

Abstract

The Water Flea as a “Canary in the Coal Mine”—Using Phenotypic and Molecular Endpoints to Understand Pollution †

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Abstract: The assessment of pollution is a serious issue and a major consequence of the overgrowing human population and its activities. Focusing on the aquatic ecosystem, traditional approaches of water chemistry mainly provide minimal monitoring with the detection of pollutants, while they fail to produce mechanistic or predictive insight. As such, effect-based methods have gained significant attention for the better mechanistic understanding of aquatic pollution. Among the key species used, daphnids have acquired a central position in aquatic toxicology and ecology. In this study, a novel feeding assay was developed and applied in a battery of exposures to different pollutants. Furthermore, in combination with biochemical markers and sensitive metabolomic analyses, the responses of daphnids following exposures were uncovered in molecular detail. Specific categories of metabolites were identified as significant indicators to predict pollution.

Keywords: molecular ecotoxicology; *Daphnia*; metabolomics; feeding; pharmaceuticals; pollutants



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Institutional Review Board Statement: Ethical review and approval were waived for this study, due to the fact that daphnids are regarded as “animals” in terms of being members of the kingdom Animalia, however, they are not “animals” as defined in regulation SI543 of 2012 on the protection of animals used for scientific purposes. Therefore, the study does not require authorization from the Health Products Regulatory Authority (HPRA), while is also in line with the aim of working under the 3Rs (reduce, refine, replacement) strategy, since daphnids are commonly used in ecology and ecotoxicology as replacements of more evolutionary advanced species (i.e., fishes), posing no ethical implications.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data sharing is not applicable to this abstract.

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