T R A C E S

THE DANGERS OF MERCURY IN VACCINES

UNEP/INC4 SPECIAL EDITION

Global Legally Binding Instrument on Mercury Treaty

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Prologue

The use of mercury in vaccines has been a disaster causing untold harm to children of this country, ranging from speechless autism to severe attention deficit disorder. Because the testosterone in boys and young men greatly enhances the toxicity of mercury while the estrogen in girls and young women is slightly protective of autism, boys more and more are having trouble competing academically with girls. The media, the Centers for Disease Control and the FDA turn a blind eye to this dilemma, pretending that mercury silver fillings are safe, as is the mercury in vaccines. While the U.S. claims to have taken all the mercury out of vaccines other than the flu vaccine, the CDC in some years has recommended as many as four flu doses for children under the age of six, pregnant women, and people over the age of 65.

While you can claim that these people are the most vulnerable population to the flu they are also the most vulnerable population to mercury. What the authorities and the news media in the U.S. have ignored for years is that mercury is a cumulative poison in all forms and whether it causes a particular individual minor problems or major problems depends on their ability to excrete mercury, which is highly variable.

The mercury in vaccines is in the form of Thimerosal which degrades into ethyl-mercury compounds, more toxic than the methyl-mercury compounds in fish. Sadly, mercury in Thimerosal is a poor preservative and much less effective than 2-PE. Mercury in this form is 300-plus times more toxic to your brain cells than it is to the bacteria it is designed to prevent in the vaccine. In contrast, 2-PE has little toxicity to brain cells and is highly toxic to bacteria. Proponents of mercury in vaccines claim that there is no viable alternative, but in doing so they ignore the safety and effectiveness of 2-PE.

I am so thrilled that Chile has leaded the western hemisphere in getting mercury out of vaccines, which will be a great benefit not only to the younger population but also to the older population. This is because, as I've already stated, mercury is cumulative, and there are about thirty peer reviewed studies that indicate mercury probably play a major role in the development of Alzheimer's disease. I applaud all the other people in Chile who led this effort and brought about a vaccine-free program in your country.

Robert E. Reeves, Attorney at Law, Environmental Law, Mercury, Amalgams and Vaccines.

Introduction

Ending Avoidable Mercury Poisoning

In the 1920s, an Eli Lilly and Company (Lilly) chemist generated and characterized a number of organic mercury compounds. Of those compounds tested, sodium ethylmercurithiosalicylate, originally trade-named Merthiolate by Lilly, was the second most toxic, the most water soluble, and, in aqueous (water-based) solutions, it became more toxic the longer those solutions were allowed to stand.

In attempting to expand their market, in the mid-1930s, Lilly, a drug and drug component maker, provided some Merthiolate to Pittman-Moore, a manufacturer of animal serums (vaccines). After performing some experiments, on July 22, 1935, the Pitman-Moore Company wrote a letter to Lilly that reported:

> "In other words, Merthiolate [also known as Thimerosal, Thiomersal and, in Latin America, Timerosal and Tiomersal] is unsatisfactory as preservative for serum intended for use on dogs...we have tested Merthiolate on humans and find that it gave a more marked...reaction than does phenol or tricresol."

Yet, though no safe:

,human exposure level has ever been established for injecting Thimerosal into developing children or, for that matter, adult humans, the World Health Organization, public health officials and the vaccine makers have resisted stopping all use of Thimerosal in vaccines.

Recently, the people of Chile were awakened to the toxicity of Thimerosal, a chemical found to be unfit for use as a preservative in serums given to dogs in 1935, which is found in some of their children's vaccines, and have demanded its removal from those vaccines.

Hopefully, those who answer to the people have truly heard the people's voice and are now quickly moving to ban all use of Thimerosal in the manufacture of any vaccine given to pregnant mothers or developing children.

To be safe for use in vaccines, scientists must establish a level for injected Thimerosal, at which there is no observed adverse effect in long-term chronic exposure testing in animals, including primates, which are known to track the toxicity of Thimerosal in humans, and then scale that level to human values by the standard relative toxicity and population-segment sensitivity factors. The general term that toxicologists use for this "safe level of exposure is "NOAEL", the "no observed adverse effect level", which for injected Thimerosal in vaccines given to children would be NOAEL for injected Thimerosal in the developing human. To date, no such NOAEL values have been published in any peer-reviewed reference source for injected Thimerosal even though the use of Thimerosal as an over-the-counter topical antiseptic was banned in the USA by the US Food and Drug Administration in 1998 — on the grounds that such uses were neither safe nor effective."

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Autism, A Novel Form of Mercury Poisoning,S.Bernard et al-2000

(www.safeminds.org)

Table 1 Summary comparison of traits of autism and mercury poisoning (**Autism Spectrum Disorders = ASD references in bold**; Mercury Poisoning= HgP References in italics)

Psychiatric disturbances

- Social deficits, shyness, social withdrawal (**1,2,130,131**; *21,31,45,53,132*)
- Repetitive, perseverative, stereotypic behaviors; obsessive-compulsive tendencies (**1,2,43,48,133**; *20,33–35,132*)
- Depression/depressive traits, mood swings, flat affect; impaired face recognition (**14,15,17,103,134,135**; *19,21,24,26,31*)
- Anxiety; schizoid tendencies; irrational fears (**2,15,16**; *21,27,29,31*)
- Irritability, aggression, temper tantrums (**12,13,43**; *18,21,22,25*)
- Lacks eye contact; impaired visual fixation (HgP)/problems in joint attention (ASD) (**3,36,136,137**; *18,19,34*)

Speech and language deficits

- Loss of speech, delayed language, failure to develop speech (**1–3,138,139**; *11,23,24,27,30,37*)
- Dysarthria; articulation problems (**3**; *21,25,27,39*)
- Speech comprehension deficits (**3,4,140**; *9,25,34,38*)
- Verbalizing and word retrieval problems (HgP); echolalia, word use and pragmatic errors (ASD) (**1,3,36**; *21,27,70*)

Sensory abnormalities

- Abnormal sensation in mouth and extremities (**2,49**; *25,28,34,39*)
- Sound sensitivity; mild to profound hearing loss (**2,47,48**; *19,23–25,39,40*)
- Abnormal touch sensations; touch aversion (**2,49**; *23,24,45,53*)
- Over-sensitivity to light; blurred vision (**2,50,51**; *18,23,31,34,45*)

Motor disorders

- Flapping, myoclonal jerks, choreiform movements, circling, rocking, toe walking, unusual postures (**2,3,43,44**; *11,19,27,30,31,34,39*)
- Deficits in eye-hand coordination; limb apraxia; intention tremors (HgP)/problems with intentional movement or imitation (ASD) (**2,3,36,181**; *25,29,32,38,70,87*)
- Abnormal gait and posture, clumsiness and incoordination; difficulties sitting, lying, crawling, and walking; problem on one side of body (**4,41,42,123**; *18,25,31,34,39,45*)

Cognitive impairments

- Borderline intelligence, mental retardation – some cases reversible (**2,3,151,152**; *19,25,31,39,70*)
- Poor concentration, attention, response inhibition (HgP)/shifting attention (ASD) (**4,36,153**; *21,25,31,38,141*)
- Uneven performance on IQ subtests; verbal IQ higher than performance IQ (**3,4,36**; *31,38*)
- Poor short term, verbal, and auditory memory (**36,140**; *21,29,31,35,38,87,141*)
- Poor visual and perceptual motor skills; impairment in simple reaction time (HgP)/lower performance on timed tests (ASD) (**4,140,181**; *21,29,142*)
- Deficits in understanding abstract ideas & symbolism; degeneration of higher mental powers (HgP)/sequencing, planning & organizing (ASD); difficulty carrying out complex commands (**3,4,36,153**; *9,18,37,57,142*)

Unusual behaviors

- Self injurious behavior, e.g. head banging (**3,154**; *11,18,53*)
- ADHD traits (**2,36,155**; *35,70*)
- Agitation, unprovoked crying, grimacing, staring spells (**3,154**; *11,23,37,88*)
- Sleep difficulties (**2,156,157**; *11,22,31*)

Physical disturbances

- Hyper- or hypotonia; abnormal reflexes; decreased muscle strength, especially upper body; incontinence; problems chewing, swallowing (**3,42,145,181**; *19,27,31,32,39*)
- Rashes, dermatitis, eczema, itching (**107,146**; *22,26,143*)
- Diarrhea; abdominal pain/discomfort, constipation, "colitis" (**107,147–149**; *18,23,26,27,31,32*)
- Anorexia; nausea (HgP)/vomiting (ASD); poor appetite (HgP)/restricted diet (ASD) (**2,123**; *18,22*)
- Lesions of ileum and colon; increased gut permeability (**147,150**; *57,144*)

Table 2 Summary comparison of biological abnormalities in autism and mercury exposure

Mercury exposure	**Autism**
Biochemistry	**Biochemistry**
Binds -SH groups; blocks sulfate transporter in intestines, kidneys (40,93)	Low sulfate levels (91,92)
Reduces glutathione availability; inhibits enzymes of glutathione metabolism; glutathione needed in neurons, cells, and liver to detoxify heavy metals; reduces glutathione peroxidase and reductase (97,100,161,162)	Low levels of glutathione; decreased ability of liver to detoxify xenobiotics; abnormal glutathione peroxidase activity in erythrocytes (91,94,95)
Disrupts purine and pyrimidine metabolism (10,97,158,159)	Purine and pyrimidine metabolism errors lead to autistic features (2,101,102)
Disrupts mitochondrial activities, especially in brain (160,163,164)	Mitochondrial dysfunction, especially in brain (76,172)
Immune system	**Immune system**
Sensitive individuals more likely to have allergies, asthma, autoimmune-like symptoms, especially rheumatoid-like ones (8,11,18,24,28,31,111,113)	More likely to have allergies and asthma; familial presence of autoimmune diseases, especially rheumatoid arthritis; IgA deficiencies (103,106–109,115)
Can produce an immune response in CNS; causes brain/MBP autoantibodies (18,111,165)	On-going immune response in CNS; brain/MBPautoantibodies present (104,105,109,110)
Causes overproduction of Th2 subset; kills/inhibits lymphocytes, T-cells, and monocytes; decreases NK T-cell activity; induces or suppresses IFNg & IL-2 (100,112,117–120,166)	Skewed immune-cell subset in the Th2 direction; decreased responses to T-cell mitogens; reduced NK T-cell function; increased IFNg & IL-12 (103,108,114–116,173,174)
CNS structure	**CNS structure**
Selectively targets brain areas unable to detoxify or reduce Hg-induced oxidative stress (40,56,161)	Specific areas of brain pathology; many functions spared (36)
Accummulates in amygdala, hippocampus, basal ganglia, cerebral cortex; damages Purkinje and granule cells in cerebellum; brain stem defects in some cases (10,34,40,70–73)	Pathology in amygdala, hippocampus, basal ganglia, cerebral cortex; damage to Purkinje and granule cells in cerebellum; brain stem defects in some cases (36,60–69)
Causes abnormal neuronal cytoarchitecture; disrupts neuronal migration, microtubules, and cell division; reduces NCAMs (10,28,57–59,161)	Neuronal disorganization; increased neuronal cell replication, increased glial cells; depressed expression of NCAMs (4,54,55)
Progressive microcephaly (24)	Progressive microcephaly and macrocephaly (175)

Neuro-chemistry	**Neuro-chemistry**
Prevents presynaptic serotonin release and inhibits serotonin transport; causes calcium disruptions (78,79,163,167,168)	Decreased serotonin synthesis in children; abnormal calcium metabolism (76,77,103,179)
Alters dopamine systems; peroxidine deficiency in rats resembles mercurialism in humans (8,80)	Either high or low dopamine levels; positive response to peroxidine, which lowers dopamine levels (2,177,178)
Elevates epinephrine and norepinephrine levels by blocking enzyme that degrades epinephrine (81,160)	Elevated norepinephrine and epinephrine (2)
Elevates glutamate (21,171)	Elevated glutamate and asparate (82,176)
Leads to cortical acetylcholine deficiency; increases muscarinic receptor density in hippocampus and cerebellum (57,170)	Cortical acetylcholine deficiency; reduced muscarinic receptor binding in hippocampus (83)
Causes demyelinating neuropathy (22,169)	Demyelination in brain (105)
Neurophysiology	**Neurophysiology**
Causes abnormal EEGs, epileptiform activity, variable patterns, e.g., subtle, low amplitude seizure activities (27,31,34,86–89)	Abnormal EEGs, epileptiform activity, variable patterns, including subtle, low amplitude seizure activities (2,4,84,85)
Causes abnormal vestibular nystagmus responses; loss of sense of position in space (9,19,34,70)	Abnormal vestibular nystagmus responses; loss of sense of position in space (27,180)
Results in autonomic disturbance: excessive sweating, poor circulation, elevated heart rate (11,18,31,45)	Autonomic disturbance: unusual sweating, poor circulation, elevated heart rate (17,180)

Conclusion

Mercury's chemical properties, even before reaching the scientific knowledge we now posses, fascinated those who came to master its technology and uses. Since very early it was granted magical powers, which served as a base for its use in the search for a cure for many different illnesses by the medical establishment. Therefore, its related toxicology with occupational activities, such as its medicinal use, is mentioned in chronicles and medical summaries.

In the XIX century the aphorism "A night with Venus, a lifetime with Mercury" was already known, meaning the bohemian nights and the syphilis treatment. In the XX century the Thimerosal synthesis allowed a great use of this organic line of mercurials as biocide, both in agriculture and medicine.

As a consequence, just like in the past, we suffered the unfortunate events of Iraq and acrodynia, (pink disease), which would appear in many countries. From these unfortunate accidents, starting in the 1970s, surfaced the need to prohibit organic mercurials in agriculture. Despite this decision, it use in vaccines continued.

Due to the necessity of applying vaccines at a large scale, Thimerosal (at doses of 0,01%) continues to be used in children vaccines. However, when the number of children vaccines was still small, many countries, discretely, never allowed it use or, if they did, only by short periods of time.

Without a doubt pediatricians are responsible for preventing illnesses through vaccines and support vaccine campaigns proposed by the public health officials. Nonetheless, the selection of the product (type of vaccine) is the result of information and clinical observation that best serves their patients. Due to the responsibility of the preventive use of vaccines, pediatricians and other health professionals can gather information to advise parents about the need to vaccinate and can, also, develop competencies to recognize the mitigating circumstances for neurological damages that low toxic metal doses (isolated or in combination) might affect the most sensible segments of the children population.

The work contained in this book offers families, and health professionals (pediatricians, medical establishment, pharmacologists, toxicologist, etc.) the scientific basis for an up-to-date debate about the political and operational decisions in the selection and implementation of immune-profilactics for children's use, among them, vaccines with or without Thimerosal.

At the end of this summary you will be able to find the charts from our study entitled Integrating Experimental (in vitro and in vivo) Neurotoxicity Studies of Low-Dose Thimerosal Relevant to Vaccines", published in 2010, that documents the results of human cells exposed to Thimerosal at nano molar doses (more than 200 times smaller than the doses contained in vaccines), and the results of Thimerosal injections in animal models at vaccine doses.

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Table 1 Summary of toxicity studies of low-dose thimerosal (or ethylmercury) and aluminum in human and animal cultured-neural-cells.

Reference	Species	Cell type	Compound	Dose	Measured outcomes
Geier et al.(2010)	Human	Neuroblastoma (SH-SY-5Y)	Thimerosal compared to other vaccine preservatives	1μM–10μM	Relative toxicity: phenol < 2-phenoxyethanol < benzethonium chloride < Thimerosal
Geier et al.(2009)	Human	Neuroblastoma (SH-SY-5Y), astrocytoma (1321N1); fetal (nontransformed) model systems	Thimerosal	10nM–10μM	Time-dependent mitochondrial damage; reduced oxidative-reduction activity; cellular degeneration; and cell death.
James et al. (2009)	Human	Lymphoblastoid derived from children with autism	Thimerosal	0.156μM - 2.5μM	Decreased the reduced glutathione/oxidized disulfide glutathione ratio and increased free radical generation in autism compared to control Cells.
Herdman et al. (2006)	Human	Neuroblastoma SK-N-SH line	Thimerosal, compared to thiosalicylate	0–2.5μM	Neurotoxicity occurs through the JNK-signaling pathway, independent of cJun activation, leading to apoptotic cell death.
Parran et al. (2005)	Human	Neuroblastoma (SH-SY5Y)	Thimerosal	1nM–10μM	Alter nerve growth factor signal transduction; causes cell death and elevated levels of fragmented DNA.
Yel et al. (2005)	Human	Neuroblastoma, CRL-2268	Thimerosal	0.025-5.0 μM	Neuronal cell death through the mitochondrial pathway (depolarization of mitochondria, generation of reactive oxygen species, release of cytochrome c and apoptosis-inducing factor).
James et al. (2005)	Human	Neuroblastoma (SH-SY5Y CRL 2266) and glioblastoma (CRL 2020)	Thimerosal	15 μM	<50% decrease in intracellular glutathione levels in the glioblastoma cells but more than 8-fold-decrease in the neuroblastoma cells.
Humphrey et al. (2005)	Human	Neuroblastoma, SK-N-SH line	Thimerosal	5 μM	Deleterious effects on the cytoarchitecture leading to mitochondrial-mediated apoptosis and oncosis/necrosis
Waly et al. (2004)	Human	SH-SY5Y neuroblastoma	Thimerosal	1 nM	Inhibition of both IGF-1- and dopamine-stimulated methylation with an IC50 of 1 nM and eliminated methylating activity.
Toimela and Tahti (2004)	Human	SH-SY5Y neuroblastoma, U 373MG glioblastoma,	Aluminum	0.01–1,000 μM	Al was effective in inducing apoptosis of glioblastoma.
Baskin et al. (2003)	Human	Cortical neurons	Thimerosal	1μM-250 μM	Changes in cell membrane permeability; induction of DNA breaks; apoptosis.

Lawton et al. (2007)	Mouse and rat	Respectively N2a neuroblastoma and C6 glioma cells	Thimerosal	1 µM	Inhibition of neurite process outgrowth in differentiating N2a and C6 cells.
Ueha-Ishibashi et al. (2004)	Rats	Cerebellar neurons	Thimerosal compared to Methyl mercury	0.3-10µM	Increased the intracellular concentration of Ca2+ ([Ca2+]i); the potency of 10µM thimerosal < methylmercury in decreasing the cellular content of glutathione in a concentration-dependent manner.
Jin et al. (2004)	Rats	Cultured sensory neurons	Thimerosal	0.3-300 µM	Altered cellular function by decreasing transient receptor potential V1 activity through oxidation of extracellular sulfhydryl residues.
Song et al. (2000)	Rats	Dorsal root ganglion	Thimerosal,	100 µM	Inhibition of sodium channels in sensory neurons
Chanez et al. (1989)	Rats	Brain homogenate, synaptosomes and myelin	Thimerosal compared to mercury cholride	50 µM	The toxicity, in terms of inhibition of Na+K+ATPase activity was greater with mercuric chloride than with thimerosal. In myelin fraction added serotonin increased inhibition caused by thimerosal.
Minami et al. (2009)	Mice	Cerebellum microglia C8-B4 cells, neuroblastoma, rat glioma cells	Thimerosal, ethylmercuric, Thiosalicylic acid	2.5µM of solutions	Increased expression of MT-1 mRNA in mouse neuroblastoma after incubation with thimerosal; decreased MT-1 mRNA in C8-B4 cells after thiosalicylate addition; ethylmercury induced MT-1 mRNA expression.
Rush et al. (2009)	Mice	Primary cortical cultures (neuronal and glial cells)	Thimerosal and MeHg	0.1-5µM	MeHg and thimerosal produced similar toxicity profiles, both causing approximately 40% neuronal death at 5 µM

Table 2 Animal studies of neurotoxic preservative-thimerosal and adjuvant-Al at doses relevant to vaccines.

Reference	Species	Postnatal age	Dose of metal	Test	Measured effects
Blair et al. (1975)*	Squirrel monkeys	Adult	Thimerosal: 2.2 - 12.0µg/d intranasally for 6 months	Clinical signs, tissue Hg concentrations	Only the high dose had significantly higher levels in brain compared to controls, but no clinical signs of toxicity.
Burbacher et al. (2005)	Monkeys	Infant birth and 1, 2, and 3 weeks.	Thimerosal containing vaccines: 20µgHg/kg	Brain distribution of total and inorganic mercury.	A higher percentage of the total Hg in the brain was in the form of inorganic Hg for the thimerosal-exposed monkeys (34% vs. 7%)
Hewitson et al. (2010a)	Rhesus macaque	Infants	USA vaccine schedule (1994-1999)	Volumetric analyses	Maturational changes over time in amygdale volume was different in exposed animals.
Hewitson et al. (2010b)	Rhesus macaque	Infants	Hepatitis B vaccine at birth	Acquisition of neonatal reflexes and sensory motor skills	Exposed animals showed a significant delay in the acquisition of three survival reflexes: root, snout and suck, compared with unexposed animals.
Gassett et al. (1975)*	Rabbits; rats	Pregnant; pregnant	Thimerosal tagged with radioactive mercury	Autoradiography of different tissues	Thimerosal was found to cross the blood-brain and placenta barriers; accumulation of mercury was noted by histopathological and histochemical studies.
Olczak et al. (2009)	Suckling Wistar and Lewis rats	7, 9, 11 and 15 days	Thimerosal 12 - 3000 µg Hg/kg (Wistar) 54 - 1080 µg Hg/kg (Lewis)	Pain sensitivity using the hot plate test and tissue Hg accumulation.	Impairs sensitivity to pain, apparently due to activation the endogenous opioid system. Hg from thimerosal accumulates in the rat brain in significant amounts. Wistar rats were more sensitive to this effect than Lewis rats.
Olczak et al. (2010)	Suckling Wistar rats	7, 9, 11 and 15 days	Thimerosal 12 - 3000 µg Hg/kg	Analysis of brain regions rich in opioid receptors	A dose dependent increase in Mµ-opioid-receptor densities in the periaqueductal gray and caudate putamen, but a decrease in the dentate gyrus, with the presence of degenerating neurons and loss of synaptic vesicle marker (synaptophysin)
Orct et al. (2006)	Suckling rats	7, 9 and 11days	Thimerosal 0.81 µMHg/kg	Tissue Hg concentrations	Brain and blood concentrations of mercury were higher in the thiomersal exposed compared to inorganic Hg group.

Minami et al. (2010)	Mouse	42 weeks	Thimerosal 12 µg/kg	MT-1 mRNA expression.	MT-1 and MT-3 mRNAs but not MT-2 mRNA are expressed in the cerebellum rather than in the cerebrum.
Minami et al. (2007)	Mouse	35 weeks	Thimerosal 60 µgHg/kg.	Hg contents in the cerebrum.	Increased tissue-Hg after damage to the blood-brain-barrier.
Hornig et al. (2004)	Mice (SJL/J)	7, 9, 11 and 15 days	Thimerosal 5.6 -14.2 µgEtHg/kg.	Autoimmune propensity to influence neurobehavioral outcomes.	Growth delay; reduced locomotion; exaggerated response to novelty; and densely packed, hyperchromic hippocampal neurons with altered glutamate receptors and transporters.
Berman et al. (2008)	Mice (SJL/J)	7, 9, 11, and 15 days	Thimerosal 5.6 -14.2 µgHg/kg.	Behavioral tests selected to assess domains relevant to core deficits.	The majority of behaviors were unaffected by thimerosal injection; female mice showed increased time in the margin of an open field at 4 weeks of age.
Petrik et al. (2007)	Mice	3 months	Aluminum hydroxide (30–34 µg/kg), commercial squalene.	Behavioral testing and motor deficits.	Al treated group expressed a progressive decrease in strength measured by the wire-mesh hang test (final deficit at 24 wk; about 50%).
Shaw and Petrik (2009)	Mice	3 months	Aluminum: 30–34 µg/kg.	Motor and cognitive behaviors.	Aluminum-treated mice showed significantly increased apoptosis of motor neurons and increases in reactive astrocytes and microglial proliferation within the spinal cord and cortex.
Hunter et al. (2010)	Neuroglin-deficient C. elegans	Young adults	Thimerosal 91nM in incubating plates.	Sensory processing and oxidative stress.	Hypersensitive to oxidative stress and heavy metal toxicity.

* Thimerosal modeled intranasal and intraocular medication, not vaccines.

EVIDENCE 101

	List of studies against mercury and its relationship with neurodevelopmental disorders especially in children:		
	Title	**Year**	**Authors**
1	Iatrogenic exposure to mercury after hepatitis B vaccination in preterm infants.	2000	G.Stajich et al
2	Autism: A novel form of mercury poisoning.	2000	S.Bernard et al
3	Mechanism underlaying children's susceptibility to environmental toxicants.	2000	E.Faustman et al
4	The three modern faces of mercury.	2002	Thomas Clarkson
5	The Neuro-pathogenesis of mercury toxicity.	2002	M.Ashner& S.Walker
6	Elevated Blood Mercury and Neuro-Otological observations in children of equatorial gold mines.	2002	S.Allen Counter et al
7	Neurodevelopmental disorders after thimerosal containing vaccines: A brief communication.	2002	D.Geier and M.Geier
8	Thimerosal induces programmed cell death of neuronal cells via changes in the mitochondrial environment.	2003	Lorrel Brown
9	Thimerosal and Autism? A plausible hypothesis that should not be dismissed	2003	M.Blaxill et al
10	An 11 - months-old boy with psychomotor regression and auto-aggressive behavior	2003	C.Chrysochoou et al
11	A case -control Study of Mercury Burden in Children with Autistic Spectrum Disorders	2003	J.Bradstreet et al
12	Reduced Levels of mercury in first baby haircuts of autistic children.	2003	A.Holmes et al
13	Activation of methionine synthase by insuline-like growth factor-1 and dopamine: a target for neurodevelopmental toxins and thimerosal.	2004	M.Waly et al
14	Neurodevelopmental disorders following thimerosal containing childhood immunization: a follow-up analysis.	2004	D.Geier& M.Geier
15	Neuro-toxic effects of postnatal thimerosal are mouse strain dependent.	2004	M.Hornig et al
16	A comparative evaluation of the effects of MMR immunization and mercury doses from thimerosal containing childhood vaccines on the population prevalence of autism.	2004	D.Geier& M.Geier
17	Mercury Exposure in protein A immune adsorption.	2004	L.Kramer et al
18	Mercury and Autism: Accelerating evidence?	2005	J.Mutter et al
19	Comparison of Blood and Brain Mercury levels in infant monkeys exposed to methyl mercury or vaccines containing thimerosal.	2005	T.Burbacher et al

20	Mitochondrial mediated thimerosal-induced apoptosis in a human neuroblastoma cell line (SK-N-SH).	2005	M.Humphey et al
21	Low dose mercury toxicity and human health.	2005	F.Zahir et al
22	Mercury Toxicity: Genetic susceptibility and synergistic effects.	2005	B.Haley
23	Toxic trace elements in the hair of children with autism.	2005	A.Fido & S. Al-Saad
24	A prospective study of thimerosal-containing Rho (D)-immune globulin administration as a risk factor for autistic disorders.	2006	D.Geier& M.Geier
25	An assessment of downward trends in neurodevelopmental disorders in the US following the removal of thimerosal from childhood vaccines.	2006	D.Geier& M.Geier
26	Cultured lymphocytes from autistic children and non-autistic siblings up-regulate heat shock protein RNA in response to thimerosal challenge.	2006	S.Walker et al
27	Early downward trends in neurodevelopmental disorders following removal of thimerosal-containing vaccines.	2006	D.Geier& M.Geier
28	Thimerosal and children's neurodevelopmental disorders.	2006	L.Maya& F.Luna
29	A meta-analysis epidemiological assessment of neurodevelopmental disorder following vaccines from 1994 through 2000 in the United States.	2006	D.Geier& M.Geier
30	Neurocognitive screening of mercury-exposed children of Andean gold miners.	2006	S.Allen Counter et al
31	Porphyrinuria in childhood autistic disorder: Implications for environmental toxicity.	2006	R.Nataf et al
32	A prospective assessment of porphyrins in autistic disorders: A potential marker for heavy metal exposure.	2006	D.Geier& M.Geier
33	Environmental mercury release, special education rates and autism disorders: an ecological study of Texas.	2006	R. Palmer et al
34	Mercury, Lead, and Zinc in baby teeth of children with autism versus control.	2006	J.Adams et al
35	Autism Spectrum Disorders in Relation to Distribution of Hazardous Air Pollutants in the San Francisco.	2006	G.C.Windham et al
36	Thimerosal induces apoptosis in Neublastoma Model via the cJun N-Terminal Kinase Pathway.	2006	M.Herdman et al
37	A case series of children with apparent mercury toxic encephalopaties manifesting with clinical symptoms of regressive autism.	2007	D.Geier& M.Geier
38	A prospective study of mercury toxicity biomarkers in autistic spectrum disorders.	2007	D.Geier& M.Geier

39	Principal components analysis and discrimination of variables associated with pre-and post-natal exposure to mercury.	2007	R.Marques et al
40	Effects of lipopolysaccharide and chelator on mercury content in the cerebrum of thimerosal administered mice.	2007	T.Minami et al
41	Neuro toxic effects of thimerosal at vaccines doses on the encephalon and development in 7 days –old hamster.	2007	J.Laurente et al
42	A review of Thimerosal (Merthiolate) and its ethylmercury breakdown product: Specific historical considerations regarding safety and effectiveness.	2007	D.Geier et al
43	Blood Levels of Mercury are Related to Diagnosis of Autism: A Reanalysis of an Important Data	2007	M.De Soto et al
44	Mercury en first-cut baby hair of children with Autism versus typically - developing children	2007	J.Adams et al
45	A comprehensive review of mercury provoked autism	2008	D.Geier et al
46	Mercury Levels in newborns and infants after receipt of Thimerosal-containing vaccines	2008	M.Pichichero et al
47	Thimerosal exposure in infants and neurodevelopmental disorders: An assessment of computerized medical records in the VSD.	2008	H.Young et al
48	Kawasaki’s Disease, Acrodynia and Mercury.	2008	J.Mutter and D.Yeter
49	Oxidative Stress in Autism: Elevated Cerebellar 3-nitrotyrosine Levels.	2008	M.Sajdel-Sulkowska et al
50	Hepatitis B triple series vaccine and developmental disability in US children aged 1-9 years.	2008	C.Gallagher & M.Goodman
51	An epidemiological analysis of the" autism as mercury poisoning" hypothesis.	2008	D.Austin
52	Biomarkers of environmental toxicity and susceptibility in autism.	2008	D.Geier et al
53	Delayed acquisition of neonatal reflexes in newborn primates receiving a thimerosal containing hepatitis B vaccine: Influence of gestational age and birth weight.	2009	L.Hewitson et al
54	Identification and distribution of mercury species in rat tissues following the administration of thimerosal or methyl mercury.	2009	J.Rodrigues et al
55	Induction of metallothionein in mouse cerebellum and cerebrum with low-dose thimerosal injection.	2009	T.Minami et al

56	Mercury Levels in premature at low birth weight newborn infants after receipt of thimerosal containing vaccines.	2009	M.Pichichero et al
57	Pre natal and post natal mercury exposure, breastfeeding and neurodevelopment during the first 5 years.	2009	R.Marques et al
58	A prospective study of prenatal mercury exposure from maternal dental amalgams and autism severity.	2009	D.Geier et al
59	Neonatal administration of a vaccine preservative, thimerosal produces lasting impairments of nociception and apparent activation of opioid systems in rats.	2009	M.Olczak et al
60	Hair mercury measurements in Egyptian autistic children.	2009	F. El-Baz et al
61	Mercury exposure, nutritional deficiencies and metabolic disruptions may affect learning in children.	2009	R.Dufault et al
62	Cellular and mitochondrial glutathione redox imbalance in lymphoblastoid cells derived from Children with autism.	2009	J.James et al
63	The Plasma zinc/serum copper ratio as a biomarker in children with autism spectrum disorders.	2009	S.Faber et al
64	A Prospective blinded evaluation of urinary porphyrins verses the Clinical severity of autism.	2009	D.Geier et al
65	The severity of autism is associated with toxic metal body burden and red blood cell glutathione levels.	2009	J.Adams et al
66	Mitochondrial dysfunction, impaired oxidative-reduction activity, degeneration, and death in human neuronal and fetal cells induced by low level exposure to thimerosal and other metal compounds.	2009	D.Geier et al
67	A prospective study of oxidative stress biomarkers in autistic disorders	2009	D.Geier et al
68	Analysis of autism prevalence and neurotoxins using combinatorial fusion and association rule mining.	2009	C.Schweikert et al
69	Mercury and Autism: A Review	2010	Jie Zhang & J. Wheeler
70	Age-dependent lower or higher levels of hair mercury in autistic children than healthy controls.	2010	M.Majewska et al
71	A biomarker of mercury body-burden correlated with diagnostic domain specific symptoms of Autism Spectrum Disorders.	2010	J.Kern et al

72	The effects of thimerosal on the Central Nervous System of the pond snail *Lymnaea stagnalis.*	2010	E.Paradis et al
73	Toxicity Biomarkers in Autism Spectrum Disorders: A blinded study of Urinary Porphyrins.	2010	J.Kern et al
74	Level of trace amounts elements (copper, zinc, magnesium and selenium) and toxic elements (Lead and Mercury) in the hair and nails of children with autism.	2010	M.Damodaran et al
75	Indetermingled modulatory and neurotoxic effects of Thimerosal and mercuric ions on electrophysiological responses to Gaba and NMDA hippocampal neurons.	2010	P.Wyrembek et al
76	Neuroligin-deficient mutants of C.elegants have sensory processing deficits and hypersensitive to oxidative stress and mercury toxicity.	2010	J.Hunter et al
77	Influence of pediatric vaccines on amygdale growth and opioid ligand binding in rhesus macaque infants: A pilot study.	2010	L.Hewitson et al
78	Sorting out the spinning of autism: heavy metals and the question of incidence.	2010	M. Desoto & R. Hitlan
79	Study of some biomarkers in hair of children with autism.	2010	E.Elsheshtawy et al
80	The relative toxicity of compounds used as preservatives in vaccines and biologics.	2010	D.Geier et al
81	Lasting neuropathological changes in rat brain after intermittent neonatal administration of thimerosal.	2010	M.Olczak et al
82	The biological basis of autism spectrum disorders: Understanding causation and treatment by clinical geneticist.	2010	D.Geier et al
83	Blood mercury levels in Autism Spectrum Disorders: Is there threshold level?	2010	D.Geier et al
84	Porphyrinuria in Korean children with autism: Correlation with Oxidative Stress.	2010	S.Youn et al
85	Chronic metals ingestion by prairie voles produces sex-specific deficits in social behavior: An animal model of autism.	2010	J.Curtis et al
86	Neonatal administration of Thimerosal causes persistent changes in Mu Opioid Receptors in the rat brain.	2010	M.Olczak et al
87	Luteolin and thiosalicylate inhibits HgCI2 and Thimerosal induced VEGF release from human mast cells	2010	S.Asadi et al
88	The value of ecologic studies : Mercury concentration in ambient air and the risk of autism	2010	K.Blanchard et al

89	Making sense of epidemiological studies of young children exposed to thimerosal in vaccines.	2010	J.Doréa
90	Theoretical aspects of autism: Causes- A review.	2011	H.Ratajczak
91	Environmental heavy metals and mental disorders of children in developing countries.	2011	M.Hassanien et al
92	Ancestry of Pink Disease (Infantile Acrodynia) Identified as a risk factor for autism spectrum disorders.	2011	K.Shandley et al
93	Persistent Behavioral Impairments and alterations of brain dopamine system after early post natal administration of thimerosal.	2011	M.Olczak et al
94	Preservative of choice for Prev(e)nar 13 in a multi-dose formulation.	2011	L.Khandke et al
95	Integrating Experimental (in vitro and in vivo) neurotoxicity studies of low-dose thimerosal relevant to vaccines.	2011	J.Doréa
96	Embryonic exposure to thimerosal, an organomercury compound, causes abnormal early development of serotonergic neurons.	2011	M.Ida-Eto et al
97	The plausibility of a role for mercury in the etiology of autism: A cellular perspective.	2011	M. Garrech & D. Austin
98	Altered heavy metals and Transketolase found in Autistic Spectrum Disorders.	2011	M.E.Obrenovich et al
99	A significant factor in autism: methyl mercury induced oxidative stress in genetically susceptible individuals.	2011	K.Leslie & Susan Koger
100	A dental look at the autistic patient through orofacial pain.	2011	F.Zeidan-Chuliá et al
101	Maternal thimerosal exposure results in aberrant cerebellar oxidative stress, thyroid hormone in motor behavior in rat pups;sex-and strain-dependant effects.	2011	Z.L.Sulkowski et al

Valparaíso, Chile, July 5th, 2011

Senate Health Commission

Enrique Paris, MD. Pediatrician and Toxicologist
President of the Medical Association of Chile

"…The toxicity or poison will depend on the dosage, in other words, very small doses repeated through time could be as toxic as a large dose given once, and this is why this concern was raised, because of the many doses that are given throughout the life of a child…

….Mercury is a neurotoxic agent, it alters various enzymatic functions, it alters the neurological development of a child, it produces deafness, produces ataxia, it produces alterations even on the skin, consequently, it needs to be removed, without any doubts it needs to be removed.

…I do not believe in financial issues, in other words, the fact that it costs more money should not be an issue that might stop us on this project, because it is much more expensive to have sick kids, neurologically sick ones, with speech problems, with developmental or communicational disorders, than to invest this money wisely…."

"From the very beginning, the scientific case against the mercury additive has been overwhelming. The preservative, which is used to stem fungi and bacterial growth in vaccines, contains ethylmercury, a potent neurotoxin. Truckloads of studies have shown that mercury tends to accumulate in the brains of primates and other animals after they are injected with vaccines-and that the developing brains of infants are particularly susceptible. In 1977, a Russian study found that adults exposed to much lower concentrations of ethylmercury than those given to American children still suffered brain damage years later. Russia banned thimerosal from children's vaccines 20 years ago, and Denmark, Austria, Japan, Great Britain and all the Scandinavian countries have since followed suit.

I can only celebrate the fact that Chile is protecting their children legislating to ban thimerosal from vaccines".

Robert F. Kennedy Jr. is senior attorney for the Natural Resources Defense Council, chief prosecuting attorney for Riverkeeper and president of Waterkeeper Alliance. He is the co-author of "The Riverskeepers". Also, he is a Clinical Professor and Supervising Attorney at Pace University School of Law.

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