By Mirja Holtrop and Aleksandra Niedzwiecki, Ph.D.

Understanding Autism

Scientific evidence, natural strategies and practical steps to achieve a healthy and thriving life

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www.dr-rath-foundation.org

Whether you are a parent or a relative of an autistic child, or simply a concerned individual you may have numerous questions about the causes, available cures and prevention of this condition. Autism is a fast- growing problem in our society and it needs serious attention. According to a 2017 report by the World Health Organization (WHO), about 1 in 160 children are affected by autism. Some scientists estimate that by 2025, if nothing is done, every second child could be affected by autism.

These are frightening projections. Furthermore, autism is a multi-faceted syndrome with no clear existing therapeutic solution, and most parents have to find out by themselves which of the available approaches can be beneficial and how to cobble them together.

Many popular textbooks on this topic teach the parents how to train their child so he or she can function better in social interactions, but do not elaborate on how to improve the underlying conditions. However, after digging into original research about the role of micronutrients in autism, it is clear to us how much robust science is out there to support new natural, safe and effective options for parents of autistic children so they can help their kids to get better. 'Food is your medicine' has real meaning here!

We are not going to recommend specific treatments or tell you what your doctor should do for you. These decisions belong to you and your doctor.

However, we will help you to understand the complexity of autism and keep you abreast of the latest autism research. With this knowledge you can analyze the information yourself and evaluate what applies to your specific situation. Moreover, the information provided in this book can help you to reshape your current knowledge of autism into a wider context. Perhaps it will trigger new questions or challenge beliefs you are familiar with, but it

may also open up entirely new possibilities for you to explore.

We are confident that continual advances in scientific research on micronutrients will bring even more options and solutions relating to autism. Every day there are more publications on every subject that we discuss in this book and these findings resonate with what we are going to explain.

There are important individuals who have contributed to this publication in different ways. Nutrition specialist Ms. Elizabeth Wells has been very helpful in conducting professional editing of various versions of the manuscript and offering valuable comments and suggestions. Dr. Matthias Rath M.D. has provided invaluable support, insightful comments and encouragement during the writing process. We also thank Paul Anthony Taylor for his continued support of our work.

This book will empower you to act, so without further delay, let's get started. Early intervention can make a huge difference in an autistic person's development and life.

Where to begin?

Autism spectrum disorder (ASD) is surrounded by numerous controversies and arguments amongst health professionals and parents so that even making a diagnosis can be very challenging.

Autism spectrum disorders (ASDs) encompass a broad range of conditions, characterized by few social skills, repetitive behavior, challenges in speech development, and nonverbal communication disabilities. These include childhood disintegrative disorder (CDD), pervasive developmental disorder-not otherwise specified (PDD-NOS) and Asperger syndrome.

The condition largely remains a mysterious problem since its causes are not well defined and it is surrounded by controversy, not only in relation to its treatment, but also whether it should be considered a disorder in the first place.

In the early 1990s autism was classified as a rare and severe form of schizophrenia. Before that autism was described as a developmental rather than a mental illness. In 1994 Asperger syndrome was added to a diagnostic manual and suddenly individuals with high IQ and good verbal skills were diagnosed as having an 'autism spectrum disorder'. Today people with autism spectrum disorder (ASD) are very diverse, many are brilliant and accomplished, but some are severely challenged. Therefore, while some

people regard autism as a form of 'neurological difference' that can lead to extraordinary insights, others regard it as a disorder that impairs a person's ability to function in society and should thus be treated—or ideally, cured.

To add to the complexity, autism's diagnostic criteria have changed over the course of the last 20 years. Psychiatrists usually diagnose using either CARS (Childhood Autism Rating Scale) or ADOS (Autism Diagnostic Observation Schedule), or ADI-R (Autism Diagnostic Interview-Revised). However, these assessments are solely based on questionnaires since there is no specific biological test to determine whether a person is autistic.

It is generally accepted that ASD starts in early childhood and tends to persist into adulthood. It can vary from mild to severe: some patients with ASD live more or less independently, but others suffer serious disabilities and require lifelong care.

Symptoms of Autism (ASD)

In children up to 5 years

- delayed speech development or refusing to speak at all
- frequent repeating of set words
- monotonous speech
- using single words; sentences are short or non-existent
- not reacting to their name being called
- rejecting cuddles and hugs initiated by a parent or sibling
- reacting inexplicably angrily or sadly when asked to do something
- not being aware of other people's personal space but being very protective about people entering their own space
- little interest in other children
- not enjoying social situations such as birthday parties
- preferring to play alone
- no facial expressions in social interaction
- no direct eye contact
- repetitive, strange movements (flapping their hands or rocking)
- playing with toys in a repetitive way (lining blocks up in order of size or color rather than using them to build a house, for example)
- requires a fixed family routine, gets very upset if there are changes to this routine
- strong preference for certain foods, based on texture and color
- unusual sense preferences; they may sniff toys, objects or people inappropriately

In children older than 6 years

- avoidance of or monotonous speech
- speaking in pre-learned phrases, not putting individual words together
- problems with two-way conversations. They tend to talk 'at' people, rather than with them
- unable to understand sarcasm or metaphors
- difficult to give them tasks, they don't respond well to instructions
- little interest in interacting with people, few friendships
- no understanding of social interactions like greeting people or wishing them farewell
- unable to find the right tone and content in different social situations: for example, speaking very formally at a casual party and then laughing with total strangers in a familiar way

- not enjoying activities that peers enjoy, i.e. card games, board games, team activities such as volleyball or soccer
- few facial expressions when communicating
- self-stimulating behavior
- little to no eye contact
- preferring to play with objects rather than people, playing with other kids as if they were objects
- aggressive behavior towards other children, biting, screaming
- a highly specific interest in a particular subject

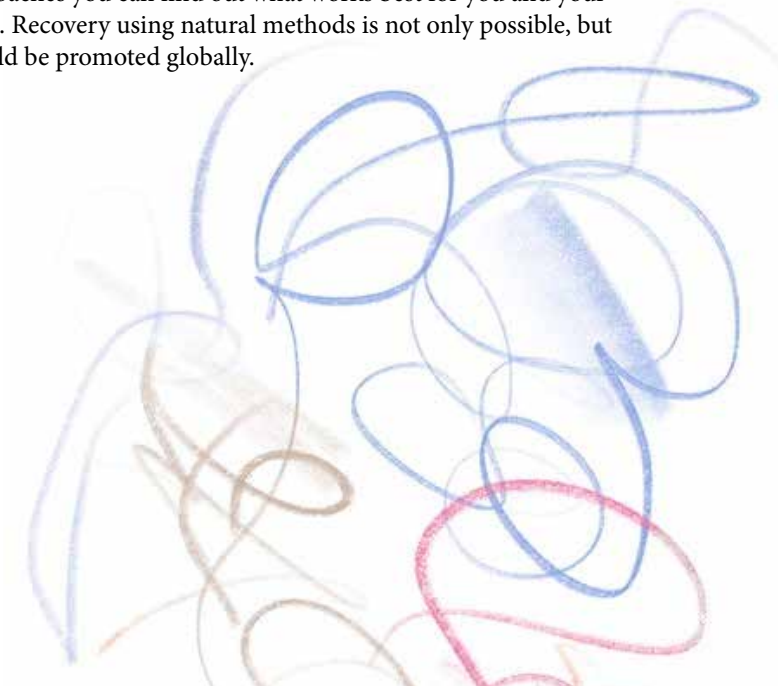
Being diagnosed as autistic brings various challenges, as children and adults with ASD are often subject to stigma or discrimination.[1] However, autism is not a hardwired impairment programmed into the genes and designed to remain there forever, as people are usually told.

Today, most pediatricians focus on symptoms and rely on chemical drugs that will suppress the autism-related difficult behaviors rather than treat their underlying causes. This also comes with a risk as pharmaceutical drugs carry unwanted side effects, including severe personality changes. Some of these medications can cause the entire brain biochemistry to alter and may even trigger wider damage. Filter organs such as the liver and kidneys—that deal with the body´s toxins—can start malfunctioning, leading to the development of secondary health problems.

Under such medication, children quite often display dullness and become unresponsive, withdrawing even more from life. This turns into a vicious circle.

Autism has to be addressed on the level it occurs, which is within the body's smallest biochemical units, the cells. We know that the body responds to environmental toxins in various ways and when toxicity reaches its limit, it can cause brain damage and manifest itself in symptoms we classify as autism. But the secret of true recovery also lies in our cells. All cells need adequate nourishment (micronutrients) to function optimally and defend themselves against exposure to toxic and artificial compounds. By adopting natural approaches and eliminating harmful chemicals from their environment, many patients have seen their autism symptoms improve drastically.

Your own observations and insights are immensely valuable in finding what works in your situation. Autism is a multifactorial, 'whole body condition' and by trying many different methods and approaches you can find out what works best for you and your child. Recovery using natural methods is not only possible, but should be promoted globally.



Risk Factors For Autism Are Not Firmly Established

Most patients still don't know the reasons for and causes of ASDs. Over the years possible causes have ranged from anti-flea powders, cell phones and cable TV (radiation), to a combination of genetics and environmental challenges (exposure to certain prenatal medications, heavy metals, environmental toxins and at the same time nutritional deficiencies). Scientific research suggests that there is a strong connection between environmental poisons and autism, so it is worth being aware of the possible culprits.

As environmental toxins increase, the fast-growing number of autistic children is no surprise.

Below you will find a list of factors that may increase a child's risk of developing an ASD. Unfortunately, these days toxins are a part of life and are found everywhere.

1. Exposure to Toxic Metals

A few of them have been evaluated in association with autism.

Mercury

Our oceans are contaminated with mercury that enters the sea from toxic waste. Whales are so full of mercury that if they beach, they must be disposed of as hazardous waste. Particularly high concentrations of mercury have been detected in tuna, swordfish, yellowtail, king mackerel and tile fish. This toxicity has prompted many people to avoid eating fish, or to switch to consuming smaller fish like herring which are less likely to be contaminated with mercury.

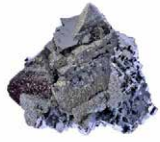
In addition to fish, common household and beauty products can also contain mercury. The worst culprits in this area are skin-lightening creams.[2] Also, many vaccines contain mercury, which we will discuss in more detail later.

It has been shown that exposure to mercury during pregnancy can lead to lower IQ, nerve damage, poor language and impaired motor development in the infant.[3]

Lead

Lead is present in a variety of commonly used products. This toxic heavy metal is found in paint, certain ceramics, pipes and plumbing tools. Even types of solder, gasoline, batteries and cosmetics have traces of lead.

This is of great concern since a study found that with higher lead levels, "children exhibit higher levels of hostile distrust and oppositional defiant behaviors, were more dissatisfied and uncertain about their emotions, and had difficulties with communication." [4]



In accordance with this, a 2015 study reported that autistic children have higher levels of lead, mercury and aluminum than their healthy peers. These children also had a lower IQ compared to the control group. The study concluded that:

"Biological damage from heavy metals as a neurotoxic substance, beside genetic susceptibility in the form of reduced ability to excrete heavy metals and/or increased environmental exposure at key times in development, may play a causal role in autism."[5]

Unfortunately, lead can even be found in some tap water coming from interior water pipes, or pipes connecting a house to the main water pipe in the street, especially if it is an older house. It usually comes from the corrosion of older fixtures or from the solder that connects pipes. Some individuals may have a genetically based reduced ability to excrete heavy metals, such as lead, and they are especially at risk.

One study suggests that toxic metal exposure in combination with some essential nutrient deficiencies, for example manganese, may harm the brain development of a fetus in the womb or during early childhood.[6] This was confirmed in a Swedish-American study published in 2017, which suggested that increased levels of lead and other heavy metals at the same time as deficiency of manganese and zinc during specific developmental windows, can severely increase the risk of ASD.[7]

Other heavy metals

A study in Egypt on 45 autistic and 45 healthy children aged 2–10 concluded that high levels of lead and mercury detected in blood and hair could be one of the main causes of autism. Detoxification by a chelating agent (chelating agents are chemical compounds that react with metal ions to form a stable, water-soluble complex) led to great improvements in these children.[8]

Another study published in 2011 showed significantly elevated arsenic, cadmium, barium, cerium and lead levels in hair and urine samples of children diagnosed with autism.[9]

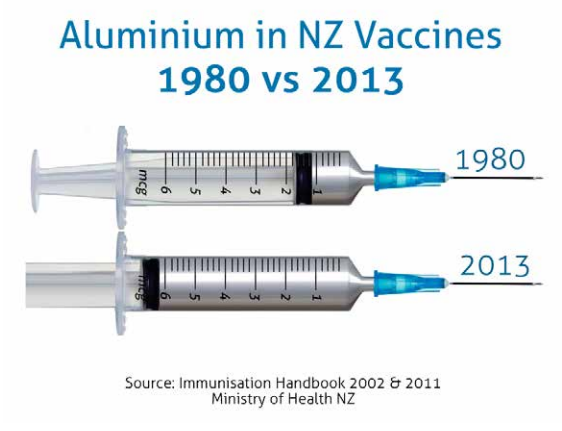
Many parents have experienced substantial improvements in the autistic symptoms of their children through a proper heavy metal detox program. There is a definitely a global need for more research into heavy metal detoxification for the treatment of ASDs.

Fluoride

This mineral is present in our environment and food. Most water supplies also contain added fluoride to prevent tooth decay in a mass population. Fluoride is present in toothpaste and many dental and chemical products. Both fluoride and aluminum interfere with a number of specific enzymes and consequently can significantly reduce cellular energy production by the cells and damage them. The synergistic interaction of fluoride and aluminum is highly toxic, particularly for children.[10]

Aluminum

This metal can be found not only in tins and tinfoil, but also in many household items and in our environment. It may be surprising to know that most aluminum we ingest comes from our diets. This metal is a potent neurotoxin and occupational exposure to aluminum has been implicated in neurological diseases, including Alzheimer's disease. Higher brain levels of aluminum have been reported in aging individuals. Interestingly, a 2018 study found that patients with ASD had significantly higher aluminum levels compared to healthy control groups.[11] These findings agree with already existing concerns about aluminum-containing adjuvants used in many vaccines (this will be discussed later).



2. Pesticides and Herbicides

As we all now know, the level of environmental pollution and use of pesticides in agriculture, gardening, parks, playgrounds and other areas attended by our children is considerable.

A 2017 study assessing the relationship between the residential proximity of pregnant women to potentially neurotoxic agricultural pesticides and the neurodevelopment of 7-year-old children found that children living near pesticide-sprayed farmland had lower IQ scores compared to children living in other areas.[12] Another study conducted in Korea showed that exposure to pesticides in pregnancy could be linked to increased risk of poor prenatal growth and impaired neurodevelopment in offspring. The chemicals assessed in this study included 4 phthalates, bisphenol A, 3 heavy metals, 19 polychlorinated biphenyls (PCBs), 19 organochlorine pesticides and 19 polybrominated diphenyl ethers. Their levels were measured in urine, blood, serum, and/or breastmilk of pregnant or lactating women. Alarmingly, these pesticides are quite commonly used in many countries and are found in conventional farming produce, on herbicide-treated lawns and can also contaminate various animal products such as milk, meat, eggs and cheese.[13]

There is also preliminary evidence that pesticides may cause autism. A study published in the American Journal of Psychiatry in 2018, strongly suggests that exposure to agricultural chemicals during pregnancy can be a risk factor for autism.[14, 15] A scientific review from the Environmental Health Sciences Center and the Department of Public Health Sciences in California linked organophosphate pesticides to cognitive, behavioral, and neurological deficits in children, and issued a recommendation for immediate actions to reduce such exposures.[16]

If you have household pets such as dogs or cats, do not use chemical tick and flea collars or dips, as these are full of harmful chemicals. Instead, try natural alternatives, like neem, lavender and tea tree oil, which can be found in many health care shops.

While it is difficult to completely eliminate our exposure to pesticides, a small step, such as using organic products or even taking your shoes off to prevent tracking lawn chemicals and other pollutants onto your floors and carpets, can help.

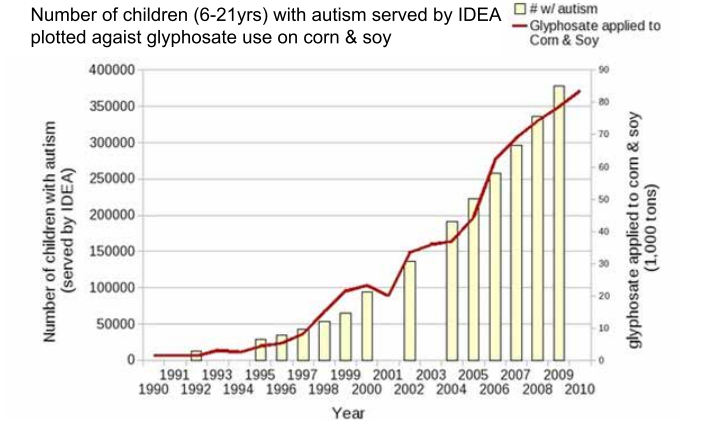
Glyphosate-based herbicides (GBHs)

The famous Monsanto herbicide glyphosate ('Roundup'), which has now been proven to kill the intestinal bacteria of bees, was first sold to farmers in 1974. Since 1978 the use of GBHs has increased approximately a hundredfold. An American study published in 2017 found that:

- GBHs are the most heavily applied herbicides in the world and their usage and exposure continues to rise
- They contaminate drinking water sources, soil, and air, especially in agricultural regions
- Glyphosate and its metabolites are widely present in the global soybean supply
- Glyphosate is now authoritatively classified as a probable human carcinogen
- Regulatory estimates of tolerable daily intakes for glyphosate in the United States and European Union are based on dated science.[17]

Stephanie Seneff from the Massachusetts Institute of Technology, a widely published author on various topics ranging from Alzheimer's disease to autism and cardiovascular disease, points to a remarkably strong link between the increased use of Monsanto's Roundup and rising rates of autism. She warns that if nothing is done in eliminating exposure to this powerful toxin, by 2025, one in two children will be autistic!'

Other research has also found alarming evidence that this substance is highly damaging to the nervous system and could be linked to autism and many other diseases, including Parkinson's and Alzheimer's, and even cancer. The study—conducted in Brazil and published in 2018—presented concerning evidence of the presence of glyphosate and its metabolite amino-methyl-phosphonic acid (AMPA) in 10 commercial brands of baby formulas analyzed between 2012 and 2017.[18]



3. Endocrine-disrupting chemicals

These substances are of the same vicious group as damaging pesticides. Endocrine-disrupting chemicals interfere with the endocrine (hormone) system, and have been known to cause cancer, birth defects, and other developmental disorders.

Among these nasty compounds, bisphenol A (BPA) and phthalates commonly found in plastic food containers including baby bottles and other types of bottle, can mimic or manipulate the effects of naturally occurring hormones, creating various developmental problems.
A recent Japanese study (2018) suggests that prenatal exposure to phthalates can cause behavioral changes in preschool children.[19] Also animal studies found that "prenatal exposure to BPA may cause obesity, reproductive abnormalities and neurodevelopmental disturbances in offspring." [20]

Yet, everyone uses plastic containers for convenience without thinking about the possible health risks. If you use plastic containers or bottles, make sure that they are BPA free. A variety of BPA-free products are now commercially available since some companies have been pressured by consumers and environmental advocates to produce them.

Living in a modern society we are surrounded by harmful chemicals, so it is not surprising that as recently as 2004 researchers found that the bodies of most pregnant women in the USA contained multiple harmful chemicals. In the 1970s some chemicals were banned but others are still used and are abundant in common household products. One of the studies showed that modern day pregnant women are exposed to 163 different toxic chemicals, all of which could be found in their blood, tissue and breast milk.[21]

The increasing number of sick infants is no surprise.

4. Food additives

Food colorants are used in many food products, drugs and cosmetics despite myriad health concerns. Many colorants are permitted, even if they are contaminated with small amounts of lead, mercury, arsenic, benzidine, and other toxins, simply on the basis that these dangerous contaminants are too difficult to remove during the manufacturing process. Therefore, in favor of business concerns it is acceptable that food additives retain 'some' harmful components.

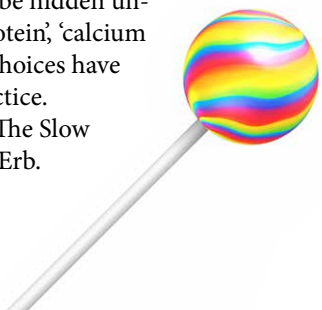
Although these dyes consumed in small quantities can't kill a person instantly, eating many products containing different colorants for long periods of time causes accumulation of these chemicals in the body, and through their interactions the toxic load increases. Infants and children remain most vulnerable to these toxins since their organs have not yet matured and because they metabolize these compounds differently from adults.

Millions of pounds of artificial coloring approved by the American Food and Drug Administration (FDA) are used in our food. Since these are found in everything from cosmetics to cereal and soft drinks, this represents a true nightmare for consumers.

Colorants in pharmaceutical medications are permitted to contain double the amount of lead compared to food coloring! As medications are usually taken by people who are already sick, this may damage their metabolism further. Imagine the consequences for the numbers of pensioners who are taking many different medications daily.

Monosodium glutamate (MSG) is commonly used as a flavor enhancer. You can find it in most commercially prepared and packaged food or in many restaurant chain's dishes because it makes even poor food taste great. MSG stimulates the brain, resulting in the overproduction of dopamine. This drug-like rush provides a brief sensation of well-being and makes consumers crave more of it. However, in the process, brain cells are destroyed. Although various studies (many funded by the food industry) claim that MSG is harmless, many sources of evidence show that MSG is toxic, and besides obesity and brain damage it can also provoke asthma and other allergic conditions.[22]

In recent years there has been a growing trend among consumers to demand MSG–free food products. This is why it is essential to read the labels on the food you buy and choose products that do not contain MSG or that can also be hidden under names such as 'hydrolyzed protein', 'calcium and sodium caseinate', etc. Your choices have the power to change industry practice.
Here is a good book about MSG: The Slow Poisoning of America by Edward Erb.



Aspartame is an artificial sweetener used in many sugar-free drinks and reduced calorie products. Unfortunately, it is just as toxic as monosodium glutamate, causing damage to the hypothalamus of the brain and triggering inflammation. Its long-term use can adversely affect the endocrine and nervous systems and has been linked to many health problems, including behavioral disorders such as schizophrenia, depression and seizures. A study found that 700 mothers who ingested large amounts of aspartame during pregnancy were more likely to give birth to a child with autism.[23]
The retired neurosurgeon Russel Blaylock MD suggests that excitotoxic food additives such as MSG and aspartame, aluminum and fluoride can contribute or are a co-factor in the development of ASD.[24]

Nothing good comes from artificial food additives, so it is best to simply avoid them. Pay attention to the information on food labels.

5. Vaccines

The vaccination of children with multiple doses of vaccines has been at the top of the list of probable causes of autism. This has led many parents to delay or refuse vaccines for their children. The MMR vaccine (mumps, measles, rubella) and specifically its inactive ingredient, thimerosal (a mercury-based preservative) has been linked to ASD and other neurodevelopmental disorders mainly because a rise in autism diagnoses can be paralleled to the increased use and presence of this and other toxic compounds in vaccines.

Since evidence of the connection has accumulated, the United States Centers for Disease Control and Prevention (CDC), the

American Academy of Pediatrics and some pharmaceutical companies finally agreed in July 1999 to remove mercury from all childhood vaccines 'as soon as possible.' As a result, the use of thimerosal in US FDA-licensed vaccines significantly declined. In the US, all vaccines for children 6 years of age and younger are available in formulations that do not contain thimerosal. However, this ingredient is present in vaccines used for children in

many other countries. Also, thimerosal is still present in many flu vaccines and other vaccines including 5 that are given to infants. Regarding the evidence of health risks associated with this mercury-containing formulation, this is scandalous.

The study, 'Delayed acquisition of neonatal reflexes in newborn primates receiving a thimerosal-containing hepatitis B vaccine: Influence of gestational age and birth weight', compared infant macaque monkeys vaccinated with the hepatitis B vaccine containing thimerosal with monkeys who received a saline placebo and those who received no shots at all. The results showed that the vaccinated monkeys had significant delays in the development of key survival responses such as rooting, snout, and suck reflexes. These reflexes are controlled by the brainstem, a crucial area es-

pecially susceptible to damage from mercury. Neonatal reflexes in unexposed animals and in the placebo group were not delayed.[25]

Parents report that their previously normal children started behaving abnormally after being vaccinated. As there was no improvement post- vaccination, many of these children were diagnosed with ASD.

In 2017 researchers discovered that there is an increased likelihood of atypical autism diagnosis following thimerosal-containing vaccine exposure. The study provides important epidemiological evidence significantly associating higher mercury content in thimerosal-containing childhood vaccines and the subsequent risk of atypical autism diagnosis, and suggests that thimerosal should be eliminated from vaccines.[26] The use of vaccines that contain mercury and the diagnosis of 'emotional disturbance' (ED) have been linked. Researchers found "a significant relationship between mercury exposure from thimerosal-containing childhood vaccines and the subsequent risk of an ED diagnosis." [27] ED is a similar neurological disease to autism.

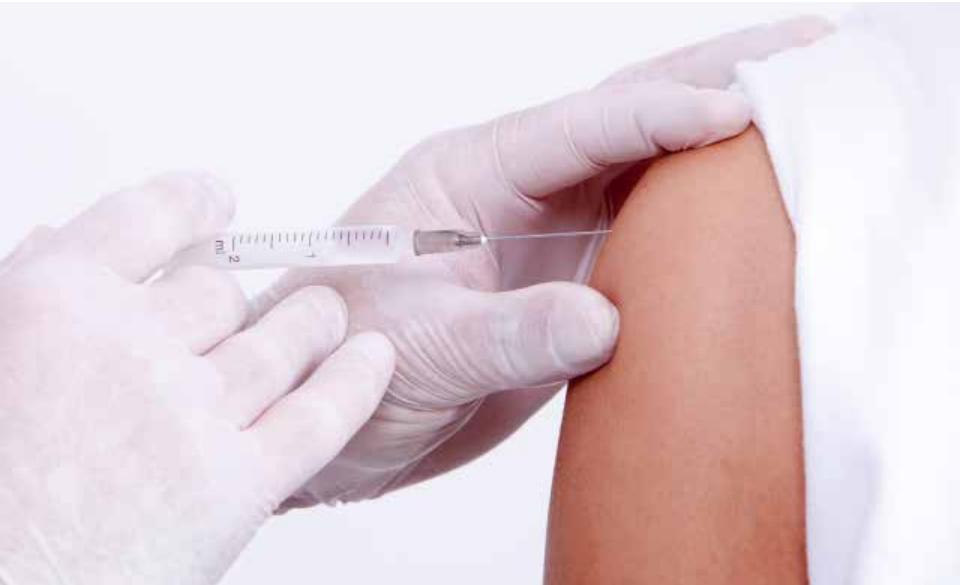
Numerous studies found that high exposure to ethyl mercury from thimerosal-containing vaccines in the first month of life increases the risk of subsequent development of neurologic development impairment. Based on these findings, research suggests malfeasance to misinform the public purporting to show thimerosal in vaccines is safe. [28] In addition, a 2006 study showed "significantly higher risk for autism, speech disorders, mental retardation, infantile spasms, and thinking abnormalities following thimerosal-containing vaccines in comparison to thimerosal-free vaccines." [29]

THE VACCINE SCHEDULE

American children are the most vaccinated in the world.
(Sources: NVIC.org & CDC.gov)

• AGE 12 hours:	1 vaccine
• AGE 2 months:	8 more vaccines
• AGE 4 months:	7 more vaccines
• AGE 6 months:	8 more vaccines
• AGE 12-18 months:	12 more vaccines
• AGE 2-6 years:	13 more vaccines
• AGE: 7-18 years:	20 more vaccines
GRAND TOTAL:	**69 vaccinations**

The US has the highest rate of infant mortality in the industrialized world and gives more vaccines to its citizens than any other country in the rest of the industrialized world.
(Source: WashingtonPost.com)



Although a 2013 study has challenged the connection between vaccines and autism, the concerns and discussions surrounding childhood vaccinations are not likely to end anytime soon.[30]

Many diseases can be prevented, and many have been eliminated through vaccination. The answer to today's vaccine problem may be to develop new technologies based on safer preservatives and adjuvants which can stimulate healthy immune responses against an antigen without generating damaging side effects. Until pharmaceutical companies invest in research focused on developing safe vaccine technology, the discussion about the pros and cons of vaccination will continue. Even worse, our children will be exposed to diseases that can easily be prevented by universal access to safe and effective vaccines.

Why don't all vaccinated children get symptoms?

Some research data indicates that the onset of autism symptoms surfacing after vaccinations could be triggered by a genetic susceptibility and extreme sensitivity to heavy metals. This could be triggered by the malfunction of a specific protein important in metabolism called metallothionein protein (MT).[31]

Also, some children suffer from a chronic accumulation of phenylalanine (PKU). This rare genetic defect causes mental retardation, seizures, altered brain development and autism symptoms. Some studies suggest that early treatment of PKU with dietary restrictions can reduce the prevalence of autism in affected children. [32]

Conventional treatment of ASD

Risperidone (Risperdal) and aripiprazole (Abilify) were approved over a decade ago for treating irritability associated with autism. Risperdal entered the market in 1993 as a treatment for schizophrenia in adults. Later, the FDA approved it in the treatment of schizophrenia in children and bipolar disorder in adults. Furthermore, it was prescribed for behavioral disorders associated with autism. Risperdal has been linked to various negative side effects, one of which is weight gain from a drug-induced increase in appetite. It has been reported that children taking risperidone gain an average of 6 pounds within 8 weeks of taking the medication. The drug can also cause drowsiness, hormonal changes and, in rare cases, tremors and involuntary movements.

Until now, Risperdal made Johnson & Johnson over $40 billion, with over $3 billion profit every year. Currently many people have filed lawsuits against Johnson & Johnson, due to the fact that Risperdal could be responsible for thousands of injuries as well as immense emotional upheaval and may even be the cause of many deaths.

For some time, it has been observed that aripiprazole (Abilify) causes patients to behave in a reckless, impulsive manner. Manufacturers of such harmful prescription drugs often argue that the benefits of the product outweigh the risks. But usually those claims are proven by research studies that are funded by the very same manufacturer.
However, a recent and independent study, published in the Journal of the American Medical Association (JAMA) suggests quite the opposite: "Abilify may not even be very effective at treating depression at all." [33]

Both drugs have shown some short-term, symptom-based benefits, such as reducing challenging and repetitive behaviors in comparison to untreated patients, but due to the possible side effects these drugs should not be used at all, especially not for a long period of time. There are children who are on these drugs and they are in a state of responsiveness that reminds of zombies.

In a search for an effective treatment to ease autism's disabling symptoms, many doctors prescribe medicines that are used 'off label', meaning that these drugs are approved for other, sometimes related conditions such as attention deficit hyperactivity disorder (ADHD), sleep disturbances or depression, mostly in adult patients. Several such 'off-label' medications are used to manage specific symptoms in autistic children:

Drugs	Used for symptoms:	Side effects
Alpha2-adrenergic agonists (guanfacine and clonidine)	Aggression, hyperactivity, inattention, sleep disturbances.	Low blood pressure (hypotension), sedation, dry mouth, headache, constipation
Opioid antagonist (naltrexone)	Irritability, repetitive/self-stimulatory behaviors, hyperactivity	Insomnia, headache, decreased appetite, bitter taste
Psychostimulants (e.g., methylphenidate, mixed amphetamine salts)	Aggression, irritability, inattention, impulsivity, hyperactivity	Loss of appetite, insomnia, headache, irritability, withdrawn behavior, irregular heartbeat, hypertension (these drugs are not recommended for children with preexisting heart disease or defects), and—with chronic use—growth retardation
Serotonin reuptake inhibitors (SSRIs) (e.g., fluoxetine, sertraline)	Aggression, impulsivity, mood swings, irritability, sleep disturbances	Sedation, dry mouth, constipation, risk of suicide (black box warning)

An important step was taken in 2007 by the US Food and Drug Administration (FDA) regarding the prescription of antidepressants (SSRIs). They issued a black box warning on this class of anti-depressant drugs highlighting the increased risk of suicidal thinking and behavior in children and adolescents who were prescribed these drugs as part of their treatment. Black box warnings often precede a removal of the drug from the market.[34] The danger of these drugs is concerning.

Since antidepressants are still widely used, patients taking them should be monitored for unusual changes in behavior, such as inner restlessness or withdrawal from normal social situations.[35] However, the monitoring of patients is difficult to conduct and cannot prevent most tragedies. Unfortunately, young adults who have been taking these drugs have committed SSRI-induced suicide just hours after their loved ones or peers thought they were completely fine.

It is also important to be aware that many general pediatricians are inexperienced in prescribing and managing psychotropic medications, especially in children with ASD. Regular monitoring, sometimes as frequently as weekly in the initial stages of starting this class of medication, is warranted. For certain medications it is important to record weight, height, blood pressure, and heart rate at each visit; for other drugs (e.g. atypical antipsychotics), laboratory tests—such as fasting lipids, liver function tests, and serum glucose—are recommended.

Because these medications are not well studied in this population group, particularly on children, and carry a high risk of adverse side effects, it is recommended to consult with a mental health specialist. Today many physicians have included other non-pharmacological measures to help their patients, so alternative options are available.

The list of antidepressants available in the US is very long with each drug carrying health risks:

Anafranil (clomipramine), Asendin (amoxapine), Aventyl (nortriptyline), Celexa (citalopram hydrobromide), Cymbalta (duloxetine), Desyrel (trazodone HCl), Elavil (amitriptyline), Effexor (venlafaxine HCl), Emsam (selegiline), Etrafon (perphenazine/amitriptyline), Lexapro (escitalopram oxalate), Limbitrol (chlordiazepoxide/amitriptyline), Ludiomil (maprotiline), Marplan (isocarboxazid), Nardil (phenelzine sulfate), Serzone (nefazodone HCl), Norpramin (desipramine HCl), Pamelor (nortriptyline), Parnate (tranylcypromine sulfate), Paxil (paroxetine HCl), Pexeva (paroxetine mesylate), Prozac (fluoxetine HCl), Remeron (mirtazapine), Sarafem (fluoxetine HCl), Seroquel (quetiapine), Sinequan (doxepin), Surmontil (trimipramine), Symbyax (olanzapine/fluoxetine), Tofranil (imipramine), Tofranil-PM (imipramine pamoate), Triavil (perphenazine/amitriptyline), Vivactil (protriptyline), Wellbutrin (bupropion HCl), Zoloft (sertraline HCl), Zyban (bupropion HCl)

Addressing symptoms and causes of autism with natural approaches

Many parents of autistic children and patients dissatisfied or concerned with conventional treatments look for other options, hoping to find better health improvements or avoid the harmful side effects of prescription drugs. Quite often they peruse various websites or popular publications, which are replete with personal recommendations, testimonials and even miracle cures, usually without any sound proof. This often causes more frustration and confusion. Genuine help comes from using scientific sources when learning about this problem and finding professionally tested approaches with proven efficacy.

As indicated earlier, it is important to start from the 'do not harm' approach, by avoiding exposure to environmental toxins where possible, staying away from processed fast food products and soft drinks, as well as removing sugar and saturated fats from the patient's diet.

Also, in order to either prevent autism or to deal with an existing autistic condition, it is critical to establish an optimum diet rich

in micronutrients, which will provide natural support for the function of most critical organs affected by, or susceptible to the disease process. Many studies have demonstrated that children and adults with ASD often have significant nutritional deficiencies, metabolic imbalances, and digestive problems that need to be addressed and corrected.

Recent research clearly demonstrates that women taking dietary supplements in the early stages of their pregnancy have about 40% lower risk of having a child diagnosed with autism compared to women not taking the supplementation. This was observed in those taking multivitamin supplements with or without additional iron or folic acid, or both.[36] Numerous studies have tested the effects of various diets and individual nutrients on autism and most of them showed that specific dietary patterns as well as folic acid and calcium intake are important in decreasing the risk of this disorder.[37]

However, supplementing with a single compound is not a good way to effectively correct the metabolic complexity of ASD. A far more successful method is to utilize a scientifically selected and synergistically interactive combination of micronutrients. This, together with a healthy diet, is the primary and most effective medicine as it supports the body's own efficient self-healing mechanisms and maintains optimum functioning of all organs.

The purpose of this publication is to provide guidance that will help you to make individual food choices and select appropriate dietary micronutrient supplementation as well as adopt other modalities in addressing your health struggle. Health can be regained on a foundation of wholesome nutrition rich in vitamins, antioxidants and other natural active compounds that can enhance optimum brain and nervous system function and equip the entire body with the necessary tools to support itself.

Research suggests that "tailoring a specially designed balanced diet with appropriate micronutrient supplementation may ameliorate the severity of autism symptoms and related abnormal behaviors." [38]

Microbiota in the gut can affect our brain function

Although most people rarely think about our guts as having anything to do with mental health, the steadily increasing scientific evidence points to the critical role of the bowel's bacterial population in many aspects of our health, including ASD. The gut interacts with the brain through our longest nerve—the vagus nerve—that starts in the brain and passes through the neck and thorax to the abdomen. This nerve senses the status of body organs and through it microbiota can biochemically 'talk' to the neurons in the brain. That's why toxins produced by certain intestinal bacteria have a direct effect on your mood and behavior.

Normal gut microbiota contains the body's community of tens of trillions of intestinal bacteria and can form a 2 kg biomass. It is

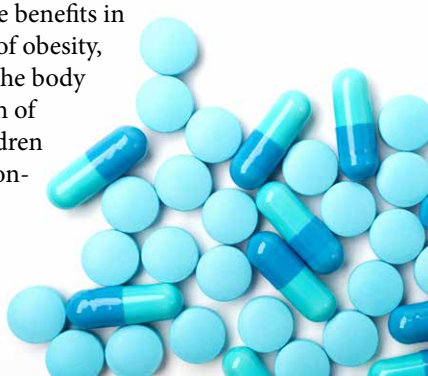
essential in protecting against pathogens, extracting food components, even producing some micronutrients, but it also plays a role in our mental health. Scientific research suggests that autistic patients have marked differences in their microbiota compared to controls and it has been discovered that imbalances or changes in microbiota can affect brain development and function. [39,40]

A large body of evidence stressing the importance of microbiota in the function of nervous system and behavior comes from animal studies. One of the studies conducted in mice shows how one strain of the probiotic bacteria—Lactobacillus reuteri—could reduce some autistic type behaviors in these animals.[41] Based on these findings, the lead researcher and neuroscientist Mauro Costa-Mattioli, a director of the Memory and Brain Research Center at Baylor College of Medicine, expressed great hope for conducting future clinical trials using this specific bacterium in patients who have autism. The bacteria Lactobacillus reuteri occurs naturally in breast milk and is present in a healthy intestinal tract. It appears that this beneficial bacterium is linked to a higher production of oxytocin (a hormone associated with kindness and social behavior) in a healthy system. Furthermore it can also improve signs of brain plasticity, which is the brain's ability to form new connections that support learning.[42] In another study it was observed that feeding mice with another beneficial intestinal bacteria Bacteroides fragilis significantly improved their sociability.[43] Based on various findings, a Spanish study published in 2018 suggested that 'manipulation of microbiota could be a positive intervention to improve ASD symptoms.' [44]

Microbiota imbalance can boost propionic acid in the gut

Some microbiota components can also contribute to negative health effects. In this regard, a Canadian autism research group at the University of Western Ontario led by Derrick MacFabe has shown that certain antibiotic-resistant gut bacteria can interfere with brain development. In particular Clostridia and other similar species that produce propionic acid tend to overgrow in the gut after a course of antibiotics.[45]

You may not be familiar with the significance of propionic acid. This short-chain fatty acid is naturally present in milk products and occurs as a result of bacterial fermentation. It is also used in bread and other foods to inhibit the development of molds. Propionic acid has demonstrated some benefits in diabetes type 2 and in the prevention of obesity, but it can also have adverse effects in the body depending on its concentration, length of exposure and other factors. Since children with autism show high levels of propionic acid-producing intestinal bacteria, propionic acid has been implicated as



a possible factor in ASD. Furthermore, one animal study showed that when pregnant rats and their offspring are fed diets rich in propionic acid the pups display many autism-like changes in their brain, in addition to intestinal inflammation.[46]

In a study in 2013, children whose autism may have been related to a propionic acid-producing microbiota, the researchers found a pattern of abnormal fatty acid oxidation products called acylcarnitines in their blood. This pattern was similar to the one found in the rat model of propionic acid-induced autism.[47]

Although research in this direction is not yet definitive, it is prudent to keep a natural balance of propionic acid production in the gut. This balance can be affected by antibiotics, but also by pesticides such as glyphosate (Roundup). In all cases a probiotic supplement to restore an optimum bacterial environment is recommended.

Stress-related changes in microbiota can impact our behavior

Animal studies have shown that stress during pregnancy increases the risk that offspring will show symptoms of autism. Researchers from the University of Pennsylvania Medical School suggest that the pathway from a mother's stress to a child's brain is through the gut microbiome.[48]

Upon delivery, the newborn receives the mother's vaginal microbiome through the birth canal. If the mother experiences abnormal stress during pregnancy this causes high cortisol levels in her

blood, which can significantly change her vaginal microbiome. Consequently, this alters the baby's gut microbiome and causes long-term consequences for the infant's brain development.

In a study on mice, the researchers stressed the pregnant mice for the first 7 days of their pregnancy by subjecting them to psychological stress through exposure to cat odor, night-time noise and flashing lights. They analyzed the vaginal bacteria in these mice before giving birth. The results showed that stressed mice had significantly less 'good' bacteria compared to unstressed controls. The same was found in the pups' gut microbiota a few days after birth. As a consequence, less beneficial bacteria will lead to poor nutrient absorption and poor brain development. As a matter of fact, the researchers also observed abnormal changes in the hypothalamus, which is the part of the brain involved in the body's response to stress.

Changes in microbiota can promote inflammation

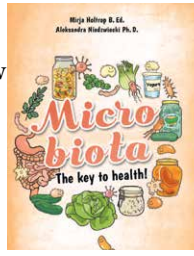
A healthy microbiota releases chemicals that affect cells in the bowel that play a role in regulating inflammation in the body. However, in a process known as dysbiosis, harmful bacteria and fungi in the intestines grow in larger numbers and can overpower the beneficial bacteria. As a result, the toxins secreted by these harmful organisms can promote inflammation.

Some data points to a link between autism and prenatal infections. Similar observations have been made in animal studies, such as the one conducted on a special mouse model of autism—

called MIA (maternal immune activation). The mice displaying symptoms of autism come from mothers who experienced viral infection during pregnancy. The researchers demonstrated that MIA mice have altered microbiota, gut abnormalities and damage to the barrier between the gut and bloodstream: a condition the medical world terms 'leaky gut'. This condition triggers widespread inflammation since bacteria or other intestinal contents can pass into the bloodstream. In addition, the MIA mice also showed high levels of microbial excretion products and when the researchers administered these same toxic products to normal mice, these mice suddenly began to show autism-like behaviors. Interestingly, after treating them with Bacteroides fragilis, a microbe that lives in a healthy human gut, the autism-like behavior in affected mice was significantly reduced and their leaky guts and inflammation levels improved.[49]

Restore your microbiota: Naturally fermented foods like coconut milk-based yogurt and kefir (coconut is very beneficial for the brain and nervous system) are good sources of useful bacteria, as is kombucha, a fermented black or green tea drink, as well as traditional recipes such as kimchi and sauerkraut which are made with fermented cabbage.

You could also start making green smoothies using a high-powered blender. Pureeing foods into a smoothie can help children to accept raw veggies like kale and spinach. If you add these greens to some fruit and coconut milk it won't affect the taste. The whole family will benefit from these healthy instant meals and they are ideal breakfast additions.



Using a good probiotic supplement to support the intestinal flora is important. Today there are many probiotic products on the market containing a variety of bacterial strains in different combinations and potencies, so choosing the right one for your needs can be challenging. Our earlier publication on the topic of microbiota ('Microbiota—the key to health') contains simple guidelines on how to select the most effective probiotic for various health conditions.

Restoring health to the gut and the immune system is the first important step towards autism recovery.

Food choices for an autistic patient

The way that our metabolism makes efficient use of food is affected by chemicals and heavy metals, as well as gluten and casein, all of which can damage the gut lining and prevent the body from processing and absorbing essential micronutrients. By focusing on giving our bodies wholesome, nutritious foods, both the gut and the brain benefit.

The Paleo diet—based on the idea that we consume what our hunter- gatherer ancestors ate, such as a diet high in fiber and low in meat and animal products—is a healthy choice. Following this diet, patients with damaged gut linings can treat chronic inflammatory conditions in the digestive tract both naturally and successfully.

The diet is based on a large variety of organic vegetables and fruit, as well as lentils, quinoa, beans, nuts, seeds and sprouts. Foods especially beneficial for treating autism include avocado, beets, blueberries, broccoli, celery, coconut oil, egg yolks, spinach, kale, Swiss chard, rosemary, turmeric, ginger and walnuts.
Here are some other important dietary factors to watch out for:

- Avoid sugar

One of the most important culprits you should eliminate is all forms of refined sugar; this includes high-fructose corn syrup. Sugar not only feeds dangerous gut fungi and causes gut dysbiosis, but also raises blood sugar levels, triggers inflammation and feeds cancer.

A 2010 study conducted in rats found that just 3 days of a sugar-rich diet caused impaired brain function of the hippocampus, which is the part of the brain responsible for learning and memory. The rats fed sugar had difficulty finding food within a maze.[50] High-sugar diets can also stimulate growth of Candida albicans: an opportunistic fungal pathogen that naturally lives in small numbers in the gut microbiota. Its overgrowth causes holes in the gut lining which results in some gut components leaking out; this prevents beneficial nutrients from being absorbed and the outcome is a large variety of physical and emotional ailments. Patients with autism usually show signs of gut dysbiosis. Furthermore, the bad bacteria population excrete toxins that damage the brain.[51]

Diets that contain high amounts of sugar may also lead to changes in gene expression. This has an impact on neurotransmitters and receptors and damages the basic function of cells. Diets high in sugar reduce the brain-derived neurotrophic factor (BDNF), which is responsible for the development, differentiation and protection of existing neurons and the building of new synapses.[52] Instead of cookies and candies get your child used to grapes, bananas, pineapples, goji berries, nuts or seeds as a treat—they taste good and are healthy for their brains!

- Gluten and casein

Many parents of autistic kids have observed a dramatic improvement in symptoms after introducing a gluten- and casein-free diet together with the elimination of fast food, soft drinks or processed foods. They have described more positive behavior in their children and noted improved concentration, calmer minds and better sleep.

Eliminating milk and soy is easy and improves ASD symptoms in many cases. A gluten-free diet is a little more complicated than simply eliminating white bread and it can be more expensive, but it truly makes all the difference! Gluten is a protein in wheat, but is also found in barley, spelt, durum, semolina and rye. It can be hidden in products that you would never suspect, therefore, it is important to read the labels of every product you buy. It appears that a link between gluten and brain function is a protein, Zonulin, which is found in the junctions linking cells lining our intestines. Zonulin,

which has been associated with impaired gut permeability and disruption of a tight blood brain barrier, can be triggered by gluten. This observation could clarify how gluten can contribute to development of neuro- inflammatory diseases and affect brain function.

The other problem with gluten and casein is that when they are processed in the digestive system, substances called 'exomorphins' are released that mimic the body's morphine-like endorphins. These exomorphins have the same effect on the body as opiates and create symptoms that make a person feel euphoric and intoxicated. Exomorphins are highly addictive, which is why a change in diet without bread can be challenging to begin with. The 'spaced out' look you often see in autistic people can be the result of those chemicals working in their system.

The important role of micronutrients

Nutritional supplements are very important since they can provide key ingredients to support specific metabolic pathways in our body cells and taken in doses that are rarely achievable through diet alone. Micronutrients have a profound impact on autistic symptoms.[53]

Most studies involving micronutrients in autism were conducted using individual nutrients and some of these are indicated below.

However, the most pronounced and comprehensive health effects can be obtained with multi-nutrient supplementation, containing pre-selected and synergistically interacting natural components.

Vitamin D: Maternal vitamin D deficiency may cause autism in newborns.[54] It has been demonstrated that autistic behaviors disappeared after high-dose vitamin D therapy.[55] Also, high blood levels of vitamin D achieved in children with its severe deficiency, were linked to reversal of autistic behaviors. It has been shown that Vitamin D deficiency during pregnancy may predispose children to autism. [56-58]

Vitamin A: Autism may also relate to the damage to G-alpha protein, a receptor protein in retina. This protein is critical for language processing and attention. Scientific work suggests that "natural Vitamin A fixes this protein defect in autistic patients." [59,60]

Glutamine: Serum levels of this amino acid are particularly low in patients with autism. Glutamine acts as a precursor of neurotransmitters (glutamate and GABA). It has been shown that it also helps to prevent leaky gut syndrome.[61,62]

Glutamate is a nonessential amino acid that can't cross the blood-brain barrier and must be synthesized in neuronal cells from local precursors. It is the most important neurotransmitter for normal brain function and involved in learning and memory. Glutamate must be balanced with GABA (another neurotransmitter) and glutamine—their precursor. Elevated levels of glutamate released during neuronal injury are toxic to neurons. Glutamate level abnormalities are considered a major mechanism behind autism. Patients with autism have high levels of glutamate which can lead to self-stimulatory behavior, seizures, and similar symptoms.[63,64]

Folate: Many research data point to low folate levels in patients with autism. Folate supplementation can resolve symptoms of autism in some cases, particularly in patients with genetic changes that affect the function of folate-dependent enzymes.[65-69]

Vitamin C lessens the severity of symptoms and improves sensory motor scores in patients with autism possibly due to its interaction with dopamine synthesis. It also has strong sparing effects on glutathione levels—an important antioxidant. Sufficient intake of vitamin C can result in decreased oxidative stress, improved cellular sulfation processes and enhanced bioenergy production (ATP, NADH, and NADPH) in the cells. [70,71]

Glutathione and cysteine: Evidence shows that autistic patients have significantly lower levels of the amino acids glutathione and cysteine compared to healthy individuals. Low antioxidant status impairs detoxification and causes oxidative damage to the cells. This has been linked to autistic symptoms, which is often considered an oxidative stress disorder. [72,73] Glutathione and cysteine deficiency impairs methylation processes in the cell, important for effective detoxification and has been linked to neurological symptoms in autism.[74-77]

Vitamin B1: A deficiency of this vitamin has been linked to delayed language development. Supplementation significantly benefits patients with autism. [78,79]

Vitamin B_{12}: Low levels of vitamin B12 impair the methylation process (important for detoxification in the cell). Insufficient intake of vitamin B12 can cause neurological damage. Deficiency of vitamin B12 can cause optic neuropathy and vision loss in autistic patients. B12 is important in raising cysteine and glutathione levels. [80-82]

Vitamin B6 levels are low in many patients diagnosed with autism. When patients receive B6 supplements, they have better eye contact, improved speech and less self-stimulatory behaviors. Vitamin B6 in combination with magnesium is an efficient treatment for patients with autism.[83-85]

Magnesium: This mineral is important for the neurotransmitters that are responsible for social reactions and emotion. Patients with autism generally have low magnesium levels. Magnesium improves the efficiency of vitamin B6 therapy and these nutrients should be taken together.[86]

Zinc binds mercury and removes it from brain tissue. Usually zinc and copper levels are particularly reduced in autistic kids. Low zinc levels impair metallothionein, a protein that helps to excrete heavy metals from the tissues.[87-90]

Carnitine transports fatty acids into cells so they can be burned for bioenergy. "A low carnitine status is a common feature of autism and impairs the ability to use fatty acids for learning and social development."
[91,92]

Omegas 3s/DHA: Scientific research suggests that children with autism have very low levels of omega-3 fatty acids. Essential fatty acids are present in every cell membrane. A major component of every brain cell is DHA (Docosahexaenoic acid). Omega 3s/DHA have strong anti-inflammatory properties.[93] Check for vegan oil capsules rich in DHA, or fish oil capsules. The omega fatty acids of highest quality are 'molecularly distilled', which means that they do not contain mercury.

Tyrosine aids dopamine production in the brain cell. Low tyrosine levels can lead to brain dopamine deficiencies which can result in mood disorders and autistic behavior. [94]

Tryptophan is a natural amino acid (found in bananas and nuts) that helps the body to produce serotonin, which is a neurotransmitter that calms people. Scientific research clearly indicates that people with autism may have a damaged tryptophan metabolism with decreased levels of this amino acid, which can change brain development, neuroimmune activity and mitochondrial function.[95]

What else you can do?

Here are some suggestions that may help to improve autism symptoms:

- Consider using Epsom salts (magnesium sulfate) in your bath on a regular basis. The skin absorbs magnesium, which has a calming effect and helps with sleep, while the sulfur component supports detoxification.
- Consider the impact that toxins and unhealthy foods have on adults and multiply that effect on children with not yet fully developed detoxification system. Choose foods wisely.
- Keep your mind and body in tip-top shape. Ensure there is time to relax.

- Brain supporting foods rich in antioxidants and other micro-nutrients such as vitamins, minerals, amino acids and fatty acids, provide energy and help protect against neurological diseases.

- Plenty of fresh glass-bottled spring water will hydrate the body and contribute to the healing effect.

- Detox your home. Check all your commercial cleaning products and replace them with non-toxic alternatives from the health food store. You can also start making your own organic 'all purpose' cleaner by mixing a cup of vinegar and half a cup of baking soda into 4 liters of water (add lemon or orange rind for a lovely fragrance and added cleaning power).

- We also found Karen Thomas' website, naturallyrecoveringautism.com, very helpful and inspiring.

We know that when you are the parent of a child with autism. there is an immense amount of pressure on you. Advocate for more research and share your experiences with us. Do it for yourself, your child, your community and your future and let´s all be part of the solution. Your child and your journey to better health are valuable to us.

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Scientific evidence, natural strategies and practical steps to achieve a healthy and thriving life

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