Title: METABOLIC AND SWIMMING IMPAIRMENT IN *OREOCHROMIS NILOTICUS* FOLLOWING ACUTE EXPOSURE THE FLUOXETINE AND ITS MAJOR PHOTODEGRADATION PRODUCTS

Authors: Pietra Terruggi Rabello[1,3]; Ailton José Moreira[2]; Israel Luz Cardoso[3]; Joyce Rodrigues de Souza[3]; Cleo Alcantara Costa Leite[3]; Ernesto Chaves Pereira[1]

Affiliations: [1]Department of Chemistry, Federal University of São Carlos (UFSCar), São Carlos - SP, Brazil, [2]Institute of Chemistry, São Paulo State University (UNESP), Araraquara - SP, Brazil, [3]Department of Physiological Sciences, Federal University of São Carlos (UFSCar), São Carlos - SP, Brazil.

Abstract:

INTRODUCTION**:** Pharmaceutical substances have been increasingly detected in aquatic environments, raising environmental concerns. Among the strategies to mitigate the impact of these emerging contaminants, photodegradation processes stand out, as they can degrade the parent compound and generate potentially toxic transformation products (TPs). Fluoxetine (FLX), a widely used antidepressant, is frequently detected in water bodies, and its degradation leads to the formation of TPs such as MAEB and TFMP. However, the potential toxic effects of these TPs are still poorly understood. OBJECTIVE**:** This study aimed to investigate the photodegradation of FLX to quantify its main TPs and evaluate the physiological effects of acute exposure to these compounds in *Oreochromis niloticus*. MATERIALS AND METHODS**:** FLX was subjected to photolysis and photocatalysis (using erbium-modified Ag_3PO_4 nanomaterial) under UV-C light. The obtained conversion rates were used to estimate exposure concentrations. Thus, individuals were exposed for 48 hours to FLX (1 mg L^{-1}), MAEB (130 µg L^{-1}), and TFMP (280 µg L^{-1}). Fish were subjected to a stepwise swimming protocol until fatigue in a Steffensen-type respirometer to measure metabolic and swimming performance. RESULTS**:** Degradation results indicate that photolysis generates higher amounts of MAEB (37,1%) and TFMP (56,6%) compared to photocatalysis (26,1% and 41,1%). Given the high conversion rates under photolysis, toxicity tests with TPs are relevant as they may be formed via natural photolysis of FLX in aquatic environments. Exposures to MAEB and TFMP caused reductions in standard metabolic rate (SMR) (39,5% ± 3,5) more significant than those observed with FLX (29%). In addition, the TPs induced decreases in maximum metabolic rate (MMR) (28% ± 2) and maximum swimming efficiency (Emax) (23,5% ± 1,5). None of the substances affected the aerobic scope (AS) or the swimming capacity of the animals. CONCLUSION**:** The TPs caused more pronounced sublethal effects than the parent compound, affecting metabolic parameters with the potential to impair essential ecological functions and, in the long term, population fitness. Therefore, considering their likely presence in FLX-contaminated ecosystems, it is relevant to investigate the need to include these compounds in environmental monitoring and risk assessment protocols.

Keywords: Emerging contaminants; Fluoxetine; Transformation products; Sublethal toxicity; Respirometry.

Funding source: FAPESP.