

US EPA Mid-Continent Ecology Division

Research Project Summary

Development Of An Amphibian Model For Assessing Thyroid Axis Disruption

Overview

We are currently developing a multi-endpoint assay to determine the effects of chemicals on the thyroid hormone system of amphibians. Our approach includes gathering mechanistic data at the biochemical and molecular levels to establish whether or not a chemical that affects apical endpoints, such as development and metamorphosis, acts specifically by the thyroid system. Establishing mechanistic specificity will reduce the uncertainties associated with classifying chemicals as thyroid disrupters based solely on apical endpoints. Mechanistic data are also needed to establish a basis for interspecies extrapolation for potential toxicity manifested through effects on relatively conserved biological systems (e.g., the thyroid axis). Finally, this work will help establish multiple gene expression, as determined by DNA microarray methods and quantitative reverse transcription polymerase chain reaction, as an endpoint of utility in ecological risk assessments. These powerful tools may provide a viable means to diagnose impacts of anthropogenic agents such as perchlorate, on amphibians.

Key Products

Degitz SJ, Holcombe GW, Flynn KM, Kosian PA, Korte JJ, and Tietge JE. 2005. Progress towards development of an amphibian-based thyroid screening assay using *Xenopus laevis*: Organismal and thyroidal responses to the model compounds 6-propylthiouracil, methimazole, and thyroxine. *Toxicological Sciences* 87(2):353-364.

Tietge JE and Degitz SJ. 2004. Wag the Frog: An analysis of the EDSTAC recommended tail resorption screening assay for thyroid agonist and antagonists. (In preparation)

Tietge JE, Holcombe GW, Flynn KM, Kosian PA, Korte JJ, Anderson LE, Wolf D, and Degitz SJ. 2005. Metamorphic inhibition of *Xenopus laevis* by sodium perchlorate: Effects on development and thyroid histology. *Environmental Toxicology and Chemistry* 24(4):926-933.

Degitz SJ, Holcombe GW, Korte JJ, Kosian PA, Tietge JJ, Veldhoen N, Bailey CM, and Helbing CC. 2004. Gene expression profiles in the brain following inhibition of thyroid hormone synthesis in *Xenopus laevis*. (In preparation)

For further information on this research contact:

Sigmund Degitz / Joseph Tietge
degitz.sigmund@epa.gov / tietge.joe@epa.gov
218-529-5168