

# Blood Levels of Mercury Are Related to Diagnosis of Autism: A Reanalysis of an Important Data Set

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The question of what is leading to the apparent increase in autism is of great importance. Like the link between aspirin and heart attack, even a small effect can have major health implications. If there is any link between autism and mercury, it is absolutely crucial that the first reports of the question are not falsely stating that no link occurs. We have reanalyzed the data set originally reported by Ip et al. in 2004 and have found that the original  $p$  value was in error and that a significant

relation does exist between the blood levels of mercury and diagnosis of an autism spectrum disorder. Moreover, the hair sample analysis results offer some support for the idea that persons with autism may be less efficient and more variable at eliminating mercury from the blood.

**Keywords:** autism; mercury; environmental health; neurotoxin; neurodevelopment; blood

There is a marked increase in the diagnosis of autism. The question of what is (and is not) related to this increase is crucial to millions of persons affected by the disorder. This article reanalyzes an original data set regarding the relation between blood levels of mercury and diagnosis of an autism spectrum disorder (ASD) by Ip et al. based on our finding of discrepancies in the original article.<sup>1</sup>

A review of what is known about the neurotoxic effects of mercury is beyond the scope of this paper,<sup>2</sup> but the observable symptoms of acute mercury poisoning have been reported to match up with many of the problems observed in autism.<sup>3</sup> Furthermore, mercury poisoning has sometimes been presumptively diagnosed as autism of unknown etiology until the mercury poisoning has been uncovered.<sup>4</sup> Because there has been a several-fold increase in environmental mercury exposure, the hypothesis that the rise in autism could be related to an environmental increase in mercury levels is a reasonable one to pursue. Autism may result from a combination of genetic susceptibility (perhaps in the form of reduced ability to remove mercury or other neurotoxins from the system) and environmental exposure at key times in development.<sup>5-7</sup> This would mean a generalized increase in mercury levels would be expected to co-occur with a generalized increase in autism, but some people

exposed to relatively high mercury would not be affected if, for example, their bodies were very efficient eliminators of such toxins. Only if an exposed infant or fetus also had a genetic susceptibility that makes one less able to remove mercury (or other heavy metals) would normal levels of mercury exposure lead to problems. Alternatively, it could be that genes that help detoxify get switched on and start to express themselves a little later than normal in those genetically predisposed to autism; or perhaps, autism results from some combination of these theories.

Nevertheless, if mercury does play any causal role in facilitating a diagnosis of autism, there would likely be at least some relation between high mercury measured in the blood and symptoms of autism even if ability to metabolize mediates the relationship between exposure and neural toxicity. This is because even if exposure is identical, those who remove mercury less effectively should still have higher levels in the blood. Interestingly, results of hair samples could be expected to be somewhat mixed. The level of mercury in hair may be better understood as an indication of how much mercury has been removed by the body as opposed to the level in the body.<sup>6</sup> If people are approximately equal in their ability to remove circulating mercury from the bloodstream, then these 2 indicators should match up closely, but if a person's ability to excrete is low, their hair samples might not be elevated even when their blood levels are high.

Fido and Al-Saad found that mercury levels in hair samples were higher in children diagnosed with autism.<sup>8</sup> These children were aged 4 to 7. In contrast, Kern et al. reported that mercury hair levels were not significantly different, but were lower at a marginally significant level.<sup>9</sup> Kern et al. used younger children, ages 1 to 6. Holmes et al. performed the

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DeSoto, CM, Hitlan RT. Blood levels of mercury are related to diagnosis of autism: a reanalysis of an important data set. *J Child Neurol*. 2007;22:1308-1311.