

## **Abstract**

**Meeting of the Midwest Chapter of the Society of Environmental Toxicology and Chemistry.**

### **TIC Information:**

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Goal 4: Communities/Eco Research Area: SP2 & EDC

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### **Development of In Vitro Assays to Assess Chemicals and Environmental Samples for Thyroid Hormone Synthesis Inhibition**

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The potential effects of chemicals in current commercial production and use on the endocrine systems of humans and wildlife is an area of ongoing concern and research. Information has been coming to light on estrogenic and androgenic activity of chemicals and their presence in surface waters, but much less is known about chemicals with thyroid activity. To address this issue, we have adapted an *in vitro* enzyme inhibition assay and an *ex vivo* thyroid gland explant culture assay to assess thyroid hormone (TH) synthesis inhibition of chemicals and environmental samples. Thyroid peroxidase, the enzyme that catalyzes the iodination and coupling of tyrosines to produce TH, can be readily measured *in vitro* using microsomal preparations from thyroid glands. This assay was used to determine the inhibitory potency of three model TH synthesis inhibitors, methimazole, 6-propylthiouracil, and perchlorate. These three chemicals were also tested for their capacity to inhibit thyroid hormone release from *Xenopus laevis* thyroid glands in culture and were all positive in this assay. Effluent samples collected from two waste water treatment plants with distinctly different inputs were freeze dried and the resultant powder was reconstituted for testing in these assays. Although no activity was detected in these samples, the enzyme inhibition assay and explant culture assays were adaptable to testing environmental samples. These *in vitro* assays provide a means to assess the capacity of chemicals to affect thyroid hormone status and are promising tools that can be further developed to test for T4 synthesis inhibition activity in environmental samples.

### **Impact Statement:**

This abstract presents research being conducted at MED under the Safe Pesticides/Safe Products and Endocrine Disrupting Chemicals research area. The research described herein is in response to the mandate to the Agency to develop a research program to evaluate the potential adverse effects of chemicals on vertebrate endocrine systems including thyroid hormones. The results are presented in the context of the development of shorter term *in vitro* and *ex vivo* assays that can be used to screen chemicals and environmental samples for thyroid activity. The results can provide information to make prioritization decisions for chemicals for further testing *in vivo*. In addition, if these assays identify the presence of potential thyroid disrupting chemicals in surface waters or other environmental samples, these can then be further analyzed to identify what specific chemicals are responsible for this activity.