



## Paper #159141

### **Use of a human breast cancer cell proliferation assay as an exposure assessment tool for total bioaccumulated xenoestrogens in Channel Catfish (*Ictalurus punctatus*) caught in various locations on the Allegheny, Monongahela and Ohio Rivers near Pittsburgh PA: Implications for consumption of river-caught fish**

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The rivers of Pittsburgh have long served as receiving waters for industrial effluents containing persistent organic pollutants (POPs) and heavy metals, some of which have estrogenic activity. Many POPs are bioaccumulated in fish tissues. The costs of identifying all possible xenoestrogenic contaminants in fish tissues are prohibitive. We thus sought to determine if a cell proliferation assay (CPA) utilizing estrogen-responsive (MCF7) and non-responsive (BT20) human breast cancer cell lines could be used to test for estrogenicity in locally caught channel catfish tissue. Catfish flesh (n=21) was extracted with organic solvents to solubilize hormonally active substances. The extracts were diluted serially and tested for estrogenicity in the CPA against estradiol and standard controls. Concentration-dependent cell proliferation was observed in MCF7 cells for some extracts; no proliferation occurred in BT20 cells, and proliferation was not dependant on fish sex. The proliferation index for each extract was compared across fish capture locations. Extracts of catfish taken near a steel works on the Monongahela River and at the confluence of the three rivers downstream exhibited the strongest proliferative responses, whereas extracts from catfish caught upstream on the Allegheny River displayed the weakest responses. These results support the hypothesis that bioaccumulated xenoestrogens are highest in fish caught nearest legacy-contaminated areas. We conclude that this breast cancer CPA shows promise as an exposure assessment tool. Additionally, since segments of the local population are semi-subsistence fishers, a fish consumption advisory may be warranted to alert persons at risk for endocrine-responsive cancers to avoid eating locally caught catfish.

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**Program Selection:** Environment

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

**Keywords:** Endocrine, Environmental Exposures

**Learning Objectives:**

- To recognize the utility of using the MCF7 human breast cancer (extremely sensitive to estrogen-estrogen receptor positive) cell proliferation assay (CPA) as a tool to assess exposure to estrogenic substances in the aqueous environment.
- To appreciate the time and economic savings of using fish bioaccumulation of estrogenic compounds as a proxy for analysis of each possible individual estrogenic chemical in water.
- To recognize that tissues of channel catfish caught nearest known sources of both chemical and metalloestrogens had higher MCF7 CPA indexes (based on a batch response to estradiol) than catfish caught in upstream areas defined as "cleaner water" by fisherman and by number of industry toxic release inventory sites (TRI).
- To recognize potential risks to both semi-subsistence fishers and recreational anglers and their families and population groups that consume large quantities of locally caught fish (Amish, African-Americans and Asians) of development of endocrine-related cancers in susceptible individuals.