**WATER RESOURCES RESEARCH GRANT PROPOSAL**

**Project ID:** 2005LA34B

**Title:** A comprehensive study of mercury/methylmercury fate, transport and bioavailability in lake Pontchartrain sediments

**Project Type:** Research

**Focus Categories:** Water Quality, Sediments, Methods

**Keywords:** pollution monitoring, analysis, public education, methylmercury, translocating

**Start Date:** 03/01/2005

**End Date:** 02/28/2006

**Federal Funds:** $15,000

**Non-Federal Matching Funds:** $42,174

**Congressional District:** 2

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## Abstract

The non-point source pollution of inorganic mercury is a major problem in areas all over the world. Mercury incinerated after industrial use is transported through the atmosphere as elemental mercury, Hgo. When inorganic mercury is deposited in natural watershed, the native population of microorganisms usually converts it into methylmercury. Environmental variables such as chemical composition of water, pH, sediments type, dissolved Oxygen, organic fraction and microbial population, dissolved organic carbon, salinity affect the rate of mercury methylation. The methylation of inorganic mercury in sediments by the action of sulfate reducing bacteria is the essential step for the transport of mercury throughout the aquatic food chain. Mercury is the most hazardous to living organisms in these methyl forms because the compound is water soluble and easily

penetrate the cell membrane. We hypothesis that the net production of toxic methylmercury (MeHg) by sediments bacteria is arguable the most critical step in the chain of events leading to mercury(Hg) contamination of Lake Pontchartrain wildlife, under various factors mentioned above.

Methylation is influenced by environmental variables that affect the availability of mercuric ions for methylation and the growth of the methylating microbial populations. Methylation rates are higher under anoxic conditions, in freshwater compared to saltwater, and in low pH environments. The presence of organic matter can stimulate growth of microbial populations (and reduce oxygen levels), thereby enhancing the formation of methylmercury. Sulfide can bind mercury and limits methylation. Methylmercury production can vary due to seasonal changes in nutrients, oxygen, temperature, and hydrodynamics.

The objective of this study is to determine a) the concentration of total mercury(THg) and MeHg in surface sediments, water column and characterize their spatial distribution in the Lake Pontchartrain, at different seasonal variation and 2) the potential for benthic MeHg production and degradation at subset of sites representative of a range conditions a long the Lake, (3) To determine the total, and inorganic mercury , and analytical method for methylmercury species, such as methylmercury chloride, hydroxide, and sulfide complexes in the sediments.

Sediment, and water samples will be collected from various sites in Lake Pontchartrain during seasonal variation( April, July and December). Measurements of (pH, DO, DOC, Temp, Salinity, and nutrients, sulfide, will be measured at the time of sampling) while the sediments, water samples will be transferred to Tulane Laboratory and stored at 4C until the time of analysis using GC-ICP-MS.

Laboratory studies will be carried out at Tulane's Aquatic Toxicology Facility. Different concentration of mercury (inorganic and organic) will be adsorbed on lake sediment, which will be placed in aquariums at a depth of one foot then covered with 18 inches of fresh water.

Mercury bioavailability by biological organisms will also be constructed in the lab. After 8 to 10 days equilibrium times, plastic weigh boat will be used to weigh out E-Coli organisms and then the worm will be added to each tank by submerging the weigh boat in the overlaying water. The warm will immediately dispersed and begin burrowing in the sediment. Measurement of salinity, temperature, pH, sulfide concentration will be measured. Crawfish will be placed in these aquariums to study the mobility/leaching of mercury from sediments to water to crawfish under controlled lab conditions. Aquariums will be divided into groups with variation of mercury concentration and variation of physical and biological variables, one aquarium will be used as a control. Sediment, water, samples will be collected at regular intervals until the end of exposure study. At the end of the exposure time (28 days) Crawfish, and organisms will be analyzed for mercury content in the whole body. At the end of the study some crawfish samples will be boiled the traditional way, and analyzed for mercury species. Finally, the remaining

crawfish from the uptake phase will be rinsed and transferred to mercury free water to determine the rate of loss of mercury accumulated during the exposure study. All samples will be analyzed for inorganic, and organic(methyl)mercury.