Health Consultation

Fish Tissue Exposure Investigation

CONTAMINATED CHEQUAMEGON BAY SEDIMENTS
AT KREHER PARK

ASHLAND, ASHLAND COUNTY, WISCONSIN

OCTOBER 25, 1999

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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ASHLAND, ASHLAND COUNTY, WISCONSIN

Prepared by:

Wisconsin Department of Health and Family Services
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Summary

People catch fish from Chequamegon Bay, at Kreher Park, in the city of Ashland, Wisconsin. Sediments in this area contain polycyclic aromatic hydrocarbons (PAHs). PAHs in fish from Chequamegon Bay at Kreher Park are not a health concern for people who eat these fish daily. Fish consumption advisories for fish in Lake Superior are for mercury and polychlorinated biphenyls (PCBs), which are probably not related to contamination at Kreher Park. Future investigations of Chequamegon Bay sediments at Kreher Park should consider testing for mercury and PCBs. People who eat sport fish should follow advice of the fish consumption advisories. Contaminated sediments at Kreher Park continue to be a health hazard. People should not touch tar slicks or disturb the contaminated sediments.

Background

Questions have been raised about whether fish from the affected Ashland lakefront have elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) and if these fish are unsafe to eat. Chequamegon Bay is a diverse and productive fishery. Kreher Park is located in between a public boat ramp and a marina, and people are often seen fishing in this area.

Sediments in Chequamegon Bay (Lake Superior) in front of Kreher Park, in the city of Ashland, are contaminated with PAHs[1]. This contamination is suspected to be related to a manufactured gas plant that operated in Ashland from the 1880s until 1947. In 1995, the Wisconsin Department of Health and Family Services (DHFS) evaluated the contamination at Kreher Park and concluded that PAHs in Chequamegon Bay sediments pose a public health hazard to people who come in contact with coal tar slicks released from affected sediments[2]. People should continue to avoid direct contact with contaminated sediments and tar slicks. Since 1995, the Department of Natural Resources (DNR) has taken actions to minimize human contact with the contamination:

- DNR posted the lakefront at Kreher Park with signs that alert park users about the hazards from contaminated sediments and tar slicks.

- DNR placed buoys across the harbor to notify boaters not to enter the area.

PAHs are a group of chemicals that are formed during the incomplete combustion of organic material, including wood, petroleum, and coal. PAHs can be formed by either natural or manmade processes. Certain PAHs cause cancer in laboratory animals when inhaled, ingested, or touched to the skin over long periods[3]. PAHs do not tend to bioconcentrate in human tissue. Various studies have found that when PAHs are ingested by vertebrates (such as fish), they are rapidly transformed into PAH metabolites, which are then eliminated from the body by excretion through the bile[4,5]. Measuring PAH metabolites in bile is a common approach to evaluating adverse PAH exposures in fish[6]. Despite the biologic processes for quickly removing PAHs from the body, investigations at some sites with high PAHs in lake sediments have found elevated PAHs in edible fish tissue[7].

Fish Tissue Sampling

To address the question about whether the fish are safe to eat, DNR and DHFS staff collected fish from the Chequamegon Bay at Kreher Park. Tissue samples from these fish were then analyzed for PAHs. Staff followed the DNR Field Procedures Manual for the collection and preparation of fish samples[8]. DNR Fisheries Management staff from the Bayfield office conducted three rounds of fish collection at the Ashland lakefront. A total of 27 fish were collected that represented 13 different species (Table 1). On May 18, 1998 and May 28, 1999, thirteen and nine fish, respectively, were collected from fyke nets that were set along the shoreline in approximately six feet of water and at the outer edge of the harbor. On October 14, 1998, electro-shocking activities produced five fish from the Kreher lakefront.

Table 1: Fish Collected from Chequamegon Bay, Lake Superior
at Kreher Park, City of Ashland
Ashland County, Wisconsin

Common & Scientific Name	Date & Number Collected		
	5/18/98	10/14/98	5/28/99
Brown Bullhead (*Ictalurus nebulosus*)	0	0	1
Brown Trout (*Salmo trutta*)	0	1	0
Rainbow Trout (*Salmo gairdneri*)	0	1	0
Largemouth Bass (*Micropterus salmoides*)	0	1	0
Smallmouth Bass (*Micropterus dolomieiu*)	1	0	0
Rock Bass (*Ambloplites rupestris*)	4	0	0
Pumpkinseed (*Lepomis gibbosus*)	1	0	0
Northern Pike (*Esox lucius*)	1	0	0
Walleye (*Stizostedion vitreum vitreum*)	1	0	1
Yellow Perch (*Perca flavescens*)	0	0	1
Shorthead Redhorse Sucker (*Moxostoma anisurum*)	2	0	1
Silver Redhorse Sucker (*Moxostoma macrolepidotum*)	0	0	1
White Sucker (*Catostomus commersoni*)	3	2	4

Fish were identified, measured, and individually wrapped, and a completed collection data card was attached to each specimen. Specimens were transported to the Wisconsin State Laboratory of Hygiene (WSLH), in Madison, where they were frozen. Fish were thawed immediately prior to sample preparation, and two scaleless skin-on fillets were removed from each specimen (with the exception of two Shorthead Redhorse Suckers, *Moxostoma anisurum*, collected on May 18, 1998, which were each prepared as whole fish samples). Both fillets and whole fish samples were then ground and submitted for polycyclic aromatic hydrocarbon analysis using WSLH Method 1460[9], which targets 16 different PAHs, including the seven

classified by the U.S. Environmental Protection Agency (EPA) as "probable human carcinogens."

The fish tissue concentration reported for each PAH analyte was then compared to the lowest available health-based comparison concentration. Comparison PAH concentrations, in micrograms of PAH per kilogram of fish (µg/kg), were derived based on the following exposure assumptions: a 70 kilogram adult eating 54 grams of fish per day, for a lifetime of 70 years. Carcinogenic PAHs were compared to fish tissue concentrations that represented an increased lifetime excess cancer risk 1 in 1,000,000. Non-carcinogenic PAHs were compared to fish tissue concentrations equivalent to the U.S. EPA Reference Dose (RfD). Carcinogenic and Reference Dose values were obtained from the U.S. EPA's Integrated Risk Information System (IRIS).

Discussion

Results indicated that fish tissue had quantifiable concentrations of six different PAHs (Table 2). The highest levels measured for five of the six detected PAHs (acenaphthene, anthracene, fluorene, naphthalene, and phenanthrene) were in a whole fish sample obtained from a shorthead redhorse sucker, *Moxostoma anisurum*, collected on May 18, 1998. All other results were from skin-on fillet samples.

Table 2: Polycyclic Aromatic Hydrocarbon Concentrations
Fish Tissue Samples
Kreher Lakefront, Chequamegon Bay
City of Ashland, Wisconsin
All Concentrations in micrograms per kilograms (µg/kg)

Analyte	Lowest Level Detected	Highest Level Detected	Frequency of Detection	U.S. EPA-Region III Screening Values
Acenaphthene	17	200	10/27	81,000
Acenaphthylene	-	8	1/27	n/a
Anthracene	9	21	2/27	410,000
Fluorene	-	73	1/27	54,000
Naphthalene	22	110	10/27	54,000
Phenanthrene	17	79	5/27	n/a

- = not found
n/a = not available

All of the detected PAHs were well below concentrations of health concern. For each PAH analyte, the highest observed concentration was compared with the lowest available screening value. U.S. EPA Region III has developed screening values, based on reference doses (RfDs)

listed in the U.S. EPA Integrated Risk Information System. Because RfD values are determined to be the daily dose of a chemical that is unlikely to cause an adverse health effect over a lifetime of exposure, the screening values are considered to be the concentration in fish tissue below which poses no health concern for average fish consumers. As shown in Table 2, the concentration of PAHs detected in the fish tissue were significantly (200 - 10,000 times) lower than their corresponding screening values. Two PAHs, acenaphthylene and phenanthrene, do not have an available, health-based screening value. None of the PAHs detected in fish tissue in Chequamegon Bay are suspected or known human carcinogens.

Although fish collected from the Ashland lakefront had safe levels of PAHs, certain fish species from Lake Superior have unsafe levels of mercury and polychlorinated biphenyls (PCBs). Each year DNR and DHFS jointly issue a health-based, sport fish consumption advisory, titled "Important Health Information for People Eating Fish from Wisconsin Waters."[10] Unsafe levels of Mercury and PCBs found in some Lake Superior fish are probably not related to Chequamegon Bay sediments at Kreher Park because manufactured gas plant wastes do not typically include elevated levels of such contaminants. However, further investigations of Kreher Park sediments should consider analysis for mercury and PCBs. All people who eat sport fish should consult with the fish advisory document, particularly pregnant women and parents of children.

Child Health Statement

This public health consultation is part of an ongoing effort by DHFS to identify, characterize and address public health issues related to contamination at the Ashland lakefront. DHFS evaluated the likelihood that children in Ashland may be eating fish with unsafe concentrations of PAHs. DHFS did not identify any fish that contain PAHs at levels that could be harmful to children who regularly eat fish.

Conclusions

1. People catch fish from Lake Superior, at Kreher Park, Ashland. Sediments in this area contain elevated concentrations of polycyclic aromatic hydrocarbons (PAHs).

2. PAHs measured in fish from the Ashland lakefront do not represent a health concern for people who eat fish every day.

3. Fish consumption advisories for fish in Lake Superior are for mercury and polychlorinated biphenyls (PCBs), which is probably not related to PAH contaminated Chequamegon Bay sediments at Kreher Park.

4. PAHs in sediments of Chequamegon at Bay Kreher Park remain a public health hazard.

Recommendations

1. People should continue to follow advice about fish consumption advisories for Lake Superior, as described in the booklet, "Important Health Information for People Eating Fish from Wisconsin Waters."

2. Further investigations of Chequamegon Bay sediments at Kreher Park should consider testing for mercury and PCBs.

3. People should avoid touching or disturbing tar slicks and contaminated sediments at Kreher Park.

Public Health Action Plan

DHFS will continue to work with DNR to issue the fish consumption advisory.

DHFS will work with DNR in evaluating whether Chequamegon Bay sediments should be tested for mercury and PCBs.

DHFS will work with DNR and local officials to ensure that signs warning about contaminants are maintained. DHFS will also determine if other health education efforts will help decrease contact with contaminated sediments.

Consultation Preparer

Henry Nehls-Lowe
Bureau of Environmental Health
Division of Public Health
Wisconsin Department of Health & Family Services

CERTIFICATION

This Ashland Lakefront Contamination public health consultation was prepared by the Wisconsin Department of Health and Family Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health consultation was begun.

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Technical Project Officer, SPS, SSAB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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Chief, SPS, SSAB, DHAC, ATSDR

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