EVALUATION OF THE ADSORPTION POTENTIAL OF ACTIVATED CARBON FIBER IN A LEAD-INDUCED TOXICITY MODEL USING ZEBRAFISH (*Danio rerio*) EMBRYOS

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INTRODUCTION: Lead (Pb) is a highly toxic metal that, due to anthropogenic activities, has shown a significant increase in environmental presence. Currently, efficient alternatives are being sought for the remediation of heavy metal contamination in water. In this context, activated carbon fibers (ACF) emerge as a promising solution. Zebrafish (Danio rerio) have stood out as a valuable model for toxicological studies, offering an effective tool to assess environmental impacts and the effectiveness of decontamination strategies. OBJECTIVE: The aim of this study was to investigate the potential of ACF in a lead-induced toxicity model in zebrafish embryos. MATERIALS AND METHODS: Fish were maintained under controlled conditions, and the OECD 236 guideline was followed with modifications for toxicological evaluations. Embryos were treated with Pb (1000 µg/L), Pb (1000 µg/L) + ACF, and ACF alone, and assessed every 24 hours up to 96 hours post-fertilization (hpf). The following parameters were evaluated: survival, in ovo movements per minute, hatching rate, lateralization, ataxia, erratic swimming, and spinal curvature. After the exposure period, embryos were euthanized and lysed with Trizol for RNA extraction. cDNA synthesis and qPCR were performed to evaluate biomarkers. RESULTS AND CONCLUSION: The tested Pb concentration did not cause significant changes in embryo survival or hatching rate. However, a significant increase in in ovo movements at 24 hpf was observed, along with a higher incidence of lateralized, erratic swimming and ataxia at 72 and 96 hpf. Regarding morphological alterations, Pb exposure led to a significant increase in spinal curvature at 72 and 96 hpf. When combined with Pb, ACF effectively reversed these alterations, including spinal curvature, and restored normal swimming behavior and embryo movement within the chorion. These results indicate that Pb exposure induces significant behavioral and morphological changes in zebrafish embryos. The use of ACF as an adsorbent demonstrated a potential mitigating effect on metal toxicity, suggesting that ACF may be a promising strategy for aquatic environmental remediation.

KEYWORDS: Adsorption; oxidative stress; neurotoxicity.

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