Investigation of Endocrine Disruptors: The Presence and Effects of Neonicotinoid and Sulfoximine Pesticides

Hines, Nickolas

This project was a continuation from 2012 when testing was performed on West Texas lakes, which revealed estrogenic endocrine disruptors. This year the most widely used pesticide in the world, neonicotinoid pesticides, and a new class of pesticide, sulfoximines, will be evaluated. Water and soil from ten West Texas lakes were collected. Water samples were processed through the solid phase extraction vacuum (SPE) and nitrogen evaporator. The soil samples were filtered, agitated and condensed down with a Rotavapor machine. The samples were tested for the presence of the pesticides using high-performance liquid chromatography (HPLC) and gas chromatography-mass spectrometry (GC-MS). The effects of the neonicotinoid and sulfoximine pesticides were then evaluated on water and soil invertebrates. To evaluate soil invertebrates, young and older mealworm larvae were evaluated using the up-and-down method. Dose concentrations ranged from5.5 µg/g to 55 µg/g. To evaluate water invertebrates, 5 day and 10-14 day Daphnia magna were evaluated. Dose concentrations ranged from 0.01 µg/mL to 5.0 µg/mL. Endocrine Disruption was evaluated using a Transcriptional Activation Assay. The hypothesis was supported. The HPLC results revealed neonicotinoid pesticides in 50% of the water samples and 90% of the soil samples. Results were confirmed by GC-MS. The up-and-down testing with mealworms revealed median lethal doses ranging of 5.5 µg/g to 36 µg/g, and the Daphnia magna testing revealed 5-30% mortality. The Transcriptional Activation Assay did not reveal endocrine disruption. The 2014 project findings are positive for our environment, but further toxicity testing and accumulation investigation needs to be performed.

Awards Won: