Vaccine Adjuvants and Selected

Neurotoxins in ADHD and Autism

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**Introduction**

 This paper explores the question of whether there is a connection between the neurodevelopmental disorders on the autism spectrum, everyday toxic exposures such as fluoridated water, and vaccine damage. One important question, in particular, is whether the glue linking these apparently very different things may involve a deficiency of the enzyme phenol sulfotransferase (PST, also known as SULT1A).

 This important enzyme is not itself a neurotransmitter, but it is needed for the brain’s neurotransmitters to function properly. It is also important for metabolism of xenobiotics such as food dyes and various other additives, toxins, medications, and foods containing salicylate, a chemical related to aspirin. In fact, some of the salicylates have been shown to not only need the enzyme for their metabolism, but to actually suppress its production (Eagle 2014). Lim, Ho, and Wong (2016) gave a detailed explanation of the interaction of PST and glutathione which are needed for detoxification of xenobiotics as well as endobiotics. Ladumor et al. (2019) described not only the various sulfotransferases and what they can do, but also how they change over time in childhood and how there are genetic differences depending on age and race. Meanwhile, Kern et al. (2017) described the increased vulnerability of males to neurotoxic exposure, and the role of glucuronide conjugation which is available for protection of females more than males when sulfate is depleted or saturated.

 This paper will focus on some of the less-recognized risk factors for both attention deficit hyperactivity disorder (ADHD) and autism, with an emphasis on the importance of the enzyme PST.

**Problem Statement**

 While vaccines are generally acknowledged as having saved millions of children from acute diseases such as polio, smallpox, and measles, increasing vaccine injuries in the form of long-term chronic neurodevelopmental deficits have also been reported (Morris, Puri, & Frye, 2017). For instance, examining the brains of several children with autism, Mold, Umar, King, and Exley (2018) reported some of the highest aluminum levels ever recorded in brain tissue. They concluded that the increasing exposure to aluminum adjuvants in childhood vaccines correlates with the increase in autism.

 Meanwhile, the “few foods” or oligoantigenic diet and the similar but less rigid Feingold diet have long been some of the more successful non-medical, or “alternative” interventions for ADHD (Pelsser, Frankena, Toorman, & Pereira, 2017; Verlaet, Maasakkers, Hermans, & Savelkoul, 2018). As Pelsser et al. described, the oligoantigenic diet is not to be used for treatment, but rather for diagnosis. It begins by eliminating everything eliminated by the Feingold diet, plus a further extensive list of possibly allergenic items such as eggs and soy. When the child improves, foods are added until an individual diet is determined. As described by Feingold (1975), the Feingold diet eliminates synthetic food colors, synthetic flavorings, three specified preservatives, and (at the start) a list of salicylate-containing foods. Eagle (2014) reported that the eliminated additives require the sulfate-based enzyme PST for their metabolism, while some salicylates not only require PST but also suppress its production. This same enzyme is needed by neurotransmitters involved in attention, memory, and cognition. Thus, if PST is insufficient for any reason, attention deficits and cognitive symptoms result.

 The role of sulfation in vaccines needs to be addressed. Kern et al. (2017) reviewed studies on the neurodevelopmental effects of neurotoxic chemicals children are exposed to, concluding that the male brain is more vulnerable than the female brain because of higher glutathione levels and better sulfate-based detoxification ability in females, as well as a potentiating effect of testosterone on the neurotoxins themselves. Jacob et al. (2015) described efforts to find out why one of two similar vaccines appeared to carry a much higher risk of narcolepsy than the other one. They concluded that sulfation played a role.

 If sulfate metabolism is a key factor in ADHD and/or autism, and if the PST enzyme is suppressed by vaccination, and/or other neurotoxins the children are exposed to, perhaps children at risk could be identified and protected before injury.

**Literature Review**

 A search was made for literature connecting sulfation, PST, or SULT1A to autism, ADHD, vaccinations, and toxins, and for clues suggesting suppression or improvement of sulfation via diet, pregnancy, and vaccinations.

 Although the Feingold diet was first introduced in the 1960s, it has only recently been accepted as a reasonable approach to controlling the symptoms of ADHD and possibly other neurobehavioral disorders (Verlaet, Noriega, Hermans, & Savelkoul, 2014). Verlaet et al. pointed out that children with ADHD also have a high comorbidity of both Th1 and Th2 mediated immune system disorders such as chronic ear infections, eczema and asthma (which often also resolve on removal of food additives and salicylates), and that they often show elevations in pro-inflammatory cytokines leading to chronic brain tissue inflammation and (unsurprisingly) behavioral effects.

 Kern et al. (2017) and Eagle (2014) claimed that sulfate conjugation is important in the metabolism of phenolic food additives and xenobiotic toxins of various kinds. Eagle concentrated on the effect of sulfate inhibition by salicylate-containing food sources, explaining that relief of this effect by removal of many items requiring sulfation is the mechanism by which the Feingold diet helps children with behavioral problems. Eagle also documented that some of the earlier non-supportive double-blind studies of the Feingold diet had been unknowingly using sulfate-inhibiting items as their placebo. Kern et al. discussed the gender effect in which males are more dependent on sulfation while females are more likely to use the alternative metabolic/detoxification pathway called glucuronidation. Without this alternative pathway, Kern et al. postulated, males would be more affected by anything that puts stress on the sulfation system, and this may explain the higher number of males affected by ADHD, autism, etc. This was elucidated via studies using acetaminophen (Tylenol) which can be given in amounts sufficient to saturate the sulfation pathway, depleting it.

 Meanwhile, Avella-Garcia et al. (2016) found that use of Tylenol during pregnancy is not nearly as benign as had been previously believed. Not only are more than 40% of children exposed prenatally, but the more Tylenol consumed during pregnancy, the more likely the child (especially if male) was to have symptoms on the autism spectrum. This did not mean the child would be rigorously diagnosed as autistic or as having ADHD, but that they would show adverse effects in that general direction. If the exposure to Tylenol, in addition to other toxic exposures which require sulfation, continues to increase, more children may reach the level at which they will be diagnosed with these disorders. Avella-Garcia et al. explained that sulfation capacity is normally reduced during pregnancy, and adding a stressor such as Tylenol may lead to deficits which also show up in some autistic children and those under oxidative stress.

 Kern et al. (2017), and Avella-Garcia et al. (2016) agree that sulfate depletion inhibits effective detoxification and makes it harder for rats (and people) to handle neurotoxins, and Kern et al. recommended banning the use of mercury still prevalent at that time in vaccines offered to pregnant women. In the past few years, most American doctors, pharmacies, and supermarkets providing vaccines have changed to the single-dose non-preserved vaccines, (“Thimerosal and Vaccines,” 2018), relegating multi-dose mercury-preserved vaccines mostly to Third World countries. The TDaP vaccine currently given to pregnant women, however, contains the aluminum adjuvant (“Vaccine Excipient Summary,” 2019), which is synergistic not only with fluoride (Strunecka & Strunecky, 2019), but also with glyphosate, the main chemical in the weed killer Roundup (Seneff, Swanson, & Li, 2015). Seneff et al. showed that these chemicals, in addition to stressing sulfation, can damage the pineal gland and other midbrain nuclei, as well as the cytochrome P450 enzyme system needed for metabolizing many medications. They can also cause impairment in gut function and serotonin synthesis, interfering with sleep processes, all of which Seneff et al. wrote is important to the development of autism, ADHD, depression, Parkinson’s disease, and several other neurological disorders. Certainly, pregnancy, with its normally reduced level of sulfation, is a bad time to be giving women these–or any other–extra toxins to handle.

 One problem with giving the flu vaccine to pregnant women is that even should it prevent the flu itself, some of the common side effects of vaccines are pain at the injection site and fever after vaccination, for which Tylenol is still routinely recommended (“Pregnant Women & Influenza,” 2019). As mentioned above, the use of Tylenol lowers sulfation levels, and autism appears to be directly related to how much Tylenol a mother takes during pregnancy (Ji et al., 2018). Thus, besides increasing prenatal exposure to toxins requiring sulfation, the very vaccines marketed to protect pregnant women and their babies may possibly be increasing both mother and baby’s prenatal exposure to Tylenol, suppressing their sulfation level and making it more difficult for both of them to deal with these and other toxins.

 One study on vaccines that has had enormous press coverage is the Hviid, Hansen, Frisch, and Melbye (2019) study on measles and autism in Denmark. It has been widely credited with proving that vaccines do not cause autism. Unfortunately, there are numerous problems with that study, beginning with the fact that all the authors work for the vaccine industry. In addition, hundreds of children with autism were excluded from the data, and an unknown number of children were several years too young for diagnosis at the time the study ended. Moreover, almost all the children in both groups had been vaccinated with all the other Danish vaccines, 95% of them receiving the MMR as well. Thus, the “unvaccinated” group’s members were actually fully vaccinated except they had *not* *yet* received the MMR, moving to the other group as soon as they did receive it. This study proves little about the safety of the MMR, let alone the safety of vaccines in general.

 Earlier, the Center for Disease Control and Prevention (CDC) had posted its own page devoted to convincing parents not to worry about vaccines and autism (“Vaccines Do Not,” 2015). The nine studies currently linked to this page were dated 2003 to 2012, and all were by authors working for the CDC, funded by the CDC, or both. They referred to studies of thimerosal and the MMR vaccine, as well as one study about the number of antigens. There was no mention of studies on injected aluminum safety, injected formaldehyde safety, or any of the various other toxins included in vaccines. There was no discussion of the role played by the common ingredient polysorbate 80 which is known to open the blood brain barrier (Gao, Mei, Huo, & Mao, 2019), nor any discussion about the role of sulfation. The facts and research presented do not support a definitive statement that “vaccines” do not cause autism.

**Critical Analysis – Causes and Effects**

 According to the CDC (“Data and Statistics,” 2019), almost 10% of children have been diagnosed with ADHD, an increase of 30% between 2003 and 2016, and 14% of them also have autism. The CDC said (“What is ADHD?” 2019) that while the causes of ADHD are unknown, studies on twins indicate that genes are important. They also listed a number of environmental risk factors including prenatal and postnatal exposure to the toxins lead, cigarette smoke, and alcohol, as well as premature delivery, low birth weight, and brain injury. This section will discuss some of the less-recognized risk factors for both ADHD and autism.

 One possible but little recognized cause of ADHD appears to be fluoride. Because of its ability to prevent tooth decay, it has long been added to water, toothpaste, mouth rinses, supplements, and even salt and milk in some countries (Bashash et al., 2018). According to Bashash et al., about 75% of fluoride intake in the United States is through drinking water in areas that are fluoridated, while in Mexico City, people get it mostly from fluoridated salt in addition to the naturally-occurring fluoride in their water. Bashash and colleagues reported that it has long been known that fluoride contributes to thyroid hormone insufficiency, and suggested that this may be the method by which it causes ADHD. They reported that the results of their study were consistent with other studies that showed that the level of fluoride intake during pregnancy was correlated with lack of attention, lower working memory and cognitive function, as well as other symptoms of ADHD in the children in Mexico. In the United States, Malin and Till (2015) reported that the level of water fluoridation in each state predicts the prevalence of ADHD in that state, and Riddell, Malin, Flora, McCague, and Till (2019), reported a similar result for Canada, in that the more fluoride found in tap water, the more children in the affected area had ADHD. Strunecka and Strunecky (2019), meanwhile, reported that fluoride is also a risk factor for autism, as it damages mitochondrial function, and causes oxidative stress, inflammation, immune-excitoxicity, and low melatonin levels. They also showed that fluoride and aluminum are synergistic, meaning that the combination can worsen the symptoms of autism at concentrations much lower than either one alone.

 A second possible cause of both ADHD and autism that is not usually considered is injected aluminum. In their Public Health Statement for Aluminum (2015), the CDC described the nervous system as sensitive to aluminum, that motor and nervous system changes have been observed in animals consuming large doses, and that baby animals exposed in the womb were less coordinated and suffered memory problems. The amount approved for use in vaccines was listed as 0.85 mg (850 µg) per dose, certainly lower than the levels normally ingested via food, water, medications, etc., but there was no discussion in this paper of any difference in the fate of the aluminum when it is injected rather than ingested. There was no mention of any concern about multiple vaccines given at the same time, with 0.85 mg of aluminum in each dose, nor about avoiding exposure to fluoride during, prior to, or following vaccination.

 While the CDC’s Public Health Statement for Aluminum (2015) reported a limit of 850 µg of aluminum per vaccine, as mentioned above, Lyons-Weiler and Ricketson (2018) claimed that this limit was based on the amount needed for the vaccine to be effective, but not on safety. They also wrote that as of 2018, aluminum levels in vaccines had never yet been based on safety studies, and that, furthermore, the level set by the World Health Organization was based on errors leading to an overestimate of safe exposure levels. According to Lyons-Weiler and Ricketson, the currently-accepted levels will put infants—expecially low birth weight infants—at risk of over-exposure to aluminum via vaccinations. A new study by McFarland, La Joie, Thomas and Lyons-Weiler (2020), has documented that the CDC vaccine schedule currently provides 15.9 times the recommended safe level of aluminum. At the two-month well-baby checkup, four aluminum-containing vaccines are administered simultaneously, creating the highest bolus of aluminum. In fact, write McFarland and colleagues, the CDC schedule gives the normal-weight baby an elevated (toxic) level of aluminum for more than 70% of his first seven months of life.

 Meanwhile, Crépeaux et al (2015) traced what happens to the aluminum vaccine adjuvant injected into a muscle, and how it progresses to various organs, including the brain. They found that injected aluminum remains for a long time as a granuloma in the muscle that was injected, and may take up to 270 days to get to the lymph nodes and various organs such as the spleen and the brain. The neurological damage it can cause is apparently related to its ability to cause oxidative damage in the brain. In another study, Crépeaux et al.(2017) found that a peculiarity of aluminum is that the lowest dose of aluminum adjuvant tested caused the worst effects, inducing long-term aluminum brain accumulation and neurotoxic effects. They report that the lowest doses contain small bacteria-size agglomerates selectively captured by monocytes, and thereby directly affecting the immune system. In a detailed study of gene expression and cytokines, Li, Tomljenovic, Li, and Shaw (2017) determined that injected aluminum caused brain changes matching those seen in autism. Meanwhile, Mhanna, Eldakroory, Hamid, Toubar, and El-Zalabany (2019), compared the hair levels of aluminum and manganese in normal children and children with ADHD, concluding that aluminum was higher in the hair of children with the inattentive type of ADHD. The effect of early exposure, elevated levels, or both, of aluminum, thus appears likely to be involved in ADHD and/or autism.

 A third possible cause of ADHD and autism not often considered is Tylenol (Andrade, 2016; Avella-Garcia et al., 2016), in particular those doses of Tylenol acquired prenatally or following vaccinations. Although Tylenol may be safe for treating the usual fevers in babies, vaccines and Tylenol appear to not mix well (Saeedan et al., 2017). Saleh, Swamy, Moody, and Walter (2016) did a survey of parents, noting that while Tylenol used to be considered harmless for use before and after vaccinations, it is no longer recommended because of possible “blunting” of the vaccine effect. Nevertheless, they found that the majority of parents were still using it. Meanwhile, Tylenol is routinely recommended to pregnant women as a safe pain reliever during pregnancy (“Pregnant Women & Influenza,” 2019) for aches, pains, fevers, and (increasingly) after the flu and DTaP vaccines recommended during pregnancy. Thus, babies are increasingly exposed to Tylenol before birth. Ji et al. (2018), examined maternal plasma within a few days of birth, and found a dose-response relationship between use of Tylenol around the time of birth and the later development of ADHD symptoms in the child. They explained that Tylenol affects brain function, learning, and cerebellar development. Andrade (2016) wrote that 46% to 65% of babies are exposed to Tylenol before birth, and that it contributes to autism symptoms in children, especially those who are also hyperactive.

 Finally, a fourth possible cause or trigger for ADHD and autism which is not frequently discussed may be a deficit in sulfation (Waring & Klovrza, 2000). Sulfation is basically the metabolic processing of various medications, toxins, and neurotransmitters by a group of enzymes called phenolsulfotransferases (PST, also called SULT1A). Bairam et al (2018) found that abnormal sulfoconjugation of dopamine, serotonin, etc. by the enzyme SULT1A3 may be involved in ADHD, migraine, heart disease, and several neurodegenerative diseases. They related this to genetic polymorphisms in the genes for sulfation. Waring and Klovrza, as well as Eagle (2014) and Verlaet, Noriega, Hermans, and Savelkoul (2014), found that removing certain foods and food additives from the diet, in an approximation of the diet introduced decades earlier by Feingold (1975), improved symptoms in many children with autism, ADHD, or both. Eagle posited that the diet lowered the need for sulfation because it excluded additives, sulfates, and other items known to require sulfation. He also found that salicylate-containing foods, as well as certain other chemicals, actually suppress sulfation, which may be a problem for those at a marginal level. Thus, insufficiency of sulfation (coupled with the usual American diet) may be a factor in the development or worsening of ADHD and/or autism. As Feingold documented, ADHD began to rise in the 1960s, at the same time that many food dyes (xenobiotics that require sulfation) were added to the daily diet. Someone whose (genetically) marginal or even low level of sulfation had never before been a problem, may begin to find symptoms appear as his sulfation ability is stressed by more demand for the enzyme as well as suppression.

 While each of these causes may individually have an effect on the child, they are not exclusive. The same child may be exposed to fluoride, Tylenol, and aluminum, not to mention prenatal exposure to cigarette smoke, glyphosate, mercury, car exhaust, and any number of other toxins that may, or may not, have a measurable effect on his cognitive function and development. The child exposed to all these things may—or may not—suffer from a deficiency in sulfation which may explain why one child is affected by the very things that do not bother another one. Even the baby’s gender is a factor, since males are far more affected by both ADHD and autism than females. The research is replete with clues on how these four individual causes interact with each other, in a manner that will hopefully illuminate future directions for research.

**Problem Resolution**

 As described above, the four causes of ADHD and autism discussed in this paper interact with each other. To review briefly, Avella-Garcia et al. (2016) reported that sulfation (sulfate metabolism) is normally reduced during pregnancy, and that Tylenol (acetaminophen) will reduce it further, because it must be metabolized to acetaminophen sulfate. Meanwhile, the two vaccines promoted by the CDC for all pregnant women—the TDaP and the influenza vaccines—provide the pregnant woman and her unborn baby with a dose of aluminum, as well as a few other toxins such as formaldehyde, which may impact her sulfation status. These vaccines are usually followed by a recommendation to take Tylenol to combat the expected fever or pain (“Get the Whooping Cough,” 2017; “Pregnant Women & Influenza,” 2019). Indeed, Tylenol has been the pain and fever medication of choice during pregnancy for years, in spite of research showing that prenatal exposure is associated with asthma, lower IQ, autism, neurodevelopmental problems, ADHD, and several other developmental problems in the babies (Toda, 2017).

 Although babies are not routinely screened for sulfation levels at birth, mothers exposed to adjuvants or other toxins and Tylenol have babies who seem to be at risk of low sulfation themselves, especially the boys (Kern et al., 2017). Unfortunately, Kern et al. found that male babies have less ability to use glucuronidation, which is an alternative pathway to sulfation and which appears to protect females preferentially, possibly explaining why far more males than females are affected by ADHD (Rowland et al., 2015) and autism (Christensen et al., 2019).

     Meanwhile, Strunecka and Strunecky (2019) found that fluoride and aluminum are synergistic, so that exposure to both can cause damage, including autistic symptoms, at a much lower level than exposure to either one alone.  They stressed that a major focus of autism prevention should be reducing exposure to both fluoride and aluminum.   The effort to reduce exposure to each of these chemicals, obviously, should be made beginning with (or before) conception and through early childhood, at least.

    The aluminum adjuvants contained in many childhood vaccines would be one obvious source of aluminum exposure for infants (“Vaccine Excipient Summary,” 2019), and it has been shown to remain in the body and brain much longer than aluminum ingested orally (Crépeaux et al., 2015).

 Another dangerous source of aluminum for low birth weight or sick babies requiring tube feedings is the food itself. Although there is always some amount of aluminum in food, water, and even breastmilk, most ingested aluminum is excreted harmlessly unless the amount is very high or there is a problem with kidney function (“Public Health Statement,” 2015).   However, Hall, Arnold, Miller, and Zello (2016) measured the aluminum in numerous samples of parenteral feedings, finding that the amount of aluminum consumed by these babies is almost three times higher than the maximum allowable limit, while Levin-Schwartz et al. (2019) reported that low birth weight infants are more susceptible to kidney damage than full term infants, resulting in an even higher build-up of aluminum in these fragile babies. And then, if their formula is prepared using “ordinary” tap water, there is the possibility of fluoride interacting with all this aluminum. If, additionally, the babies are vaccinated with the Hep B vaccine during this time, following the usual newborn schedule, they will receive an injected amount of aluminum, as well.

 A further source of aluminum that should be considered is the use of aluminum drinking cups or bottles. Stahl et al. (2017), for example, found that drinking apple juice or tea from an aluminum bottle may exceed the allowable total weekly intake (TWI) for adults and children.  According to Stahl et al., we began using aluminum drink containers and pots as long ago as the 1890s, but today aluminum is so ubiquitous, that not only do we use aluminum foil for everything, and buy foods in aluminum cans, foil pouches, or foil wraps, but often juices will be stored in aluminum tanks before ever being packaged, resulting in occasional very high aluminum exposures when we have no reason to expect it.  Stahl, Falk, Taschan, Boschek, and Brunn (2018), found that adolescents and adults are also exposed to aluminum in cosmetics, deodorants and pharmaceuticals, besides foods.  Reducing exposure of children to aluminum may be challenging, and would certainly be opposed by the aluminum industry, food packaging industry, and the food industry itself.  Surely, however, levels of aluminum in the food aimed at children could be more critically analyzed and managed, if our regulators can guide the industry to do so.

     Meanwhile, water fluoridation must be reconsidered, remembering that Strunecka and Strunecky (2019) found fluoride to interact with aluminum. Even without reference to autism, the more fluoride a pregnant woman is exposed to, the lower the IQ of her children (Green et al., 2019), and the more likely she herself may be to develop low thyroid function (Peckham, Lowery, & Spencer, 2015) which Modesto et al. (2015) found to be another possible cause of ADHD symptoms in her future children.

 Fluoride could and should be treated as any other medical procedure, to be applied as needed by the dentist, and not swallowed wholesale by the population in their drinking water. The fluoride sellers, however, will undoubtedly object to this suggestion, and are unlikely to go away quietly.

    While one might suggest telling pregnant women to filter their water or buy special non-fluoridated water for drinking (Sun, Zhang, Zue, Niu, & Wang, 2018) or for mixing with formula (Harriehausen, Dosani, Chiquet, Barratt, & Quock, 2019) this would cause financial stress for women who cannot afford it. Beyond that, it is doubtful women would respond happily to an explanation such as, “We are adding fluoride to your water to protect your teeth, but we recommend avoiding it to protect your baby’s brain.”  Parents would also have great difficulty in avoiding any individual vaccines in today’s climate of mandated vaccination.

 Moreover, it is hard to avoid Tylenol in favor of “old fashioned” nonmedical efforts for bringing down a fever or relieving a headache, when pharmacists and doctors claim Tylenol is safe.   A reason given for the flu shot in pregnancy, for example, is to avoid the flu’s fever which can be harmful to the baby (“Pregnant Women & Influenza,” 2019)—so how can we tell the woman not to treat a fever the shot itself lists as a common side effect (“Package Inserts,” 2019)? Do we tell her, “Oops, we forgot to mention that the Tylenol you’ve been taking could give your baby ADHD (Ji et al., 2018) or make him autistic (Andrade, 2016)?” What do we tell the mother to do for her baby suffering pain and fever after a vaccination, now that we know Tylenol may bring on symptoms of autism (Schultz & Gould, 2016)? If we are to stop using Tylenol, we must find something safer.

 In general, educating the end-user (the family) on all this would be inadequate (we have been trying to educate people out of smoking cigarettes and eating cholesterol for decades), so the only other possible solution would be regulatory. Doctors and pharmacists must be told to stop offering Tylenol as a “safe medication” to pregnant women, and this order must come from the CDC or the FDA. The FDA has done it before when they realized blue dye in parenteral feedings was killing patients (Acheson, 2003).

 The CDC, as the vaccine regulator, must rethink the two vaccines being promoted to pregnant women. While these are the first vaccines ever given in pregnancy, they have actually never been tested for safety in pregnancy (“Package Inserts,” 2019). Perhaps there is a better way for women to avoid getting the flu without putting their children at risk of autism? Perhaps the CDC, NIH, or FDA could fund more research on unpatentable bovine colostrum; the few studies on it so far indicate it may be a prevention better than vaccines not only for the flu, but for other respiratory tract infections and diarrhea, as well–and with no downside (Buttar, Bagwe, Sukhwinder, Bhullar, & Kaur, 2017; Esfandiari et al., 2018; Wong, Mallet, Duarte, Matar, & Ritz, 2014). As for the TDaP vaccine, giving the baby immunity to pertussis is billed as the main reason for giving it to pregnant women (“Get the Whooping Cough,” 2017), but the pertussis part of this vaccine is actually a failed vaccine, in that those who have been vaccinated are more likely than others to acquire the disease and pass it on than are those who are not vaccinated (Centers for Disease Control and Prevention, 2013, p.6). The value of giving this vaccine prenatally, with its load of aluminum, should be reconsidered..

 Our regulatory agencies must spearhead all this effort. They must oversee removal of aluminum from tube feedings intended for babies, from juice storage containers, and other controllable sources, and perhaps they could make a better effort at curbing aluminum levels in makeup, deodorants, and other items used by pregnant women and children. The CDC must urgently encourage the pharmaceutical industry to develop safer adjuvants, while rethinking the vaccine schedule to avoid excessive aluminum “loading.” For example, the aluminum-containing vaccine Hepatitis B is given at birth in the United States, followed by two more doses in infancy (“Immunization Schedules,” 2019).  However, except for children of mothers infected with Hepatitis B, this is not a disease babies face until they are much older and involved in unsafe sex or recreational drug use (“Viral Hepatitis,” 2020).  Thus, if mothers are simply tested for Hepatitis B upon the birth of their babies, those at risk can be vaccinated, but most babies are not at risk and can safely wait for years or even decades before receiving this vaccine (Chang & Nguyen, 2017).   Cutting out these three doses (“Immunization Schedules,” 2019) alone would cut the baby’s vaccine-related aluminum by 2,550 µg.   It is relatively certain, unfortunately, that the pharmaceutical companies who profit from the sale of vaccines and who have neither liability for damage nor incentive to improve the safety of their vaccines (Levin, 2015), would probably object to any changes that would cut into the profits from distribution of any of their products.

 Pharmaceutical companies surely could, if required, find a safer vaccine adjuvant and test it for safety before use. On the other hand, the aluminum itself may be less of a problem once fluoride is removed, and the fluoride removal could be done first since, after all, water is just water, and fluoride is not necessary for its use or safety. While decisions to fluoridate local water supplies are usually a local issue, surely national regulatory agencies can step in and (at least) advise because there is an issue of safety involved.

 To sum up, exposure to fluoride and aluminum must be reduced by authorities, beginning with fluoride as the easiest to control, while doctors and pharmacists must be notified to stop recommending Tylenol as a safe medication for pregnant women and for children following vaccination. Reduced sulfation in pregnancy must in the future be considered before mandating otherwise-safe medications and/or vaccines for pregnant women; indeed, reduced sulfation in babies—particularly male babies—must also be considered so that such babies can be identified before blindly submitting them to the usual vaccine schedule and sulfate-reducing Tylenol. This is more than individual families can handle; it must be done by implementing the broad powers of our nation’s agencies to fund appropriate research into testing for sulfation problems in babies to identify those at risk before they are damaged, as well as to actually regulate all the relevant industries.

 This approach will be very difficult to implement given the history of the relationship between the pharmaceutical industry, the food industry, and our government regulators. It often appears that the regulators are actually working for the industries they are supposed to regulate, and indeed it has often been referred to as a “revolving door” between government and industry (Piller, 2018), in which key leaders of the CDC, FDA, NIH and other national health-related organizations are rewarded with high-salary positions in industry when they do as told.

 It may appear impossible, but we really cannot afford to just give up. Perhaps it is time to make it illegal (as in jail time, not a fine) for anyone in government to accept money, favors, or job offers from industry? As forecasted by economists Leigh and Du (2015), the financial

burden of caring for our increasing population of people with autism will be as high as $1,011 billion by the year 2025, which is only five years away, far exceeding the forecasted costs of diabetes and ADHD. If we go along as we have been, they forecast a $510 billion shortfall by 2025, with the suggestion we are heading down a path from which we may not be able to return.

**Conclusion**

 Most of the time, children get vaccines without any particular problem, but in some cases exposure to a vaccine can change their lives forever. Especially now, as more and more vaccines are being introduced and mandated, it is urgent to identify in advance which children will be vulnerable to this sort of damage—as well as which other environmental neurotoxins may be specifically involved—so that these children can be protected while we look for safer vaccine adjuvants for all children. This is an area requiring more specific research, including an effort to measure sulfation without using the old drug saturation technique, (Waring & Klovrza, 2000) to determine a “safe” level for both mother and child, and an effort to avoid suppressing and stressing the sulfation levels of pregnant women and their infants.

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