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Exploring the toxicity effects of 3-chloromethcathinone (3-CMC) on the morphophysiological parameters of *Daphnia magna*

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Abstract

Background: The constant discharge of several potentially harmful compounds to the environment raises significant concerns about the risk of toxicity to non-target organisms and human health [1,2]. The 3-chloromethcathinone (3-CMC) is a chiral synthetic cathinone belonging to the group of new psychoactive substances (NPS) [3]. After consumption, this substance and/or its metabolites are excreted in urine, reaching the surface water through the sewage systems due to the inefficient removal in the wastewater treatment plants [4]. **Objectives**: This work aimed to evaluate the ecotoxicity of racemate 3-CMC on the morphophysiological parameters using the freshwater microcrustacean *Daphnia magna* as an aquatic model. **Methods**: Neonates under 24 hours old were used and exposed to 260, 325 and 520 µg/L of the racemate 3-CMC nominal sublethal concentrations for 9 days. Twenty daphniids were used per replicate, for five replicates per group. They were kept in moderately hard reconstituted water (MHRW), at 20 °C ± 2 °C, with a cycle of 16:8 h (light/dark) and fed every 48 h with a suspension of *Raphidocelis subcapitata*. Data were analysed with Jamovi using general linear models, unifactorial design (significance level of 0.05). **Results**: An increase in body size was observed at all concentrations. An increase in heart size was also observed, although only at the lowest concentration. No significant differences were observed in heart rate for all exposure concentrations. An increased mortality of daphnia was observed at high concentrations. **Conclusions:** These findings demonstrate that exposure to sublethal concentrations of racemate 3-CMC can significantly affect the morphophysiological development of *D. magna*. A significant impact on body size was observed at all concentrations, suggesting a potential interference at the lipid metabolic pathway. However, an increase in heart size was observed only at the lowest concentration (260 µg/L), which may suggest an early adaptive response that diminishes with higher exposures. These results highlight the need for further investigation into the long-term impacts and mechanisms of action of 3-CMC in aquatic ecosystems.

Keywords: psychoactive drugs; ecotoxicity; environmental risk assessment

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