

Poster 41

## Impact of environmental caffeine contamination in zebrafish: ecotoxicological approach

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### Abstract

**Background:** Caffeine (CAF) is considered a suitable indicator of anthropogenic contamination of aquatic environments, and several pharmacological and biological effects have been observed in target and non-target organisms [1,2]. **Objective:** Assess the chronic effects of environmental concentrations of CAF in several biomarker responses in *Danio rerio*. **Methods:** After chronic exposure to CAF (0.16, 0.42, 1.09, 2.84, 7.40, 19.23, and 50 µg/L) on *Danio rerio*, several biomarkers of antioxidant defense (superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), glutathione reductase (GRed) activities, and glutathione (GSH) content), biotransformation (glutathione *S*-transferase activity (GSTs)), lipid peroxidation (thiobarbituric acid reactive substances (TBARS) levels), energetic reserves (glycogen (GLY), lipids (LIP), protein (PROT) contents, and lactate dehydrogenase (LDH) activity), and neurotransmission (acetylcholinesterase (AChE) activity) were evaluated. A multi-biomarker approach known as Integrated Biomarker Response (IBR) was also employed to perceive the most sensitive and responsive biomarker, after CAF exposure. **Results:** Exposure to CAF disrupts several metabolic pathways in *D. rerio*, such as changes in antioxidant defenses, specifically in the activities of SOD, GRed, and GSH content, which may have led to lipid peroxidation. LDH activity decreased at all tested concentrations, while AChE activity was only affected at the highest concentrations (19.23 and 50 µg/L). IBR revealed that the highest stress occurred at a concentration of 50 µg/L and showed clearly that biomarker responses were responsive and coherent to demonstrate the stress caused independently to CAF concentration in fish. **Conclusions:** These results highlight the urgent need to minimize the increasing load of CAF on the aquatic ecosystems, considering the adverse impacts of CAF pollution in the aquatic environment. These results show that the implementation of scientific programs and monitoring projects are imperative to classify the CAF as a high-priority environmentally hazardous emerging pollutant.

**Keywords:** *Danio rerio*; chronic exposure; physiologically-based ecotoxicity; biochemical biomarkers

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