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Exploring the swimming behavior of *Daphnia magna* exposed to a mixture of five psychoactive substances – preliminary data

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Abstract

Background: Psychoactive substances (PAS) are commonly found in freshwater ecosystems increasing concern about the potential negative impacts on non-target organisms, such as aquatic invertebrates [1]. Indeed, the environmental occurrence of amphetamine (AMP), and recreative drugs as 3,4-methylenedioxyamphetamine (MDMA), 3,4-methylenedioxyamphetamine (MDA), and synthetic cathinones as butylone (BTL) and 3,4-dimethylmethcathionone (3,4-DMMC) has been reported in aquatic ecosystems and wastewaters ranging from ng/L to µg/L. Recent studies have revealed diverse adverse effects of single PAS exposure to aquatic organisms, like *Daphnia magna* [2, 3] however, these substances occur in the environment as complex drug mixtures which may lead to unforeseen toxicity impacts and/or induce different final adverse effects than single PAS exposure. **Objective:** This work aimed to assess the potential effects on swimming behavior induced by mixtures of PAS on the aquatic organism *D. magna*. **Methods:** Neonates from the third/fourth brood of *D. magna*, less than 24 hours old, were exposed to two levels, 0.1 and 1.0 µg/L, of a selected mixture of 5 PAS, namely MDA, MDMA, AMP, BTL and 3,4-DMMC, for 7 and 14 days. Exposure concentrations and control were conducted with 5 replicates each containing 20 organisms. On days 7 and 14, swimming behavior endpoints as active time, total distance and swimming speed were determined. **Results:** No significant changes were observed in the swimming behavior parameters such as active time, total distance and speed on the organisms exposed to both concentrations of the PAS mixture after 7 or 14 days. **Conclusions:** Although previous studies have shown significant changes in swimming behavior, morphophysiological and biochemical parameters on *D. magna* exposed to single exposure of these PAS [2,3], the exposure to this selected mixture in the same range of concentrations, 0.1 and 1.0 µg/L, did not cause changes on swimming behavior even after prolonged exposure, i.e., 14 days, including for the higher level tested. Additional parameters such as oxidative stress and antioxidant enzymes levels are ongoing to better understand the global effects of this combined PAS exposure.

Keywords: ecotoxicity; psychoactive substances; daphnids; combined exposure; swimming parameters

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