

Researchers use fluorescence to develop method for detecting mercury in fish

November 18 2008

Researchers at the University of Pittsburgh have developed a simple and quick method for detecting mercury in fish and dental samples, two substances at the center of public concern about mercury contamination. The technique involves a fluorescent substance that glows bright green when it comes into contact with oxidized mercury, the researchers report in the current online edition of the *Journal of the American Chemical Society*. The intensity of the glow indicates the amount of mercury present.

Developed in the laboratory of Kazunori Koide (Ko-ee-deh), a chemistry professor in Pitt's School of Arts and Sciences, the new method can be used onsite and can detect mercury in 30 to 60 minutes for dental fillings (or amalgams) or 10 to 30 minutes for fish, Koide explained. "Our method could be used in the fish market or the dentist office," he said. "We have developed a reliable indicator for mercury that a person could easily and safely use at home."

The fluorescence results from the reaction of mercury ions with hydrocarbons called alkynes—the alkyne is converted into a ketone and creates a fluorescent molecule. Koide's method differs from similar mercury indicators in that it withstands the oxidation process mercury samples must undergo prior to testing, Koide said. The mercury species found in most fish and dental amalgams—such as the toxic methyl mercury—must be converted into a safer variety of mercury with an oxidizing agent. Other fluorescent detectors are often not compatible with samples that have been oxidized.

In testing fish, Koide and his team oxidized a piece of salmon (about the size of a fingertip) in water mixed with a chlorine solution similar to household bleach. The conversion process is safe and relatively simple, Koide said. Afterward, the team added the alkyne solution and the mixture glowed bright green.

The Pitt researchers also tested for mercury leaching from dental amalgam, a common tooth filling composed primarily of mercury mixed with smaller amounts of other metals. Concern exists about the mercury seeping from a filling into a person's body and about the disposal of unused amalgam by dentist offices (which is not federally regulated in the United States). To test for leaching, the team pressed a cloth to a tooth with an amalgam filling for one minute; the sample glowed when exposed to the mercury-detecting agent. They also submerged two amalgam-filled teeth in the amino acid cysteine to mimic sulfur-rich foods, which are thought to increase mercury seepage from amalgam. Again, the cysteine solution turned bright green when the indicator was added, suggesting that Koide's method can also be used to monitor mercury leaching caused by sulfur-rich food.

In terms of amalgam disposal, Koide suggested that his method could be used to test dentist office wastewater for mercury content onsite without sending samples to analytical laboratories.

Source: University of Pittsburgh

Citation: Researchers use fluorescence to develop method for detecting mercury in fish (2008, November 18) retrieved 16 July 2024 from <https://phys.org/news/2008-11-fluorescence-method-mercury-fish.html>

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