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Poster 68

Effects on apoptosis and neurotransmitters after exposure to 3-chloromethcathinone during embryonic development of zebrafish: preliminary results

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Abstract

Background: Synthetic cathinones are a class of new psychoactive substances (NPS) widely consumed worldwide. Their large-scale production and constant structural modifications lead to the emergence of new NPS every year. 3-Chloromethcathinone (3-CMC) was first identified on the European market in 2014 and is a halogenated and *N*-alkylated derivative of cathinone [1]. 3-CMC has a chiral centre, giving rise to two enantiomers: (*R*)-3-CMC and (*S*)-3-CMC. It shares structural similarities with methcathinone and 4-chloromethcathinone (4-CMC, clephedrone). Like other cathinones, 3-CMC interacts with the monoamine transporter system, acting as a psychostimulant by increasing the release of dopamine, norepinephrine, and serotonin [2]. The presence of NPS in wastewater and surface waters has been growing, underscoring the importance of investigating the potential toxic effects that these substances may have on aquatic organisms [3]. **Objective:** This study aimed to evaluate the effects induced by 3-CMC on neurotransmitter levels (dopamine, serotonin, and their metabolites) and apoptosis in zebrafish (*Danio rerio*) larvae. **Methods:** Embryos, ≈ 3 hours post-fertilization were exposed for 96 hours to different concentrations of 3-CMC (0.02 to 200 µg/L, 3 replicates). After exposure, 10 larvae were randomly collected and immersed in acridine orange dye. Apoptosis levels were then measured through fluorescence (excitation/emission: 535/590 nm). Additionally, 20 larvae were randomly collected for neurotransmitter assessment. Serotonin, 3,4-dihydroxyphenylacetic acid (DOPAC, a dopamine metabolite), and 5-hydroxyindolacetic acid (5-HIAA, a serotonin metabolite) were measured by liquid chromatography coupled to an UV detector at 210 nm while dopamine was assessed at 280 nm. **Results:** After 96 hours of exposure, no significant changes were detected in dopamine, serotonin, or their metabolite levels. Similarly, 3-CMC did not induce apoptosis in exposed larvae at any tested concentration compared to the control. **Conclusions:** These findings suggest that the tested concentrations of 3-CMC during zebrafish embryonic development may not induce effects on neurotransmitters or apoptosis. However, these results are preliminary, and since NPS are expected to increase in the aquatic environment further research is needed to understand their impact (including 3-CMC) on other biomarkers, improving the accuracy of environmental risk assessment namely to assess significance and develop mitigation measures.

Keywords: psychoactive substances; environmental risk assessment; environmental contaminants

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