Ecological Risk Assessment in the 21st Century: The Role of Ecotoxicogenomics and the need for Multidisciplinary Research

Ecological risk assessments have traditionally relied on analytical chemistry for exposure assessment and whole animal toxicity testing for hazard/effects assessment. However, these approaches are costly and limited in their applicability to a broad diversity of chemical and non-chemical stressors, toxicologically-relevant endpoints, and species. As a result, there are growing demands to transform the risk assessment paradigm using new technology and approaches. This seminar uses results from an integrated, multidisciplinary, program of research on the effects of endocrine disrupting chemicals on fish reproduction to highlight the potential roles of ecotoxicogenomics in that process. Micorarray data from these studies are analyzed and interpreted in the context of phenotypic data (e.g., reproductive performance, morphology of secondary sex characteristics, gonad histology, plasma steroid profiles, etc.) and complementary metabolomics data. Results have been used to 1) identify transcriptional fingerprints and biomarkers with potential utility for exposure assessment and environmental monitoring, 2) elucidate and understand chemical mode(s) of action, 3) characterize dose-response including compensatory responses to chemical stressors and recovery after exposure, and 4) reverse engineer transcriptional networks with relevance to adverse outcomes. Additionally, the results have informed the development of computational systems models relevant to fish reproduction. Together the diagnostic indicators, improved understanding of mechanisms of toxicity, and development of biologically-based extrapolation models emerging through multidisciplinary ecotoxicogenomic research should facilitate new approaches in ecological risk assessment. *This abstract does not necessarily reflect USEPA policy.*