

Ilex paraguariensis MICROENCAPSULATED EXTRACT NEUROMODULATORY EFFECTS ON ZEBRAFISH BEHAVIOUR

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INTRODUCTION: Environmental exposure to heavy metals has become a significant problem due to their neurotoxic potential. Among these metals, aluminum (Al) is widely used in various industrial sectors due to its qualities. Although essential in technological applications, studies show that its accumulation in organisms has been associated with neurological disorders. In this context, neuroprotection measures based on natural compounds become relevant. *I. paraguariensis*, traditionally known as yerba mate, is culturally significant in South America and consumed around the world. Research has revealed that *I. paraguariensis* may have antioxidant and neuromodulatory properties. **OBJECTIVE:** In this study, we used zebrafish (*Danio rerio*) as a model organism to investigate effects of Al and the neuromodulatory properties of yerba mate (CEUA: 2229110319). **MATERIALS AND METHODS:** The fish were initially exposed to Al at the concentrations: 0 mg.L⁻¹, 5.5 mg.L⁻¹, 8 mg.L⁻¹, and 10.5mg.L⁻¹ for four days. The animals were then treated with microencapsulated *I. paraguariensis* extract (MIPE) (prepared by infusion of 7 g of yerba mate in 100 mL of Milli-Q water at 70 °C for 15 min, filtered and then microencapsulated) for eleven days. After exposure, behavioral tests were performed, including the social preference test (SPT), mirror-induced aggression (MIA), and novel tank test (NTT). **RESULTS:** The results show that aggressive behavior remained unchanged compared to the control group. In the NTT, Al exposure altered the time the fish spent at the bottom of the aquarium, and the Al + MIPE treatment failed to reverse this effect. In the SPT, all Al concentrations increased the time spent in the empty area of the aquarium, however, MIPE treatment restored the fish's social interaction. **CONCLUSION:** Thus, exposure to Al is associated with behavioral changes such as increased anxiety and social isolation. MIPE likely restored social behavior in aluminum-exposed zebrafish by modulating dopamine- and oxytocin-related pathways and reducing oxidative stress in social brain circuits. However, its components were insufficient to restore anxiety-like behavior, possibly due to persistent serotonergic disruption and inflammation in brain regions critical for anxiety regulation. These findings suggest that MIPE has neuromodulatory potential and may help behavioral patterns.

Keywords: yerba mate, toxicology, anxiety

Financiamento: CNPq, Fapergs e IFRS.

