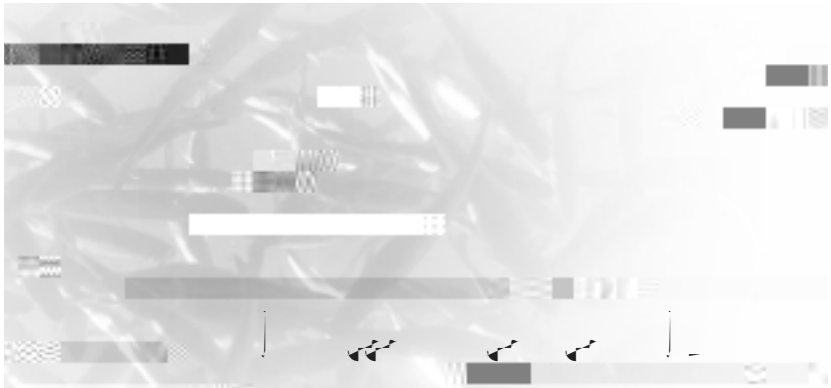
GREAT LAKES FISH CONSUMPTION

ADVISORIES

Discussion Paper prepared by the Health Professionals Task Force
for the International Joint Commission

January 2004



United States Section

Peter Orris, MD, MPH, FACP
Drew Brodkin, MD, MPH
Heraline Hicks, PhD
Mary Foley, MS, RN
John Dellinger, PhD
Judith Kaur, MD
Elwyn Grimes, MD, FACOG

Canadian Section

Alan Abelsohn, MD, CCFP, FCFP
Pierre Gosselin, MD, MPH
Brian Gibson, MD, CCFP
Margaret Sanborn, MD, CCFP
Irena Buka, MBChB, FRCPC
Morris Duhaime, MD
Tony Myres, PhD

Secretary: Jim Houston
U.S. Section Liaison: Kay Austin

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At the request of the Commissioners of the International Joint Commission, the Health Professionals Task Force (HPTF) prepared this discussion paper to stimulate a review of the current approaches to advising the public about fish consumption in the U.S. and Canada. Recent literature on human toxicants and their biologic effects was reviewed along with data on human consumption patterns of Great Lakes fish, and fish contaminant levels for mercury and polychlorinated biphenyls. In addition, verbal and written testimony from public health experts, state and federal regulatory agencies, environmental organizations and concerned citizens from both countries were considered. The advisories themselves were collected and several of the current approaches used were assessed with the objective of providing guidance to the Commisioners.

It is the opinion of the HPTF members that the International Joint Commission should support a more effective approach to the development of fish consumption advisories, through better protection of those people at risk, without deterring the majority of people from fish consumption. To develop such an approach, environmental monitoring and exposure assessments (to track trends in persistent organic pollutants) are urgently needed. Dietary exposures and their associated risk factors can be accurately determined and communicated to appropriate at-risk populations.

While the HPTF focused on two of the four major pollutants (i.e., mercury and polychlorinated biphenyls) found in the Great Lakes, members are also of the opinion that to adequately protect Great Lakes fish eaters there is a need to monitor a variety of other groups of chemicals.

Members of the HPTF believe in primary prevention, which demands that efforts are continued to reduce contaminant levels in all Great Lakes fish. Through better awareness and education about fish consumption advisories, improved public health could be achieved.

The International Joint Commission (IJC) in its tenth Biennial report committed to give further consideration to the issue of fish consumption advisories (IJC, 2000). This discussion paper was prepared by the Health Professionals Task Force (HPTF) for the IJC and examines the public health issues arising from fish consumption advisories that exist in all jurisdictions throughout the Great Lakes basin. The HPTF in its review of fish consumption advisories also sought to provide guidelines to the IJC to improve the effectiveness of fish advisories, particularly for at-risk populations. Fish consumption advisories are primarily generated as a result of concerns about the health effects of ingesting fish contaminated by persistent organic pollutants such as mercury and polychlorinated biphenyls (PCBs). Information on current fish consumption advisories can be found in the US Environmental Protection Agency's (EPA) fact sheet, "National Listing of Fish and Wildlife Advisories" (USEPA 2003). The fact sheet also includes information on Canadian advisories.

This discussion paper focuses on mercury and polychlorinated biphyenls (PCBs). They are the two most pervasive contaminants found in the waters of the Great Lakes and dominate the typical contaminant pattern seen in fish. For more complete reviews of the literature and the potential risks to human health, readers are directed to recent reports by the Agency for Toxic Substances and Disease Registry (ATSDR, 1999 and 2000) and the National Research Council (2000).

In preparing this report, the following observations were used by the HPTF to assist in the development of the guidelines provided herewithin for more effective fish consumption advisories:

1. Progress has been made in reducing many persistent organic pollutants such as the organochlorine compounds in the water and in fish commonly consumed, though this reduction appears to have leveled off in recent years (LaRoe, 1995, USEPA 2002). Concern remains about several groups of unmonitored chemicals including pharmaceuticals, flame-retardants and high – volume chemicals such as biodegradable pesticides, given they are persistent, but usually biodegradable, and not all of them are bioaccumulative (IJC 2000, 2002).

2. Mercury, a neurotoxin, continues to be a major concern in the Great Lakes basin. A majority of the fish consumption advisories for the Great Lakes and connecting waters focus on mercury contamination.

3. Evidence from past epidemiological outbreaks associated with well documented severe exposures to Mercury (e.g., Minimata, Grassy Narrows, and Iraq) indicates a human health risk is associated with consuming fish containing high or elevated (above background levels) concentrations of mercury and persistent organic pollutants (NRC 2000). Recent scientific evidence also suggests subtle effects are occurring at low doses.

4. Certain subpopulations, especially the developing fetus, are most susceptible to low dose exposures of methylmercury and PCBs, with neurodevelopmental effects being perhaps the most sensitive adverse human health indicator from these exposures.

5. Fish is an important nutritional component of many people's diets and a good source of n-3 (Omega 3) fatty acids (McIvor, 2001)[1]. Additionally, fish are high in protein and low in saturated fats (Johnson et al., 1998).

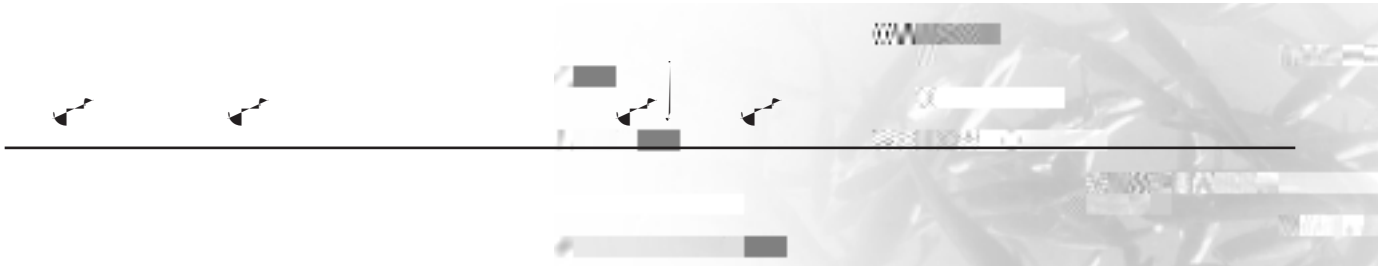
6. Alternative protein sources have been shown to contain other contaminants of concern. Avoiding native fish and substituting grocery-purchased fish or other protein sources may lessen health risks associated with some of the known contaminants.

7. In June 1999, the World Health Organization (WHO) convened the 53rd Joint FAO/WHO Expert Committee on Food Additives and published their report, "Safety Evaluation of Certain Food Additives and Contaminants" (WHO, 1999). The WHO report concluded:

"...The Committee noted that fish makes an important contribution to nutrition, especially in certain regional and ethnic diets, and

(page 93, World Health Organization, 1999)

1 Omega 3 fatty acids are long-chain polyunsaturated fatty acids, important components of cell membranes and precursors of a variety of biologically active compounds. For normal grol12 -Jtutrrrrrrol12 elopment and function of neu and visual function infants require polyunsaturated fatty acids, provided in breast milk and orm ult (Health Canada, 2001, 2002). Fish, baked or broiled, is low in fat with the exception of Atlantic mackerel, salmon and lake whitefish. Fish is a dietary source of sodium, potassium, selenium, Vitamin A, folic acid and niacin (Health Canada, 2001).



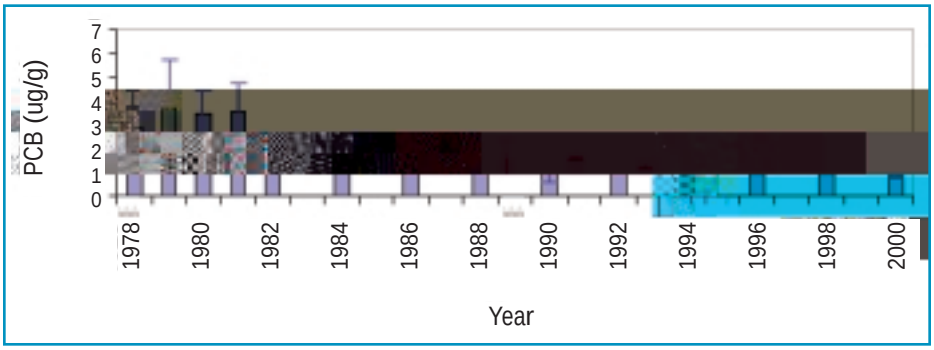
Fish consumption advisories warn people about the risk of consuming contaminated fish. The objective of an advisory is to 1) provide information about the chemical contaminants in sport fish; 2) educate consumers about waterbodies and fish species of concern and methods to reduce their exposure; and 3) indicate benefits of fish consumption (Johnson et al., 1998). Depending upon specific bodies of water and the species of concern, fish consumption advice ranges from advice to not eat any fish to advice specifying the maximum numbers of meals that may be safely consumed. All Great Lakes fish consumption advisories do specify information on which parts of the fish should be avoided and what preparatory/cooking methods should be used to reduce exposure to contaminants of concern. Typically, advisories are stricter for women of childbearing years, for women who may be pregnant or nursing, and for very young children. For example, the Guide to Eating Ontario Sport Fish (the Guide) contains detailed advice on selecting fish for eating from Ontario lakes and rivers including the Great Lakes (OME, 2003). It clearly recommends not eating any organs, fat or skin of any fish. Included in the Guide's general recommendations is advice to 1) eat smaller fish; 2) eat bass, pike, walleye, perch, and pan fish from the Great Lakes instead of fatty species such as salmon and trout; and 3) allow fat to drip away when cooking fish.

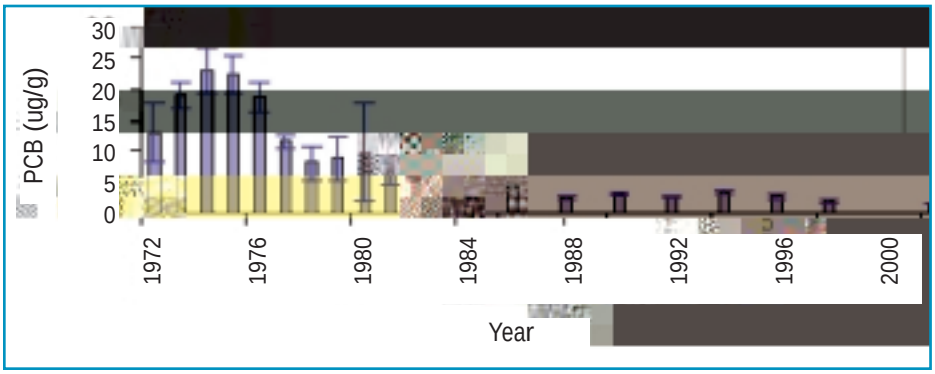
Use of the Guide was studied by Health Canada between 1995 and 1997 (Grondin, J. and LaRue, R., 2000). When deciding whether to eat their catch, 38% of fish eaters surveyed used only conventional sources of information, with media being the most often cited source. But when government sources were cited, fifteen percent of survey respondents used only the Guide. Thirty-four percent of survey respondents used only unconventional sources of information, citing interpersonal contacts as the most commonly used source of information. The Health Canada study also found fish eaters believed that the most credible informal information came from local sources such as bait shop owners.

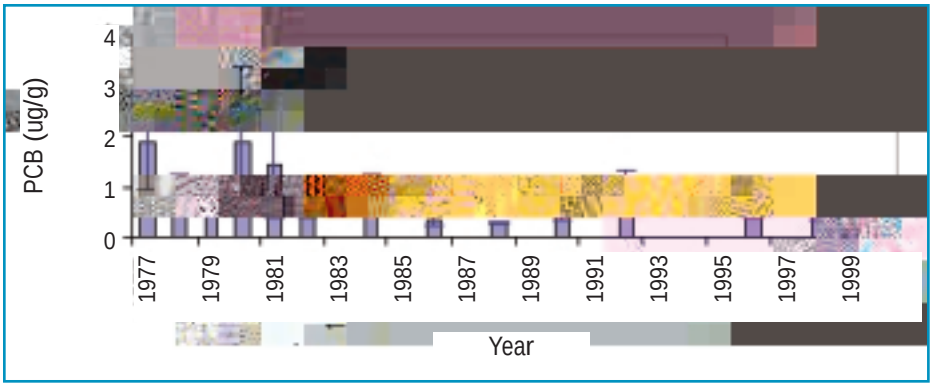
The USEPA National Listing of Fish and Wildlife Advisories for 2001 (USEPA 2002) includes the contaminants of concern, fish species and its size, the year the advisory was introduced, the current status of the advisory (i.e., active or rescinded) and the advisory type. The five The five The fivuy (i.I.d t4seonv

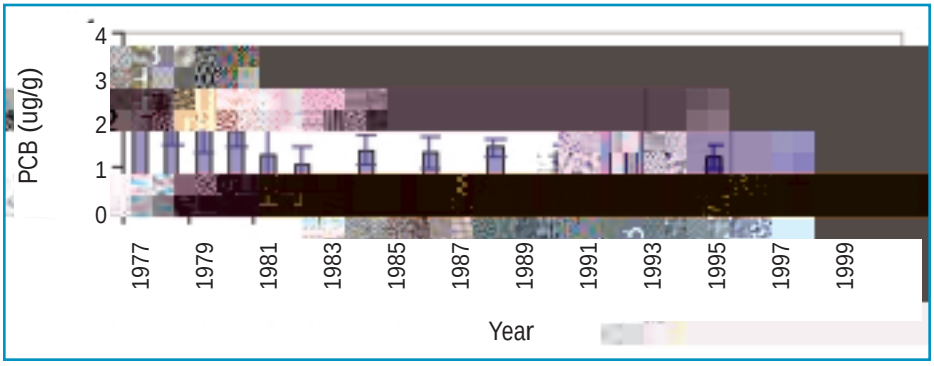
Great Lakes	PCBs	Dioxins	Mercury	Chlordane
Lake Superior	✓	✓	✓	✓
Lake Michigan	✓	✓	✓	✓
Lake Huron	✓	✓	✓	✓
Lake Erie	✓	✓	✓	
Lake Ontario	✓	✓		

Groups of chemicals such as heavy metals, organochlorine pesticides, and other numerous chemical compounds including, but not limited to, creosote, mirex, polyaromatic hydrocarbons, hexachlorobenzene, and pentachlorophenol, make up the remaining 4% of all fish consumption advisories in the U.S. (USEPA, 2003). Of the remaining 4% a majority of these advisories are a result of a New York statewide advisory for the contaminant mirex.









As noted previously, fish consumption is not limited to Great Lakes fish alone. Consumers may additionally eat wild and farmed fish (e.g., freshwater and/or marine species). Some of these marine fish can be a source of persistent toxic contaminants that may pose a health risk to regular weekly consumers (Hightower et al., 2003, Easton, et al., 2002). For example, in a recent advisory issued by Health Canada, Canadians were advised to limit their consumption of fresh shark, swordfish and tuna. Mercury in these marine species has been found at levels in the range of 0.5 to 1.5 ppm (Health Canada, 2002).

In a Health Canada study conducted between 1995 and 1997, Canadian Great Lakes sport fishers were surveyed for their fish consumption patterns, including their fishing habits, advisory compliance and knowledge (Grondin and LaRue, 2000). The results showed that 66% of respondents stated they primarily fished for pleasure, while only 6% fished for food. Respondents who ate their catch stated they liked the fish because it tasted good, but also expressed concerns about polluted water and contaminated fish. Results also showed that 52% of the fish eaters consumed less than 12 meals per year of fish they caught, 22% ate 12 to 25 fish meals per year, 21% ate 26 to 95 fish meals per year, while only 6% ate more than 96 fish meals per year. The study found that as fish consumption increased, so did the likelihood that parts other than fillets were consumed. The results also showed that those who did not eat their catch were younger, employed, and more likely to report an income of $60,000 or more. Younger respondents indicated the main reason for not eating the fish they caught was their belief that the water was polluted or the fish were contaminated.

In its review of available information, the HPTF noted that despite public concerns about consuming contaminated fish, many subpopulations in North America desire to catch and consume fish from their native habitats for esthetic purposes (e.g., fishing is fun), social interactions (e.g., encourages family activity), or due to economic reasons (e.g., more affordable than supermarket fish). Wheatley and Wheatley (2000) noted that each of these desires reflects benefits that must be weighed against the risks of consuming contaminated fish. An earlier study of Canadian Indigenous People (Wheatley and Paradis, 1996) suggested that the indirect effects they found were apparently due to the change in behavior (i.e., reduced fish consumption) in response to knowledge about environmental contaminants levels and/or advisories and could lead to social/cultural disruption, change of lifestyle, socio-economic damage and change of diet leading to increasing incidences of diabetes, substance abuse and violent behavior.

f) Suboptimal neurodevelopment in Dutch neonates was related to high levels of PCBs, chlorinated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MIDDLE EAU CLAIRE L
DIAMOND L
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WHITEFISH L
BOND L
WASHBURN
TAINTER L
CHIPPEWA
CONNORS L
MILLE LACS L
CLAM RIVER FL
County Boundary
N TURTLE L
PINE L
ENGLISH L
OXBOW L
TENDERFOOT L
DUNN
L WISSOTA
BARRON
HEMLOCK L
DAIRYLAND RESERVOIR

The HPTF believes that the development of fish consumption advisories to protect public health should

1) be simple to permit effective comprehension and retention of information by the targeted population;

2) utilize the precautionary principle to reduce exposures based on a likelihood of harm;

3) indicate that fish is a significant dietary source of protein for many including Aboriginal and immigrant populations and avoid implying support for alternative protein sources with equivalent or higher risks to human health;

4) be widely distributed with targeted messages so that individuals can exercise their personal judgment about the risks to themselves or to their offspring from consuming contaminated fish;

5) be science-based and rely on animal studies, toxicological assessments, as well as occupational and epidemiological studies;

6) be targeted to at-risk populations specifically to women expecting to become or currently pregnant, nursing mothers and young children;

7) contain information concerning the comparative benefits and disadvantages of consuming fish and/or other protein sources in clear terms to the general population;

8) be updated regularly and based on continued monitoring and surveillance for both Canada and the United States;

9) be written in clear, simple terms, using informal native language of the targeted population and be culturally specific and designed to reach minority communities within each region; and

10) be well publicized and made easily accessible to the public, and recommend actions or steps that can be accomplished by the affected communities.

Country/ Organization	Fish Type	Mercury		
United States	Fish, shellfish and other aquatic animals (FDA)	1 ppm methyl Hg(2)	FDA Action level	US EPA reference dose: 0.1Fg methyl Hg/kg body weight per day
	States, tribes and territories are responsible for issuing fish consumption advise for locally-caught fish; trigger level for many state health departments	0.5 ppm methyl Hg	Local trigger level	
Canada (Health Canada)	All fish except shark, swordfish or fresh or frozen tuna (expressed as total mercury in the edible portion of fish)	0.5ppm total Hg	Guidelines/Tolerances of Various Chemical Contaminants in Canada	Provisional Tolerable Daily Intake: 047Fg Hg/kg body weight per day for most of the population and 0.2Fg Hg/kg/day women of childbearing age and young children.
	Maximum allowable limit for those who consume large amounts of fish, such as Aboriginal people	0.2ppm total Hg		
WHO	All fish except predatory fish	0.5 mg methyl Hg/kg	Fao/WHO Codex Alimentaius guideline level	0.47 ug/kg/day
	Predatory fish (such as shark, swordfish, tuna, pike and others)	1 mg methyl Hg/kg		JECFA provisional tolerable weekly intake: 3.3 Fg methyl Hg/kg body weight per week.

(1) Units as used in references “mg/kg” equals Fg/g and ppm (parts per million. It is assumed here that fish limit values not mentioned as “wet weight” or “wet flesh” are most likely also based on wet weight, as this is normally the case for analysis on fish for consumers.

(2) This value is misleading as a majority of the states use a dose-based methodology as recommended by EPA’s national guidance for establishing advisories. This approach results in varying thresholds associated with various levels of consumption. As an for es(young cr cos(yo. e/suw54 0 TD[(2sed i002 TcA)54tAled P))total Habli1e)-3.3 2.- 2sed i0 TD(flesh

Country/ Organization	Fish Type	PCBs	
United States	Fish, shellfish and other aquatic animals (FDA) States, tribes and territories are responsible for issuing fish consumption advise for locally-caught fish; trigger level for many state health departments	The Food and Drug Administration (FDA) requires that infant eating fish and shellfish, contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food	FDA Action level
Canada (Health Canada)	All fish except shark, swordfish or fresh or frozen tuna (expressed as total mercury in the edible portion of fish) Maximum allowable limit for those who consume large amounts of fish, such as Aboriginal people	2ppm	Guidelines/Tolerances of Various Chemical Contaminants in Canada
WHO	All fish except predatory fish		

State	Threshold General Population (ppm)	Threshold Sensitive Populations (ppm)	Consumption Recommendations – Sensitive Populations
Illinois	0.50	0.50	No consumption
Indiana	0.16	0	Ranges from four 8-ounce meals per month to consumption (0.65 ppm) depending on level of mercury contamination; statewide advisory recommends one 8-ounce meal per month (all freshwaters not under a specific advisory)
Michigan	0.50	0.50	On 8-ounce meal per month; no consumption at 1.5 ppm; statewide advisory recommends one 8-ounce meal per month of eight species from all inland lakes
Minnesota	0.16	0.05	Ranges from unlimited consumption to no consumption (at 2.8 ppm) depending on level of mercury contamination; statewide advisory recommends the same range
New York	1.00	1.0*	No consumption; statewide advisory recommends four 8-ounce meals per month
Ohio	0.05	0.05	Ranges from four 8-ounce meals per month to no consumption (at 1.0ppm) depending on level of mercury contamination; statewide advisory recommends four 8-ounce meals per month for waters not under a specific advisory
Pennsylvania	0.13	0.13	Ranges from four 8-ounce meals per month to no consumption of species
Wisconsin (Candy S. Schrank, Aquatic Toxicologist, Wisconsin, DNR)	0.16 to 0.5	0.05 to 1.0	Statewide advisory recommends four 8-ounce meals per month of six species and one 8-ounce meal per month of other sport fish (all freshwaters not under a specific advisory), no consumption at 1.0 ppm. Site-specific recommendation may be 'do not eat' or '1 meal/month'

* consumption limits more stringent for sensitive populations

Source: Combination of The State PIRGs (In: Brain Food, What women should know about mercury contamination of fish), April 2001, written by The Environmental Working Group, a nonprofit environmental research organization based in Washington, D.C. and written correspondence from state experts identified above.

Species	Mean (PPM)	Range (PPM)	No. of Samples
Grouper (Mycteroperca)	0.43	0.05-1.35	64
Tuna (fresh or frozen)	0.32	ND-1.30	191
*Lobster Northern (American)	0.31	0.05-1.31	88
Grouper (Epinephelus)	0.27	0.19-0.33	48

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International Joint Commission

January 2004