

Evaluation of Triclosan Concentration Determination by Attaching a Fluorescent Tag and Measuring the Fluorescent Signal in Drinking Water Samples Around Sault Sainte Marie, Michigan

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Introduction

Triclosan is a nonprescription antibacterial used in a wide array of personal care products and as an additive to certain materials to give them antibacterial properties. Specifically, triclosan causes cell death by apoptosis at high enough doses. A concern recently is that triclosan has been found in wastewater and drinking water at ng L^{-1} levels. Triclosan had the ability to bioaccumulate, as it partitions to organic matter. Therefore at these elevated concentrations the levels in the human tissues can increase to $\mu\text{g L}^{-1}$ and even mg L^{-1} . There have not been many studies about the long term effects of triclosan exposure, but based upon its method of action it could be assumed that at some concentration, triclosan could cause cell death in humans. Unfortunately, there is not a simple or cost effective method to test for triclosan. The purpose of this study was to evaluate a method developed by Mao, et. al. and determine if the method model could be used to measure triclosan levels. Mao and colleagues developed a simple method to determine the concentration of certain environmental estrogenic chemicals, also called endocrine disrupting chemicals (EDCs), by attaching a fluorescent tag to compounds and measure them against a standard curve to determine the concentration down to the low ng L^{-1} level.

Project Goals and Objectives

The goal is to measure the concentration of triclosan in several water samples from around Lake Superior State University, using fluorescence in tandem with high performance liquid chromatography (HPLC) to quantify the amount of triclosan in the effluent from the water treatment plant. To accomplish this, (a) a method will first have to be established to fluoresce triclosan, (b) a standard curve must be prepared, and (c) samples must be collected and run, assuming that pretreatment is not required to. Once the levels in drinking water are known, it will give a better understanding of the levels that we are seeing and how they are changing over time. Triclosan partitions to organic matter, so can be stored in the sediments surrounding water bodies. There are some historical levels that can be compared to the readings determined by the proposed method to determine if levels have changed in the past 10 years.

Methods

This is the tentative method as it will need to be changed to ensure that the fluorescent peaks for the samples have complete separation. If the method does not work properly in the lab,

then water samples will not be able to be analyzed. Also, if the method does work out properly in the lab, there is no guarantee that we will be able to use the method to measure the chemical amounts in water samples.

1. Take a water sample, blow down to zero volume under a stream of nitrogen gas
2. Add 0.10 cm³ of a 0.20 g cm⁻³ *p*-nitrobenzoyl chloride in acetonitrile solution
3. Leave 30 minutes at ambient temperature (25°C)
4. Add 0.40 cm³ of a 30:70 acetonitrile-H₂O solution
5. Agitate for 1 minute
6. Agitate for 1 minute
7. Allow all of the precipitate to form before removing the supernatant
8. Inject the supernatant (~20μL) into the chromatograph

*Can spike samples before extraction for recovery experiments.

Timeline

The project method is currently being evaluated and changes are being made to ensure that complete separation occurs and that a distinct signal is obtained. Over the summer and into Fall 2009, the method will be perfected as much possible and actual water samples will be run to evaluate the efficiency of this method.

** Possible References on Next Page*

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