



Fish Facts for Health Professionals: Methylmercury Exposure and Health Effects

Workbook



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Introduction

Health professionals are often asked by their patients and families about the benefits and risks of fish consumption. Conflicting media messages about health risks and benefits related to fish consumption, coupled with limited health professional training, has led to confusion by health professionals about advising patients and families about safe fish consumption. *Building health professional capacity, fish consumption, and health effects* is a collaborative effort between environmental, medical and nursing experts from across the country to develop an educational series for busy health professionals about the risks and benefits of fish consumption. This effort, informed through focus groups comprised of experts in the field, resulted in the development of a series of educational media modules entitled *Fish Facts for Health Professionals*. This media series comprised of four, 3-5 minute media modules was designed for busy health professionals that are interested in learning more about the risks and benefits of fish consumption and methylmercury (MeHg) exposure. This workbook complements the media series and provides more in-depth information and resources for those seeking additional information.

This initiative was funded through the Environmental Protection Agency (EPA). Many thanks to the many environmental health and health professionals who advised the development of the media modules through their participation in the focus groups or review of the product. This work is dedicated to the memory of Dr. Kate Mahaffey, a leader in the effort to reduce health risks related to methylmercury exposure and a participant in the focus groups.

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Directions

The educational media module series, *Fish Facts for Health Professionals* can be accessed at www.fish-facts.org. In this workbook, each of the four modules includes the following information: Learning objectives, background, resources for learning more about the topic, and references. In addition, the appendices in this workbook include a sample dietary questionnaire that can be used in the clinical setting and a list of web-based resources for health professionals. After viewing *Fish Facts*, please share your opinion about this learning experience at www.surveymonkey.com/s.aspx?sm=esBVc7qlPkdOomBblF9gqw_3d_3d.

Continuing Education Credit

Nurses interested in viewing *Fish Facts for Health Professionals* for continuing education credit should review the workbook, including learning objectives prior to viewing the series and take the Evaluation Survey that can be found at www.surveymonkey.com/s.aspx?sm=0QCwdWebBBiWku6H4crvoQ_3d_3d. Georgetown University School of Nursing & Health Studies will be coordinating the distribution of continuing education contact hours.

Module 1: Epidemiology and Toxicology

Learning objectives

After viewing this media module, the participant will be able to:

- Describe how people are most often exposed to methylmercury
- Identify human health effects of exposure to methylmercury
- Select populations most at risk for health effects

Background

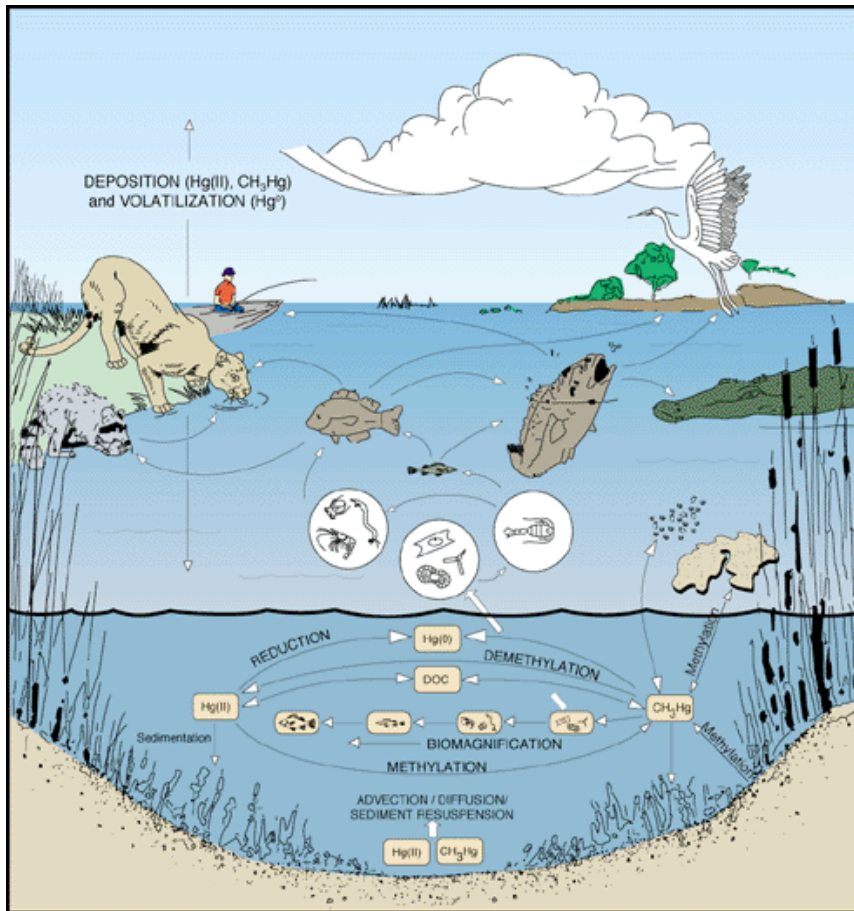
Why is the relationship between methylmercury and fish consumption important for health professionals to understand?

Fish consumption is the primary route of exposure to MeHg. Because of the increasing popularity of fish as a source of dietary protein, largely due of its “heart healthy” benefits (because it is high in omega 3 fatty acids), a significant percentage of the US population may be at risk for methylmercury induced health problems. Ironically, emerging data indicates that elevated blood mercury from fish consumption may actually increase one’s risk for cardiovascular disease. Fish contains MeHg which has been linked to an increased risk of cardiovascular disease including heart attacks.^{1,2} These health risks are important for health professionals to understand. Ironically, emerging data indicates that elevated blood mercury from fish consumption may actually increase one’s risk for cardiovascular disease. Fish contains MeHg which has been linked to an increased risk of cardiovascular disease including heart attacks.^{1,2} These health risks among others such as neurodevelopment adverse impacts, are important for health professionals to understand and communicate to patients.

What is mercury and methylmercury?

Mercury is a metal that can be released into the environment for example, through coal-fired plant processes or hazardous waste incineration. It enters the atmosphere then drifts into water systems such as rivers, lakes, and wetlands. Once in the water, mercury is then converted by bacteria into methylmercury (called organic complexing). Methylmercury is a neurotoxic substance which means it causes damage to nerve tissue.³ MeHg then accumulates through the food chain, so that smaller fish eat the plankton contaminated with MeHg, larger fish eat the

smaller fish, and so on, so that fish that live long and eat other fish can accumulate high levels of methylmercury in their tissue.⁴ The concentration of methylmercury in the top level of the food chain can reach a level a million times higher than the level in the water (http://water.usgs.gov/nawqa/mercury/HgEST_FAQ.html). It is therefore, important to consider the type of fish a person consumes when assessing exposure to MeHg.



The Mercury Cycle (www.epa.gov)

What are the signs and symptoms of methylmercury toxicity?

Exposures in adults can result in symptoms such as ataxia (gross lack of coordination of muscle movements), memory loss, paresthasias (“pins and needles”), blurry vision, and diminished hearing. Low dose chronic exposures have been associated with non-specific symptoms, cardiovascular disease, neuropsychiatric damage, infertility, and autoantibody induction.⁵

Prenatal exposure to MeHg can cause lifelong adverse developmental and cognitive effects, even at low doses. This is because mothers who eat fish and shellfish during pregnancy the fetus is exposed to MeHg. Children who are exposed in the womb are at increased risk of poor performance on neurobehavioral tests such as those measuring attention, fine motor function, and language skills, for example.⁶ MeHg can also impact the neurological system throughout

childhood, particularly when children experience periods of growth and development. There is some evidence that early life exposure may also affect cardiovascular, immune, and reproductive health.⁷ More severe health effects as a result of high poisoning events include cerebral palsy, mental retardation, deafness, and blindness which was evidenced in the sentinel case that occurred in the 1950s in Minamata Bay, Japan.^{8,9}

What do we know today about risks in the US?

Our knowledge of methylmercury poisoning began with a mass poisoning that occurred at Minamata Bay, Japan. Since then, we have found this is not just an isolated issue and MeHg is a concern even today. Since Minamata Bay, a number of studies have been conducted to explore the impact of fish consumption and mercury toxicity. For example, using data from the U.S. Centers of Disease Control and Prevention's National Health and Nutrition Examination Survey (NHANES) a recent study indicated that over 600,000 U.S. children could be exposed to unsafe levels of MeHg as a result of prenatal exposure. This study also found that almost 16% of US women in childbearing age have high blood Hg concentrations; and of women who eat any fish at all, 50% consume more than safe levels.¹⁰⁻¹⁴ Another study found that while inorganic mercury was detected in the blood of 2 percent of women aged 18 to 49 years of age in the 1999-2000 NHANES survey, that level increased to 30 percent of women by 2005-2006.¹⁵

Also of concern are populations with high fish consumption, including many island and coastal communities and ethnic groups, and those who by habit chose fish with higher mercury content. These groups have been found to have MeHg exposures substantially higher than those reported among these national studies.^{16,17}

Other concerns related to fish consumption and health include PCBs (polychlorinated biphenyls). PCBs accumulate in the sediments at the bottoms of waterways and lakes. These chemicals can build up in the fatty tissues of fish and other animals, and in high concentrations pose serious health risks to people who frequently eat contaminated fish. To reduce exposure, certain fish need special preparation before eating (or avoided). More information can be found at: <http://dhs.wisconsin.gov/eh/Fish/FishFS/PCBfish.pdf>.

Finally, overfishing has increased the problem of sustainability in our waters of many fish such as Chilean Sea Bass, Yellowfin Tuna, Orange Roughy and Grouper. Information on which fish are at risk can be found at Environmental Defense Fund website: www.edf.org/page.cfm?tagID=1521&s_src=ggad&s_subsrc=ss&gclid=CPWDieyhuJOCFRBM5QodQG_ijg.

Interested in more information?

Visit the Integrated Risk Information System (IRIS) Risk Information for Methylmercury (MeHg) at <http://www.epa.gov/iris/subst/0073.htm> and

ToxFaqs: Mercury CAS: 7439-97-6 at <http://www.atsdr.cdc.gov/tfacts46.pdf>

America's Children and the Environment, Second Edition (2003), Environmental Protection Agency; Mercury link found at: www.epa.gov/envirohealth/children/body_burdens/b4-graph.htm

Toxicity and Exposure Assessment for Children's Health (TEACH) chemical summary for organic mercury, Environmental Protection Agency; found at www.epa.gov/teach/chem_summ/mercury_org_summary.pdf

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Fish Module 2: Hazard Identification and Exposure Assessment

Learning objectives

After viewing this media module, the participant will be able to:

- Identify fish low in MeHg levels
- Identify fish high in MeHg levels
- Describe key factors to reduce risks associated with fish consumption and MeHg consumption

Background

What is hazard identification and why is it important for health professionals to understand? Hazard identification is the process of determining whether exposure to a toxic substance can cause an increase in the incidence of specific adverse effects. In the case of methylmercury and fish, it is important for health professionals to understand the science behind the guidance they provide to families who are interested learning how to reduce risks, through safer choices of fish that they consume. ¹

What do we currently know about methylmercury concentrations in different species of fish? Although levels of methylmercury can vary by region, in general, the larger the fish, the older the fish or if it consumes other fish, the more methylmercury tends to be concentrated in the fish. So, for example swordfish, orange roughy, tilesfish, King Mackerel, shark, and some types of tuna (big eye, ahi, albacore) can be very high in methylmercury.

We also know that smaller, younger fish that don't consume other fish are lower in methylmercury. These include anchovies, sardines, and clams, for example. It is important to avoid some fish altogether, particularly for pregnant women and children because of the risk of neurodevelopmental issues that might arise.^{2,3} The www.fish-facts.org site provides a number of resources that list more detailed information about methylmercury concentrations in different species of fish.

Are there other factors that can impact risk for families that eat fish?

Yes, the **frequency of consumption and the portion size** can all impact risk. A typical portion of fish is about 4-6 ounces (the size of the palm of your hand). However, when people eat out

(such as “Friday night fish fries”) they may be eating more than one serving of fish in one sitting. So, although they may be eating fish lower in methylmercury such as haddock, consumption of **large portions** of fish will increase risk, since the methylmercury bio-accumulates in the human body. Also, the **frequency** of fish consumed is also important to consider. Eating a low mercury fish every day such as bluegill, will expose a person to methylmercury and because methylmercury bio-accumulates in the body, could lead to a body burden that exceeds guideline values.^{3,4}

What is exposure assessment and why is this important for health professionals to understand?

Exposure assessment refers to methods for estimating the magnitude, frequency, and duration of exposure to a toxic substance like methylmercury. It is important for health professionals to understand that some groups of people are more at risk for methylmercury toxicity, based on their exposure to this toxic substance. For example, because methylmercury is a neurotoxic substance, children are particularly vulnerable to health effects from exposure because of their developing neurological system. For example, a 45 pound child that eats one can of albacore tuna per week will be 3.6 times above recommended levels set by the EPA. To stay within EPA guidelines, albacore tuna intake cannot exceed one can per month for children⁴

Other populations with high fish consumption and therefore exposure, such as island and coastal populations, or those eating fish for a “heart healthy” diet, can have MeHg exposures substantially higher than those reported in national surveys. In 2004, the Wisconsin Department of Health Services surveyed residents about fish intake and measured MeHg levels through hair sampling, and found that men were significantly more likely to have higher levels of MeHg than women. In addition, average hair mercury levels were significantly correlated with monthly fish consumption estimates (the more fish eaten the higher the levels of methylmercury in hair).⁵

Monitoring for MeHg exposure can be accomplished through the measurement of the total mercury content of blood, hair or toenails. Hair measurements are less invasive and can also be used to establish the timing of exposure to MeHg. MeHg in the mother’s blood is correlated with exposure to the fetus. The National Resources Defense Council provides an online tool that can calculate a person’s approximate risk, based on weight and fish consumption habits, including type of fish, frequency of consumption and portion size (www.nrdc.org). Sierra Club offers hair testing for a small fee (<http://www.sierraclub.org/communities/mercury/default.aspx>)

Interested in more information?

Visit the Risk Assessment Portal at <http://www.epa.gov/risk/hazardous-identification.htm>.



Community screening program for MeHg using hair samples

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Module 3: Clinical Perspectives

Learning objectives

After viewing this media module, the participant will be able to:

- Describe the most important intervention by health professionals to screen for methylmercury exposure from fish consumption
- Identify populations sensitive to the neurodevelopmental effects of MeHg
- Describe pathways of MeHg exposure in infants

Background

The general public is often confused and concerned about fish consumption and potential health effects. What are the key points for health care professionals to consider when assessing for methylmercury toxicity?

Fish consumption is the primary source of methylmercury exposure so it is essential that health care providers screen for methylmercury exposure by taking a thorough dietary history.

Important populations to screen and counsel to reduce health risks related to methylmercury include: children and women of childbearing age since methylmercury can pass through the placenta and breast milk., High-end fish consumers, should also be screened. Target mercury levels should be less than 5.0 mcg/l in blood, or hair level less than 1.0 mcg/g, to confer good health for a lifetime of fish consumption¹ Mercury exposure in utero or early childhood has the potential to impact the developing brain.^{2,3}

The dietary history should address:

1) the type and size of fish consumed (for example, large predatory fish such as swordfish are high in mercury) as well as

2) portion size and frequency of consumption. One easy tip to share with families is that a 4 ounce fish serving is approximately the size and thickness of a deck of cards.

Health care providers should routinely take an environmental history that includes daily fish intake. The most important piece of counseling to families is to eat fish but choose wisely. The

goal for families is to maximize the benefits of omega 3 fatty acids found in fish while reducing potential exposures to methylmercury.

Advice to share with families:

Pregnant women, women of childbearing age, nursing mothers and young children should completely avoid fish known to be high in mercury including:

- King mackerel
- Marlin
- Orange Roughy
- Shark
- Swordfish
- Tilefish
- Tuna (Bigeye, Ahi)⁴



Rule of thumb: The smaller the fish, the safer the fish

Families often ask, “should I have a test for mercury performed?” What is recommended?

This should be decided on a case by case basis in consultation with a health professional or environmental health specialist. Often times, the most important intervention is educating families about the recommended guidelines on dietary intake of fish. Diagnostic testing using blood or hair from a reliable laboratory can be conducted but is not always needed.

If you have questions about methylmercury exposure, a free resource available to health care providers and families are Pediatric Environmental Health Specialty Units that have teams of health professionals who are knowledgeable in the field of environmental health.⁵ The local Poison Control Center is also an excellent resource if concerned about the diagnosis of acute symptoms of mercury poisoning which is very rare in the US.

Case Study: The educational media module provides a dramatic representation of an actual case that occurred in which a middle-aged woman experienced mercury poisoning as a result of eating two cans of Albacore tuna each day over two weeks (she was trying to lose weight). By ceasing consumption of the tuna and beginning a regimen of Vitamin B Complex and Selenium (to

alleviate neurological impacts), she was able to reverse her symptoms of ataxia, memory loss, blurry vision, and loss of appetite.⁶

Interested in more information?

Review *Fish consumption to promote good health and minimize contaminants: A quick reference guide* at <http://www.arhp.org/publications-and-resources/quick-reference-guide-for-clinicians/fish-and-health/summary>. See Appendix A for a sample dietary history questionnaire;

Mercury contamination in fish: A guide to staying healthy and fighting back \at www.nrdc.org/health/effects/mercury/index.asp; and *What you need to know about mercury in fish and shellfish, joint advisory from EPA/FDA*, www.epa.gov/waterscience/fish/advice/index.html

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Module 4: Risk Communication and Fish Advisories

Learning objectives

After viewing this media module, the participant will be able to:

- List agencies responsible for providing fish advisories
- Describe whether geographical location impacts the level of MeHg contamination in fish
- Identify key areas of knowledge needed for effectively communication risks and benefits regarding MeHg and fish consumption

Background

In previous media modules, we've learned about how mercury enters the food chain, ways to evaluate for mercury exposure and strategies to reduce exposure. Preventing exposure to methylmercury is best accomplished through health information messages specifically adapted for local populations. We know that health care providers, who are trusted by consumers and patients, play an important role in the dissemination of health information.

What is *risk communication* and why is it important for health care providers to understand risk communication when working with patients and consumers?

Risk communication is defined as an exchange of information among interested people about the magnitude, significance, or control of a risk.¹ For example, the risk for MeHg exposure related to fish consumption and ways to reduce one's health risks.

Unfortunately, despite efforts to inform the public of methylmercury risks and safe fish eating guidelines, there is considerable evidence that messages have not reached important vulnerable populations.^{2,3}

In order to be effective in risk communication or messaging, you need a credible, respected third party to help carry out the message: health care providers are very trusted and excellent sources of health information for consumers and patients.⁴

What methods are currently used to inform the public about health risks from certain types of fish, in certain geographical areas?

One important method is through national, state, and local fish advisories. Most fish advisories are posted on websites, distributed through fishing license brochures, or advisory signs near bodies of water.

However, the responsibility to provide fish advisories and fish consumption guidance is split between federal and state agencies which in some instances have resulted in inconsistent messages about health risks. The US Food and Drug Administration (FDA) oversees commercial fish in stores and restaurants, state environmental and public health agencies are responsible for sport-caught fish, and the US Environmental Protection Agency (EPA) has advisories for all sport-caught freshwater fish not covered under local advisories. Further confusion on recommended fish consumption guidelines is created when information presented by the popular media, not necessarily consistent with state or national advisories, is broadcast. There is an initiative by several states to integrate sport fish and commercial fish advisories and increase collaboration and the sharing of federal resources to allow the more active local agencies to disseminate more comprehensive advisories.⁵

Is there a source where health care providers can begin to become informed about state and national fish advisories?

Yes, the federal government, through the EPA's National Listing of Fish Advisories (NLFA), maintains a database of states, tribes, and territories issuing fish advisories and safe-eating guidelines are a good place to begin.⁶ This website can be found in the materials posted in the www.fish-facts.org website.

It is important for the health care provider to also become familiar with local advisories and materials that may be available that address the needs of sensitive subpopulations such as ethnically diverse groups. In some communities, language barriers, cultural practices, and complex or contradictory risk messages may prevent some populations from receiving essential information. For example, Native Americans who fish on home reservations are not required to purchase a fishing license and therefore may not receive advisory messages included in license brochures. Similarly, advisory signs near bodies of water would not likely be effective for urban Latinos who primarily buy their seafood from local markets. These materials can be accessed through many state or local health departments.

What is important information to enable health care providers to be effective in their risk messaging with patients?

There are three key areas that health care providers should know:

- First, be informed regarding both risks and benefits of fish consumption, including current recommendations related to fish species (type of fish consumed and average levels of MeHg).
- Second, become aware of your state's fish monitoring and advisory programs which provide local and regional fish consumption advisories;
- Third, become familiar with the specific needs of vulnerable subgroups including socio-cultural perceptions, specific risks, and language barriers, and design your fish advisory messages using cultural and linguistic appropriateness.

Determining and then communicating the risks and benefits of fish consumption effectively with vulnerable populations can be daunting even for the most experienced provider. Best approaches will incorporate clinical practice recommendations, current research, and an awareness of local resources and advisories.⁷

Interested in more information?

There are a variety of brochures and other resources available to health professionals. Be sure to check local public health agencies for specific information on your area. Some examples can be found at www.nrdc.org (wallet card and mercury calculator) or at <http://dhfs.wisconsin.gov/eh/Fish/FishFS/MercryBrchre.pdf>.

For more information on tips for communicating risk, *A Primer on Health Risk Communication* can be found at <http://www.atsdr.cdc.gov/risk/riskprimer/index.html>.

The National Listings Fish Advisories by the EPA can be accessed at <http://www.epa.gov/waterscience/fish/advisories/>.

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Appendix A



SAMPLE: Fish & Mercury Dietary Questionnaire

1. Today's Date: Enter month/date/year (e.g., 01/01/1966)
2. _____ / _____ / _____

3. Name _____
4. Address _____ (include zipcode)

5. How old were you on your last birthday?
Select one:
 Child _____ Enter years of age (Note: 18 years of age and under: assent needed)
 Adult _____ Enter years of age (Note: 19 years of age and over: consent needed)

6. What is your gender?
 Female Male

7. Which of the following best describes your race or ethnic background? (*check all that apply*)

 African American
 Asian
 Native Hawaiian or other Pacific Islander
 Hispanic or Latino
 Native American/Native Alaskan
 White
 Other (please specify _____)

8. Do you or any one in your household work around toxic chemicals? Yes No Not sure
a. If so, do they shower and change clothes before returning home from work? Yes No Not sure

9. Do you or anyone in your household have arts, crafts, ceramics, stained

glass work or similar hobbies?

Yes No Not sure

10. Are you aware of any recent exposure to mercury at work or at home? (if yes, please explain)

Yes No Not sure

a. If yes, please explain _____

11. Do you include fish or seafood in your diet?

Yes No

a. If no, what is the main reason you **DO NOT** eat fish? (*Check one*)

I don't like fish.

I am a vegetarian.

I am concerned about the safety of fish.

It has never been part of my family's diet.

Other reason (*please specify below*):

12. Estimate about how many ounces of fish you eat **AT EACH MEAL**:

4 ounces or less

6 ounces to 12 ounces

Greater than 12 ounces

13. Which **TYPES** of seafood do you normally eat? (*Check all that apply*)

Total ounces *per month* (4 ounces is approx. size of deck of cards)

Albacore Tuna 6 ounces or less 7 ounces to 12 ounces > 12 ounces

Bass 6 ounces or less 7 ounces to 12 ounces > 12 ounces

Bluegill 6 ounces or less 7 ounces to 12 ounces > 12 ounces

Carp 6 ounces or less 7 ounces to 12 ounces > 12 ounces

Catfish 6 ounces or less 7 ounces to 12 ounces > 12 ounces

Chilean Sea Bass 6 ounces or less 7 ounces to 12 ounces > 12 ounces

- | | | | |
|--|---|--|--------------------------------------|
| Cod, Perch, Haddock <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Crappie <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Flatfish and Flounder <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| King Mackerel <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Orange Roughy <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Perch <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Pike <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Tile Fish <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Canned Tuna(light) <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Canned Tune (Albacore) <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Fresh tuna (Yellowfin, Ahi) <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Salmon <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Shark <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Shellfish (shrimp, lobster) <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Swordfish <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Walleye <input type="checkbox"/> | <input type="checkbox"/> 6 ounces or less | <input type="checkbox"/> 7 ounces to 12 ounces | <input type="checkbox"/> > 12 ounces |
| Other (Please list: _____) | | | |

14. Have you heard anything about limiting fish consumption because of mercury contamination?

- Yes No

15. Have you or any family member had a diagnosis of any of the following? (**Check all that apply**)

- Autism Learning disability Developmental delay Heart disease High blood pressure

If yes, which family member? (**List all members and specify condition**)

16. Do you or any family member suffer from any of the following recurrent symptoms? (**Check all that apply**)

- Headaches Fatigue Unexplained pain Ataxia Blurring vision
 Dizziness Memory loss

17. Blood pressure reading today: (systolic: _____ diastolic: _____)

Appendix B

Web Sites Containing Information on Mercury and Health

This listing is not in any special order but describes some of the web sites available to health professionals and the general public describing information on methylmercury, health effects and special concerns for pregnant women and children.

- A. www.nrdc.org : Contains a wallet card with recommended levels of fish consumption and a number of articles on mercury and related health effects
- B. www.epa.gov/ost/fish : contains up to date information on recommended fish intake for pregnant women and children
- C. http://www.sierraclub.org/mercury/factsheets/feeding_mercury.pdf : General information to fish consumers about mercury and health effects
- D. <http://dnr.wi.gov/org/water/fhp/fish/pages/consumption/hookintohealthyfish04.pdf> : This site provides information on the selection of sports fish for safer levels of mercury
- E. www.environmentaldefense.org Contains link that describes safe fish guidelines
- F. http://www.focusonenergy.com/data/common/dmsFiles/V_ER_RESE_Knobeloch_report%20.pdf : *Population-Based Methylmercury Exposure Assessment* (August 2005) Lynda Knobeloch, Research and Toxicology Supervisor; Henry Anderson, Chief Medical Officer; Wisconsin Department of Health and Family Services, Division of Public Health, Bureau of Environmental and Occupational Health. This study identifies subpopulations in Wisconsin that consume fish several times a week and populations that had elevated levels of mercury in their bodies. Comparison of hair mercury levels with the types and quantities of fish they consumed provides important information on dietary exposure to methylmercury.
- G. www.environmentaldefense.org : This site provides a range of information including an Ocean's Alive site that highlights issues surrounding fish sustainability (overfishing) as well as safe fish consumption=<http://www.oceansalive.org/eat.cfm?sitecode=edhp2>
- H. www.ewg.org: Environmental working group has information on fish consumption and health, specifically tuna
- I. www.sierraclub.org : This group provides hair testing for mercury levels for \$25.00 and information about safe fish consumption (including a wallet card)
- J. www.usgs.gov/themes/factsheet/146-00 : The U.S.Geological Society provides information on safe fish consumption
- K. www.psr.org : Physician's for Social Responsibility provides information on health effects of mercury and how to reduce risks through changes in fish consumption
- L. www.iceh.org/LDDI : This organization, the Institute for Children's Environmental Health has information regarding learning and developmental disabilities and has information on the hazards of mercury exposure on children's growth and development, along with a brochure produced through the Learning Disabilities Association of America, the National Education Association, and the Arc of the United States.
- M. www.Gotmercury.org

Appendix C

Fish Facts: Continuing Education Evaluation

Survey and Answers

(access at www.surveymonkey.com/s.aspx?sm=0QCwdWebBBiWku6H4crvoQ_3d_3d)

Fish Facts Module 1: Epidemiology and Toxicology

1. People are MOST OFTEN exposed to methylmercury through which of the following? (Select ONE answer):

- Thermometers
- Dental Amalgams
- Fish Consumption

2. Methylmercury causes which of the following health effects in adults? (Select ALL that apply):

- Paresthesias
- Memory Loss
- Ataxia
- Weight gain

3. Which group of individuals is MOST VULNERABLE to the neurotoxic effects of methylmercury exposure? (Select ONE answer):

- Elderly
- Women
- Children
- Ethnic Minorities

Fish Facts Module 2: Hazard Identification and Exposure Assessment

1. Which of the following seafood items are generally considered LOW in methylmercury? (Select ALL that apply):

- Anchovies
- Shark
- Shrimp
- Albacore tuna

2. Which of the following seafood items is generally considered HIGH in methylmercury and should be consumed in limited amounts? (Select ALL that apply):

- Shark
- Shrimp
- Albacore Tuna
- Swordfish
- Clams

3. When counseling patients, what key factors should be considered to reduce risk? (Select ALL that apply):

- Frequency of fish consumed
- Type of fish consumed
- Amount of fish consumed
- Time of day fish is consumed

Fish Facts Module 3: Clinical Perspectives

1. What is the MOST IMPORTANT intervention for health care professionals to conduct, that will support patients who are concerned about methylmercury exposure? (Select ONE answer):

- Conduct blood test for mercury
- Conduct dietary assessment for fish consumption
- Evaluate cardiovascular status
- None of the above

2. Sensitive populations to screen and counsel to reduce neurodevelopmental health risks related to methylmercury include (Select ALL that apply):

- Men over the age of 40 years
- Childbearing women
- Pregnant women
- Children

3. Methylmercury can pass through the placenta and breast milk and has the potential to impact the developing brain.

- True
- False

Fish Facts Module 4: Risk Communication and Fish Advisories

1. The provision of fish advisories to the public is the responsibility of the following agency (ies)? (Select ALL that apply):

- Food and Drug Administration (FDA)
- Environmental Protection Agency (EPA)
- Local Hospitals
- State Public Health Agencies

2. Does geographical location impact levels of methylmercury contamination in fish?:

- True
- False

3. To be effective in risk communication, it is important that health care providers be knowledgeable in the following areas (Select ALL that apply):

- Risks and benefits of fish consumption
- Chelation methods
- Local, regional, and state fish consumption advisories
- Specific information needs of vulnerable subgroups