



Paper #157770

Mercury, Arsenic and Selenium in Channel Catfish from the Allegheny, Monongahela and Ohio Rivers near Pittsburgh PA: Implications for metallotoxin source identification and fish consumption by local anglers

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Fish can serve as biomonitors (sentinels) for source identification of aqueous metallotoxins. Additionally, there is evidence that local fishers and their families are exposed to metallotoxins through the consumption of river-caught fish. Our Community Based Participatory Research Project recruited local anglers to catch channel catfish (n=63) in legacy metals industry and sewer overflow contaminated areas of the Three Rivers Area (TRA) of Pittsburgh PA and upstream in angler-defined “cleaner water” at Kittanning PA, proximal to power plants. We wished to determine if fillet concentrations of mercury (Hg), arsenic (As), and selenium (Se) varied significantly by location of river catch as compared to store-bought. There were no significant differences in Hg, As, or Se concentrations among the TRA catch, thus we combined these data.

Unexpectedly, significantly higher levels of Hg and Se were found in Kittanning-caught catfish compared to those caught in the TRA (both $p < 0.0001$). The store-bought fish were significantly lower in mercury and selenium than those caught in the TRA (both $p < 0.0001$). Kittanning and TRA fish had 19 and 3.1 times, respectively the mercury as store-bought fish; 23% of samples from Kittanning had mercury levels over the 0.3-ppm EPA flesh criterion. The As concentrations from the TRA and Kittanning catches were significantly higher than store-bought (both $p = 0.0001$). Contaminant levels in catfish from Pittsburgh rivers varies significantly by location and can aid in identifying sources of pollution particularly deposition of emissions from coal-fired power plants. Fish consumption advisories should be based on location-specific fish concentrations and actual consumption rates.

Abstract ID#: 157770

Password: 823801

Program Selection: Environment

Topic: Emerging Environmental Health Challenges (ex: persistent bioaccumulative toxins, endocrine disruptors, biotechnology, nanotechnology, emerging infectious disease and environment)

Keywords: Environmental Exposures, Environmental Health Hazards

Learning Objectives:

- acquire and be able to demonstrate knowledge of how catfish flesh concentrations of mercury, arsenic and selenium varies significantly by location between the Pittsburgh Pool (high legacy waste area) and a location upstream in a known deposition area of coal fired emissions and compared to storebought fish.
- be able to apply this information to find sources of this contamination.
- be capable of evaluating the risk posed to local semi-subsistence fishers and recreational anglers from the consumption of locally caught catfish
- appreciate how concentrations of contaminants and thus risk varies over relatively short geographical distances and understand what this means for hazard assessment and risk communication.
- understand how a community based project can be applied to an environmental topic and how to work with diverse community partners to design, execute a project and disseminate its results.
- gain perspectives on the use of fish, which smooth temporal and spatial variability in water concentrations of contaminants, to monitor for water quality.