Final Report

Electrochemical Methodology for Measurement of Steroidal Hormones in Water

Overview

The goal of the proposal was to develop an electrochemical analytical method for determining steroid hormones in water. This was achieved by coating the detector (sensor) with nickel nanostructures, which protect the electrode from fouling (loss of activity). The sensor was found to be stable and catalyzed the oxidation of steroid hormones. The detector was coupled to high performance liquid chromatography to provide both quantitative and qualitative information. To this end the analytical method was characterized in terms of sensitivity, limit of detection and reproducibility of the measurement. Work on testing steroid hormones in real samples from St Joseph River is in progress.

Description of grant-supported activity

May – mid July 2012: Flow injection analysis studies were carried out to determine the optimal detection conditions. The electrode was modified with nickel nanostructures and tested for its ability to oxidize steroid hormones. Data on sensitivity, detection limits, reproducibility of the sensor were obtained. The performance of the sensor under flowing conditions served as a guide for the detector conditions that were used when the sensor was coupled to high performance liquid chromatography.

Mid July – August 15th: The sensor was coupled to high performance liquid chromatography to obtained both qualitative and quantitative information. The separation of the steroid hormones
was optimized. The performance of the method was evaluated in terms of sensitivity, reproducibility and limits of detection for the steroid hormones. The limit of detection for the steroid hormones, which is the lowest concentration that can be detected, showed that we can test the method for the determination of steroid hormones in real contaminated water.

Due to time limitation, the testing of steroid hormones in real water samples from St. Joseph River was not completed, and this is continuing over 2012/2013 academic year. This work is in collaboration with scientists at the City of Elkhart who have observed relatively severe cases of intersex in the smallmouth bass along St. Joseph River.

**Dissemination of Results**

Results obtained over the summer will be presented in conferences including the NCUR and Pittcon, abstracts have been accepted for the two conferences. After completion of a real sample analysis of the St. Joseph River, a manuscript will be written to be submitted to the peer-reviewed *Environmental Science and Technology* journal.