Portland Harbor, Fish and Public Health

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Portland Harbor, Fish and Public Health

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Portland Harbor
Portland Harbor:

Physical characteristics:
- several upland sources
- six mile stretch of river
- complex system

Fish and Portland Harbor:
- 39 fish and shellfish species
- Several resident sport fish and “subsistence” fish
- 3 Chinook salmon, 1 Coho & 2 steelhead runs
- Fish consumption was identified as the most significant exposure pathway
- Numerous ethnic groups catch and consume fish from the Harbor
Portland Harbor & Industry

Numerous industries, including ship building, bulk fuel facilities, steel mills and wood treatment facilities, have contributed past and present contamination in the Harbor. Pollutants of concern include:

- metals
- plastics
- petroleum products
- pesticides
- PCBs
- solvents, and more….

A group of ten industries and municipalities created the Lower Willamette Group to fund the initial investigation into the Portland Harbor clean-up.
Portland Harbor Clean-up:

The US Environmental Protection Agency declared Portland Harbor a Superfund Site on December 1, 2000. EPA is responsible for in-water cleanup, while DEQ is responsible for upland sites and sources. Other stakeholders involved with the Portland Harbor site include:

- Citizens Advisory Group
- Six Tribes
- Oregon Dept. Human Services
- US Fish & Wildlife
- NOAA
- Multnomah Co. Health Department
- Lower Willamette Group
- ATSDR, and more….
Fish Consumers of Concern in Portland Harbor

- Recreational Angler
- Subsistence Fisher
- Native American
- Women of child-bearing age
State of Oregon Fish Advisory Recommendations for Portland Harbor*:

• Women of childbearing age, particularly pregnant or breastfeeding women, children and people with weak immune systems, thyroid or liver problems, should avoid eating resident fish from Portland Harbor, especially carp, bass and catfish.

• Healthy women beyond childbearing age and healthy adult males should restrict the amount of resident fish eaten from Portland Harbor to no more than one 8-ounce meal per month.

• Non-resident fish, such as salmon and steelhead, are considered an excellent high-protein, low-fat food source and have no restrictions on the amount eaten from Portland Harbor.

*between Fremont Bridge and Sauvie Island
Fish & Portland Harbor
Fishy Characteristics:

How can you tell if the fish you caught has a lot of mercury or other contaminants? Does it smell, look, act or taste different?

General Guidelines:
- Larger fish vs. smaller fish
- Fish that are top predators (bioaccumulation)
- Older fish
- Source?
Bioaccumulation/magnification:

1. Pollutants get into the sediment or water from man-made or natural processes.
2. Plants and small organisms absorb/ingest the pollutants, including juvenile fish.
3. Large fish eat smaller fish.
4. Top predators (man, eagles, raccoons, etc…) eat the big fish.

Some pollutants can be found at much higher levels in fish compared with sediment!
Resident species were collected and analyzed by the Lower Willamette Group, since these species have a clear connection to site specific contaminants. Examples of resident fish include bass and carp. Migratory fish, such as salmon, were sampled by several governmental agencies.
Bass:

Smallmouth bass sampled in Portland Harbor had the second highest levels of PCBs (> 1 ppm) and pesticides. Bass collected in Swan Island Lagoon were especially high in pollution.

Bass are voracious predators and eat lots of smaller fish (part of the biomagnification cycle). In addition, bass have limited home ranges – if they reside in a highly polluted area, their burden of pollution would be high.

Across Oregon, bass (largemouth & smallmouth) have some of the highest mercury levels among all species tested. Surprisingly, the levels of mercury in Portland Harbor were low.
Carp:

Carp had the highest levels of PCBs compared with any other fish tested. Carp had elevated levels of pesticides and dioxins as well.

Information from several sources suggests that carp are consumed by Asian and Eastern European groups from Portland Harbor. There is also concern that carp are consumed using traditional methods such as fish paste, whole fish soup, use of eyes, etc... that would increase exposure to pollutants.
Bullhead catfish:
Catfish had moderate levels of contamination (less than bass and carp). However, the level of PCBs were high enough to include on our advisory. Other catfish, such as white or channel catfish, would be expected to have similar or more contamination.

Crappie & panfish:
Black crappie were sampled from segments of Portland Harbor. Levels of contamination were generally low in the crappie. These fish do not grow to very large sizes and tend to eat insects instead of fish.
Shellfish:

Crayfish:
Can accumulate organic pollutants, including PAHs (which are effectively metabolized in fish). Advisory exists in Portland Harbor and Bonneville Dam. Small home range increases susceptibility to pollution.

Bi-valves:
Limited information in freshwater systems for Oregon. Shellfish collected near Bonneville Dam were very high in PCB content.
Salmon:
The salmon sampled in 2003 were spring Chinooks, collected from the Clackamas River (after having spent time migrating through Portland Harbor). Levels of PCBs, pesticides and mercury were the lowest of any fish tested. This is most likely a result of their migratory nature and adult lifespan in ocean waters.

Salmon eggs: these are fat-rich and have elevated levels of pesticides and other organics compared with other parts of the salmon from previous studies.
White Sturgeon:

White Sturgeon sampled in this study had moderate to low levels of PCBs and pesticides. The sturgeon had the highest amount of mercury detected among any species sampled. Sturgeon can attain massive size and live for many years (> 100 years). The sturgeon sampled in this study were around 40” in length, which are considered to be juveniles. Larger sturgeon would be expected to have more contamination.

On numerous occasions, we have observed people fishing for sturgeon in Portland Harbor and the surrounding area. Sturgeon is popular among many groups, especially Eastern European and Asian communities.
Chemicals of Concern
Why focus on women of child-bearing age?

Toxins can cross the placenta and are found in breast milk.

Fetal exposure can affect behavioral, neurological and cognitive function in infants and children.

Many of the most pronounced effects occur in the first trimester and chemicals like PCBs have a long half-life in the blood.
Polychlorinated biphenyls (PCBs):

PCBs were used in many industrial processes, such as insulating electrical transformers and hydraulic fluids. PCBs were banned in 1977, yet still persist in fish and wildlife today. PCBs accumulate in the fatty tissues of fish and fish consumers.

Possible health effects from high exposure to PCBs include reduced IQ, response time, visual recognition, memory retention and learning abilities in children exposed in the womb by mothers who consumed contaminated fish.

In addition to neurological effects, PCBs can have an adverse impact on thyroid hormones, immune system performance, liver function and cancer.
PCBs in fish from Portland Harbor:

- SM Bass
- Crappie
- Bullhead
- Carp
- Salmon
- Sturgeon
- Lamprey

Parts per billion

1 ppm
Total DDT (DDT, DDE & DDD):

DDT was banned for use in the United States in 1972, due to concerns for persistence and effects on wildlife. While levels of DDT have gone down since the ban, fish and humans continue to have the pesticide in their tissue.

On-going studies about the effect of the estrogenic effect of DDE in reproductive, developmental and endocrine function. Animal studies have shown potential exists for negative impacts. Animal studies have demonstrated that some pesticides can cause cancer, especially of the liver. Human studies are less conclusive. Currently, the EPA classifies DDT, DDE and DDD as probable human carcinogens.
Insert slide on pesticide data....
Mercury:
The form of mercury found in fish is methylmercury. Unlike PCBs and pesticides, this compound binds to the protein in fish fillet. It will cross the blood-brain barrier and placenta and accumulates in the brain and kidneys of people.

Sensitive effects of mercury are primarily neurological, especially on the developing nervous system. Children of women who consumed a large amount of fish had poorer performance on reaction time, memory and visual tests compared with other children. At high doses, mercury can also effect the kidneys and may have a role in cardiac health impairment.
Mercury Results (mg/kg) – Resident Fish

*Data has not been validated
Health Education
The wrong message:

“People should not eat any fish caught in or near Portland Harbor.”

“Don’t worry about a thing, the fish are completely safe to eat.”

Both messages are incorrect and not based on sound medical or scientific advice. Worse, the public becomes confused, credibility is lost and the right message is not conveyed.
OREGON FISH ADVISORY

Fish from these waters may be harmful to eat, especially for children and pregnant or nursing women.

**Atención:** Los peces de estas aguas pueden ser dañinos al comerlos, especialmente a mujeres embarazadas, mujeres que están lactando (amamantando) y a niños.

**Chú ý:** Ăn cá từ những vùng nước này có thể sinh nguy hại, nhất là cho trẻ em, phụ nữ đang mang thai hoặc cho con bú.

注意﹕食用這些水域的魚類，可能會使健康受損，尤其對兒童、懷孕婦女、或正在用母奶哺乳的母親影響更大。

**Внимание:** Рыба из этой воды может быть вредной для употребления, особенно для детей,
**Health Education:**

While it is impossible to remove all contaminants from fish, the proper preparation and cooking methods will reduce your exposure.

In addition, the head, eyes, organs and eggs should be removed and discarded. Avoid making fish head soup or other whole body dishes.
Cooking Methods:

The way in which you cook fish can determine how much exposure you have as well. Cooking methods that allow fats to drip off the fish are recommended, such as:

- grilling
- broiling
- baking
- smoking

Frying fish is not as effective compared with the methods above.
Known health benefits of fish consumption:

- reduction in cardiovascular disease
- reduction in hypertension
- reduced risk of colon & breast cancer
- many benefits to diabetic patients
- decreased incidence of asthma induced attacks
- reduction in pain for arthritic patients

And, what will replace the fish.....
Metal concentrations in fish tissue were relatively low in Portland Harbor, especially compared to the mid-Willamette River.

- PCBs are high (> 1 ppm) in bass and carp: requires a lot of health education and communication.

- Organic contaminants are much higher in resident fish compared with migratory fish: proper preparation and cooking techniques can reduce exposure.

- Target risk group: women of childbearing age and infants, especially in communities that eat the most contaminated fish.