



POSSIBLE RELATIONSHIP BETWEEN MERCURY DERIVATIVES AND AUTISM: THE EFFECTS ON ERYTHROCYTES

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ABSTRACT

Autism spectrum disorder (ASD) is associated with multiple physiological abnormalities, such as changes in erythrocytes and mitochondrial dysfunction, in addition to oxidative stress and immune imbalance, encompassing a range of behavioral changes related to the neurological disorder, with varying degrees of difficulty in diagnosis.¹ ASD is a multifactorial condition, where genetic modifications associated with environmental factors, such as exposure to metals like mercury (Hg), are among the possible contributing factors. Thimerosal (TM), a mercury-derived compound, is used as a preservative in various products such as eye drops, cosmetics, and vaccines. In an aqueous environment, it releases ethylmercury, one of the most toxic forms of this metal.² Erythrocytes (Ery) are the red blood cells that contain an abundance of hemoglobin, the protein responsible for transporting oxygen to the tissues. Valproic acid (VPA) is used as an antiepileptic drug, but it's also known as an ASD inducer in pregnancy. This study aims to analyze the effects of TM exposure on Ery of 60-day-old C57BL/6 mice (CEUA 01/2023) born to pregnant females in which, on the 12th gestational day, were divided into four groups: control (300 μ L of phosphate buffer, ip), VPA (600 mg kg⁻¹, ip), the TM group (20 μ g kg⁻¹, ip), and the TM/VPA group (TM 20 μ g kg⁻¹ + VPA 600 mg kg⁻¹, ip). The results showed a significant difference in the marble burying and open field behavioral tests, showing a profile similar to ASD pathology. In Ery, oxygen uptake decreased by 56, 52, and 46% for VPA, TM, and TM/VPA, respectively, compared to control. The activities of the antioxidant enzyme catalase decreased by 42% for TM. Still, it increased by 60 and 125% for VPA and TM/VPA, while superoxide dismutase increased by 10.6, 14.3, and 29.2% for VPA, TM, and TM/VPA compared to control. Lactate dehydrogenase activity from plasma increased by 51 and 67% in the TM and TM/VPA groups. Therefore, our findings suggest that TM exposure can disturb hemoglobin functionality and the redox state of erythrocytes, potentially contributing to the development of ASD.

References: ¹ROJAS-CHARRY, Liliana et al. Abnormalities of synaptic mitochondria in autism spectrum disorder and related neurodevelopmental disorders. *Journal of Molecular Medicine*, v. 99, n. 2, p. 161-178, 2021. ²KHATTAB, Nourhan A. et al. The emerging role of α 7nAChRs/caspase-3/Nrf-2 signaling pathway in citicoline improved autistic behavior induced by thimerosal in mice, *International Immunopharmacology*, v. 130, p. 111736, 2024.

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