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**DIAGNOSTICS**  
*Formerly Great Plains Laboratory*

# Understanding Autism Spectrum Disorders

## The Importance of Biomedical Testing

Traditionally, the diagnosis of Autism Spectrum Disorders has been based on the observation of behavior, and treatment focused primarily on alleviating challenging behaviors. However, there is a very real biomedical component to the disorder in which underlying medical issues often cause or contribute to autistic behaviors. Some of the most common problems include gastrointestinal (GI) overgrowth of *Candida* and *Clostridia*, inability to detoxify environmental toxins, and development of food intolerances and/or allergies. These physical and environmental factors limit the nutrients available to the brain and body, resulting in damage to cellular, metabolic, and central nervous system functionality. Every individual with Autism exhibits unique behavioral and cognitive symptoms with varying degrees of severity. Common symptoms can also include eczema, diarrhea, constipation, rashes, dark eye circles, and visible stomach pain.<sup>1</sup>

Genetic susceptibility to Autism may determine who develops this complex disorder, but nutrient deficiencies and food allergies strongly influence the severity of symptoms. Exposure to toxins (particularly metals) and imbalanced microbial growth in the GI tract contribute to pathological responses to food. Yeast (most commonly, *Candida*), parasites, viruses, and bacteria, particularly *Clostridia*, all have the potential to act as pathogens.

Eradicating harmful and often recurrent intestinal microbes and restoring proper intestinal flora balance is the best place to start so the body can begin to heal and detoxify itself. Eliminating IgG-reactive foods which can contribute to inflammation is an important part of healing the GI tract.

### **The following are peripheral issues seen in Autism that are exacerbated by abnormal intestinal flora**

- Impaired detox pathways
- Reduction in glutathione levels
- Poor sleep quality
- Speech and behavioral issues
- Oxidative stress
- Immune dysfunction
- Deficient essential fatty acids

### **Recommended Tests for ASD**

- Organic Acids Test
- TOXDetect Profile
- MycoTOX Profile
- Metals – Toxic + Nutrient Elements
- IgG Food MAP with *Candida* + Yeast
- Glyphosate Test

### **Optional Tests for ASD**

- Advanced Cholesterol Profile
- Comprehensive Stool Analysis
- Copper + Zinc Profile
- Omega-3 Index Complete
- Streptococcus Antibodies Profile

## Organic Acids Test (OAT)

Reducing or eliminating yeast overgrowth can be an effective method of reducing autistic symptoms. Microbial overgrowth can be measured by urine organic acid analyses of yeast and bacterial metabolites. The Organic Acids Test quantifies other useful markers of energy cycle and neurological function, as well as nutritional adequacy. The test is also designed to identify some rare genetic diseases and indirect indicators of methylation problems. When *Candida* grows out of balance, it can disrupt areas of the intestinal wall, producing toxins and leading to leaky gut syndrome. *Candida* toxins can depress the immune system. An inflammatory immune response and multiple food sensitivities can result from the leaky gut. Many children on the autism spectrum have an overgrowth of certain *Clostridia* species, which produces a compound called HPHPA (3-(3-hydroxyphenyl)- 3-hydroxypropionic acid).<sup>2</sup> HPHPA may disrupt dopamine metabolism by interfering with the enzyme dopamine beta-hydroxylase. HPHPA is a potent toxin with profound neurological effects in Autism, and can lead to moodiness, tantrums, extreme anxiety, aggression, and /or self-injurious behavior.<sup>3</sup>

## TOXDetect Profile

A large number of studies have linked Autism to increased exposure to a wide range of environmental chemicals or a decreased ability to detoxify toxic chemicals.<sup>4-5</sup> Because exposure to environmental pollutants has been linked to many chronic diseases, including Autism, we have created TOXDetect Profile, a toxic non-metal chemical profile that assesses a variety of metabolites of commonly exposed toxicants such as phthalates, volatile organic compounds, pesticides, and more.

## MycoTOX Profile

Mycotoxins released from mold fungi are some of the most prevalent toxins in the environment. A majority of mycotoxin exposures are through food ingestion or airborne exposure from water-damaged buildings and homes. Unfortunately, mycotoxins are resistant to heat and many processing procedures. Diseases and symptoms linked to mycotoxin exposure include fever, pneumonia-like symptoms, heart disease, rheumatic disease, asthma, sinusitis, cancer, memory loss, vision loss, chronic fatigue, skin rashes, depression, ADHD, anxiety, and liver damage.<sup>16-17</sup> Studies are now coming out correlating the severity of symptoms from mycotoxin exposure with Autism, perhaps due to common decreased detoxification abilities for those with Autism.<sup>18-19</sup> With our MycoTOX Profile, we can identify exposures to 11 common mycotoxins and make recommendations for detoxification treatments that have been effective.

## Metals – Toxic + Nutrient Elements (Urine, Hair, Whole Blood, Red Blood Cell, Stool)

Symptoms of Autism are consistent with those of a mercury toxicity.<sup>20</sup> Metal toxicity impacts cognition, language, immunity, and behavior. Identifying and eliminating metals such as lead, arsenic, aluminum, and mercury is an important step toward recovery. Evidence shows that children with Autism tend to have low levels of glutathione and cysteine, which are critical to the removal of toxic metals like mercury. Children with Autism Spectrum Disorders are also frequently treated excessively with oral antibiotics, which greatly inhibits excretion of mercury.

## IgG Food MAP with Candida + Yeast

Most of the time, food reactions are IgG-mediated. These sensitivities tend to create problems because they stress the child's immune system, compromising digestion and resulting in inflammation and increased behavioral issues.<sup>3</sup> IgG food allergy testing can identify the specific antibody reactions not commonly tested by allergists. Eliminating offending foods strengthens the

immune system and may help significantly reduce autistic symptoms and GI problems. The use of probiotics may also be beneficial in alleviating GI dysfunction, inflammation, and potential behavioral symptoms shown by some children on the Autism spectrum.<sup>21</sup>

## Glyphosate Test

Glyphosate is the world's most widely produced herbicide. High correlations exist between glyphosate usage and numerous chronic illnesses, including Autism. Several researchers have proposed that it may be a cause of Autism, based on epidemiological data that correlates increased usage of glyphosate with an increased Autism rate.<sup>6-8</sup> Ingestion of foods exposed to glyphosate can lead to elevated glyphosate in the gastrointestinal tract, which in turn leads to an alteration of the intestinal microbial flora in which harmful species such as *Clostridia* replace beneficial microorganisms. In people with Autism, a number of studies<sup>9-10</sup> have indicated increased colonization of the intestinal tract with a variety of *Clostridia* species.<sup>9</sup> The presence of increased *Clostridia* bacteria results in the increased production of *Clostridia* metabolites, such as HPPHA and 4-cresol.<sup>11</sup> Those compounds inhibit the conversion of dopamine to norepinephrine in the brain and in the sympathetic nervous system.<sup>12-13</sup> Excessive amounts of the dopamine metabolite homovanillic acid have been found to be prevalent in urine samples from children with Autism.<sup>14-15</sup> Metabolites of dopamine induce mitochondrial dysfunction, oxidative stress, the formation of neurotoxic  $\alpha$ -synuclein protofibrils, and impaired protein degradation. The Glyphosate Test is a urine test that can be easily added on to other urine tests like the Organic Acids Test or TOXDetect Profile.



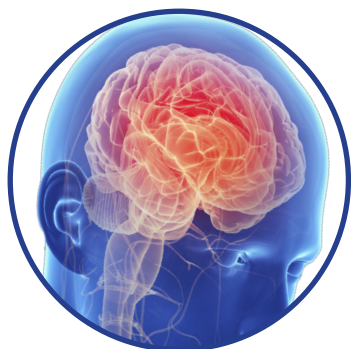
Glyphosate is sprayed on GMO food crops.



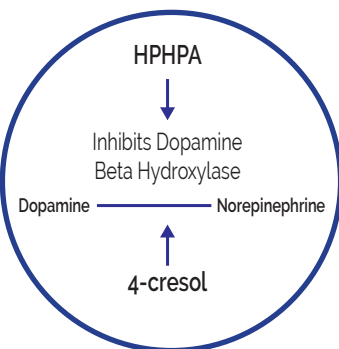
GMO corn is one of the most common crops to be treated with glyphosate.



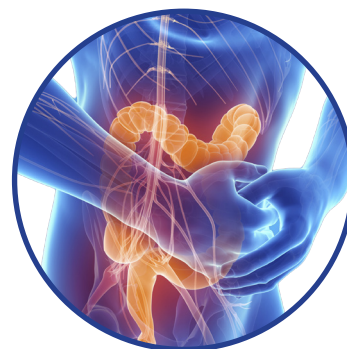
We consume the GMO corn with glyphosate.



Excess dopamine can cause brain damage.



*Clostridia* produces HPPHA and 4-cresol, which inhibit the conversion of dopamine to norepinephrine in the brain.



Glyphosate has been shown to reduce beneficial bacteria in the gut and allow toxic bacteria like *Clostridia* to proliferate.

## Advanced Cholesterol Profile

Cholesterol is essential to brain development, and is one of the healthy fats required for myelination of the brain and for the health and repair of cell membranes. Cholesterol supports adrenal pathways and sex hormone production, and is also critically important in improving the efficiency of oxytocin receptors in the brain. The majority of kids on the spectrum have a problem with oxytocin function, which can result in problems with socialization and cause symptoms of anxiety.<sup>3</sup> Identifying and treating low cholesterol levels with cholesterol supplementation can significantly improve the symptoms of Autism.

## Comprehensive Stool Analysis

Comprehensive stool analysis detects the presence of pathogenic yeast, parasites, and bacteria that could be contributing to chronic illness and neurological dysfunction. The test evaluates overall intestinal function and beneficial bacterial levels, and indicates which agents will be most effective in killing harmful bacteria and yeast.

## Copper + Zinc Profile

The Copper + Zinc Profile is an excellent way to determine immune status and the nutritional intake and/or absorption of zinc and copper. Zinc is necessary for the proper functioning of the immune system. This essential trace element is required for the activity of over 300 enzymes and is involved in most major metabolic pathways. The immune system depends on zinc in almost every aspect. Zinc deficiency may be common in children with Autism who have had diarrhea for extended time periods and could contribute to their poor appetites.<sup>24</sup> Zinc has an inverse relationship with copper in the body. This means that as zinc goes down, copper goes up and vice versa. Adequate copper levels are essential for the growth of new blood vessels, wound healing, and recovering from heart attacks and strokes. When levels are only slightly above normal physiological amounts, copper can be toxic. Any mild abnormality or impairment of liver function can lead to copper excess.

## Streptococcus Antibodies Profile

This profile screens for the two most common antibodies against streptococcus, DNase antibodies in serum (ADB); antistreptolysin O titer (ASO). These antibodies may cross-react with brain tissue causing abnormal behaviors. Both of these tests are performed to identify a previous infection of group A beta-hemolytic Streptococcus. These infections cause rheumatic fever or a kidney disease called glomerulonephritis, poststreptococcal versions of these diseases, as well as scarlet fever. Recently, high titers of these antibodies have been associated with PANDAS (Pediatric Autoimmune Neuropsychiatric Disorder Associated with Streptococcal Infections) and with Autism, Tourette syndrome, tic disorder, Parkinson's disease, and OCD.<sup>25</sup>

## Personalized Testing and Treatment

Typical routine lab work often falls short of uncovering subtle abnormalities which can have a profound effect on health. Unless accurately addressed, this vicious cycle will continue to inhibit the various biochemical pathways necessary for proper neurological and immune function. The resulting complications contribute to, and may even cause, the symptoms of Autism.

To achieve optimal results, it is critical that potential biomedical issues be assessed and included as part of the overall treatment programs for individuals with Autism Spectrum Disorders.

Comprehensive laboratory testing can identify the physiological imbalances that contribute to Autism and point to an individualized treatment approach. Treatments are designed to restore the body to balance and optimize function through nutritional support, diet, detoxification, and reduction of toxic environmental influences.

## The Need for Comprehensive Testing in Autism Spectrum Disorders

By Kurt N. Woeller, D.O.

*Co-Owner of Sunrise Medical Center and Integrative Medicine Academy, Consultant for Mosaic Diagnostics*

The complex health challenges of many children with Autism Spectrum Disorders (ASD) cannot be overstated. Commonly, these children are dealing with multiple medical problems including chronic allergy, digestive problems, food intolerances, nutritional deficiencies, heavy metal toxicity and detoxification issues, immune disorders, and more. All of these create a significant problem, particularly when attempting to implement a comprehensive treatment program through dietary intervention, nutritional support, detoxification therapies, and traditional medications.

Much can be assumed when it comes to biomedical intervention for Autism – such as a particular child may be suffering with all or some of the above listed items just based on clinical history and examination. However, clinical assumption will only take you so far in your decision-making and the concrete information becomes imperative. I believe comprehensive testing is necessary for most ASD children. Even the seemingly easy cases of autism can be very complex from a biomedical standpoint, and when testing is not complete, early indicators of underlying health problems can be easily missed.

The information you gather today could save weeks or even months of therapeutic inactivity for a particular child who otherwise could have benefited from medical treatments. Below are some of the reasons I recommend comprehensive testing is to gain a more complete understanding of the complex health challenges facing children with ASD.

- Children with ASD rarely receive laboratory testing beyond what would be considered the basics, such as Fragile X and standard blood work. Many times, despite the fact that a child is obviously dealing with chronic allergies, digestive issues, etc., no testing is initiated by their regular physicians. All of these children need and deserve a thorough lab work-up.
- The more testing you can do up front for a child the quicker both basic (supplements, anti-fungal medication) and advanced therapy (detoxification, immune support) can be initiated.
- Precious time can be lost if testing is done “piece meal.” Although not every parent or patient can afford up-front comprehensive testing all at once – if you do not offer it, you will never know. I never try to interpret what a patient can and cannot afford. I offer them what I believe is critical to evaluate their child and let them determine if they can afford the testing. Doing anything less is a disservice to them and their child.

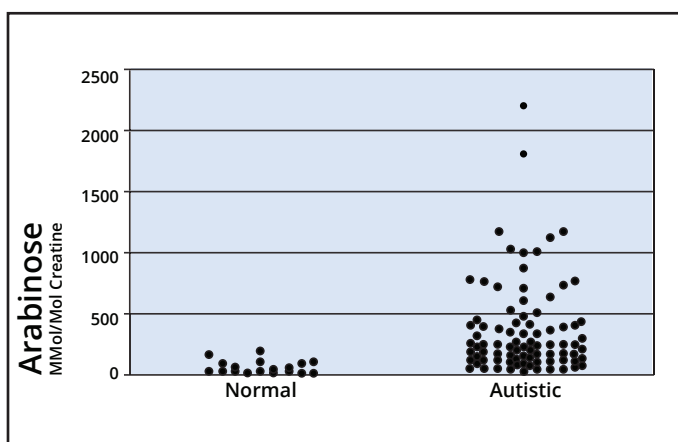
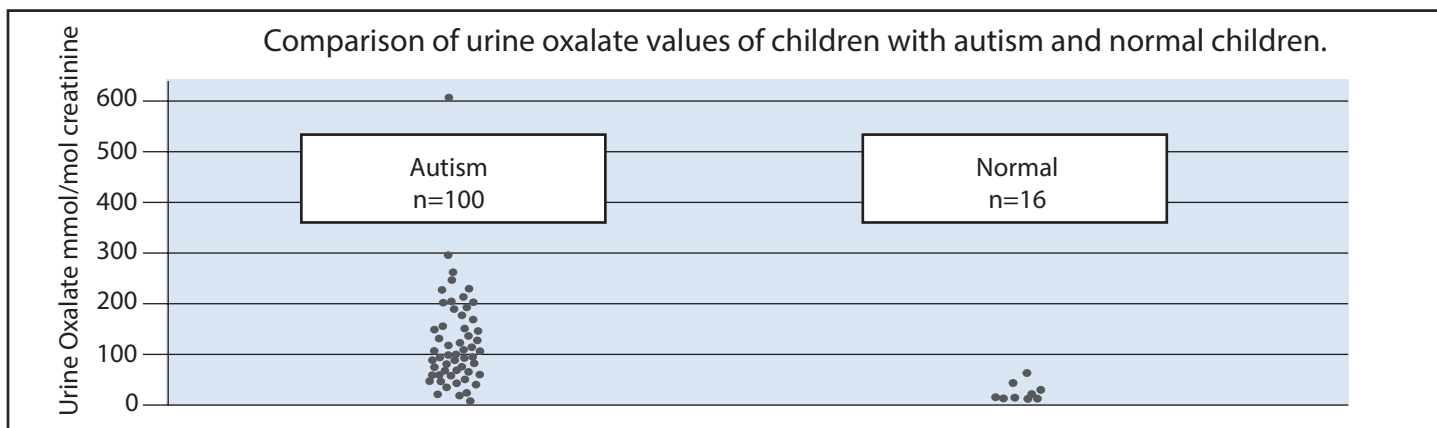
- Parents (or patients) will often not be easily convinced to start dietary or therapeutic intervention until they see a positive test result. An example of this is the gluten and casein-free diet. You can tell the parents all day long that it is necessary to implement the diet for their child, but until they see a test result on paper, they will not be moved to activity.
- Many times comprehensive testing can help rule out what is not wrong with a particular child. This is invaluable information since much time can be wasted chasing things that do not exist.
- I have also experienced over the years that tremendous time can be wasted if enough information is not ascertained in the very beginning. It is time that could be spent on treatment. Remember, for many of these kids, time is of the essence.
- Finally, in my many years in practice, I have seen money lost because parents waited to do comprehensive testing on their child(ren). This happens because therapies are initiated before/without testing that do not work, or are less effective because of other mitigating issues that could be found with testing. For example, implementing heavy metal detoxification therapy in a child that has not fully addressed digestive imbalances of yeast and bacteria will be less effective than it could be. Another example is implementing anti-fungal therapy for many months in a child who has chronic food intolerances that have not yet been addressed, when those intolerances contribute to the chronic yeast problem.

Many parents/patients think that comprehensive testing is going to be their biggest expense when it comes to biomedical intervention, when in fact it is the therapies such as medications, supplements, and dietary changes that generate most of the expense. Even consultations with the doctor are just a small fraction of what many parents will spend on treating their child.

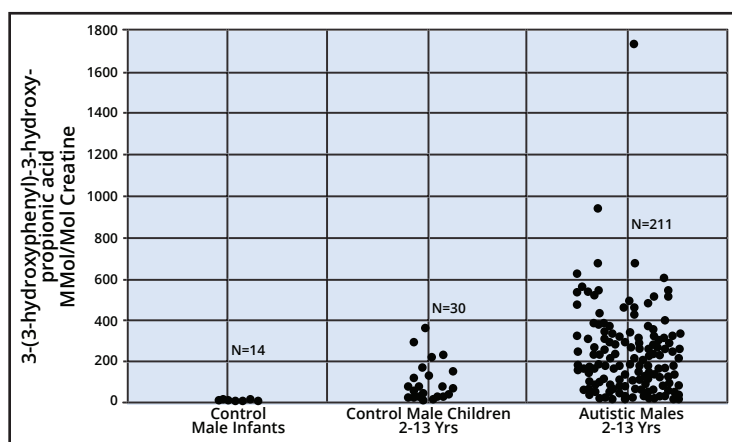
My recommendation is to get as much information as you can upfront so that each family can prioritize their financial resources for treatment for their child. While progressing through treatment with a particular child, other tests may be needed, but most of the time this does not include large test panels. Instead, a few tests here and there to recheck blood mineral levels or the status of yeast treatment may be necessary.

Most parents who are seeking answers to their ASD child's health problems have been told for months or years by the traditional medical community that nothing can be done to help their child. The door has been slammed shut because these doctors do not know what to do. Parents are looking for answers and know intuitively that certain therapies could be helpful, but they need guidance in getting it done. Never run a test purely for information gathering, but only with the clear intent that it will shape your therapeutic approach. This is what parents are seeking – options for intervention, and the means to help their kids improve emotionally, mentally, and physically.

The below figures show the rate of three specific health conditions common in children with Autism compared to the rate in non-autistic children. All three of these conditions are specifically assessed in our Organic Acids Test.



Comparison of arabinose (indicator of candida fungal overgrowth) values in children without Autism and those with Autism



Distribution of values of clostridia metabolite in urine samples of male infants, control boys, and boys with Autism

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