MSc in Environmental Contamination and Toxicology EMJMD
UPV/EHU – UBx – ULiège UPPA – NTNU – UPO an Erasmus+ Consortium
www.ectplus.eu

Co-funded by the Erasmus+ Programme of the European Union

MASTER THESIS PROJECT

Endocrine disrupting chemical mixtures modulate behavior and metabolic rate in the turquoise killifish (*Nothobranchius furzeri*)

ANTARA BINTA AKKAS

Department of Biological and Environmental Science
Gothenburg University
Gothenburg, Sweden

PLENTZIA (UPV/EHU), JULY 2023

Universidad del País Vasco Euskal Herriko Unibertsitatea
université de BORDEAUX
UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR
LIÈGE université
NTNU Norwegian University of Science and Technology
U.PORTO

Abstract

Wildlife and humans are continually exposed to a wide range of synthetic compounds, including substances that can function as endocrine disrupting chemicals (EDCs). These EDCs can potentially impact essential biological processes such as brain development, reproduction, metabolism, and growth. The susceptibility of organisms to these chemicals is particularly high during the early stages of development, known as "windows of exposure," when endocrine-dependent organs are still developing. The presence of EDCs and other pollutants in the environment as complex mixtures poses challenges for conducting risk assessments. Therefore, it is crucial to assess the effects of EDCs mixtures following early developmental exposure. In this study, we conducted exposure investigations using an emerging ecotoxicological fish model, Turquoise Killifish, to evaluate the effects of EDCs mixtures with relevance to human health. Specifically, our research focused on two mixtures, MIX G0 and MIX G1, which were designed based on chemicals found in the serum of pregnant women. These chemicals were associated with adverse effects on neurodevelopment and birth weight in their children. After a 48-hour exposure period, we examined the impact of these EDCs mixtures on multiple behavioral traits in *Nothobranchius furzeri* at several time points. Our findings indicate that the EDCs mixtures can significantly affect locomotion, boldness, and schooling behavior in *N. furzeri* individuals. Furthermore, we investigated the influence of EDCs mixtures on the alternation of oxygen consumption rate in *N. furzeri*, highlighting a potential link between thyroid regulation and disruptions in behavior and metabolic rate. Results demonstrate that EDCs mixtures can adversely affect oxygen consumption. Overall, this study introduces *N. furzeri* as a promising model organism and demonstrates its utility in investigating the effects of EDCs mixture. Through our pilot study, we establish *N. furzeri* as a sensitive species suitable for screening the effects of EDCs. Additionally, we propose a methodology based on behavioral and respirometry techniques for analyzing the mixture toxicity of EDCs in the turquoise killifish.

Keywords: Endocrine disrupting chemicals, EDCs mixtures, ecotoxicology, killifish, behavior, locomotion, boldness, schooling, metabolism, thyroid disruption