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ORIGINAL ARTICLE

The levels of blood mercury and inflammatory-related neuropeptides in the serum are correlated in children with autism spectrum disorder

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Abstract Tachykinins (substance P, neurokinin A, and neurokinin B) are pro-inflammatory neuropeptides that may play an important role in some autoimmune neuroinflammatory diseases, including autism spectrum disorder (ASD). Mercury (Hg) is a neurotoxicant, and potentially one of the main environmental triggers for ASD as it induces neuroinflammation with a subsequent release of neuropeptides. This is the first study to explore the potentially causal relationship between levels of serum neurokinin A and blood mercury (BHg) in children with ASD. Levels of serum neurokinin A and BHg were measured in 84 children with ASD, aged between 3 and 10 years, and 84 healthy-matched children. There was a positive linear relationship between the Childhood Autism Rating Scale (CARS) and both serum neurokinin A and BHg. ASD children had significantly higher levels of serum neurokinin A than healthy controls ($P<0.001$). Increased levels of serum neurokinin A and BHg were respectively found in 54.8 % and 42.9 % of the two groups. There was significant and positive linear relationship between levels of serum neurokinin A and BHg in children with moderate and severe ASD, but not in healthy control children. It was found that 78.3 % of the ASD patients with increased serum levels of neurokinin A had elevated BHg levels ($P<0.001$). Neuroinflammation, with increased levels of neurokinin A, is seen in some children with ASD, and may be caused by elevated BHg levels. Further research is recommended to determine the pathogenic role of increased levels of serum neurokinin A and BHg in ASD. The therapeutic role of tachykinin receptor antagonists, a potential new class of anti-inflammatory medications, and Hg chelators, should also be studied in ASD.

Keywords Autism · Neurokinin A · Neuroinflammation · Mercury

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Introduction

Neurogenic inflammation is a neurally mediated immune inflammation that is orchestrated by a large number of neuropeptides, mainly tachykinins. Tachykinins (substance P, neurokinin A, and neurokinin B) have been considered as a group of neuropeptides which are released from the excitatory part of the nonadrenergic, noncholinergic excitatory nervous system nerves after exposure to allergens. The biological activity of tachykinins depends on their interaction with three specific tachykinin receptors, neurokinin (NK)1 (specific for substance P), NK2 (specific for neurokinin A) and NK3 (specific for neurokinin B) receptors (Maggi 2000; Richardson and Vasko 2002; Geppetti et al. 2008; Ramalho et al. 2011; Almeida et al. 2004).