Metabolomics in Small Fish Toxicology: Assessing the Impacts of Model EDCs

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Although lagging behind applications targeted to human endpoints, metabolomics offers great potential in environmental applications, including ecotoxicology. Indeed, the advantages of metabolomics (relative to other 'omic techniques) may be more tangible in ecotoxicology because there is often not a sequenced genome available for ecologically relevant species. We are conducting metabolomics studies on small fish, such as the fathead minnow, that are used both as model organisms in ecotoxicology research, and in regulatory testing programs. Our goal is to use information from these studies to meet EPA's mission to protect ecosystems from potentially harmful effects of chemical pollutants. For example, as part of a project involving a large, interdisciplinary team of scientists from US government, academia, and industry, we are integrating transcriptomic, proteomic, and metabolomic data to describe endocrine disruption in the fathead minnow. We seek to understand how chemical exposures are linked through early molecular changes to whole-organism adverse outcomes and, ultimately, to changes in population status. To achieve this goal, a systems-based approach is being used to define toxicity pathways for model chemicals with well defined modes of action within the hypothalamic-pituitary-gonadal (HPG) axis of the fathead minnow. We will describe the unique role that metabolomics plays in this important environmental applications.