Title

Effects of Perchlorate and Hypoxia on Molecular and Physiological Responses in *Daphnia magna*

Authors

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Abstract

Perchlorate is a water-soluble endocrine-disrupting contaminant (EDC) that is toxic to humans, however it is not currently regulated in our drinking water. *Daphnia magna*, an aquatic microcrustacean and established model for ecotoxicology, was used to study the interactive effects of perchlorate and hypoxia (low oxygen) on the invertebrate endocrine system. The endocrine system of *D. magna* consists of juvenile hormone and ecdysteroids. Juvenile hormone plays a role in modulating the switch between asexual (when environment is stable) to sexual (when environment is stressed) modes of reproduction, which also coincides with the production of males. The regulation of juvenile hormone may be disrupted by some environmental EDCs. Hypoxic environments are known to increase the expression of the protein hemoglobin in *D. magna* and results in an observable phenotypic shift in color from clear to pink. In this study, I tested the hypothesis that *D. magna* responds to hypoxia and perchlorate through transcriptional regulation of hemoglobin and phenotypic plasticity. Specifically, *D.magna* were chronically co-exposed to different concentrations of perchlorate and hypoxia using a factorial design. Gene expression changes were evaluated using quantitative real-time PCR of hemoglobin genes (*dhb1*, *dhb2*, and *dhb3*). Phenotypic plasticity was assessed using microscopy, with an emphasis on quantifying morphological characteristics (e.g., body length, body width) and mode of reproduction. I anticipate that perchlorate and hypoxia exposure will cause the reproductive modality of *D.magna* to be altered due to disruption of the juvenile hormone by perchlorate, and additionally, that hemoglobin genes will be transcriptionally upregulated. The data we generate from these studies are critical for future policy related to perchlorate regulation, which will ultimately help protect human and environmental health.