
Effects of urban Trace Metal Elements mixture on the reproduction of *Taeniopygia guttata*.

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Résumé

In the urban environment, Trace Metal Elements (TME) are found in mixtures as a diffuse and chronic pollution. TME are known for their toxicity at low doses, notably disrupting metabolism, endocrine function or inducing oxidative stress with potential differential effects depending on the sex and the developmental stage of individuals. Even though TME are well studied, their potential physiological and long-term effects as a mixture are poorly understood. For instance, sex or age differences in TME bioaccumulation in several birds' species have been showed without clear trend. Reproduction is a key step regarding population dynamics and is relatively sensitive to external perturbation. For instance, exposure to Cd has been correlated with alteration of reproduction like reducing egg production or thinning eggshell. Other studies showed that eggshell thickness can be suitable indicator of TME pollution. In this study, we experimentally investigated the effects of urban relevant TME mixture on the reproduction of zebra finches (*Taeniopygia guttata*). Half of the 80 pairs of adult zebra finches were exposed during 3 months to a mixture of TME through drinking water and the other half was the control group. The mixture contained Cd, Pb, As, Zn, Cu and Ni at urban relevant levels. The individual exposure of birds was monitored by RFID antenna at the drinking bottle. First, we compared the effects of exposure to the TME mixture on the physiology of male and female zebra finches by monitoring their TME feather content, their mass and their antioxidant defenses and their glutathione metabolism in blood. As the cost of reproduction is higher in females, we expected females to show stronger negative effects of the treatment. Second, we investigated the effects of the treatment on reproductive investment by monitoring the number of eggs laid and their mass. We expected treated couples to lay less and smaller eggs. Finally, we looked at the egg composition and characteristics to quantify the importance of maternal effects in response to these pollutants. We evaluated the transmission of the contamination to the egg of exposed females by measuring TME in eggshell, egg yolk and albumen. We also measured eggshell thickness and yolk antioxidant composition as these parameters are known to depend on the maternal environment.

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Mots-Clés: trace metal elements, birds, mixture, toxicity, reproduction