THE BIOLOGY OF AUTISM PREVENTION

The Connection between Epigenetics, MTHFR, the Cell Danger Response and Autism

The incidence of autism has increased nearly 10,000 percent in the last 30 years. The only explanation for this dramatic rise, in my opinion, is environmental. While there is good evidence that genetic susceptibility plays a role, our genes don't change so drastically in a single generation as to cause this epidemic. When I was in medical school in the early 1970s, autism was so rare that there were no lectures on the subject, and we did not see a single child with autism through my entire training. Now, it is so common that virtually everyone has a friend or relative with an affected child.

The intensive search for genetic causes has detected major genetic contributions in perhaps 25 percent of children on the autism spectrum. There is also evidence that many of the inherited factors impacting risk are caused by toxic damage to the DNA, which is vulnerable to environmental factors such as man-made toxins, radiation, and electromagnetic pollution.

Why is epigenetics or "above genetics" so important in the work of prevention?

Simply stated, epigenetics is the way that genes are turned on or off by life experiences and biochemical events from conception until death. This epigenetic activation or silencing of our genes can be profoundly altered by environmental factors, including toxins, stress and nutrition. In other words, there is a strong, profound and continuous "dialogue" between our environment and our genes. A foundation of autism prevention is that ***we do have considerable influence***, through life choices, on how our genes express and are regulated.

In fact, our epigenetic condition directly influences the course of development from conception throughout life. In fact, we have learned that, through fetal programming, our mother's epigenetic status may be transmitted to her children and even her grandchildren and great-grandchildren. The bottom line is that we need to diligently care for our genes and how they express through pregnancy.

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Following these prevention guidelines will help you to make choices to protect and support your DNA.

By making healthy choices before and during pregnancy, you can **prepare your uterus as a healthy "baby home"** where your baby can incubate and develop to its highest potential. In addition, continuing to make optimal health choices through your baby's infancy and toddler years can significantly improve the likelihood of avoiding autism and related conditions in the new incoming child.

MTHFR's Role in Epigenetic Vulnerability

The MTHFR genetic polymorphisms (variants) are a major contributor to epigenetic vulnerability. This genetic variant is very common in our population, with more than 50 percent of our population carrying a variation. Everyone gets two copies of each gene, one from Dad and one from Mom. With most genes, there is commonly only one type of that gene, but the MTHFR gene has several common variants, each of which reduces the effectiveness of the enzyme coded by this gene. This enzyme is required to activate the important B vitamin, folate, and having a variant form will significantly reduce production of activated folate. **Activated folate is pivotal in our methylation pathway, which is the major regulator of epigenetic expression.**

Our testing of more than 2000 children with autism, has identified methylation impairments in nearly 100 percent of them. In addition to autism, methylation problems are associated with midline birth defects (such as spina bifida and cleft palate), infertility, miscarriages, impaired detoxification, immune disorders and susceptibility to a myriad of health problems. In addition, deficiencies in other B vitamins and magnesium, as well as the insult of many environmental toxins directly impair our methylation pathway. In addition, as discussed below, the methylation pathway is also harmed by the persistent activation of the Cell Danger Response.

This sounds so confusing; can I do anything about these potential problems?

Because MTHFR polymorphisms are so common, I recommend that you either have your physician test your MTHFR status or simply assume you are affected. In either case, I suggest you **take a prenatal supplement with activated folate (folinic acid or L-methyl tetrahydrofolate)** prior to conception and through pregnancy and breastfeeding.

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The second reason folate supplementation is important in autism prevention is the research finding of *folate receptor antibodies in up to 75 percent of children with autism*. These antibodies represent an autoimmune response against the receptor that binds and transports folate to its target tissues, through the placenta to the baby, and most importantly, to the baby's brain.

Moms of children with autism are more likely to have these antibodies, which reduce the flow of folate to the baby, resulting in increased need of the good forms of folate during pregnancy. Again, if you have these antibodies, taking an activated form of folate will help overcome the folate transport problems.

Why are moms developing autoimmune responses?

One of the most common causes of autoimmune responses is environmental toxins such as

mercury and myriad man-made chemicals commonly found in our bodies which are actually many of the same as those found in Super Fund sites.

Milk products contain folate receptors which stimulate folate receptor antibody production in people who have this autoimmune condition. A dairy-free diet will help reduce production of these antibodies over a period of several years. **If you've already have a child with autism, it makes sense to follow a dairy-free diet from preconception through breast feeding, or to have yourself tested for folate receptor antibodies and be sure to avoid dairy if you test positive.**

Impairments in the folate and methylation pathway also impact our detoxification systems, as some of our most important detoxification molecules are derived from this pathway through a process called "trans-sulfuration."

In simple terms, detoxification is the process of "cleaning up" the systems in our bodies, both by removing the normal waste products of body functioning, and by removing toxic substances encountered in our environment. As with MTHFR, there are common genetic variances in the trans-sulfuration pathway which can further compromise our defenses. Four important detox molecules derived from trans-sulfuration are cysteine, taurine, glutathione and sulfate. All depend on adequate folate metabolism. These substances are critical in protecting our tissues from all sorts of toxins, both man-made and intrinsic to our metabolism.

Through testing, we have found **almost all children with autism have low levels of the antioxidant glutathione,** which results from weak methylation activity, additional common genetic variations, and toxins which exhaust glutathione reserves. The "Catch-22" of low glutathione is that this makes us less able to get rid of toxins, which then accumulate and further deplete our glutathione. This is one of the main causes of increased build-up in the body and subsequent damage from common environmental toxins.

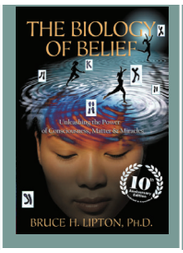
Judy Van de Water, PhD, and colleagues at the MIND Institute have identified another immune threat to pregnancy. Their tests of mothers of children with autism identified a subset of these moms who *produce* antibodies against human brain tissue, again, a type of autoimmune response, and this was not found in moms of neurotypical kids. The association with autism risk has been supported by demonstrating in animal studies that these antibodies are harmful to fetal brain development, through binding to susceptible tissues and upsetting their normal pathways of making connections.

These auto-antibodies are a result of immune system disruption, as the proper function of this system is self-protection, not self-attack. Similar disruption of the protective immune response has been identified in many studies of environmental toxin exposure, as described above. Over the years in our practice, we have found that **this self-against-self problem can be greatly helped by super-nutrition, reducing toxic exposures, and detoxification support**, all means of reducing cell danger activation. The steps in this Guidebook help balance your immune response and provide optimal support for your genes.

I want to emphasize that we have always had genetic susceptibilities, but have only recently experienced the dramatic increases in autism and other chronic childhood disorders.

There are some children with types of autism clearly caused by a genetic mutation. For parents of such kids who are considering another pregnancy, I recommend triad testing (genetic testing of child and both parents), as it can identify whether this is a parental mutation or a result of de novo (new to the child) gene injury, which is not transmitted from parent to child. De novo gene injuries may be caused by genotoxic chemical, electromagnetic

or radiation exposures, which can be avoided in subsequent pregnancies.



It's not all doom and gloom! Find inspiration and hope in *The Biology of Belief,* a wonderful book written by cell biologist Bruce Lipton, Ph.D. He elaborates on how responsive our genes are, not only to molecular influences related to life style choices, but even to our intentions and feelings.

The Cell Danger Response and Autism

The research of mitochondrial expert, Robert Naviaux, MD Ph.D, provides the best unifying explanation of how environmental threats contribute to the underlying imbalances we find in autistic children.

The Cell Danger Response (CDR), found in humans and throughout nature, is a normal reaction in our cells which frequently gets turned on and off. It is a complex chain of metabolic changes involving multiple pathways, triggered by such threats as infections, toxins, and injuries, but also by overeating, over-exercising, or excessive stress. Its role is to protect our bodies and clear the threat. When the CDR is activated, energy production is reduced, cellular repair and maintenance are diminished, the immune system is activated, and critical body functions such as oxygen utilization, methylation and cellular communication are down-regulated.

Dr. Naviaux compares our cells in CDR to countries at war: they seal off their borders and stop communicating with their neighbors. When the threat is cleared, the functions of maintenance, repair, energy production, and communication are restored.

Autism research over the years has demonstrated that **a wide variety of factors or hostile threats increase the risk of autism**. The evidence supports the conclusion that the final common pathway to most types of autism is through activation and abnormal persistence of the CDR. If there is an overload of threats (the "perfect storm" as described above), the child's physiology may get stuck in CDR, which can produce all the symptoms and biochemical disturbances we call autism.

My own work in treating children with autism over the past 20 years has reinforced the findings of Dr. Naviaux. By addressing and treating all correctable hostile threats—from infections to toxic load, to nutritional and metabolic imbalances, to sensory overload and breaking the self-perpetuating cycles of injury—**we see children with autism heal and sometimes recover entirely.**

What does the CDR have to do with autism prevention?

Activation and persistence of the CDR in one or both of the parents-to-be can compromise everything ranging from the energy required for the sperm to swim properly, to the wellbeing and vitality of the mother, and ultimately to the safety and healthy development of the child in the uterus. Because the epigenetics of methylation can be compromised by the Cell Danger Response, we want to do all we can to minimize the activation of the Cell Danger Response during pregnancy.

This Guidebook will show you how to reduce exposure to environmental triggers and activate your protective mechanisms to clear problems quickly and efficiently. The outcome is a healthier and safer home in which your baby can grow and develop, and for you to thrive through the pregnancy, delivery, nursing of your baby and beyond.

Epigenetics, Environment and the Biology of Autism at a Glance

- Rates of autism and related conditions have risen more than ten thousand percent in the last two generations, related to changes in our environment, lifestyle and toxic load which disturb gene expression, our defense systems, and multiple metabolic functions.
- This epidemic cannot be explained by changes in our genes. While genetic susceptibilities play a role in autism, we have always had these susceptibilities.
- Certain common genetic weaknesses increase vulnerability to environmental toxins.
- Toxins can change gene expression through direct damage to DNA and by disruption of epigenetic pathways.
- One of the most important pathways, the methylation pathway, which is involved in protection of our genes and bodies, is often genetically weak and abnormal in children with autism.
- The methylation pathway is vulnerable to nutritional status, to environmental toxins, and to activation of the Cell Danger Response.
- You can reduce our toxic load through lifestyle changes that protect your genes, your cells, and the environment of your womb.
- These changes and simple strategies focus on super-nutrition, reducing toxin exposures, and supporting detoxification, and will enhance the health and safety of the baby you're preparing to bring into the world.