WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2004NJ73B

Title: Use of stable isotope ratios of mercury to track and differentiate between sources of mercury pollution

Project Type: Research

Focus Categories: Toxic Substances, Methods, Treatment

Keywords: stable isotope fractionation, SIF, methylmercury, reductase, methylation

Start Date: 03/01/2004

End Date: 03/01/2005

Federal Funds: $5,000

Non-Federal Matching Funds: $10,177

Congressional District: 6

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Abstract

This project addresses the question: ‘Can Hg stable isotope ratios be used to track the fate and transport of Hg and to distinguish between biological vs. non-biological transformations of Hg ?

The goal of this research is to determine if Stable Isotope Fractionation (SIF) occurs during the reduction of Hg(II) to Hg0 by the bacterial enzyme mercuric reductase and if so, examine SIF in highly contaminated water samples where indigenous bacteria possess active reductases.

Specific objectives are: 1) Optimization of experimental setup to determine SIF during reduction of Hg[II] to Hg0 by a pure culture of bacteria possessing mercuric reductase. 2) Determination of the effect of temperature, concentration of substrate, the extent of reaction completed, and choice of electron donors on SIF during bacterial reduction 3)

Determination of the extent of SIF during reduction of Hg[II] to Hg0 in a contaminated natural water sample.

The knowledge of extent of fractionation during these transformations would assist steering remediation efforts by (i) identifying processes that affect Hg speciation in the environment and (ii) tracking sources of mercury pollution.