

**Thimerosal and autism?  
A plausible hypothesis that should not be dismissed**

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FROM ABSTRACT

The autism–mercury hypothesis first described by Bernard et al. has generated much interest and controversy.

The Institute of Medicine (IOM) reviewed the connection between mercury-containing vaccines and neurodevelopmental disorders, including autism.

They concluded that the hypothesis was biologically plausible but that there was insufficient evidence to accept or reject a causal connection and recommended a comprehensive research program.

Without citing new experimental evidence, a number of observers have offered opinions on the subject, some of which reject the IOM's conclusions.

In a recent review, Nelson and Bauman argue that a link between the preservative thimerosal, the source of the mercury in childhood vaccines, is improbable.

In their defense of thimerosal, these authors take a narrow view of the original hypothesis, provide no new evidence, and rely on selective citations and flawed reasoning.

We provide evidence here to refute the Nelson and Bauman critique and to defend the autism–mercury hypothesis.

**[K.B. Nelson and M.L. Bauman, Thimerosal and autism? *Pediatrics* 111, 3 (2003), pp. 674–679.]**

THESE AUTHORS ALSO NOTE:

“In 1999, the US Public Health Service and the American Academy of Pediatrics (AAP) called for the reduction or elimination of the ethylmercury preservative thimerosal from vaccines, saying that the cumulative amount of mercury in infant vaccines exceeded US Environmental Protection Agency (EPA) guidelines for methylmercury.” **[IMPORTANT]**

**[CDC. Thimerosal in vaccines: a joint statement of the American Academy of Pediatrics and the Public Health Service. *MMWR* 1999;49(26):563–65.]**

"In 2000, Bernard et al. published an extensive literature review, which outlined the shared traits and biological abnormalities between mercury poisoning and autism. **[S. Bernard, A. Enayati, L. Redwood, H. Roger and T. Binstock, Autism: a novel form of mercury poisoning. *Med. Hypotheses* 56 (2001), pp. 462–471.]**

Bernard's 2000 study notes:

- 1) Autism may be induced by early mercury exposure.
- 2) Genetic and non-genetic factors determine why mercury's adverse effects do not occur in all children.

"Since 2002, thimerosal-containing vaccines have been largely eliminated for administration to infants under 6 months of age in the developed world, except for the influenza and diphtheria–tetanus vaccines in the US and the routinely recommended diphtheria–tetanus–pertussis vaccine in the UK."

"Thimerosal is still widely used in infant vaccines in the developing world."

The article "Thimerosal and Autism?" was an invited commentary which represented a literature review. This commentary, by Karen Nelson and Margaret Bauman, appeared in *Pediatrics*, and was a direct rebuttal of the 2000 Bernard et al. autism–mercury paper. The commentary contains a number of assertions and conclusions that demand close examination. The current paper analyzes the contents of the Nelson–Bauman commentary and provides evidence that directly refutes the primary assertions and conclusions made therein. These authors examine 4 areas of the Nelson-Bauman commentary:

#### #1 CLINICAL MANIFESTATIONS OF MERCURY POISONING

There is no "typical" pattern of mercury poisoning. "No other metal better illustrates the diversity of effects caused by different chemical species than does mercury."

Clinical manifestations of mercury toxicity vary greatly depending on numerous factors, including:

- amount of exposure (dose relative to body weight),
- dosing patterns (intermittent bolus, chronic, and acute),
- species type (ethyl, methyl, di-methyl, metallic, mercuric, and mercurous),
- route of administration (cross-placental, ingested, injected, inhaled, mucosal, and trans-dermal),
- excretion context (in utero, with antibiotics, immature commensal flora and/or bile production, and milk diets),
- age and developmental context at exposure (prenatal, postnatal, infant, toddler, child, and adult).

"Age at exposure is critically important for the autism–mercury hypothesis."

"Nelson and Bauman derive their list of mercurialism symptoms largely from relatively high dose, ingested, methyl mercury exposures in adults. These exposure patterns are not closely comparable to the relatively low dose, injected, ethyl mercury exposures hypothesized to provoke autism symptoms in infants. Their claim that 'the typical clinical symptoms of mercurism are not similar to the typical clinical signs of autism' is therefore inaccurate, misleading and unsupported by evidence from any comparable childhood disorder of mercury exposure."

## #2 NEUROPATHOLOGY OF MERCURY TOXICITY

Nelson and Bauman note that ethylmercury does not readily cross the blood-brain barrier. These authors cite studies that clearly show that assertion to be false.

"Nelson and Bauman assert 'material differences in the neuroanatomic findings in autism as compared with those in mercury toxicity'. This assertion is based on a handful of selectively chosen studies of mercury neuropathology in rats and severely poisoned adults, yet even these studies provide meager direct support for their claims. Other studies that they choose not to cite contradict their claims. None of these studies provide even a marginally comparable test of the hypothesized exposure levels and timing involved in the autism-mercury hypothesis. Consequently, Nelson and Bauman's assertion of 'material difference' in the neuropathology of autism and mercury poisoning has little evidentiary support."

## #3 EVIDENCE OF INCREASED MERCURY EXPOSURE AND RETENTION IN AUTISTIC PERSONS

"Emerging evidence supports a finding of elevated mercury exposure and unusual mercury metabolism in autistic children."

"Higher levels of exposure to thimerosal-containing vaccines have been observed among children with autism as compared to controls."

"Increased levels of prenatal exposure to mercury in autistic children have been found, resulting from both higher numbers of maternal amalgam fillings and higher probability of receiving thimerosal-containing Rho D immunoglobulin injections."

More than 8% of women have blood mercury readings in excess of the EPA's allowable levels. **[S.E. Schober, T.H. Sinks, R.L. Jones, P.M. Bolger, M. McDowell, J. Osterloh et al., Blood mercury levels in US children and women of childbearing age, 1999-2000. JAMA 289 (2002), pp. 1667-1674.]**

"Lower levels of mercury have been found in the first baby haircuts of autistic children as compared to controls, suggesting reduced excretion rates, since the autistic group had elevated mercury exposures as compared to controls."

**[A.S. Holmes, M.F. Blaxill and B.E. Haley, Reduced levels of mercury in first baby haircuts of autistic children. Int. J. Toxic. 22 4 (2003), pp. 277-285.]**

High levels of mercury are detected in the urine of autistic children following chelation therapy with DMSA.

#### #4 EPIDEMIOLOGICAL EVIDENCE IN POPULATIONS EXPOSED TO MERCURY

These authors note that studies conducted on small populations of children, (under one thousand), cannot be expected to yield a significant number of children with autism and are therefore meaningless. Yet, Nelson and Bauman do just that.

These authors further cite articles that refute the assertions of Nelson and Bauman that recent increased rates of autism are the results of diagnostic substitution and/or a changing of diagnostic standards.

#### CONCLUSIONS

"In the March 2003 issue of *Pediatrics*, Nelson and Bauman's 'Thimerosal and Autism?' answers the title's question through a unilateral dismissal of the autism-mercury hypothesis. In the process, the authors effectively oppose the findings of the Institute of Medicine, which in its October 2001 report found the connection between thimerosal exposure and neurodevelopmental disorders to be 'biologically plausible'."

The IOM found insufficient evidence to recommend "full consideration be given... to removing thimerosal from vaccines administered to infants, children or pregnant women in the United States."

"Just over a year after the IOM issued its report, Nelson and Bauman, while offering no new evidence, "consider it improbable that thimerosal and autism are linked". In addition, "when information is incomplete", they offer the startling suggestion that infant exposures to mercury in vaccines should be continued. Their positions violate principles of both precaution and scientific method."

"The facts are increasingly clear. The incidence of autism has increased 10-fold in a decade [5 references]. Such order-of-magnitude increases must have environmental roots. Increased mercury exposure is both biologically and epidemiologically plausible as a sole or contributing causal factor. Instead of speculative dismissals of this model, as offered by Nelson and Bauman, we need more evidence-based research. This is what the IOM has recommended and we should get on with it."

#### KEY POINTS FROM DAN MURPHY

- 1) The incidence of autism has increased 10-fold in a decade, which can only occur as a consequence of environmental change.
- 2) Increased mercury exposure is both biologically and epidemiologically plausible as a sole or contributing causal factor for autism.

- 3) In 1999, the US Public Health Service and the American Academy of Pediatrics called for the reduction or elimination of the ethylmercury preservative thimerosal from vaccines, saying that the cumulative amount of mercury in infant vaccines exceeded US Environmental Protection Agency (EPA) guidelines for methylmercury.
- 4) Since 2002, thimerosal-containing vaccines have been largely eliminated for infants under 6 months of age in the developed world.
- 5) Thimerosal is still found in the influenza and diphtheria–tetanus vaccines in the US and in the diphtheria–tetanus–pertussis vaccine in the UK.
- 6) Thimerosal is still used in infant vaccines in the developing world.
- 7) The age of exposure is critically important in the autism–mercury hypothesis.
- 8) Ethylmercury from vaccinations readily crosses the blood–brain barrier.
- 9) Elevated mercury exposure and unusual mercury metabolism are noted in autistic children.
- 10) Higher levels of exposure to thimerosal-containing vaccines are observed among children with autism as compared to controls.
- 11) Increased levels of prenatal exposure to mercury in autistic children have been found, resulting from both higher numbers of maternal amalgam fillings and higher probability of receiving thimerosal-containing Rho D immunoglobulin injections.
- 12) More than 8% of women have blood mercury readings in excess of the EPA's allowable levels.
- 13) “Lower levels of mercury have been found in the first baby haircuts of autistic children as compared to controls, suggesting reduced mercury excretion rates, as compared to normal controls.
- 14) High levels of mercury are detected in the urine of autistic children following chelation therapy.
- 15) The article in the March 2003 issue of *Pediatrics*, authored by Nelson and Bauman, titled ‘Thimerosal and Autism?’ claims that it is “improbable that thimerosal and autism are linked” and that “infant exposures to mercury in vaccines should be continued,” is crazy and flawed.
- 16) The Institute Of Medicine believe that thimerosal should be removed from all vaccines administered to infants, children or pregnant women in the United States.