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3-Chloromethcathinone abiotic degradation studies – preliminary data

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Abstract

Background: New Psychoactive Substances (NPSs), such as the synthetic cathinone 3-chloromethcathinone (3-CMC), have raised concerns regarding the potential social and health risks they may pose [1,2]. 3-CMC is a chlorinated derivative of methcathinone that has gained prevalence in the illicit market following the legal control of its analogues [1]. Due to the inefficient removal by wastewater treatment plants, this NPS and/or its degradation products frequently reach the surface waters, being a potential threat to non-target organisms [3]. Although its toxicity has been documented, there is a critical knowledge gap regarding its environmental degradation/transformation and enantioselective ecotoxicity [2]. **Objective:** This study aims to evaluate the enantioselective stability and degradation kinetics of 3-CMC under controlled conditions, in accordance with Organisation for Economic Co-operation and Development (OECD) guideline 111, with a focus on the influence of pH on its degradation and the potential occurrence of enantioselective transformation. **Methods:** For the 9-day hydrolysis assay, ultrapure water buffered at pH 4, 7, and 9 was spiked with racemic 3-CMC at 26 $mg.L^{-1}$ (n = 3) and incubated at 25 °C and at room temperature under constant agitation. Aliquots were collected at intervals (days 0, 1, 2, 5, 7, 9) and analysed by high-performance liquid chromatography coupled to a diode array detector (HPLC-DAD), using a Lux® 3 µm AMP (150 × 4.6 mm) chiral analytical column. The mobile phase consisted of methanol/5 mM ammonium bicarbonate, at a flow rate of 1.0 $mL.min^{-1}$. **Results:** Under non-buffered control conditions, both enantiomers exhibited minimal degradation rates after 9 days, with 3.29% for the first eluted enantiomer (E1) and 4.95% for the second eluted enantiomer (E2). At pH 4, 3-CMC remained highly stable, with only 2.8% and 1.8% degradation rates for E1 and E2 at day 9, respectively. In contrast, degradation increased markedly at neutral and alkaline pH. At pH 7, E1 degraded by 46.9%, while E2 underwent complete degradation. At pH 9, both enantiomers underwent further extensive degradation reaching 89.5% for E1 and 91.9% for E2. **Conclusions:** Overall, the data obtained reveal a strong pH-dependent and enantioselective hydrolysis, with E2 degrading more extensively than E1, under neutral and alkaline conditions. These results highlight the relevance of enantioselectivity for an accurate environmental risk assessment.

Keywords: new psychoactive substances; 3-chloromethcathinone; enantioselectivity; degradation kinetics

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