

Reduced Levels of Mercury in First Baby Haircuts of Autistic Children

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Reported rates of autism have increased sharply in the United States and the United Kingdom. One possible factor underlying these increases is increased exposure to mercury through thimerosal-containing vaccines, but vaccine exposures need to be evaluated in the context of cumulative exposures during gestation and early infancy. Differential rates of postnatal mercury elimination may explain why similar gestational and infant exposures produce variable neurological effects. First baby haircut samples were obtained from 94 children diagnosed with autism using *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM IV) criteria and 45 age- and gender-matched controls. Information on diet, dental amalgam fillings, vaccine history, Rho D immunoglobulin administration, and autism symptom severity was collected through a maternal survey questionnaire and clinical observation. Hair mercury levels in the autistic group were 0.47 ppm versus 3.63 ppm in controls, a significant difference. The mothers in the autistic group had significantly higher levels of mercury exposure through Rho D immunoglobulin injections and amalgam fillings than control mothers. Within the autistic group, hair mercury levels varied significantly across mildly, moderately, and severely autistic children, with mean group levels of 0.79, 0.46, and 0.21 ppm, respectively. Hair mercury levels among controls were significantly correlated with the number of the mothers' amalgam fillings and their fish consumption as well as exposure to mercury through childhood vaccines, correlations that were absent in the autistic group. Hair excretion patterns among autistic infants were significantly reduced relative to control. These data cast doubt on the efficacy of traditional hair analysis as a measure of total mercury exposure in a subset of the population. In light of the biological plausibility of mercury's role in neurodevelopmental disorders, the present study provides further insight into one possible mechanism by which early mercury exposures could increase the risk of autism.

Keywords Amalgam, Autism, Hair, Mercury, Thimerosal

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Autism has been defined by symptoms rather than causes since it was first characterized by Kanner in the 1940s (Eisenberg and Kanner 1956). Since Rutter's (Rutter 1978) further elaboration of diagnostic standards in 1976, the prevailing standards for diagnosis (*Diagnostic and Statistical Manual of Mental Disorders*, 3rd edition [DSM III] 1980; 3rd edition—revised [DSM-III-R] 1987; 4th edition [DSM IV] 1994) have included impairment in three domains: social relatedness, communication, and behavior. In a small number of cases, either genetic (Wahlstrom et al. 1986; Bolton et al. 2002; Steffenburg et al. 1996) or environmental (Stromland et al. 1994; Williams and Hersh 1997; Aronson, Hagberg, and Gillberg 1997) causes have been established, but the vast majority of cases remain idiopathic.

The need to account for the relative contribution of genetic and environmental causes has taken on increased importance in light of possible sharp increases in the incidence of autism. Early prevalence studies in the United States (Burd, Fisher, and Kerbeshian 1987; Treffert 1970; Ritvo et al. 1989) and the United Kingdom (Lotter 1966; Wing and Gould 1979; Deb and Prasad 1994) reported low rates of autism—generally less than 5 per 10,000—among children born before 1990. Studies of populations born in the 1990s, however, show far higher (Bertrand et al. 2001; Baird et al. 2000) and increasing (Department of Developmental Services 1999; Kaye, del Melero-Montes, and Jick 2001; Taylor et al. 1999) rates of autism and autism spectrum disorders (ASDs), in some cohorts as high as 55 per 10,000 for autism and 80 per 10,000 for ASDs.

These increases clearly point to the rising importance of environmental factors and raise the possibility of an etiological role for toxic exposures: either prenatal, postnatal, or in some cumulative pattern that combines the effect of maternal, gestational, and infant exposures. One group (Bernard et al. 2001) has hypothesized a causal connection between mercury exposure and the symptoms of autism.

Until recently, thimerosal, a preservative containing 49.6% ethyl mercury, was used in three childhood vaccines: hepatitis B, *Haemophilus influenzae B* (Hib), and diphtheria-pertussis-tetanus (DPT). Hib and hepatitis B were introduced to the U.S.