

Autism Rising: Part 1

Pandemic Rates of Autism Cannot Be Explained by Genetics or Diagnosis Alone

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“Our very great concern is that children worldwide are being exposed to unrecognized toxic chemicals that are silently eroding intelligence, disrupting behaviors, truncating future achievements, and damaging societies.”(2)

*Dr. Phil Landrigan
Dr. Phillippe Grandjean*

April was Autism Awareness Month, but if you are a parent of an autistic child you are aware of autism every day of every month. The individual and societal implications of the burgeoning autism rate are staggering. Caring for and educating an autistic child can be overwhelming. Parents are forever concerned about their child's future independence and happiness. Economic losses are also significant. In 2012, Autism Speaks, the world's leading autism science and advocacy organization, estimated autism costs society an astounding \$126 billion per year in the U.S. That number has more than tripled since 2006. The lifetime cost of caring for an individual who is not impacted by intellectual disability is estimated at \$1.4 million in the U.S. (19)

Autism Rates Skyrocket

Do you have a sense there are more children who have learning disabilities, attention deficit disorder, or just behavior problems with more aggression and less focus? Studies would confirm your impressions and, in fact, neuroscientists are now warning of a “silent pandemic” of neurologic developmental disorders, some of which are obvious, and others so subtle they fall under the research radar. Disorders of neurobehavioral development affect 10%-15% of all births. (4) According to a March 2014 report from CDC's Autism and Developmental Disabilities Monitoring (ADDM) Network, about **1 in 68 children are now identified with autism spectrum disorder (ASD)**. (1) This is a 30% increase from the last report, just two years ago, when it was 1 in 88 children. The CDC has used the same method to determine autism prevalence every two years since 2000.

Autism historically has been rare throughout the world. The first reported case was in 1943 in the U.S. by Dr. Leo Kanner, a psychiatrist from Johns Hopkins Hospital. In 1981, the U.S. autism rate was 1 in 10,000. In 2007, it was 1 in 150. In 2009, it was 1 in 100.

At this rate, it is estimated that by 2025 it will be 1 in 2 or 50% – very bad news indeed. What is causing the increase in autism prevalence? Is it just better diagnosis and funding? That large an increase can't be dismissed as just improved diagnosis, however convenient that explanation is. Autism is a tragedy for families and our society. Experts advise that we shift our attention to environmental factors that have changed since the 1990s when the steep curve began. Is it a single toxin or a combination of factors that is driving this alarming trend both here and abroad? (2)

Quote enlarged —“*Autism costs society an astounding \$126 billion per year in the U.S.*” (19)

A Growing List of Neurotoxic Chemicals

As the shocking news of rising autism rates came out this year, another major article on developmental neurotoxins was published in the *Lancet* by pediatrician and epidemiologist Dr. Phil Landrigan, a professor of preventative medicine and director of the Children's Environmental Health Center at Mount Sinai School of Medicine, and Dr. Philippe Grandjean, adjunct professor of environmental health at Harvard University School of Public Health. They have spent decades working to identify environmental threats to children and the unborn fetus, where key development occurs. They conclude that a growing list of chemicals in our environment contributes to this rise and that genetics or improved diagnosis cannot account for the steep increase. (2)

Their original review in 2006 identified 201 adult neurotoxins as well as five developmental neurotoxicants – **lead**, **methylmercury**, **polychlorinated biphenyls** (industrial lubricants, carbonless paper), **arsenic** (semiconductors, pesticides, coal combustion, food), and **toluene** (solvent in glues, paints, nail polish, printing ink). (3)

A recent update of epidemiological studies have documented six additional developmental neurotoxins – **manganese** (gasoline additive, batteries, steel and aluminum manufacturing), **fluoride**, **chlorpyrifos** (pesticide), **dichlorodiphenyltrichloroethane** (DDT pesticide), **tetrachloroethylene** (Perc dry cleaning fluid), and the **polybrominated diphenyl ethers** (flame retardants). Unfortunately, the article notes that there are many more chemicals commercially released that have not been studied for harm to the developing brain. (2)

Quote enlarged—“*Inhibition of neurite outgrowth was found at concentrations of additives theoretically achievable in plasma by ingestion of a typical snack and drink.*” *Liverpool study* (6)

Food Additives - Mixed Exposures - Synergistic Effects

A big problem in identifying chemicals causing any disease is that we are not exposed to just one chemical at a time, but this is how they are tested in the laboratory for toxicity. In our kitchens, cars, living rooms, offices, and on the highway, breathing fumes, we have chronic low-dose daily exposure to chemicals causing cancer, pulmonary disease, renal toxicity, asthma, in addition to neurotoxicity. Biomonitoring studies have documented these chemicals and metals of concern brewing in our bodies for decades. (5) In 2009, studies of newborn umbilical cord blood revealed more than 200 chemicals that were circulating through the babies' brains prior to birth. (17)(18) Some of these toxins are persistent pollutants and do not easily break down in our bodies or in nature, such as DDT or flame retardants (PBDE). Others such as triclosan (antibacterial additive) or Bisphenol A (BPA), have a half life of less than a week in our bodies, but are found in the vast majority of those tested because of constant exposure in consumer products.

Chemicals in combination can give a one-two punch to the developing brain. It has been demonstrated that food dyes and additives can cause adverse behavioral effects such as hyperactivity.(19)(20) Scientists have studied deleterious effects of food additives on the developing brain as well. In a study from the University of Liverpool, scientists examined the neurotoxic effects of four common food additives in combinations of two (Brilliant Blue and L-glutamic acid, Quinoline Yellow and aspartame) to assess potential interactions. They found "Inhibition of neurite outgrowth was found at concentrations of additives theoretically achievable in plasma by ingestion of a typical snack and drink....and both combinations had a straightforward additive effect on cytotoxicity."(6)

Environmental Chemicals Target Essential Thyroid Hormone

The most critical developmental window in humans extends from early gestation to the first two years of life. That is when the majority of cells and synapses are settled in place. The brain does not complete development until the early 20s however. The billions of brain cells that form a functioning brain require a very complex and fragile dance between DNA, RNA, proteins, cells, and circulating hormones that occurs in a defined sequence. Many mechanisms can be responsible for harming a growing brain at many points in the process. Thyroid hormone is one factor that plays an essential role in brain development. Environmental operatives that disrupt its production or function will cause irreversible neurologic harm.

It is well known that iodine given to pregnant women is necessary for thyroid hormone production in the first trimester to prevent cretinism. However, if given in the second trimester, iodine supplementation does not prevent neurological damage. The fetus begins

to produce its own thyroid hormone from 10-12 weeks, but still uses maternal thyroid hormone. (10)

“During these sensitive life stages, chemical exposure can cause permanent brain injury at low levels that would have little or no adverse effect in an adult.” Dr. Grandjean, Dr. Landrigan (2)

Everyday Endocrine Disruptors Affect Thyroid Hormone

R. Thomas Zoeller from the University of Massachusetts has extensively studied the effects of industrial toxins on thyroid function and found that PCBs can reduce the circulating levels of thyroid hormone, although the TSH levels were not altered. There is strong scientific evidence that exposure to polychlorinated biphenyls (PCBs) – global pollutants found in transformers, old fluorescent lights and fish – is associated with negative effects on cognitive development and IQ. (9)(10)

Many commonly used chemicals have been found to interfere with thyroid hormone.

1. **PBDEs**, which are ubiquitous flame retardants, reduce circulating levels of thyroid hormone. PBDE's have also been shown in several animal studies to lower circulating levels of vitamin A, which is a co-regulator of gene expression with thyroid hormone signaling.
2. **Perchlorate** is a stable compound found in fireworks, rocket fuel, and is now a widespread water contaminant. It is found in breast milk. Perchlorate has been shown to interfere with thyroid function by reducing iodide uptake and thus thyroid hormone synthesis.
3. **Bisphenol-A (BPA)** is one of the highest volume chemicals produced worldwide with over six billion pounds produced each year. Over 100 tons are released into the atmosphere each year. It is found in the lining of tin and aluminum cans, on cash register receipts, dental sealants. 93% of humans tested had BPA in their bloodstream, although the half-life is about a week. BPA has a complex, but harmful interaction with thyroid signaling and has been shown to bind to thyroid receptors.
4. **Phthalates** are ubiquitous chemicals found in plastic water bottles, pharmaceutical drug and vitamin coatings, PVC products, IV bags, flexible plastic toys, paints, printing inks, as a food contaminant in milk and meats, and in drinking water. Most Americans test positive for phthalates in their urine. Phthalates were found to have thyroid receptor

antagonistic activity. (12)(13)

5. **Perfluorinated compounds** found in Teflon, lining of pizza boxes and takeout cups, fire fighting foam, water/stain proofing on clothing and shoes are bioaccumulative and are found in most people and animals in biomonitoring studies. Perfluorinateds can cross the placenta and compete with thyroxine (T4, i.e., the transport form of thyroid hormone) for binding to the human thyroid hormone transport protein transthyretin (TTR). They can thus inhibit and adversely affect the thyroid hormone system in animals and humans. (15)

Considering there are over 80,000 synthetic chemicals being produced and a mere 200 have been tested for neurotoxicity alone, it would take geologic time to test all of these in combination. Experts agree it is time for action. We should not have absolute proof of harm before removing a chemical from consumer or environmental exposure. A precautionary approach is called for to reduce/eliminate chemicals in consumer products once harm is discovered. (2) New and old chemicals need to be fully tested before commercial release or we will eventually find them in our coffee and our cake.

What are some major environmental factors that have emerged since 1990?

Several emerging commercial practices of concern for public and environmental health that have been proliferating since the early 1990s are below. These are added to the chemical/heavy metal blends previously described and which may contribute to the rise in autism and other neurobehavioral disorders.

- **Genetically modified foods** with built-in pesticides along with much higher levels of pesticide applications, especially glyphosate.
- **Flame retardant** use continues to rise in furniture and electronics.
- **Electromagnetic wireless microwave** radiation in cell towers, cell phones, cordless phones, routers, smart meters.
- **Nanoparticles** in consumer products.

Autism Rising: Part 2 will discuss some of these issues.

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