

Research Article

The Severity of Autism Is Associated with Toxic Metal Body Burden and Red Blood Cell Glutathione Levels

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This study investigated the relationship of children's autism symptoms with their toxic metal body burden and red blood cell (RBC) glutathione levels. In children ages 3–8 years, the severity of autism was assessed using four tools: ADOS, PDD-BI, ATEC, and SAS. Toxic metal body burden was assessed by measuring urinary excretion of toxic metals, both before and after oral dimercaptosuccinic acid (DMSA). Multiple positive correlations were found between the severity of autism and the urinary excretion of toxic metals. Variations in the severity of autism measurements could be explained, in part, by regression analyses of urinary excretion of toxic metals before and after DMSA and the level of RBC glutathione (adjusted R^2 of 0.22–0.45, $P < .005$ in all cases). This study demonstrates a significant positive association between the severity of autism and the relative body burden of toxic metals.

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1. Background

Autism is a severe developmental disorder which involves social withdrawal, communication deficits, and stereotypic/repetitive behaviour. The pathophysiological etiologies which precipitate autism symptoms remain elusive and controversial in many cases, but both genetic and environmental factors (and their interactions) have been implicated. One environmental factor that has received significant attention is the body burden of mercury, lead, and other toxic metals [1–5].

Bernard et al. [1] discussed the many similarities between the symptoms of children with autism and children poisoned by mercury. An epidemiology study by Windham et al. [2] found that the amount of airborne pollutants, and especially mercury, correlated with an increased risk for autism. A study by DeSoto and Hitlan [3] found that blood levels of mercury did significantly correlate with the diagnosis

of autism. A small study by Adams et al. [4] found that children with autism had a 2-time higher level of mercury in their baby teeth than typical children. A study by Bradstreet et al. [5] investigated the body burden of toxic metals by giving dimercaptosuccinic acid (DMSA), an oral chelation medication approved by the FDA for treating infantile lead poisoning. They found that the children with autism excreted 3.1 times as much mercury into their urine (which is where DMSA is excreted), $P < .0002$, but lead and cadmium levels were not significantly different. Overall there is some evidence to suggest that mercury and possibly other toxic metals are related to the etiology of autism.

This study investigates the possible relationship of the severity of autism to the relative body burden of toxic metals. The severity of autism was assessed using four tools, a professional evaluation based on the Autism Diagnostic Observation Schedule [6], and parental evaluations based on the Pervasive Developmental Disorders Behaviour Inventory