

# Toxic Metals, and You

## Dartmouth Researchers Look at Pollution in Estuaries

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For the Valley News

**HANOVER** — The cold November rain that has fallen in the Upper Valley recently is slowly finding its way to the ocean. Rainwater percolates through the soil and drains into the brooks that wind down through our hills, feeding tributaries of the Connecticut River, which eventually flows out, hundreds of miles away, into Long Island Sound.

Throughout its course, water picks up particles and carries them along, like bits of decayed flora and fauna, as well as various chemicals and metals, some of which are toxic.

All this ends up as sediment deposited at the bottom of an estuary — a place where freshwater and seawater mix. We usually know estuaries by other names — Long Island Sound, or Chesapeake Bay, for example.

But toxins that settle in estuaries may not remain there forever. They may end up in your bloodstream.

Scientists at Dartmouth are studying how the toxic metals mercury, lead, arsenic and cadmium that accumulate in the sediment of New England estuaries move through the food chain, perhaps reaching human stomachs.

Having been awarded a \$1.4 million government grant in October, Dartmouth researchers Celia Chen and Joseph Shaw will spend three years sampling and analyzing organisms from several coastal sites.

“There are ones we eat directly, and there are the ones that are eaten by other things that we eat,” said Chen, an assistant research professor at the college’s Center for Environmental Health Sciences.



**Dartmouth researchers Celia Chen and Joseph Shaw have received a grant to study toxic metals in estuaries.** AP

Toxic metals accumulate in oysters, mussels and clams, which people harvest directly from estuaries. Also, small fish eat tiny organisms that live in the sediment. Bigger fish eat those fish, and so on up to the catch of the day.

It’s well known that mercury, a toxin that has harmful effects on the nervous system, especially in developing brains, gets more and more concentrated as it moves up the food chain. Pregnant women and nursing mothers are warned to limit their consumption of large ocean fish like tuna, and to avoid fish like shark and swordfish altogether.

Lead also damages the brain and nervous system. Arsenic and cadmium potentially cause cancer, among other bad health effects. Concentrations of these metals seem to thin out in larger sea creatures. “None of them behave like mercury,” Chen said.

Levels of toxins in fish and shellfish are often

tested, but scientists still have a limited understanding of how long toxic metals stay in various organisms and how they transfer when one sea creature eats another.

The Dartmouth researchers share the grant with Nicholas Fisher, a biologist at the State University of New York at Stony Brook. His laboratory will test how readily different marine animals absorb toxic metals and how quickly they eliminate them.

“They’re not irreversibly bound to them,” Fisher said.

To measure rates of absorption and elimination, he uses radioactive isotopes of the metals. These isotopes are not found in the sediment, but they behave the same way as normal metals do. Because they are radioactive they are easy to track. “It’s almost as if we were to take some of the metals and color them so we can see them,” Fisher said.

In the lab at Dartmouth, Chen and Shaw will look for changes in the DNA of organisms exposed to the metals. They will also run the field studies. The sites they have chosen are Mount Desert Island in Maine’s Acadia National Park, the Webhannet estuary in Wells, Maine, the Providence River estuary in Providence, R.I., and Portsmouth Naval Shipyard.

The latter site is unique in that it’s not only a place where toxins wash out from upstream, but also because the naval facility is a major source of pollution. That is of particular interest to the Department of Defense, which is funding the grant along with the EPA and the Department of Energy.

The site wasn’t chosen just because of the Defense Department’s involvement, however. “We had gone there before we even knew about this grant,” Chen said.