Title: Effects of water-borne copper and lead on metabolic and excretion rate of Bahaii loach (*Turcinoemacheilus bahaii*)

Authors: Mehrnaz Moghimi, Nasrollah Mahboobi-Soofiani, Pedram Malekpouri

PII: S1382-6689(18)30087-5
DOI: https://doi.org/10.1016/j.etap.2018.04.023
Reference: ENVTOX 3011

To appear in: *Environmental Toxicology and Pharmacology*

Received date: 7-3-2018
Revised date: 27-4-2018
Accepted date: 29-4-2018

Please cite this article as: Moghimi M, Mahboobi-Soofiani N, Malekpouri P, Effects of water-borne copper and lead on metabolic and excretion rate of Bahaii loach (*Turcinoemacheilus bahaii*), *Environmental Toxicology and Pharmacology* (2010), https://doi.org/10.1016/j.etap.2018.04.023

Effects of water-borne copper and lead on metabolic and excretion rate of Bahaii loach (*Turcinoemacheilus bahaii*)

Authors

Mehrnaz Moghimi[a], Nasrollah Mahboobi-Soofiani[a*], Pedram Malekpouri[b*]

Affiliations

[a] Fisheries Division, Department of Natural Resources, Isfahan University of Technology, Isfahan 8415683111, Iran

[b] Young Researchers and Elites Club, Science and Research Branch, Islamic Azad University, Tehran, Iran

*Correspondence to

N. M. Soofiani, E-mail: soofiani@cc.iut.ac.ir, Tel: +98 31 13 91 35 87, Fax: +98 31 13 91 2840

P. Malekpouri, E-mail: p.malekpouri@gmail.com, Tel: +98 21 22 37 41 60, Fax: +98 31 13 91 2840

Highlights

- Different lead treatments increased aerobic scope while all copper treatments showed no significant changes.
- The specific rate of ammonia excretion was declined following all lead or copper treatments as compared with control.
- Lead and copper can cause damages to fish gills and kidneys, hence, affecting the metabolic and excretory capacities of fish.

Abstract

Beyond the role of anthropogenic activities, natural sources of metal contaminations are still controversial, together counting, however, as a major threat to inland and coastal waters, becoming an even more prominent stressor for aquatic life. To address the effects of metals on the physiological response of fish, standard metabolic rate (SMR), maximum metabolic rate (MMR), aerobic scope (AS) and factorial aerobic scope (FAS) as well as specific rate of ammonia excretion (J_{amm}) of *Turcinoemacheilus bahaii* were determined following different water-borne Cu^{2+} and Pb^{2+} treatments. Following LC_{50}-96h determination, 72 fish (BW=1.153±0.56 g and TL=6.155±0.97 cm) were exposed to different amounts of Cu^{2+} and Pb^{2+} in 9 different treatments (eight fish/treatment), including 0.910 mg l^{-1} Cu^{2+} for 24h, 0.455 mg l^{-1} Cu^{2+} for 7d, 0.182 mg l^{-1} Cu^{2+} for 14d and 0.091 mg l^{-1} Cu^{2+} for 30 d as well as 124.430 mg l^{-1} Pb^{2+} for 24h, 62.215 mg l^{-1} Pb^{2+} for 7d,12.443 mg l^{-1} Pb^{2+} for 14d, 6.221 mg l^{-1} Pb^{2+} for 30d and control. The SMR of fish was reduced following exposures to all Cu^{2+} and Pb^{2+} treatments ($P<0.05$), except for 30d exposure as compared with the control. The MMR remained steady following all Cu^{2+} treatments while it was raised significantly ($P<0.05$) following Pb^{2+} treatments at 7, 14 and 30d exposure. Although the AS showed a similar pattern to MMR, the FAS was elevated ($P<0.05$) following all the treatments when compared with control. Lower J_{amm} were observed following all metals-treated fish in comparison with control ($P<0.05$). In addition, higher ($P<0.05$) levels of injuries were observed following all Cu^{2+} and Pb^{2+} treatments in gills and kidneys. The results suggest that Cu^{2+} and Pb^{2+} over the experimental period could impair the metabolic and excretory capacities, hence affecting the possible physiological performance of fish.

Keywords

Metabolic Capacity, Aerobic Scope, Metabolic Waste, Gill and Kidney Histopathology, Metals