AUTISM: IS IT ALL IN THE HEAD?

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A hologram is a 3 dimensional photographic image. But it is much more. If you take a glass plate that stores any holographic image and break it into a thousand pieces, each fragment when illuminated with a laser will recreate the entire image. Autism is a hologram for chronic disease. In it is reflected all the causes and cures for chronic disease. Autism is an extreme manifestation of disruptions in normal biology that exist in varying degrees in most chronic illness. Shining a light deep into the biology of autism will illuminate not only the mysteries of "brain disorders" such as Alzheimer's, attention deficit disorder, and depression, but also heart disease, autoimmune disease, digestive disorders, cancer, obesity, chronic fatigue, and more.

The discoveries that have led to the picture of autism as a reversible systemic disorder that is influenced by genetics and that affects the brain, rather than a genetically determined fixed brain-based disorder, emerged from a unique process in the history of medicine—the mining of the collective intelligence of scientists, clinicians, and parents of children with autism. What they have discovered is this: the broken brain of autism is caused by a broken body. Fix the body, and the brain can recover. Out of their experience emerged a road map that can be generalized to nearly all chronic illness because the roots of the biochemical disasters and metabolic dysfunction are the same—genetic predispositions (rather than determinants), a toxic environment, and a nutrient-deficient diet. In the case of autism, the effects of these insults are magnified by the overuse of medications such as antibiotics and vaccinations, which increase susceptibility to infections and promote allergy and autoimmunity.

What has emerged is the extraordinary insight that autism is a complex, multisystem disorder rooted in a series of toxic, infectious, and allergic insults. Inflammation, disruptions in normal energy metabolism and ATP production resulting in mitochondrial dysfunction, and impairment in critical regulation of oxidative stress and detoxification through a breakdown in the twin interconnected cycles of methylation (B_6, folate- and B_{12}-dependent transfer of methyl groups or CH_3) and sulfation (which produces glutathione) produce a metabolic encephalopathy.

Remove the dates of birth from the laboratory results and remove the diagnostic labels from a patient with autism and a patient with Alzheimer's, and you will discover the same biological forces at work—inflammation, oxidative stress, impaired methylation and detoxification, mitochondrial dysfunction, and even the genetic polymorphisms. What are we to make of this observation? Is it coincidence, or does it reflect deeper patterns hidden in biological systems?

The increase in mood, developmental, and neurodegenerative disorders in the 21st century makes it imperative to learn from the autism experience. The central insight of systems biology that holds the key to solving the puzzle of chronic disease is this: the plethora of diseases of modern life (and codified in the ICD-9 classification system) can be explained by a few general biological laws.

The 18th century physicist Pierre Laplace (1749-1827) observed this principle, which applies not only to biological systems but also must be applied to the diagnosis and treatment of chronic disease in the 21st century. He said, "The simplicity of nature is not to be measured by that of our conceptions. Infinitely varied in its effects, nature is simple only in its causes, and its economy consists in producing a great number of phenomena, often very complicated, by means of a small number of general laws."[1(p71)]

The media and scientific literature present a jumble of confusing information and apparently disconnected data points—measles, vaccines, mercury, genetics, toxic insults, food allergies, gut inflammation, brain trauma, and more, leaving scientists, clinicians, parents, and policy makers bewildered and misguided. It is all of these things and none of them. Through the story of one boy, the current paradigm of medicine is cracked open, illustrating the collapse of the medical system, the failure of medical care, and the end of medicine as we know it. His story is one of the thousands with autism and the millions with chronic disease and paints a picture of the future of medicine through the lenses of the philosophy of science, epidemiology, toxicology, biochemistry, genetics, and systems theory.

IS RECOVERY POSSIBLE? PATTERNS AND SYSTEMS, NOT DIAGNOSES AND SYMPTOMS

A desperate mother came to see me because her 2½-year-old son, "Sam," had just been diagnosed with autism. He was born bright and happy, breast-fed, had the best medical care available (including all the vaccinations he could possible have). He talked, walked, loved, and played normally—until his measles, mumps, and rubella vaccination at 22 months.

He was vaccinated for diphtheria, tetanus, whooping cough, measles, mumps and rubella, chicken pox, hepatitis A and B, influenza, pneumonia, hemophilous, and meningitis—all before the age of 2 years.

After this string of vaccinations, he lost his language, became detached, withdrawn, less interactive, and was unable to relate in normal ways with his parents and other children—all signs of autism. He also developed foul-smelling, sticky stools, dark circles under his eyes, and itchy ears. How could a normal boy be transformed so quickly?

He was taken to the best doctors in New York and "pronounced" as having autism (as if it were his fate), and told that there was nothing to be done except arduous, painful, and minimally effective behavioral and occupational therapy. The doctor told his mother the progress would be slow and she should keep her expectations low.

Devastated, his mother sought other options and found her way to me. When I first saw this little boy, he was deep in the inner wordless world of autism—watching him was like watching someone on a psychedelic drug trip. We dug into his biochemistry and genetics and found many things to account for the problems he was having.

We looked carefully at the few biological systems that go awry, manifesting as the clinical features of autism: gut and immune dysfunction, nutritional deficiencies, toxicity and impaired detoxification, mitochondrial dysfunction and oxidative stress, and genetic polymorphisms that set the stage for biochemical train wrecks. In autistic children, test results often reveal deviations that are far more significant than in other chronic illness, but nonetheless, the same patterns exist. By unraveling the tangled roots of his distress, we were able to address the systemic causes of his broken brain.

Let's examine each of these areas of dysfunction.

Genetic Polymorphisms (Predispositions)

Impaired Glutathione Metabolism

- *Homozygous for 2 glutathione S-transferase P1 (GSTP1 ++) genes (I105V and A114V).[2,3] This reduces the ability to biotransform toxicants such as toxic metals, xenobiotics, solvents, pesticides, herbicides, and polycyclic aromatic hydrocarbons. Point mutations in the gene coding for glutathione s-transferase enzymes have been associated with increased risk for autism.*

Impaired Methylation

- *Methylenetetrahydrofolate reductase (MTHFR 677C>T and 1298A>C) heterozygous polymorphism. MTHFR is the enzyme involved in the final methylation step of folic acid, producing 5-methyltetrahydrofolate from 5,10 methylenetetrahydrofolate. Impairment of this enzyme usually results in an elevated homocysteine, as 5-methyltetrahydrofolate is required to recycle homocysteine back to methionine. However, in autistic children, increased oxidative stress results in shunting of homocysteine to provide cysteine for glutathione production, resulting in the low levels of homocysteine.[4] James demonstrated in 2004 that treating ASD children with methyl donors including B_{12}, folic acid and trimethylglycine normalized glutathione and homocysteine levels.[5] This patient had a series of genetic predispositions and insults that led to accumulation of toxins and increased oxidative stress, triggering the vicious cycle of impaired methylation and glutathione production. This was manifested by his low homocysteine of 3 mmol/L (nL 6-8 mmol/L).*
- *Catechol-O-methyltransferase (COMT 472G>A) was heterozygous, which tends to slow the detoxification of the neurotransmitters needed for attention, focus, and cognitive skills, such as dopamine, epinephrine, and norepinephrine. COMT polymorphisms have been noted to occur with increased incidence in autistic children.*

Allergy and Autoimmunity

- *Elevated IgG anti-gliadin antibodies of 91 units (nL<20), indicating an autoimmune response to gluten.*
- *Elevated total IgG antibodies to not only wheat but to 28 foods, including dairy, eggs, yeast, and soy, indicating disrupted intestinal permeability.*

Digestive Function

- *Stool analysis cultured 3 species of yeast and a deficiency of beneficial flora, including* Lactobacillus *and* Bifidobacteria.
- *Elevated stool markers in intestinal inflammation consistent with allergy, infection, or inflammatory bowel disease (eosinophil protein X 18.2 mg/g (nL<7 mg/g) and calprotectin 46 mg/g (nL<40 mg/g).*
- *The urinary organic acids revealed very high levels of D-lactate—an indicator of overgrowth of bacteria in the small intestine resulting in intestinal fermentation of carbohydrates.*
- *Urinary peptide analysis revealed very elevated IAG (indolylacryloylglycine 161 μg/mg creatinine (nL<9.5), a toxic phenylalanine metabolite derived from dysbiotic bacterial metabolism and deltorphins and enkephalins. These are neuroactive peptides, which disrupt cognitive function and have been associated with autism spectrum disorder.[6,7]*

Nutritional Deficiencies

- *Low amino acids reflect inadequate protein intake (unlikely) or maldigestion, malabsorption, or overutilization in phase 2 detoxification pathways because of toxicity. For example, methionine and threonine are metabolized to cysteine and glycine respectively, which when combined with glutamate form the glutathione tripeptide.*
- *Mineral deficiencies: zinc (important for immune function, activation of digestive enzymes, as a cofactor for metallothionein, necessary for intracellular detoxification of heavy metals and 200+ other enzymes), magnesium (a natural N-D-methyl aspartate or NMDA receptor antagonist that reduces brain excitotoxicity and is a cofactor for 300+ enzymes), and manganese (a cofactor for super oxide dismutase, a critical mitochondrial antioxidant enzyme).*
- *Impaired methylation: elevated urinary methylmalonic acid, indicating B_{12} deficiency, and low homocysteine.*
- *Vitamin A and vitamin D deficiencies.*
- *Essential fatty acid deficiencies: eicosapentaneoic acid (EPA) deficiency and elevated AA/EPA ratio (an excess of inflammatory to antiinflammatory fatty acids) are associated with autism spectrum disorder.[8,9]*

Mitochondrial Dysfunction and Oxidative Stress

- *Organic acid analysis revealed widespread impairment in fatty acid, carbohydrate, and citric acid metabolism (elevated lactate, citrate, isocitrate, succinate, malate), indicating mitochondrial dysfunction resulting in energy deficits linked to cognitive dysfunction and demonstrated in 70% of autistic children.*[10]
- *Elevated suberate indicated impaired fatty acid transport into the mitochondria from carnitine deficiency.*
- *Very elevated lactic acid (L-Lactate) 101mg/mg creatinine (nL<22), indicating cellular acidosis and coenzyme Q_{10} deficiency.*
- *Increased oxidative stress, indicated by elevated DNA adducts or a 8-Hydroxy-2' deoxyguanosine of 11.5 mg/mg creatinine (nL<5).*

Toxicity and Impaired Detoxification

- *Elevated red blood cell aluminum and lead.*
- *Elevated hair antimony and arsenic, but low levels of mercury because of impaired ability to excrete mercury.*
- *Elevated post 2,3-dimercapto-1-propane sulfonate (DMPS) provocation urinary mercury 14 mg/gram creatinine (nL< 3).*
- *Markers of impaired sulfur (low sulfate) and glutathione status (elevated pyroglutamate) on urinary organic acids. Pyroglutamate elevation is indicative of glutathione wasting via a number of possible mechanisms, including cysteine and glycine insufficiency, and a low urinary sulfate is a functional marker for total body sulfur stores.*
- *Elevated urinary porphryins indicate enzymatic disruption of normal porpryhin metabolism from heavy metals, which has been documented in autism.*

TREATING THE WHOLE SYSTEM

Is it possible to point to any one gene, biomarker, or biological dysfunction, and say "Aha! This is the cause of autism, and this is what we should treat!" The answer is an unequivocal no. None of these is the cause of autism. All of them exist in varying degrees and patterns in each individual. The key to unraveling the tangle of molecules and metabolic disruption is seeing patterns and working systematically with those patterns in the right order. Gathering the information is the first step. Understanding how to navigate is critical. Rather than a focus on just one thing, Sam's treatment involved a simple concept. Identify impediments to optimal function (toxins, infections, allergens) and remove them, and identify the ingredients necessary for optimal function and provide them—a simple idea, but perhaps the most powerful in medicine today.

Sam's treatment started with repairing his gut and immune system. We then added nutrients needed for optimal function and removed heavy metals after we had optimized his nutritional status, methylation, and transsulfuration, the highways of detoxification and the quenchers of oxidative stress.

Specifically, his treatment consisted of the following.

Step 1: Correct Digestive Imbalances and Remove Food Allergens and Sensitivities

1. Eliminate gluten and IgG food sensitivities.
2. Treat small bowel bacterial overgrowth with non-absorbed antibiotic (rifaximin).
3. Treat intestinal yeast with antifungals (fluconazole, itraconazole).
4. Re-inoculate with beneficial bacteria (broad-spectrum probiotic) and *Saccharomyces boulardii.*
5. Correct maldigestion with plant-based enzymes, including dipeptidyl peptidase IV (DPP-IV).

Step 2: Correct Nutritional Deficiencies and Optimize Nutritional Status

1. Multivitamin, topical zinc, magnesium, methyl folate, methylcobalamin, pyridoxine (B_6).
2. Cod liver oil for EPA/DHA and vitamins A and D.
3. Coenzyme Q_{10} to correct mitochondrial dysfunction (elevated L-Lactate).

Step 3: Enhance Detoxification and Treat Oxidative Stress

1. High dose intramuscular methylcobalamin B_{12} necessary to enhance methylation and overcome toxic injury to methionine synthase (part of the methylation cycle) and activate dopamine receptors.
2. Topical glutathione to support detoxification.
3. A chelating medication dimercaptosuccinic acid (DMSA) to remove mercury and lead.

Treatment Results

After 3 weeks on a gluten-free diet, Sam showed dramatic and remarkable improvements. He began to talk again and showed much more connection and relatedness to people.

After 4 months, he was more focused, used more words, and was able to enter a more mainstream school.

Ten months into treatment, he was retested. The gut inflammation resolved (normal eosinophil protein X and calprotectin), the small bowel bacterial overgrowth resolved (normal D-lactate), but a mild yeast overgrowth (elevated arabinitol) persisted. Urinary peptide markers (IAG, enkephalins) dramatically improved. His methylmalonic acid was still elevated but improved.

The glutathione deficiency markers improved (pyroglutamate and sulfur), and urinary porphyrins were improved but still elevated. Urinary organic acid testing revealed normalization of his mitochondrial function and a 50% reduction in L-lactate. The oxidative stress marker (8OHDG) was normal.

Most importantly, he went from nonverbal to verbally fluent and no longer qualified for a special school or special services because he "lost" his diagnosis of autism. And his bowel movements normalized.

Sam now has a wonderful sense of humor (typically completely absent in autistic children) and engages in spontaneous play and hugs with friends and family.

This result was not random but the result of a deliberate application of a few simple biological laws that explain the diverse phenomena observed in Sam's clinical presentation and laboratory evaluation. It is the clinical application of systems biology without which the puzzle of chronic disease cannot be solved. Now let us take a journey into the frontiers of medicine and science and see how that puzzle intersects with Sam's story.

A PARADIGM SHIFT: A REVERSIBLE METABOLISM ENCEPHALOPATHY, NOT A FIXED BRAIN DISORDER

Martha Herbert is an assistant professor of neurology at Harvard Medical School and the director of TRANSCEND (Treatment, Research and Neuroscience Evaluation of Neurodevelopmental Disorders). She has put together a remarkable story of autism, which is like a hologram through which we can see the systemic nature of most illness. Her landmark paper, "Autism: A Brain Disorder, or A Disorder of the Brain?"[11] will change forever our thinking about mental and brain illness.

Rather than ignore the almost universal physical complaints found in autistic children, most of which have been described in the scientific literature since the 1940s, she explains how they could be at the root of the behavioral symptoms found in autistic children. She explains how the incoherent brain connections that show up as the inability to talk, connect with other people, or produce odd repetitive behaviors have their root not in the brain but in problems with the digestive system and the immune system, environmental toxins, mitochondrial dysfunction, and oxidative stress. These breakdowns in the body, which lead to behavioral problems, occur because of genetic susceptibilities, which are amplified by environmental stresses and toxins.

Why, she asks, do 95% to 100% of autistic children have gastrointestinal dysfunction? Why do 70% of them have immune system abnormalities? It has also been noted that autistic children have frequent infections and allergies and often have had multiple courses of antibiotics. After examining all the accumulated research on autism, including her own work on brain imaging and the structure and function of the brain in autistic children, she concludes that autism is not a brain disorder but a systemic disorder that affects the brain.

Dr Herbert noticed that brains of autistic children on MRIs are bigger, swollen perhaps.[12] At the same time, Dr Carlos Pardo and his group from Johns Hopkins examined on autopsy the brains of 11 autistic children. They also looked at the spinal fluid of living autistic children. By examining and comparing these factors, they found the children's brains to be swollen and inflamed. The swollen brains are filled with activated immune cells and inflammatory molecules.[13]

This brought up another question: Why were their brains inflamed to begin with? The short answer is allergens, toxins, infections, and nutritional deficiencies.

Where do problems like these come from and how do they affect the brain? Are they in the brain to begin with? Or are we looking in the wrong place?

According to Dr Herbert, these gut, immune, and toxicity problems are integrally related to and often the cause of what happens in the brain. In fact, she suggests that autism is a systemic metabolic disorder that changes brain function. The brain and body function as a whole system, and multiple chronic, insidious triggers can throw the brain into chaos.

This is a 180-degree turn from conventional thinking. If an altered response to a microbe or bug in the body by the immune system can affect brain function, or if a molecule made in the gut can change behavior or perception, then of course the brain is in communication with the rest of the body.

We insult our digestive tract every day. We do everything to harm it and hardly anything to help it work as it was designed to work. We eat food that is low in fiber, high in sugar, and full of antibiotics, pesticides, and hormones; we drink alcohol and caffeine; we take antibiotics, acid-blocking medication, antiinflammatory drugs, hormones, and steroids (all of which can inhibit proper gut function); we are under constant stress; and we are exposed to thousands of environmental toxins, all of which damage the gut. These factors trigger widespread inflammation because our gut-immune system reacts to all the foreign proteins in food and the myriad of bugs and becomes "angry" and inflamed. So if inflammation starts in the belly (many autistic children have swollen bellies) then it spreads to the brain, it can literally lead to a swollen brain.

Imagine the extraordinary beauty and dance of the brain where everything is exquisitely regulated. The timing and coordination of nerve cell firing and the amplitude (or volume) of the message has to be just right. Filters that modulate our sensory inputs must let in only the information needed. The activity of the brain must be perfectly synchronized for us to be awake, alert, receptive, interactive, communicative, flexible, and happy.

But what if the signals start misfiring and the coordination and synchronization break down because of multiple metabolic disturbances such as ineffective enzymes or cell function due to insults from toxins, microbes, allergens, or nutritional deficiencies? This is the net effect of inflammation, whatever the original cause. It triggers a runaway cascade of damaging effects. All mental processing slows, neurotransmitters can't do their job, cell membranes don't function the way they were designed to, cellular enzymes get hijacked or derailed, cells get triggered into a death spiral called apoptosis, and the delicate network of cellular connections and communications is interrupted and/or altered.

How does that show up? As autism or Alzheimer's disease or depression. It depends on the individual's unique genetic makeup and environment.

Scientists are now asking why. Why do we find more mercury in autistic children, and what is the effect of mercury on the brain? Why do these children have altered immune function? Why do they have more viral infections? Why do we find measles virus in the intestinal lining of these children and in their spinal fluid?

And there are other questions. What is the effect of giving babies 9 immunizations at one doctor's visit or more than 27 vaccinations by the age of 2 years? What is the effect of being born with an average of 287 toxins already in the bloodstream? How do all these trigger inflammation, and how does this cause autism? These questions force us to ask how genes, biology, brain, and behavior are connected

THERE IS NO GENE FOR AUTISM: LOOKING AT ALL THE CAUSES

Researchers searched for the one autism gene or the one location in the brain that is damaged that leads to autism. Such an approach implies that the cause of autism (or other "brain dis-

orders") is genetically hard-wired, and therefore treatment is hopeless. It is now clear that there is no one gene to be found. The search for dozens of genes continues; however, the effects of the environment and metabolism remain neglected.

The same metabolic and environmental problems hold true for the 1 in 6 children with some type of developmental problem, the 1 in 10 with ADHD and the 1 in 150 with autism. Each of these may be a problem related to underlying metabolic disorders, and not the result of genetically hard-wired diseases or damaged brains. It is all the same problem; it just shows up slightly differently in different kids.

Jill James, PhD, and her group from the Department of Pediatrics, University of Arkansas for Medical Sciences, have done studies showing that children with autism have common patterns of "abnormal" genes that affect methylation and sulfation.[2] Dr James examined the blood for signs of abnormal methylation and sulfation in 80 autistic and 73 normal children. She also examined the genes of 360 autistic children and 205 normal children finding common patterns. In another key study, Dr James and her colleagues were able to fix this biochemical disruption of methylation and sulfation through nutritional supplementation with methyl donors (B_{12}, folate, B_6, and trimethylglycine).[5]

Dr Herbert suggests that many different causes can lead to the same symptoms—namely the lack of language and social connection and the rigidity and inflexibility of behavior seen in children with autism, as well as many "behavioral" problems in children, such as those with ADHD. A few common pathways result in the same symptoms from a host of different insults. In fact, Dr Herbert challenges the idea that there is only one kind of autism. Researchers are realizing that there may be many "autisms" because each child has unique genetic and environmental factors that can lead to very similar symptoms and behaviors.

Rather than hunting for drugs that target the brain to treat autism, the better path may be to study treatments that target the inflammation, toxins, allergens, infections, biochemistry (like problems with methylation and sulfation), and digestive dysfunction, which alter brain function in the first place.

Treating the gut, replacing B_{12}, B_6, and folate, omega 3 fats, vitamins A and D or magnesium and zinc, eliminating gluten and casein from the diet, or detoxifying mercury and lead from their little bodies may be the best way to get autistic children's brain connections working again.

The experience of thousands of children, parents, scientists, and doctors who are part of a unique collaborative effort called Defeat Autism Now! confirms this approach and helps children recover—some slightly, some miraculously—from a disorder that was thought to be incurable.

In the treatment of psychiatric and neurological disorders, we must look at the body. We need to look for the connections, patterns, and final common pathways, which have enormous implications for so many "fixed" diseases. If recovery and improvement are documented in autism, what does that mean for Alzheimer's, chronic depression, bipolar disease, psychosis, eating disorders, or violent sociopathic behavior?

These problems, it seems, are not hard-wired into the brain as we believed but the result of a few common systemic problems that completely disrupt the fine dance and coordination of the brain—problems than can be fixed metabolically and systemically.

THE GUT-IMMUNE SYSTEM AND THE BRAIN

Many medical discoveries are made by accident. An open inquiry of observed phenomena sometimes reveals unexpected clues. Many doctors and scientists have ignored the fact that up to 95% of autistic children have intestinal problems, such as altered bowel function and abdominal distention. How can their intestinal problems affect their brains, interrupt their language, and lock them in their own private world?

Dr Wakefield asked how. He happened to notice inflammation (or lymphoid nodular hyperplasia) in the bowels of some children with autism. Could this observation be brushed off as coincidence? In a study of 148 children with autism compared to 30 normal controls (children without autism), 90% of autistic children showed inflamed bowels on biopsy compared to only 30% of controls (although 30% is a lot! This makes me wonder if many nonautistic children have bowel inflammation from poor diet and allergies as well).[14] He also noticed the inflammation was much more severe in autistic children. Food allergens, bacteria, viruses, and toxins (such as mercury) could all be the cause.

In addition to all the potential digestive problems that autistic children face, it also seems they are more susceptible to allergy and gut inflammation triggered by certain foods, such as gluten and casein.[15] The extreme inflammation in the guts of autistic children contributes to their inflamed brains.

The bottom line is that the guts of these genetically susceptible autistic children are damaged for many reasons—live measles vaccinations, toxic metals, overuse of antibiotics, abnormal gut flora, and food allergies. And some children have different combinations of these triggers than others.

The net result is that their digestion breaks down. Digestive enzymes don't work properly. Food particles (especially from gluten and dairy) are partially digested and become brain-fogging toxic compounds (like the peptides mentioned above). Toxins, viruses, bacteria, and food allergens leading to brain inflammation activate the immune system in the gut. Toxic bacteria and yeasts take over, releasing compounds that change normal brain operations. All this overwhelms the system and creates chaos between the brain and the gut-immune system.

Through the extreme example of autism, we can see one end of a spectrum of disorders that affects millions in small and large ways, from full on psychosis and dementia to mild anxiety and a little depression. Addressing gut inflammation is a back door into healing the brain.

Making Sense of the Measles Vaccine Controversy

Other studies have linked the live measles virus from vaccinations to the inflamed gut. Living measles viruses have been identified in some people with inflamed guts. Vaccines, even an

"inactivated" live virus, stimulate the body's humoral immune system to produce protective antibodies. But sometimes, as in the case of autistic children, a weakened immune system can't manage this "inactivated" live virus. Then the live attenuated virus persists, producing low-grade inflammation—in both the gut and the brain.

A study of children with developmental delay found that 75 of 91 patients with autism and inflamed bowels had live measles virus detected in samples of their intestinal tissues. Only 7 of the 70 control patients were found to have the measles virus in their gut.[16]

In another study, DNA analysis was performed on the measles strains found in autistic children and compared to that of strains found in nonautistic children with inflamed bowels. The DNA of the measles virus in autistic children came from vaccine strains of measles, not wild types.[17] A more recent study did not find persistent measles virus in children with autism, but even this does not rule out the possibility that the virus did its harm in a "hit and run" fashion.[18]

This doesn't mean that ALL children who are vaccinated have problems, but for some reason autistic children are unable to handle the live measles viruses used in immunizations, triggering an inflammatory response in the gut and the brain. These children can't handle the vaccine (maybe because mercury suppresses their immune system), and then the normally benign live measles virus in the vaccine takes root in the body and sends these kids into an even deeper spiral of brain dysfunction.

More alarming is that vaccine strains of measles virus seem to migrate into the brains of some children with autism. That means it may not be only gut-related inflammation that is causing the problems, but the measles virus may take root in the brain itself. How this happens is not clear, but the trail from vaccine to the gut to the brain is smoking hot. Vaccine measles strains have been isolated from the spinal fluid of autistic children.[19]

Large-scale population studies show no connection between the measles, mumps, and rubella (MMR) vaccine and autism.[20] That is because in such large populations the effect on children who are susceptible to autism as a result of the MMR vaccine is "washed out." If you study large groups of people, you won't pick up small effects on genetically or biochemically unique individuals. It is also possible that this is only one of a variety of autism triggers. Looking at the problem using this kind of statistical analysis is unhelpful for treating individual patients.

Oddly, in the major study "disproving" this connection, the authors noted an increase in autism diagnosis in the 6 months after the MMR vaccine but dismissed it as unimportant because it "appeared to be an artifact related to the difficulty of defining precisely the onset of symptoms in this disorder."[20(p2026)] If your child had autism or autistic behaviors, you would you know it, and you would know when it started! This is yet another example of conventional science seeing what it believes instead of believing what it sees.

The vaccine probably only affects a few genetically susceptible children who are biochemical and immunological train wrecks because of toxic overload. The methods of these larger population studies are not designed to ferret out the uniqueness of individuals. If they looked at all the genetic subgroups in the population, then there could be meaningful data. If they did intestinal biopsies and spinal fluid examinations on affected and unaffected kids, as Dr Wakefield did, then they might obtain some meaningful information.

Roger Williams, the author of *Biochemical Individuality* said that, "Nutrition [and medicine] is for real people. Statistical humans are of little interest. People are unique. We must treat people with respect to their biochemical uniqueness."[21(pX)]

MIND AND METALS: A DANGEROUS COMBINATION

A group of dedicated parents, scientists, and doctors led by Sidney Baker, MD, John Pangborn, PhD, and the late Bernard Rimland, have created a map for this new territory where we now find ourselves. Through their organization Defeat Autism Now!, this "think tank" has made clear that many children on the autism spectrum, and those with ADHD and even learning difficulties, are toxic.[22]

Autistic children have low levels of glutathione, the major detoxification compound in the body, so they cannot excrete metals. Their hair shows low levels of mercury because genetically they can't excrete it,[23] but they have higher levels in their baby teeth.[24] Chelation challenge tests using DMSA or DMPS show that autistic kids have more mercury and other metals than normal children.

Thimerosal and Autism

Until recently, mercury, in the form of thimerosal, was the most common disinfectant placed in vaccines (most flu vaccines still contain it) and contact lens fluid. A recent study "proved" that thimerosal has no link to autism or ADHD.[25] Or does it?

The study, which appeared in *The New England Journal of Medicine,* apparently was designed to show no link. Here is how the vaccine industry–funded scientists designed the study, which could not accurately answer the question of the effect of thimerosal in autism:

1. They excluded all children with ADHD and autism. These are the children with the genetic susceptibilities to problems. These are the children who cannot detoxify. This is like doing a study to see if peanuts cause allergies but excluding all kids with an allergy to peanuts from the study. It's just plain bad science.
2. They did not measure mercury in hair, urine, or blood or the total body burden of metals in the children—just their exposure. So if some children were good detoxifiers, they would be able to excrete mercury. They should have measured the total body load of mercury in these children and then noted how that correlates to any neurologic or other effects. They also should have measured the genes involved in detoxification of mercury, such as apo E4, GSTM1, and MTHFR. Again, this is just plain bad science.
3. Manufacturers who put mercury in vaccines in the first place employed or funded the authors of the study and its accompanying editorial. That's like putting tobacco companies in charge of studies on the risks of smoking. This is documented in the disclosures section of the paper.
4. They didn't explain how it could be safe that babies received

187.5 μg of mercury by the time they were 6 months old when the safe level is 0.5 μg/kg of mercury at any one time, according to the EPA.

If thimerosol is as safe as studies like this attempt to suggest, why was it removed from use after 50 years from all childhood and adult vaccines in 2001 (except, of course, the ones we export to the third world)?

Metals Stuck in Our Chemistry

Mercury and other heavy metals block many metabolic pathways, including those related to building new hemoglobin molecules. Porphyrin metabolism is disrupted by mercury. Studies show that markers of abnormal porphryins can be found in the urine of patients with heavy metal toxicity.[26] Genetic polymorphisms in porphryin metabolism are linked to the development of neurotoxic and neurobehavioral effects from mercury exposure.[27]

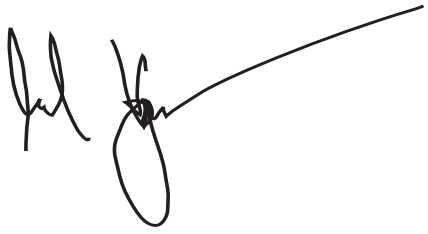
In addition, polymorphisms for brain derived neurotrophic factor (BDNF) is important in helping the brain repair, and neuroplasticity significantly increases the risk of mood, cognitive, and motor problems even at very low levels of mercury exposure.[28,29]

This explains variable susceptibility to heavy metal poisoning and why studies of large populations often show no harmful effects from toxins. If 95 of 100 children can detoxify metals and are not affected, they are 100% fine. The problem, however, becomes significant and the effect severe for the 5% of children who cannot detoxify well.

It is not the porphryin, BDNF, GST, or MTFHR genes that are the problem. It is the unique combination of all genes with the toxic environment and immune challenges that triggers brain dysfunction and illness.

THE FUTURE OF MEDICINE AND HEALTHCARE

Autism is a hologram. Through it a 3-dimensional picture of the failure of our current medical paradigm and the promise of a new one has formed. The lessons learned from the dissection of the functional causes and mechanisms of autism can illuminate the path for whole systems medicine and clinical research and the potential for it to address the global crisis of chronic disease. All we have to do is shine the light through the fragments of the hologram scattered at our feet. Then we have to pay attention and act collaboratively socially, politically, environmentally, and personally.



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