*proceedings*

MDPI

*Abstract*

# Effects of Non-Lethal Arsenic Contamination on Manifesting Fin Strokes in Zebrafish (*Danio rerio*) †

**Tithi Paul [1,2] and Chayan Munshi [1,*]**

[1] Ethophilia Research Foundation, Santiniketan 731235, India
[2] Department of Zoology, Visva Bharati University, Santiniketan 731235, India
* Correspondence: chayanbio@gmail.com
† Presented at the 1st International Electronic Conference on Toxics, 20–22 March 2024; Available online: https://sciforum.net/event/IECTO2024.

**Keywords:** arsenic; fin strokes; behavioural ecotoxicology

**Introduction:** The locomotion of fish is considered to be crucial in regulating activities such as prey predation and foraging. Understanding the swimming patterns of fishes provides deep insights into the underlying neuroethological and biomechanical mechanisms. The fish locomotion mechanism is predominantly controlled through regulated fin strokes, which involve correlation between the stroking patterns of the fins (pectoral, dorsal, anal, pelvic and caudal). However, geometric morphology and hydrodynamics also play a critical role. The aim of our study is to elucidate whether non-lethal concentrations of arsenic trioxide ($As_2O_3$) in the aquatic environment can affect the swimming pattern of a freshwater-habitant zebrafish (*Danio rerio*).

**Methods:** A population of zebrafish was exposed to a 1/50 $LC_{50}$ concentration of $As_2O_3$ for 7 days. A comparative assessment of fin stokes per minute was conducted between fishes from uncontaminated and arsenic trioxide-contaminated water. The stroking frequencies of all the fins were analysed to understand the effect of arsenic on fish locomotion.

**Results:** Our result demonstrates that fishes in arsenic-contaminated water manifest more frequency of all fin strokes. All of the fins move significantly more in a given time frame due to arsenic trioxide contamination. The alteration of the fin stroke pattern of fishes in a polluted environment is clearly elucidated.

**Conclusions:** This study clearly indicates that arsenic contamination can be a causative abiotic stressor for the alteration of neuronal activities, which in turn alters the muscular activities responsible for the movements of fins. *Danio rerio* is a promising model to study the environmental pollution and neurotoxicity of arsenic. It is postulated that enhanced fin activity alters the locomotion pattern as well as the velocity of fish. This study encompasses the three disciplines of behavioural ecotoxicology, neurotoxicology and biomechanics, highlighting locomotory abnormalities in fish due to environmental perturbation.

**Author Contributions:** Conceptualization, supervision, review and editing, C.M.; Data curation, original draft preparation, T.P.; Formal analysis, C.M. and T.P. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.



**Citation:** Paul, T.; Munshi, C. Effects of Non-Lethal Arsenic Contamination on Manifesting Fin Strokes in Zebrafish (*Danio rerio*). *Proceedings* **2024**, *102*, 36. https://doi.org/10.3390/proceedings2024102036

Academic Editor: Demetrio Raldúa

Published: 3 April 2024

**Data Availability Statement:** Experimental data is not available due to ethical restrictions.

**Conflicts of Interest:** The authors declare no conflict of interest.