

To the Point

UW-SRP* Research Snapshots



Rebecca Neumann

Rebecca Neumann and **Jim Gawel** have chosen the South-Central Puget Sound Lowlands region in Washington State for their research on arsenic (As) bioavailability in urban waters. Arsenic is a known neurotoxic element and is considered a priority Superfund contaminant. Dr. Neumann's and Dr. Gawel's research teams have identified regional lakes that are situated downwind from historic copper ore smelting operations (arsenic is a metalloid that is present in copper ore). The bottom sediments of these lakes have accumulated arsenic emitted by the smelter over time.

The study has been carefully designed to explore the complex chemical and biological processes affecting arsenic in a natural system. Oxygen and nutrient concentrations in the water column can influence how much arsenic is available to the microorganisms and fish in the lake (bioavailability). The lakes in the study are used recreationally and some have public fishing. These lakes are overseen by local and state aquatic resource managers. The results of the project will provide important information about the mobility of different 'forms' of arsenic that impact the organisms in the lake. This is very important to governmental agencies like the Environmental Protection Agency that oversee surface water quality guidelines which are intended to protect human health and the ecological health of aquatic systems.

Dr. Neumann's and Dr. Gawel's research teams are also collaborating with Dr. Evan Gallagher's laboratory (Project 1) and the Genomics and Bioinformatics Core to develop biological markers in lake species that will serve as indicators of arsenic toxicity for the organisms at the top and bottom of the aquatic food chain.



Jim Gawel

What are neurotoxicants?

Neurotoxicants include heavy metals, metalloids and chemical compounds that can cause damage to the central nervous system in humans and other animals. Dr. Neumann and Dr. Gawel are studying arsenic, which is a metalloid neurotoxic element that impacts human health. In the environment, arsenic can mimic the essential element phosphorus and thus interfere with biological functions that require phosphorus.

How do neurotoxicants enter the environment?

Although arsenic can be naturally occurring, in our region of the country, arsenic is most often present as a product of industry waste. Arsenic may also be produced from vehicle exhaust and tobacco smoke. Exposure to arsenic can happen through contact with contaminated water or soil, or through inhalation of contaminated air particles.

What does this research have to do with Superfund site hazardous chemicals?

The Superfund is a federal program that was established to clean up the nation's priority hazardous waste sites. A list of the most harmful chemicals has been established by the Agency for Toxic Substances and Disease Registry (ATSDR) and <http://www.atsdr.cdc.gov/spl/>

What is already being done to protect the environment?

The team's research has informed federal regulatory policy about arsenic exposures so that actions can be taken to make regulations safer. To learn more about the laws that protect our health see the Toxic Substance Control Act link below.

Linked resources for further information:

University of Washington Superfund Research Program: <http://depts.washington.edu/sfund/>

NIEHS Superfund Research Program: <http://www.niehs.nih.gov/research/supported/srp/index.cfm>

ATSDR ToxFAQs™: <http://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=19&tid=3>

EPA Superfund sites information: <http://www.epa.gov/superfund/sites>

Toxic Substances Control Act: <http://www.epa.gov/tsca-inventory/about-tsca-chemical-substance-inventory>

*University of Washington Superfund Research Program