

Blood mercury levels in autism spectrum disorder: Is there a threshold level?

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Mercury (Hg) may significantly impact the pathogenesis of autism spectrum disorders (ASDs). Lab results generated by Vitamin Diagnostics (CLIA-approved), from 2003-2007, were examined among subjects diagnosed with an ASD ($n=83$) in comparison to neurotypical controls ($n=89$). Blood Hg levels were determined by analyzing Hg content in red blood cells (RBC) using cold vapor analysis, and consistent Hg measurements were observed between Vitamin Diagnostics and the University of Rochester. Adjusted (age, gender, and date of collection) mean Hg levels were 1.9-fold significantly ($P<0.0001$) increased among subjects diagnosed with an ASD (21.4 $\mu\text{g/L}$) in comparison to controls (11.4 $\mu\text{g/L}$). Further, an adjusted significant ($P<0.0005$) threshold effect (>15 $\mu\text{g/L}$) was observed for Hg levels on the risk of a subject being diagnosed with an ASD in comparison to controls (odds ratio=6.4). The weight of scientific evidence supports Hg as a causal factor in subjects diagnosed with an ASD.

Key words: Asperger, autistic, body-burden, neurodevelopmental, PDD

INTRODUCTION

Autism spectrum disorders (ASDs) are neurodevelopmental disorders, presenting in childhood that affect at least 1 in 110 children in the United States (Centers for Disease Control and Prevention 2009). The condition is characterized by severe impairments in socialization, communication, and behavior. Individuals diagnosed with an ASD may display a range of problem behaviors such as hyperactivity, poor attention, impulsivity, aggression, self-injury, and tantrums. Further, these children often display unusual responses to sensory stimuli, such as hypersensitivities to light, sound, color, smell or touch, and have a high threshold to pain (Austin 2008).

Emerging evidence supports the theory that some ASDs may result from a combination of genetic/biochemical susceptibility, specifically a reduced ability to excrete mercury (Hg), and exposure to Hg at critical

developmental periods (Austin 2008, Geier et al. 2008, 2009e). Exposure to Hg can cause immune, sensory, neurological, motor, and behavioral dysfunctions similar to traits defining/associated with ASDs, and these similarities extend to neuroanatomy, neurotransmitters, and biochemistry (Austin 2008, Geier et al. 2008, 2009e).

DeSoto and Hitlan (2007) postulated that if Hg does play any causal role in facilitating an ASD diagnosis, there would likely be at least some correlation between high Hg measured in the blood and the symptoms of autism, even if an individual's ability to metabolize mercury mediates the relationship between exposure and neural toxicity. This is because even if exposure is identical, those who remove Hg less effectively should still have higher levels in the blood. Subsequently, these researchers analyzed blood Hg levels in a cohort of children from China (ASDs and controls). These researchers concluded that a statistically significant relationship exists between total blood Hg levels and a diagnosis of an ASD (DeSoto and Hitlan 2007).

A subsequent study by Hertz-Picciotto and coauthors (2010) examined blood Hg levels documented in

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