due to a limited intake but rather an inability to

make cholesterol. Cholesterol is produced by the liver and other organs in the body via a complex metabolic pathway. The cholesterol that the liver produces is vital to strengthening the membranes of each and every cell in the body. Bile acids, a by product of the cholesterol metabolism, are made in the liver and are the “detergents” of fat metabolism; they are also signaling molecules that provide the body with key information about the state of the liver.²⁴

Symptoms of fatty acid deficiencies in ASD children are skin conditions (dry, bumpy, eczema), diarrhea, fatigue, aggression, failure to thrive, eating disorders, excessive thirst, immune deficiency, hyperactivity, and impaired wound healing.²⁵

Organic Acid Urinary Analysis.

Developed to assess efficiency of cellular energy production, metabolic toxicity problems/detoxification functions, functional vitamin, mineral and amino acid deficiencies and neurotransmitter metabolism. In addition, this analysis provides important information about clinically significant gut flora imbalances by detecting elevated levels of metabolic waste products from bacteria and yeast.

A Case Study:

1 year old girl, presented with typical symptoms of autism, no receptive language or communication, didn't play with toys, no pointing, no babble, apraxic, no back and forth interactions, bowels were impacted requiring a daily enema, elevated liver enzymes, extreme eczema - she looked like a burn victim. Child is put on a biomedical heavy metal detoxification protocol (TD DMSA) with out addressing liver function. Six months on this protocol and a baseline OAT is performed. See results below.

Fatty Acid Metabolites	Baseline Test	Post Test	Ref. Range
3-hydroxybutyric	408.46	14.89	0.0-10.0
Acetoacetic	686.27	47.48	0.0-10.0
adipic	13.17	10.40	0.0-12.0
suberic	7.75	1.95	0.0-2.0
Toxic Indicators			
pyroglutamic	27.08	43.56	20.0-115.0
Vitamin Indicators			
Ascorbic	129.11	9471.5	10.0-200.0
Kreb Cycle			
Citric	138.38	371.10	180-560
Yeast Metabolites			
Arabinose	238.09	87.89	0.0-47.0
glyceric	12.20	9.59	0.0-10.0

²⁰ © 2003 Timothy Ray OMD LAc The pH Management of Heavy Metal Detox ²¹ <http://health.groups.yahoo.com/group/BioRaynaturaldetox> ²² Great Plains Laboratory 800-288-0383 <http://www.greatplainslaboratory.com>, Genova Diagnostics 800-522-4762 www.genovadiagnostics.com ²³ Fatty Acids in Dyslexia, Dyspraxia, ADHD and the Autistic Spectrum Alexandra Richardson, D.Phil (Oxon), PCGE ²⁴ Bile acids, receptor key in regenerating livers by Ruth SoRelle, M.P.H. ²⁵ Fatty Acids in Dyslexia, Dyspraxia, ADHD and the Autistic Spectrum Alexandra Richardson, D.Phil (Oxon), PCGE

Child's first morning urine pH is 6.8 and saliva is 8.0, both severely out of healthy range.

Liver Life is incorporated into her TD DMSA heavy metal detoxification protocol starting with one drop of Liver Life 2x per day. Next day, she has bowel movement with out inducing for first time in several months. Daily independent bowel movements continue on Liver Life and pH's come into range, eczema completely resolves, liver enzymes come into range.

Three months after introducing Liver Life another OAT is performed.

OAT results show that Liver Life enabled her to decrease yeast overgrowth, improve the Krebs cycle, and regulate excessive fatty acid oxidation, increase glutathione levels as well as increase nutrient absorption. The excessive levels of Ascorbic indicate that the high doses of nutritional supplements can be lowered, she is assimilating nutrients from her food and supplements more efficiently.

Case Outcome:

Patient, now 3 years old, is Neural Typical, very healthy, and advanced in all areas, "currently talking circles around other children her age". Mom says: "Liver Life enabled me to do the treatments that my daughter needed. It was exactly what we were looking for."

Symptomology commonly reported when Liver Function is compromised in ASD Children:

- ◆ Yeast and bacterial infections
- ◆ Food intolerances/allergies
- ◆ Seasonal allergies/high histamines
- ◆ Significant decrease in absorption of nutrients from food and supplements
- ◆ Decrease in verbal and non-verbal communication skills
- ◆ Impaired digestive function
- ◆ Decreased cognitive ability
- ◆ Lack of focus
- ◆ Sensory overload
- ◆ Emotional outbursts
- ◆ Skin rashes/conditions (i.e. eczema)
- ◆ Disrupted sleep

How does this help with heavy metal and chemical detoxification?

When liver structure and function are impaired or congested, all systems in the body become aggravated, toxins "back up" in the body and signs of a healing crisis ensue. In children on the spectrum this has been seen as "regressing" and symptoms appear as stated above. This process is reversible by giving substances that feed the liver allow it to do the job nature intended: eliminate, manufacture, and store. Improving liver function in ASD children increases the efficacy of allopathic and integrative treatments as well.

When the liver function has been restored in ASD children; their doctors, parents and teachers report:

- ◆ better social skills
- ◆ increased communication
- ◆ appropriate speech
- ◆ more focus
- ◆ improved comprehension
- ◆ ability to do school work
- ◆ more calm
- ◆ consistency in day to day abilities
- ◆ better absorption of nutrients from foods
- ◆ able to decrease mega doses of vitamins and minerals
- ◆ decrease in food sensitivities
- ◆ healthier bowel movements

While liver function is the primary subject of this paper – all other organs of elimination must also be addressed.

In order to maintain optimum efficacy of the chosen chelator, the preparation of the organs associated with detox is more important than the methodology of the chelator.

We see and hear of success with many different chelators. Success is equal to how well the organs of elimination are prepared and supported during these interventions.

"If more poison is mobilized than can be excreted or neutralized, the poisons redistribute into otherwise healthy tissue and continue to cause cell death, dysfunction or mutation.

This produces the symptoms of a 'healing crisis', which is really a misnomer for either a crisis of poor case management, the disturbing chemical interaction of mercury with ammonia, acute infections due to the withdrawal of the antimicrobial effects of various heavy metals, or candida die-off symptoms, (which are actually a sudden release of the heavy metals bound into the yeast cell wall as the yeast dies)."²⁶

How to improve the livers' structure and function: Foods

Whole organic foods contain 300 times²⁷ more nutrients than processed foods. These nutrients provide energy and materials for our cells to rebuild.

- ◆ Eat plenty of fresh fruits and lightly cooked vegetables especially dark green, leafy vegetables and orange, yellow, purple, and red colored fruits and vegetables — they contain living enzymes, fiber, vitamin C, natural antibiotic substances, phyto-nutrients and they are excellent support for Phase I detox pathway.
- ◆ Eat sulfurous veggies (broccoli, cabbage, etc.) – they assist Phase II detox pathway
- ◆ Eat foods that increase glutathione levels in the body. Asparagus, watermelon and broccoli are good sources of glutathione while papayas and avocados help the body to produce glutathione.
- ◆ Supplement digestive enzymes to assist absorption of nutrients needed to restore the alkaline reserve, decrease the stress on the liver and optimize digestion.

²⁶ © 2006 Timothy Ray, L.Ac. OMD Explore! For the Professional, Volume 15, Number 5 ²⁷ <https://www.bioray2000.com/uploads/OrganicFoodsareHealthier.pdf>

How to improve the livers' structure and function:

Remedies & single ingredients – Liver Life is a food for the Liver.

Liver Life²⁸ is a certified organic blend of live medicinal mushrooms and herbs, a synergistic formula that restores healthy liver function and opens Phase I and II detox pathways. There is a common misconception regarding the use of medicinal mushrooms when candida is present. The high polysaccharide content in some medicinal mushrooms makes them a viable remedy in treating candida. Each quality ingredient listed below contains valuable properties that contribute to “feeding” the liver.

Himmematsutake (Agaricus Blazei) – modulates the immune system, supports digestive health, speeds up the healing process, and inhibits histamine production. This medicinal mushroom also filters the blood by engulfing and destroying viruses, bacteria, yeast, heavy metals, pollutants and bits of dead tissue.

Red Root (Jersey Tea) – assists in the removal of toxins, tissue wastes, acids, and cellular debris. It improves blood circulation, helps to decongest, drain and transport lymph fluids. This herb also has anti inflammatory, antispasmodic, and antimicrobial properties.

Milk Thistle Seeds – prevent penetration of liver toxins into the interior of the cell, decongests the liver, prevent the depletion of glutathione, decrease inflammation, purifies the blood, protects the kidneys, protects against free radical damage.

Olive Leaf – It prevents pathogens from reproducing and creating more microbes within the body and has antioxidant and antimicrobial properties. Olive leaf increases the flow of bile and tonifies the liver.

Coriolus Versicolor – stimulates the antigen-presenting cell function of macrophages which help to stimulate and strengthen overall immune function. It enhances the cytotoxic activity of natural killer cells, contains powerful antibacterial and antioxidant capabilities.

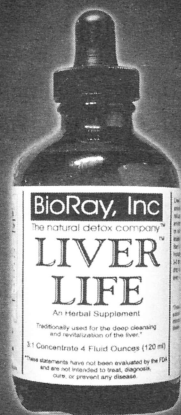
Ganoderma Lucidum (Reishi) – modulates the immune system, inhibits histamine release, restores homeostasis, enhances natural killer cell activity, and increases the production of interleukin and interferon. Also, has an anti-inflammatory, antibacterial, antifungal, antiviral, and antioxidant property.

Grifola (Maitake) – contains unique beta-glucan called D-fraction which protects the body by stimulating immune cells, protects liver tissue from environmental toxins, inhibits both the accumulation of liver lipids and the elevation of serum lipids, activates macrophages and aids the body in adapting to physical and emotional stress.

End Note

We have seen hundreds of cases where children on the spectrum are put on a moderate to extensive heavy metal detoxification protocol without support for the organs of elimination. Many parents report their children are unable to follow through with the recommended protocol due to significant symptoms of a “detox reaction”. Valuable healing time is lost. Monitoring pH values is easy for both the parent and child; it’s a tool that parents can use to “see” if their child is draining acids. Restoring the liver’s metabolism is a simple, yet profound step in a successful detox protocol for ASD children; improving health and vitality while insuring a gradual and effective detoxification. 🌿

²⁸ Call BioRay, Inc. (949) 305-7454 (www.bioray2000.com) or Scientific Bio-Logics (714) 847-9355 (www.sblogics.com) to order Liver Life and other BioRay products.



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