

Fish Contamination Curriculum: Training for Partners of the Fish Contamination Education Collaborative



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Revised April, 2006

Supported in part by funding from the United States Environmental Protection Agency

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Background Information for Trainers

What Is Environmental Health?

Our environment can be described as where we live, work and play. Many environmental hazards can affect our environment and in turn affect our health. Environmental hazards may occur naturally, such as ultraviolet light from the sun; or they may result from activities carried out by people, such as gases in exhaust from cars or chemicals used in manufacturing. The study of how these factors affect our health is rapidly developing. There are still many things we do not know regarding how chemicals in the environment affect our health. What we do know is that the likelihood of people experiencing health problems from exposure to chemicals depends on several factors:

- the way in which a person was exposed (breathing in, eating, or getting a chemical on the skin)
- the amount and type of chemical the person was exposed to, and
- the length of time over which the exposure occurred.

We also know that some groups, like pregnant women (fetuses), infants and children up to 17 years of age, may be more affected by chemicals than others because they are actively growing and developing.

Background and Purpose of Curriculum

This curriculum has been developed to provide information to people about eating fish commonly caught off the coasts of Los Angeles and Orange Counties (between Pt. Dume and Dana Point). State and federal agencies have conducted studies to determine chemicals in fish caught in these areas. These studies show that levels of chemicals in some fish could pose health concerns for people who eat these fish regularly. The highest levels of chemicals are found mainly from fish caught around the Palos Verdes Peninsula and the Los Angeles and Long Beach Harbors.

There are several main chemicals of concern in fish caught off the coasts of Los Angeles and Orange Counties. Montrose Chemical Corporation manufactured the pesticide DDT at its former chemical plant near Torrance, California from the 1940s until the 1980s, and released wastewater into the sewer system. In the environment, DDT breaks down into DDE and DDD; thus we refer to the DDTs. When DDTs were found to be harmful to both human health and wildlife, its use was banned in the United States. Other industries released polychlorinated biphenyls, or PCBs. **The DDTs and PCBs** got into the sewer system and ultimately flowed out of the sewer outfall pipes located off White Point on the Palos Verdes Peninsula. The chemicals spread over a large area, extending into Santa Monica Bay and the Los Angeles/Long Beach Harbors. The highest levels of DDTs and PCBs were found about one to three miles off shore of the Palos Verdes Peninsula. More than a hundred tons of DDTs and about 11 tons of

PCBs are in the sediments on the ocean bottom between Pt. Fermin and Pt. Vicente. Both types of chemicals do not break down quickly and tend to stay in the environment for many years. A third chemical of concern is mercury. Mercury occurs naturally in the environment and can also be released by incineration and coal burning power plants, as well as by mining and industrial processes. Most of the mercury released into the environment eventually ends up in water where biological processes change it into a form called **methylmercury**. Some fish tend to build up methylmercury as they get older and bigger.

Fish that swim and feed in water over contaminated sediments will generally have higher levels of DDTs and PCBs in their bodies than fish from other areas. Fish with the highest levels of DDTs and PCBs are bottom feeders. The white croaker fish, commonly called kingfish or tomcod, feeds directly off the bottom of the ocean floor and is one of the most contaminated fish. Fish that eat other contaminated fish may also have chemicals in their bodies.

Health Risks

Because these chemicals are in the sediments at the ocean floor, swimming and surfing in the contaminated areas do not pose a health concern. However, many people catch fish regularly in the waters off the coasts of Los Angeles and Orange Counties. By eating the fish caught in these areas, people will get these chemicals into their bodies. However, people who eat fish from the affected areas are not likely to experience health effects unless they eat large amounts of fish for many years. Eating these fish once in a while will not make you sick.

Since 1985, fish consumption advisories or warnings have been issued and posted for areas between Pt. Dume and Newport Beach because of elevated levels of DDTs and PCBs. (Refer to advisory table for Southern California developed by the Office of Environmental Health Hazard Assessment, also known as OEHHA.) These advisories and warnings aim to inform people about limiting or avoiding consumption of certain fish caught from specific areas in order to reduce their exposure to the chemicals in these fish. The tri-fold brochure entitled ***Protect Your Health! Catch and Eat Cleaner Fish!*** shows fish contamination zones along the coasts of Los Angeles and Orange Counties. In particular, bottom-feeding fish caught from the red zone areas are likely to have the most chemicals. People should avoid eating white croaker (also known as kingfish or tomcod), which has the highest DDT and PCB levels, if caught from the red zone areas. Limited consumption of other fish, such as kelp bass, rockfishes, queenfish, black croaker, corbina, surf perches, and sculpin is also recommended. (Refer to OEHHA advisory table and also fish consumption recommendations in trifold brochure.)

Since the advisories were developed in 1985, more information about DDTs, PCBs, and methylmercury is now available, as well as information about chemical levels in fish commonly caught off the coasts of Los Angeles and Orange Counties. Through the Fish Contamination Education Collaborative, additional resources, such as this

curriculum, are also now available to better inform people who catch and eat fish about the advisories, safer ways to eat fish, and about health risks.

The kinds of health problems that have been linked to DDTs and PCBs include effects on the nervous, immune, endocrine, and reproductive systems, infant development, and cancer. Methylmercury can also affect the nervous system and brain development in babies before and after they are born, and children. Thus, fish consumption advisories are more restrictive for women of childbearing age, pregnant and nursing women, and children under 17 years of age.

Fish Consumption Recommendations

The Fish Contamination Education Collaborative recommends that everyone follow the fish consumption recommendations listed below. These recommendations are also shown in the brochure titled ***Protect Your Health – Catch and Eat Cleaner Fish!***:

Recommendations for those who eat locally caught fish:

1. Do not eat any white croaker (kingfish or tomcod) caught from the RED ZONE areas.
2. Whenever possible, catch and eat fish from the YELLOW zone areas off the coasts of Los Angeles County and Orange County that have lower levels of chemicals. Follow the fish consumption advisories for these areas that recommend eating limited amounts of different kinds of fish from these areas (no more than four times per month for combinations of different fish).
3. Use fish preparation and cooking methods that will lower the amount of chemicals like DDTs and PCBs that get into your body. Since these chemicals build up in fatty parts of fish, the methods include:
 - a) eat only the fillet
 - b) remove and throw away the head, guts, kidneys, the liver, and fatty parts of the fish, such as the skin and the belly flap, before cooking
 - c) bake, broil, steam, or grill your fish, and throw away the cooking juices. Add seasonings and sauces after throwing cooking juices away.
 - d) use only fish fillet when preparing soups, stews, or chowders.
4. Mercury is found in all parts of fish, including the fillet, so the above preparation and cooking methods do not decrease the levels that may be in fish. Follow the recommended limits on fish consumption to reduce exposure to mercury.
5. Since chemicals can pose greater health risks to babies and young children, it is particularly important for women of childbearing age, pregnant women, and nursing mothers to follow the fish consumption advisories.

The United States Environmental Protection Agency (US EPA) is currently evaluating ways to clean up the most contaminated areas of the Palos Verdes Shelf. Their goal is to reduce risks to human health and the environment. Even after the chemicals are

reduced in the water and ocean sediment, they will remain in the fish for many years. Fish warning signs posted on piers have had limited effectiveness. Methods that target affected populations must be developed and implemented. Additionally, public inquiries have been raised regarding the safety of fish, especially white croaker, sold in commercial markets and restaurants in Los Angeles and Orange Counties. The US EPA is also looking into ways to assure that in the future, white croaker sold in stores comes from cleaner waters.

How to Use This Curriculum

Because people from many different ethnic and cultural groups enjoy catching and eating fish, this curriculum was designed to be readily adapted to meet a variety of needs. It can be used for formal training of trainers, as well as for conducting community workshops in a variety of settings, such as health forums. It can also be adapted by presenting specific modules and/or activities to parent groups, or people attending schools, churches, community centers, WIC centers, prenatal classes, nutrition classes, or other health education settings.

Each module provides the instructor with baseline information, training materials, and recommended exercises. To promote understanding of the issues, it is recommended that the modules be presented in the order given.

Instructors are encouraged to present the provided information using resources, discussion topics, group methods, and learning aids that would be most relevant to the intended audience. In many cases, the instructor may not have time to complete the entire curriculum. If this is the case, we suggest that the instructor either present the curriculum during two or more training sessions, or to present, in one session, the modules that are most relevant to the audience. For example, Modules 3 and 5 are particularly important for people who catch and eat fish from the coastline off Los Angeles and Orange Counties.

The information in this curriculum mainly covers chemicals commonly found in fish. Bacteria, viruses, and biotoxins in fish and shellfish may also be of concern. This information is briefly covered in Appendix D and can be included in trainings as needed.

Materials Needed For Workshops

Accompanying this curriculum is a compact disc containing PowerPoint files that can be used for each module. Overhead transparencies for use with an overhead projector and handouts can be printed out from these files. If you plan to make handouts, you can photocopy the printed materials and provide them to participants in an informational packet.

Each module contains a list of materials needed for that section of the training. Additionally, a complete list of all training materials is included in Appendix A and a list of printed educational materials on safer fish consumption and how to obtain them is included as Appendix B.

Outreach and Education Partners

With funding from the US EPA, the California Department of Health Services convened an Outreach and Education partnership to develop educational materials to help community-based organizations and local health departments reach affected populations with fish contamination information. The development, field-testing, and distribution of this curriculum is one of several components of the educational efforts of the task force. Partners include representatives of community-based organizations, and federal, state, and local governmental agencies.

Contact Information

This curriculum can be easily reproduced and implemented in a variety of settings. If you would like more information about the curriculum or have any comments or suggestions, please contact:

Fish Contamination Education Collaborative
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Los Angeles, CA 90013
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website: <http://www.pvsfish.org>



Module One: Introduction to Workshop

Objectives:

By the end of this module, participants will be able to:

1. Introduce themselves and have the opportunity to meet and learn about other participants;
2. List workshop objectives;
3. Discuss participants' fishing practices.

Materials

Overheads/PowerPoint slides 1-7 (Module 1)

Flipchart paper, markers

Teaching Method(s):

- Lecture/discussion, using PowerPoint slides
- Icebreaker Activity

Overview of Workshop Objectives

Most people enjoy eating fish. Many people also enjoy catching their own fish and sharing it with family and friends. However, some fish that people eat may have chemicals that can be harmful to your health. In this workshop, we will:

- identify specific areas of contamination along the coasts of Los Angeles and Orange Counties
- identify fish caught from these areas that have chemicals
- identify which fish are safer to catch and eat
- discuss how chemical exposures can affect your health and the health of your family
- learn how to prepare and cook fish to make them safer to eat.



Exercise A:

Purpose: To create a comfortable learning environment among participants and to informally assess the fish consumption practices of the audience.

Instructions: Participants break up into pairs and interview each other using the questions below. Each person gets three minutes to talk. After each person is done answering questions, the larger group comes together and each person introduces the person they interviewed and answers some of the questions asked. Facilitator records summary of answers on a flipchart.

- What is your name?
- How often do you eat fish?
- What kinds of fish do you eat?
- Do you ever eat fish that you, a family member or someone else has caught?
- Do you buy fish from the local market?
- How do you prepare and cook fish?



Module Two: Benefits and Concerns of Eating Fish

Objectives:

By the end of this module, participants will be able to:

1. Discuss the benefits of eating fish;
2. Identify two types of contamination;
3. Discuss the history of the Palos Verdes Shelf chemical contamination;
4. Describe how contaminants get into fish.

Learning points:

1. Fish and shellfish are an important part of a healthy diet. People of all ages can benefit from eating fish.
2. Some fish you catch off the coastline of LA and Orange Counties may contain chemicals that can be harmful to your health.
3. The chemicals were historically released from industrial sources and have deposited in the ocean sediments.
4. The chemicals have gotten into some of the fish and are then passed onto other fish, birds, and people who eat these fish.

Materials:

Overheads/PowerPoint slides 1-12 (Module 2)

Teaching Method(s):

- Lecture/discussion, using PowerPoint slides
- Interactive exercise

Benefits of Eating Fish

Fish are nutritious and can be an important part of a balanced, healthy diet. The American Heart Association recommends eating fish at least twice a week.

They can provide:

- an excellent source of protein
- a good source of healthy fat (omega 3 fatty acids—DHA & EPA)
- Omega 3 fatty acids can help reduce the risk of developing heart disease, high blood pressure, cancer, and other chronic diseases.
- Omega 3 fatty acids are also important for brain and vision development in infants.

Types of Contamination in Fish

Although fish are delicious and nutritious, they can be unsafe to eat for two main reasons:

1. Contamination by chemicals in the water and/or ocean sediment. These chemicals can come from manufacturing and industrial processes, and also from materials or products used by people. Some chemicals are naturally present in the environment. It is almost impossible to detect **any of** these chemicals in the fish by looks, taste, or smell.
2. Contamination by bacteria, viruses, and natural toxins. Generally, these may also be hard to detect by looks, taste, or smell.

In this class, we mainly discuss chemical contamination. Chemicals have polluted the ocean sediment and water, affecting fish commonly caught off the coasts of Los Angeles and Orange Counties.

History of Contamination in Palos Verdes Shelf and Related Areas

From the 1940s to the 1970s, the Montrose Chemical Company located near the city of Torrance released chemicals into the sewer system, eventually emptying into the ocean around the Palos Verdes Peninsula. The plant closed down in 1983, but the chemicals still remain in the environment. Other industries in the area also released harmful chemicals into the ocean waters through the sewer system, which eventually emptied into the ocean. The chemicals deposited in an area called the Palos Verdes Shelf and also spread north into Santa Monica Bay and over to the Los Angeles/Long Beach Harbor and Breakwater area. The chemicals are in sediments on the ocean floor where some fish feed. The chemicals get into some of the fish and are passed onto people when they eat these fish. **White croaker**, also known as **kingfish, tomcod, or king croaker**, is a bottom feeding fish known to have high levels of chemicals. The chemicals can build up in people's bodies and lead to health problems.



Exercise B - Food Web

Purpose: To provide participants with a visual depiction of how chemicals can affect the food web.

Instructions: Facilitator shows picture of food web to each participant and asks the following question to stimulate discussion:

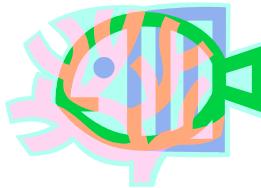
What do you see happening in this picture? – (prompt the participants)

- a factory emitting into the environment or waste tanks leaking into the ground or water
- someone pouring liquid waste materials like motor oil down storm drain
- waste materials/chemicals settling onto the bottom of the ocean
- fish eating from the ocean floor

- bigger fish eating the smaller fish
- people catching fish
- people eating fish

After participants have described the events occurring in the picture, facilitator sums up the description in the following manner:

The chemicals are in sediments on the ocean floor where some fish feed. The chemicals get into some of the fish and are passed onto people when they eat these fish. **White croaker**, also known as **kingfish**, **tomcod**, or **king croaker**, is a bottom feeding fish known to have high levels of chemicals. The chemicals can build up in people's bodies and lead to health problems.



Module Three: Fish Contamination Zones

Objective:

By the end of this module, participants will be able to:

1. Identify Fish Contamination Zones.

Teaching Method(s):

- Lecture/discussion, using PowerPoint slides
- Interactive exercise

Learning points:

1. Chemicals released from industrial sources have spread along the coasts of LA and Orange Counties. Some areas have higher levels of chemicals than others.
2. Fish caught from the RED zone areas are likely to have higher levels of chemicals.
3. Fish caught from YELLOW zone areas have lower levels of chemicals.

Materials:

Overheads/PowerPoint slides 1-6 (Module 3)

Suggested Handouts

Maps from California Coastal Access Guide by the California Coastal Commission of public fishing sites along LA and Orange County coastlines

Protect Your Health! – Catch and Eat Cleaner Fish! tri-fold brochure

Blank map of the coast with limited identifiers

Fish Contamination Zones

Chemicals released into the ocean have spread to different parts of the coast. If you catch and eat fish from piers, shores, or boats off the coast of Los Angeles and Orange counties, it is important to know the areas where fish are likely to have less chemicals.

The map of the coastline of Los Angeles and Orange County in the FCEC tri-fold brochure uses the colors red and yellow to show fish contamination zones. Fish caught from the red zone areas are likely to have the highest levels of chemicals. The red zone areas include the northern part of Santa Monica Bay (Pt. Dume and Malibu), the Palos Verdes Peninsula extending to the Los Angeles/Long Beach Harbor and Breakwater, Horseshoe Kelp, and just north of Newport Beach. Some fishing points located in this area include:

- Palos Verdes Point
- Point Vicente
- San Pedro/White Point
- Cabrillo Pier
- Pier J
- Belmont Pier

Fish caught from the yellow zone areas tend to have lower levels of chemicals. These areas include:

- Santa Monica Pier
- Redondo Pier
- Huntington Beach Pier



Exercise C:

Purpose: Participants will construct a map of the red and yellow zones during this exercise. At the completion of this exercise, participants will be able to identify the fish contamination zones and locate fishing sites within the zones.

Instructions:

- Facilitator breaks participants up into small groups.
- Each group receives the tri-fold brochure, a list of fishing sites and a blank map of the coast with limited identifiers.
- Prompt participants to list Santa Monica Bay, Palos Verdes Peninsula, Los Angeles/Long Beach Harbor and Breakwater, Horseshoe Kelp, and Newport Beach on map and to identify highways and other locators that define the areas.
- Participants use the tri-fold map to assist them in labeling fishing sites on their blank map.
- Once participants have finished filling in the blank map, facilitators ask participants if they are familiar with the sites and prompt them to generate local names for sites listed.
- Encourage participants to identify and locate local fishing sites that may not be listed.
- Once locations have been filled in, participants will highlight the RED and YELLOW zones on their map with markers.

One map is chosen for display on the wall. This map will eventually resemble the lower half of the inside of the tri-fold brochure.



Module Four: Chemicals Found in Fish and Their Health Effects

Objectives:

By the end of this module, participants will be able to:

1. Describe exposure factors related to chemicals in fish;
2. Identify two main chemicals of concern;
3. List the health effects associated with increased exposure to the two chemicals.

Learning Points:

1. The likelihood of people experiencing health problems from eating contaminated fish is related to several factors: the type of chemical in fish, how much of the chemical is in fish, how much fish is eaten, how often fish is eaten, and an individual's age, gender, lifestyle, and overall state of health.
2. DDTs and PCBs are man-made chemicals that were banned for production in the United States in the 1970s.
3. Health effects related to increased exposure to these chemicals in fish include cancer and liver damage.
4. Health risks may also be higher for infants and children up to 17 years of age. During pregnancy and lactation, mothers can pass DDTs and PCBs onto their infants. These chemicals can then affect overall growth and development, and brain development and function.
5. The likelihood of developing health problems related to DDTs or PCBs are highest for people who eat a lot of contaminated fish from the red zone areas throughout their lifetime. Eating fish with DDTs and PCBs does not make people sick right away. However, these chemicals can build up and stay in your body.

Materials:

Overheads/PowerPoint slides 1-19 (Module 4)

Suggested Handouts

OEHHA fact sheet on PCBs

Visual Aids

Laminated illustrations depicting the different stages of life (pregnant woman, infant, child, adult and a family unit)

Cards with descriptions of health effects in two colors: green indicates health benefits and red indicates health risks

Teaching Method(s):

Lecture/discussion, using PowerPoint slides

Interactive exercise

Exposure Factors

The likelihood of people experiencing health problems from eating contaminated fish is related to several factors:

the type of chemical in fish

how much of the chemical is in fish

how much fish is eaten

how often fish is eaten

an individual's age, gender, lifestyle, and overall state of health.

You can lower the likelihood of developing health problems related to chemicals by reducing your exposures to chemicals in fish. **You can do this by controlling how often you eat fish, how much fish you eat, and which parts of the fish you eat.** We can also work to improve water quality and the overall environment.

¹ DDT is 1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane. DDE is 1,1-dichloro-2,2-bis(chlorophenyl)ethnylene. DDD is 1,1-dichloro-2,2-bis(p-chlorophenyl)ethane.

Chemical Contaminants in the Fish

The first chemical of concern in fish caught along the coasts of Los Angeles and Orange Counties is **DDT**¹. DDT is a man-made chemical that was widely used in the United States until the 1970s to control insects that destroy crops and carry diseases like malaria. In the environment, DDT breaks down into DDE and DDD; thus we will refer to these chemicals as the DDTs.

Another group of chemicals is called **PCBs** (polychlorinated biphenyls). PCBs are also man-made and were used in industrial processes, such as in the production of electrical equipment.

Both DDTs and PCBs were banned in the 1970s because they proved to be harmful to both human health and wildlife. However, these chemicals break down very slowly in the environment and are likely to remain in the water and sediment for many decades.

Another chemical is methylmercury. This chemical will be discussed in Module 7.

Health Effects

Eating fish with DDTs and PCBs does not make people sick right away. However, these chemicals can build up and stay in your body.

The likelihood of developing health problems related to DDTs or PCBs are highest for people who eat a lot of contaminated fish throughout their lifetime. Health risks may also be higher for infants and children, as well as people with preexisting illnesses. During pregnancy and lactation, mothers can pass DDTs and PCBs on to their infants. These chemicals can then affect overall growth and development, and brain development and function. Since pregnant and nursing mothers, infants, and children are at greatest risk, they should be the most careful about limiting their exposure to contaminated fish. Note: Even though the chemicals may be in breastmilk, it is still best to breastfeed. Breastmilk contains so many other healthy properties for the baby and may help reduce the harmful effects of the chemicals.

Health problems associated with increased exposure to DDTs include:

- Cancer
- liver damage
- effects on the immune, endocrine, and reproductive systems

The half-life of DDTs is about 10-20 years. This means that it can take 10-20 years for the level of DDTs in a person's body to be reduced to half the original amount, if no other source of DDTs is getting into the body.

Health problems associated with increased exposure to PCBs also include:

- cancer
- liver damage
- thyroid problems
- effects on the nervous and immune systems
- possible reproductive problems
- Delayed growth and development also occurred among some children whose mothers ate fish with high levels of PCBs. The levels of PCBs in the fish eaten by these mothers were 5 to 10 times higher than levels of PCBs found in fish from the Los Angeles and Orange County coasts.

The half-life of PCBs is about 1-6 years. This means that it can take 1-6 years for the level of PCBs in a person's body to be reduced to half the original amount, if no other source of PCB is getting into the body.

Note: Some of the health problems associated with PCBs and DDTs have been identified through research with animals.

The United States Environmental Protection Agency is working to clean up the contamination on the ocean floor, but the chemicals will likely remain in the fish for decades. Thus it is important to provide information to people to help reduce their exposure to chemicals in the fish.



Exercise D: Health Effects of Eating Fish

Purpose: To illustrate the potential health effects, both positive and negative, of eating fish and how the benefits and risks of eating fish can vary depending on the stage of life of the individual.

Instructions: Post laminated illustrations of the following: A pregnant woman, an infant, children, adults, and a family unit. Give each participant a card that describes a health benefit or risk. Have the participant read it to the group and place it nearest to the most appropriate life stage. Explain the benefit or risk in more detail before moving on to the next one. Emphasize that all the negative effects are caused by chemicals in fish, not the fish themselves.

Note: The health effects may apply to more than one stage of life.



Module Five: Fish Consumption Advisories for Los Angeles and Orange Counties

Objectives:

By the end of this module, the participants will be able to:

1. Describe fish advisories and how to obtain information about them;
2. Identify the areas for Los Angeles and Orange Counties where fish are safer to catch and eat;
3. Identify white croaker and other fish of concern.

Learning points:

1. Government agencies issue fish consumption advisories to protect public health when chemicals in fish are at levels of concern. The advisories have been summarized in a brochure developed by the Fish Contamination Education Collaborative.
2. Fish caught from the red zone have higher levels of chemicals than fish caught from the yellow zone. The most limited consumption is recommended for fish caught in the red zones.
3. Within the red and yellow zones, some fish are safer to eat than others.
4. Do not eat white croaker caught from the red zones and eat no more than 2 meals of white croaker per month caught from the yellow zones.
5. Follow fish consumption advice in the brochure for other fish you catch.

To simplify the advisory and the brochure even further, the Fish Contamination Education Collaborative has developed the following overall messages for the project:

1. Fish is good for you, however fish caught off the coast off LA and Orange Counties may contain harmful chemicals.
2. Local fish advisories are available by calling ____.
3. Do not eat white croaker caught from the red zone.
4. Fish caught in the yellow zone are safer to eat.
5. Do not eat the fatty parts of the fish (including the skin and guts) because they contain more chemicals.
6. Children and women of childbearing age are more sensitive to the harmful chemicals and should be especially careful.

Materials:

Overheads/PowerPoint slides 1-41 (Module 5)

Visual aids

Felt backdrop of tri-fold brochure, 19 components of fish, meal portion, and wording from inside the tri-fold brochure

Teaching Method(s):

- Lecture/discussion, using PowerPoint slides
- Interactive exercises

Fish Consumption Advisories for Los Angeles and Orange Counties

The purpose of fish consumption advisories, also called health advisories, is to recommend that people limit or avoid eating certain types of fish caught from specific coastal waters, lakes, or rivers in order to reduce their exposure to harmful chemicals. Because some chemicals may be more harmful for certain groups of people like pregnant women and children, the advisories may include specific recommendations for these populations.

Suggested Action: Ask if anyone has seen or heard information about catching fish along the coasts of Los Angeles or Orange Counties.

Office of Environmental Health Hazard Assessment (OEHHA)

The Office of Environmental Health Hazard Assessment (OEHHA) is the state office that issues fish consumption advisories for fish that people catch themselves, when levels of chemicals in fish pose health concerns. OEHHA issued fish consumption advisories for Los Angeles and Orange Counties in 1991. Until recently, outreach and education to the fishing public about the advisories were very limited. Local health departments posted warnings at some fishing sites.

OEHHA also distributes advisory information through its Sport Fish Consumption Advisory brochure. This brochure contains general fish preparation and consumption advice, advice to pregnant women, and site-specific advice. The brochure can be obtained at: www.oehha.ca.gov

Suggested Action: Provide everyone with a copy of OEHHA's Sport Fish Consumption Advisory brochure and have them turn to the page where site-specific advisories for Los Angeles and Orange Counties are listed.

The California Department of Fish and Game

The California Department of Fish and Game publishes the advisories in the California Sport Fishing Regulations booklets that are available when people buy fishing licenses. There are separate booklets for freshwater and marine regulations. The booklets are available only in English. People who fish on piers do not need a license and so they may not have seen the fishing regulations booklet.

Suggested Action: Distribute current fishing regulations handbooks and have them turn to the page where the health advisories are listed for different parts of California.

Signs

Local health departments have posted signs on piers. Los Angeles County and the City of Long Beach have created their own versions of these signs.

Suggested Action: Show pictures of the signs posted by Los Angeles County and City of Long Beach. Ask if anyone has seen them and where.

FCEC Brochure: Protect Your Health! Catch and Eat Cleaner Fish!

To make the fish advisories more accessible and understandable to people that fish and their families, the Fish Contamination Education Collaborative is working with different community groups to develop and distribute new educational materials to help people reduce their exposures to chemicals in fish. Currently available is a brochure entitled **Protect Your Health! – Catch and Eat Clean Fish!** The brochure:

1. Identifies two zones off the coasts of Los Angeles and Orange Counties.
2. Indicates that fish caught from the RED zones have higher levels of chemicals than fish from the YELLOW zones.
3. Includes pictures of fish so people can identify safer fish to eat and safer areas to fish.

Facilitator distributes the brochure and reads through each section, starting from the bottom to the top (which reflects the water column).

1. When fishing from the RED ZONE, do not eat white croaker (also called kingfish or tomcod) caught there.
2. When fishing from the YELLOW ZONE, eat no more than 2 meals a month of white croaker (also called kingfish or tomcod) caught there.
3. When fishing in the RED ZONE, eat no more than 1-2 meals per month of fish (kelp bass, queenfish, surf perches, rock fishes, sculpin, black croaker, sculpin) caught there.
4. When fishing from the YELLOW ZONE, eat no more than 4 meals per month of fish (kelp bass (calico bass), queenfish, surf perches, rockfishes, sculpin (scorpionfish), black croaker, sculpin) caught there.
5. When fishing in either the YELLOW or RED ZONES, eat no more than 4 meals per month of bonita, Pacific (chub) mackerel, or top smelt caught along the coasts of Los Angeles or Orange Counties.
6. WHEN FISHING IN either the YELLOW or RED ZONES, eat no more than 2-4 meals per month of barracuda caught along the coasts of Los Angeles or Orange Counties.

7. Except for white croaker, eat no more than 4 meals per month of combinations of different fish. For example, if you have eaten 2 meals of bonito and two meals of queenfish this month, do not eat any more fish caught from the coast!
8. Women of childbearing age, pregnant and nursing women, and children up to 17 years of age should be especially careful about following the advisories because they may be more sensitive to the chemicals.

Fish of Most Concern

The advisories state that white croaker (kingfish, tomcod) caught from red zone areas should not be eaten at all. High levels of PCBs and DDTs have been found in white croaker caught from these areas, partly due to the fact that they feed directly off the bottom of the ocean floor where the chemicals are located. White croaker are also a fatty fish and DDTs and PCBs tend to build up in fatty tissues.

White croaker caught from yellow zone areas generally have lower levels of chemicals than those caught from the red zone areas. Up to two meals per month of white croaker caught in yellow zones can be safely eaten.



Exercise E: Identifying white croaker

Purpose: To give participants the opportunity to learn how to identify white croaker.

Instructions:

Step 1: Use a fresh white croaker or a color picture to illustrate. There are several overheads provided for this. Point out distinguishing features:

- 12 – 15 spines on dorsal fin
- Black spot at base of pectoral fin (the fin on the side of the fish)
- Horizontal mouth facing down that gives it a sad, glum look
- Does NOT have barbel under jaw
- Slightly protruding snout, like it has an overbite
- Bluntly rounded head
- Has distinct lateral line
- Color ranges from shiny brown to yellowish on back, with a silver belly
- Fins are yellow to white in color

Step 2: Hold up a picture of a queenfish, yellowfin croaker, and black croaker and compare to the white croaker

Step 3: Ask participants to give other names they use to identify croaker (e.g., kingfish, tomcod.)



Exercise F: Fish Zones

Purpose: Participants will construct an enlarged version of the inside of the ***Protect Your Health! Catch and Eat Cleaner Fish!*** tri-fold brochure. The activity will provide the opportunity for them to learn to identify fish zones and fish species.

Materials: Felt backdrop of tri-fold brochure, 19 components of fish, meal portions and wording from the inside of the tri-fold brochure.

Instructions:

Step 1. Facilitator puts a felt backdrop of an enlarged version of the inside of the tri-fold on the wall. Each participant receives a laminated piece of information from the tri-fold (a fish picture or wording, a fillet etc.).

Step 2. Participants place their laminated piece on the backdrop, thereby recreating the inside of the tri-fold.

Step 3. When all the pieces are on the felt, the facilitator asks the following questions:

- Given the red and yellow zones, what advice would you give people who fish at Cabrillo Pier or White's Point?
- What advice would you give people who are catching white croaker on Cabrillo Pier?
- What advice would you give people who catch and eat fish on a daily basis from this coast?
- What are some names you use to identify the fish?

Overall message to the public

To simplify the advisory and the brochure even further, the Fish Contamination Education Collaborative has developed the following overall messages for the project:

1. Fish is good for you, however fish caught off the coast off LA and Orange Counties may contain harmful chemicals.
2. Local fish advisories are available by calling ____
3. Do not eat white croaker caught from the red zone.
4. Fish caught in the yellow zone are safer to eat.
5. Do not eat the fatty parts of the fish (including the skin and guts) because they contain more chemicals.
6. Children and women of childbearing age are more sensitive to the harmful chemicals and should be especially careful.

Suggested Discussion Guide

Facilitator can engage participants in discussion about their current fish catching habits with the following questions:

- *Does anyone here catch fish from any of the areas on the Fish Contamination Zone Map, or have family or friends who do? Where do you/they catch fish?*
Suggestion: Encourage people to fish in areas located in the yellow zone areas where fish have lower levels of chemicals whenever possible.
- *What kind of fish do you catch and where? By boat? On piers? From a shore?*
Suggestion: Identify fish by zone if possible and review consumption recommendations. Encourage people to fish from the yellow zones where fish have lower chemical levels.
- (Referring to the opening discussion in Module One) *Some of you said earlier that your friends give you fish that they catch. Do you know where they fish? Do you give fish you catch to family or friends?*
Suggestion: Discuss how advisories also apply to fish caught by family and friends and how they could also benefit by knowing about and following the advisories and fish consumption recommendations.
- *Do you buy fish from people who are fishing on the piers or boats, or from any anglers?*
Suggestion: Discuss how the advisories may also apply to fish caught by these people as well, especially if they do not have a commercial license to catch and sell fish.
- *Do the advisories apply to fish sold in fairs, markets, stores, or restaurants?*
Suggestion: The advisories and the information in the fish consumption brochure apply mainly to fish caught by you, family, or friends. Commercial fishing is banned in most of the area of the Palos Verdes Shelf that has the highest contamination in the ocean sediment.
- *How often do you eat fish that you, family or friends catch?*
Suggestion: Be encouraging to participants, acknowledge that changing behaviors can be challenging, but the intent is to try to take steps to follow the advisories and fish consumption recommendations.



Module Six: Cooking Methods that Lower the Amount of DDTs and PCBs in the Fish You Eat

Objectives:

By the end of this module, participants will be able to:

1. Demonstrate safe preparation and cooking methods.

Learning points:

1. DDTs and PCBs build up in the fatty parts of the fish. To lower the amount of PCBs and DDTs in the fish you eat, remove these fatty parts and follow these recommendations:
 - a) Eat only the fillet. Use only fish fillet when preparing soups, stews, or chowders.
 - b) Remove and throw away the head, guts, kidneys, the liver, and fatty parts of the fish, such as the skin and the belly flap, before cooking.
 - c) Bake, broil, steam, or grill your fish, letting fatty juices drip away.
2. In presenting these recommendations to the public, we must consider cultural differences in cooking practices.

Materials:

Overheads/PowerPoint slides 1-8 (Module 6)

Materials for a cooking demonstration: fresh fish, cutting boards, knives, water, etc.

Handouts

Fish recipes

Safer Fish Preparation and Cooking Guide

Teaching Method(s):

- Lecture/discussion, using PowerPoint slides
- Interactive cooking demonstration

Recommended Cleaning and Cooking Methods

Certain fish preparation and cooking methods can lower the amount of chemicals like DDTs and PCBs in fish and thus lower the amount that gets into your body. Since these chemicals build up in fatty parts of fish, the methods include:

- a) eat only the fillet
- b) remove and throw away the head, guts, kidneys, the liver, and fatty parts of the fish, such as the skin and the belly flap, before cooking
- c) bake, broil, steam, or grill your fish, letting cooking juices drip away. Add seasonings, sauces, or gravy after discarding cooking juices.
- d) use only fish fillet when preparing soups, stews, or chowders.

Identifying Cultural Barriers

The fish consumption recommendations and preparation and cooking advice include information that may be new to you, or that may seem very different than what you are used to doing. Let's discuss your usual fishing and consumption practices and see how the consumption recommendations and preparation and cooking advice can work for you.

Discussion Guide:

Review the preparation and cooking methods employed by participants. The following questions can be used to stimulate discussion:

- *Do you leave the skin on fish?*

Suggestion: Removing the skin before cooking and discarding the cooking juices will remove the most chemicals. Although less effective, another option is to puncture the skin to let fatty juices drip away as much as possible, or to cook with the skin on then scrape it off before eating.

- *How do you prepare fish when making fish stew or soups?*

Suggestion: It is best to use only fillet when making fish stew or soups. Using the head, skin, or belly flap to make soup or stew will increase the amount of chemicals in it. Add spices or herbs for seasonings.

- *What steps can you take to make fish safer to eat?*

Suggestion: Follow the safe preparation and cooking practices to reduce the amount of some chemicals in fish. These practices can be used for all fish you eat, including the fish you catch and the fish you buy in stores and restaurants. Also refer to Modules 8 and 9



Exercise G:

Purpose: To reinforce to participants how they can modify traditional or cultural recipes in order to lower the levels of DDTs and PCBs in fish.

Instructions:

Option 1:

Break class up into small groups. Each group receives a copy of a recipe popular within a particular ethnic community. Have each group read the recipe and identify how to apply cleaning and cooking methods that will lower the levels of DDTs and PCBs from fish. If working with a multi-ethnic group, each group should receive recipes from a variety of ethnic groups. All small groups will join in for a larger discussion of how each group altered their recipes.

Option 2:

Conduct a cooking demonstration to show how to apply the cleaning and cooking recommendations for lowering DDTs and PCBs in fish. Solicit suggestions from participants about how they can add spices, seasonings, or sauces to enhance flavor.



Module Seven: Mercury in Fish

Objectives:

By the end of this module, participants will be able to:

1. Describe health effects of mercury and populations at greater risk;
2. Identify ways to limit exposure to mercury in fish.

Learning points:

1. Mercury is a chemical that builds up in the muscle tissue/fillet of some fish as they get bigger and older. Avoiding fish with known high levels of mercury is the best way to avoid exposure to mercury.
2. Mercury poses the greatest health risk to developing fetuses, children up to age 17, pregnant women and nursing mothers. These populations should especially limit consumption.
3. Limit exposure by following fish consumption recommendations in the **Protect Your Health! Catch and Eat Cleaner Fish!** tri-fold brochure and following health advisories for other areas.
4. Do not eat shark, swordfish, king mackerel and tile fish. These fish are known to have high levels of mercury.

Materials:

Overheads/Powerpoint Slides 1-22 (Module 7)

Handouts

US FDA and US EPA materials on Mercury in Fish for Women,
OEHHA Methylmercury in Sport Fish: Answers to Questions on Health Effects
EHIB brochure (English only) and LA County (English and Spanish)
brochure on Mercury
Prop 65 notice

Teaching Method(s):

- Lecture/discussion, using PowerPoint slides
- Interactive exercise

Overview of Mercury Issues

So far we have focused mainly on DDTs and PCBs in fish. A third chemical of concern is **mercury**. Mercury is a type of metal that can be found in soils and rocks. It can also be released by incineration and coal burning power plants, as well as by mining and industrial processes. It is also used in thermometers, batteries, lamps and other products people use. Whether released into air or from soil and rocks, mercury eventually ends up in water where biological processes change it into a form called **methylmercury**. Fish tend to build up methylmercury as they get older and bigger. Eating fish that have methylmercury in them is the most common way people are exposed to it.

During this course we have learned about how chemicals in the environment can get into the fish we eat. We have also discussed how to lower our exposure to chemicals in fish by following the health advisory and by applying fish preparation and cooking methods. The cooking methods are useful because DDTs and PCBs mainly stay in the fat of the fish and can be reduced by eating only the fillet and throwing away fatty parts of the fish like the skin and the belly area.

Methylmercury is different because it is in all parts of fish, including the muscle tissue, or the fillet. Following the consumption limits defined in the advisories will help reduce exposure to methylmercury.

Health Effects of Methylmercury

The nervous system and brain are particularly sensitive to methylmercury. Methylmercury poses the greatest risk to a developing fetus, infant, or children up to age 17 because the brain and nervous system are still developing. Too much methylmercury can hurt an unborn child before it harms the mother.

The risks for developing babies and young children are:

- Babies born to mothers who have a lot of mercury in their bodies may develop more slowly and have problems learning.
- Some babies born to mothers who had high amounts of methylmercury in their bodies learned to walk and talk later than other babies. High exposures are also linked to developmental problems with attention, language, and memory.
- Children and teenagers, whose brains are still developing, may also be harmed by mercury.

Therefore, women who may become pregnant (i.e., women of childbearing age, pregnant women, nursing mothers, children and teens less than 17 years old) should be especially careful to limit their exposure to methylmercury in fish.

However, everyone should limit their exposure to methylmercury. The possible health effects for adults are:

- Increased risk of heart disease with high mercury levels.
- Tingling in hands and feet, tiredness, blurred vision, and kidney disorders.

The half-life of mercury is 60-70 days. This means that it can take 60-70 days for the level of methylmercury in a person's body to be reduced to half the original amount, if no other source of methylmercury is getting into the body.

Ways to Reduce Exposure to Mercury in Fish

Distribute and review EHIB brochure.

1. Pregnant and breastfeeding women, infants and children up to age 17 need to be especially careful about following the consumption recommendations or health advisories for fish caught along the coasts of Orange and Los Angeles Counties. Follow the Fish Consumption Recommendations and eat no more than the lower amount of recommended meals (example, no more than two meals per month of barracuda).
2. **DO NOT EAT:** Shark, swordfish, tilefish, or king mackerel. These fish are known to have the highest levels of mercury. Tilefish and king mackerel are more commonly found in the Gulf of Mexico and the eastern coastal states.
3. Find out about health or fish consumption advisories for other areas where you fish and follow them. Health advisories that are due to mercury are usually more restrictive for pregnant and nursing women, women who may become pregnant, and children and teens less than 17 years old.
4. If there are no health advisories for the areas where you fish, women of childbearing age, pregnant and nursing women, and children and teens less than 17 years old can eat up to **one meal*** (6 oz.) a week of fish caught by self, family, or friends.

OR:

5. For fish from stores or restaurants, women of childbearing age, pregnant and nursing women, and children and teens less than 17 years old should follow the following guidelines:
 - Do not eat any shark, swordfish, king mackerel, and tilefish because they have high levels of mercury.
 - For all other fish from stores or restaurants, eat no more than 2 meals a week (12 ounces total for adults, smaller portions for children).
 - For tuna you buy, eat up to 2 meals/week (12 oz.) if it is canned light tuna. Eat up to 1 meal/week of albacore tuna or tuna steaks and eat no other fish that week since albacore and tuna steaks have more mercury.
6. Women who are planning to become pregnant should follow the above consumption advice for a year before pregnancy.
7. **Do not** add the recommended amounts. For example, if a pregnant woman eats 2 meals of fish purchased from a store, she should not eat any other fish that week.

8. One meal is about $\frac{1}{2}$ pound (8 ounces) of uncooked fish, or 6 ounces of cooked fish for an adult.
 - A 3 oz. portion is about the size of a deck of cards.
 - A 6 oz. portion is about the size of 2 decks of cards
 - An 8 oz. portion is about the size of a thin paperback book.

Portion size for children is smaller and is based on body weight – 1 ounce of fish for 20 pounds of body weight. Example: portion size for a child weighing 40 pounds is 2 ounces.



Exercise H:

Purpose: To provide participants an opportunity to identify recommendations for reducing exposure to mercury by comparing various sources of information on mercury.

Instructions: Facilitator distributes the EHIB mercury brochure and WIC mercury brochure. Ask participants to mark where the documents seem different from each other. Explain the differences, e.g., WIC brochure uses raw weights and EHIB brochure gives cooked weights, but it is the same recommended amounts. WIC also identifies children under 6 because that is the population they serve, but the information also applies to children under 17 years old. Have participants focus on the most health protective recommendations.



Module Eight: The Safety of Fish and Shellfish from Stores and Restaurants

Objectives:

By the end of this module, participants will be able to:

1. Describe how fish from contaminated areas may end up in local markets
2. Provide a summary of how store-bought fish is regulated
3. Describe how to detect unhealthy fish in the store

Learning Points:

1. While some market owners may buy some fish from recreational fishers, commercial fishing is banned in most of the Palos Verdes Shelf with the highest contamination.
2. Due to efforts with market owners to promote buying fish only from reputable sources, store-bought seafood is generally considered safe to eat.
3. Being a smart shopper and knowing how to identify fresh fish in the market can also ensure that you buy only healthy fish.
4. Following seafood storage and preparation recommendations is another way to minimize risk.

Materials:

Overheads/PowerPoint slides 1-14 (Module 8)

Handouts

US Food and Drug Administration handout – “Critical Steps Toward Safer Seafood”

PSR Consumer Brochure - “Healthy Fish, Healthy Families”

Safer Preparation and Cooking Guide

Teaching Method(s):

- Lecture/discussion, using PowerPoint slides
- Interactive exercise

Chemical contamination in store-bought fish

The advisories and the information in the fish consumption brochure apply mainly to fish caught by you, family, or friends. Commercial fishing is banned in most of the area of the Palos Verdes Shelf that has the highest contamination in the ocean sediment so consumers can be confident that, in general, the fish sold in their local stores is safe. In 1997, Heal the Bay, a local environmental organization sampled white croaker from fish markets in Los Angeles and Orange Counties to see if they pose a significant risk to consumers. Seven percent of the samples (10/132) had levels of DDT exceeding the USFDA action levels of 5 parts per million. No samples exceeded the US FDA action

levels for PCBs (2 parts per million). It is believed that some of this fish may be in markets because market owners may purchase the croaker directly from recreational fishers off the piers or off the backs of trucks; fish that may have been caught in contaminated zones along the coast. This is called the gray market.

Over the last three years FCEC partners have conducted outreach with over 250 local markets to promote purchasing fish from approved sources. In addition, environmental health inspectors from Los Angeles and Long Beach Health Departments are conducting targeted inspections to investigate the gray market. To date, the overwhelming majority of the stores inspected have been able to produce proper invoices for the fish they sell.

As part of Phase I of the market monitoring program, the U.S. EPA conducted sampling at local markets from July 2004 through January 2005. The purpose of the sampling was to evaluate whether contaminated white croakers from the Palos Verdes Shelf Superfund site are reaching local consumers through markets. The U.S. EPA completed 135 visits at 68 markets in the Los Angeles and Orange Counties. The U.S. EPA was able to collect 30 white croakers at 6 markets, mostly on repeated visits. White croakers were not found at the other 62 markets during the survey. The white croakers collected will be analyzed for DDTs and PCBs. Upon completion of analysis, the results will be made available to the public and used by the U.S. EPA for future planning of their program activities. In particular, the data will be used for the commercial/market fish outreach, and commercial fish enforcement programs.

Concerns about farmed fish

There are also concerns about PCBs and PBDEs (chemicals commonly used as flame retardants) that are similar to PCBs in farmed and wild salmon. Higher levels of these chemicals have been reported in farmed salmon due to the concentrated fish feed they receive. Since mercury levels in salmon are very low and omega-3 fatty acid content is high, women can be encouraged to choose fresh, frozen or canned wild salmon whenever possible. The preparation and cooking recommendations discussed previously should also be followed with salmon to reduce exposure to chemicals like PCBs and PBDEs that tend to build up in fatty tissues.



Exercise I:

Purpose: To help participants become familiar with recommendations for how to shop wisely for fish purchased in stores or restaurants.

Instructions: Facilitator distributes the PSR consumer brochure and explains the PSR/ARHP Guide to Healthy Fish. Point out the consistencies with previous advice covered. Encourage participants to clip the wallet card and consult it when grocery shopping or dining out. Also distribute "Safer Preparation and Cooking Guide" handout.

Bacterial and viral contamination in store-bought fish

Generally, seafood is safe to eat. It is as safe, if not safer than other meat sources. No food is completely safe. Seafood can be exposed to a range of hazards from the water to the table. We have talked about how fish can be contaminated by chemicals in the environment. Fish can also be contaminated by bacteria and naturally occurring toxins. There are governmental programs that aim to prevent or reduce contamination of fish. You can also avoid contamination of fish by naturally occurring toxins by being a smart shopper.

See Appendix C for a more detailed description of the US FDA program for regulating store bought fish and shellfish. Appendix D contains an optional module that can be used to provide a more detailed presentation about bacterial and viral fish contamination.

Identifying Fresh Fish

Here are some steps you can take to ensure that you buy only healthy fish:

- Buy only from reputable sources. Be wary of people selling fish out of the back of their truck or door-to-door. There is no way to tell if these fish are safe.
- Buy only from stores that are clean, don't smell, and have the fish on fresh (not melting) ice and under some type of cover.
- Buy only fresh fish, look for:
 - Clear and slightly bulging eyes (a few fish, such as walleye, have naturally cloudy eyes)
 - Firm shiny flesh on fillets and whole fish — the flesh should spring back when touched
 - A fresh and mild smell
- Fish may not be fresh if you notice:
 - Darkening around the edges of the fish, brown or yellowish discoloration
 - A fishy or ammonia-like smell

Storing Seafood Safely

Fresh seafood should be stored in the coldest part of the refrigerator and used within two days after purchase. If it will be used later than two days after purchase, it should be frozen in air-proof freezer paper or foil. Avoid refreezing fish if it was previously frozen and thawed for sale in a store.

Preparing Seafood Safely

1. Wash hands thoroughly with hot soapy water before and after handling any raw food.
2. Thaw frozen seafood in the refrigerator. Gradually defrost overnight to maintain the best quality
3. Marinate seafood in the refrigerator not on the counter. Throw out the marinade after use because it contains raw juices, which harbor bacteria.
4. Do not allow cooked seafood to come into contact with raw products. Use separate cutting boards and utensils or wash items completely in hot soapy water before use.

CLOSING EXERCISES

If you choose to end the training here, we suggest completing the workshop with exercises J or K. Exercises L or M can also be conducted for potential trainers. There is also an optional module (Module 9 in Appendix D) that covers information about non-chemical contamination by naturally occurring toxins in fish. If you choose to continue with module 9, you can do these exercises at the end of the training.



Exercise J: Fish Feud Game

Purpose: To review health effects and ways to reduce exposure to DDTs, PCBs and mercury in fish.

Materials:

A stack of ten 8.5 by 11 cards with the following pictures or words: 1. DDTs, 2. PCBs, 3. Mercury, 4. Picture of fish fillet, 5. Picture of Swordfish, 6. Picture of fish guts, 7. Picture of pregnant woman, 8. Picture of young child, 9. Picture of white croaker, 10. Picture of map of coastline (without zones).

Instructions:

Two groups of people (Between 2-5, depending on group size) are identified. One team is named “The Croakers” and the other is named “The Barracudas.” The two groups gather on each side of the facilitator at the front of the room. A blank piece of paper is taped to the wall next to each group.

Beginning with the Croakers, the facilitator asks one participant to pick a card from the pile of 8.5x11 pictures. The facilitator asks a question that pertains to the word or picture on the card. That participant can confer with his/her group to answer the questions. For each correct answer the facilitator draws one of five fish parts (e.g., head, body, tail, top fin, bottom fin) on the blank paper next to the group. The first team to answer five answers correctly, thereby completing the fish drawing, wins.

Pictures and corresponding questions

1. Picture of **fish fillet**: What chemical tends to build up in this part of the fish?

Answer: Mercury (Can also remind participants that DDTs and PCBs will also be in the fillet, but they tend to concentrate in the fatty parts of fish and mercury does not.)

2. Picture of **Mercury**: Name one health effect related to exposure to this contaminant? (Can affect brain development in children, can affect nervous system, tingling in hands, etc.).

3. Picture of **DDTs/PCBs**: Name three ways to cook fish in order to reduce exposures to these chemicals.
Answer: Follow consumption recommendations. Cook the fish by grilling, letting fatty juices drip away, eat only the fillet, remove fatty parts of fish such as the guts, and skin.
4. Picture of **swordfish**: What chemical is known to be found in this fish?
Answer: Mercury (or methylmercury)
***Extra bonus point if you can name one other fish that is included in the mercury advisory.
Answer: tilefish, king mackerel, shark.
5. Picture of **pregnant woman**: What is the best way for this woman to lower the amount of mercury she is exposed to in fish?
Answer: Follow fish consumption recommendations, decrease the amount of fish she eats that have higher concentrations of mercury; do not eat tilefish, king mackerel, shark, or swordfish.
6. Picture of a mother with **baby**: How can chemicals in fish affect this child?
Answer: Chemicals get into breast milk and can be passed on to a baby through breastfeeding. They can affect growth and development, can affect the nervous system). Note: Breastfeeding is still the healthiest infant feeding choice.
7. Picture of **map of coast**: Which areas have fish with higher levels of DDTs and PCBs?
Answer: Red zone areas around Palos Verdes Peninsula, Pt. Dume, Malibu, Newport Beach, Cabrillo Pier, Horseshoe Kelp.
8. Picture of **map of coast**: Name three areas in the yellow zone:
Answer: Santa Monica, Huntington Beach, Redondo Beach
- 9a. Picture of **fish guts**. What should be done with them when preparing a fish meal?
Answer: Throw them away.
- 9b. Name two other parts that should be thrown away when preparing a fish meal.
Answer: skin, belly flap-any fatty part.
10. Picture of **white croaker**: What is the problem with this fish?
Answer: The white croaker has higher levels of DDTs and PCBs than other fish because it is fatty and because it is a bottom feeder.

BONUS QUESTION: Both teams get to answer this questions at the same time. The first team to write down the correct answer wins the game. The team must clap when they are finished writing.

NO PICTURE: Name at least three exposure factors that influence whether fish will affect health.
Answer: how much chemical is in the fish, how much fish is eaten, how often you eat fish. Other answers may include age, overall health status, gender.



Exercise K: Fishbowl

Purpose: To increase participant's confidence in applying the information they have gained in the workshop.

Instructions: Participants form a circle with their chairs, leaving a space in the center of the room. Two volunteers receive roles and act out a scenario. Suggested scenarios include:

1. an outreach worker approaching a fisherman on a pier
2. a nurse providing consultation to a pregnant woman in a doctor's office
3. a wife talking to her husband who has just come home from fishing from a pier

During the role-playing process, if participants are unable to complete a scenario, the facilitator can call "freeze" and ask for volunteers from the rest of the class to raise their hand to contribute to the scene from their seats. Another option is that a role player can pass and randomly call on another class member to replace him or her. At the end of each scene the facilitator reviews the information learned.



Exercise L: Summary discussion for potential trainers only

Purpose: Trainees will foresee issues they will have to consider when designing their own training and learn to plan ahead to address these issues.

Instructions: The facilitator breaks the class up into small groups and poses the following questions for discussion:

1. Having gone through this training, what concerns or obstacles do you foresee in conducting this workshop within your communities?
2. What difficulties do you think the community will have in adopting these recommendations?
3. What mechanisms can you use to address these difficulties and concerns?



Exercise M: Exercise Development for potential trainers only

Purpose: Trainees will practice meeting curriculum objectives by creating training exercises that meet the needs of their communities.

Instructions: Facilitator breaks group into small groups of 3-5 people. Each group is instructed to take any objective from any module and work together to create an interactive way of teaching that objective.

Appendix A

Complete List of Training Materials

Module One:

List of questions for Exercise A

Module Two:

Overheads

Pictures of people eating fish or show fish meals, especially food dishes commonly eaten by participants

Pictures of people fishing from piers, shores, boats

Pictures of fish as part of healthy, varied diet

Benefits of eating fish

Food Web

Handout

Picture of Food Web

Module Three:

Overheads

People fishing

Fish Contamination Zone Map with noted fishing sites/areas

White croaker picture

Suggested Handouts

Maps from California Coastal Access Guide by the California Coastal Commission of public fishing sites along LA and Orange County coastlines

Protect Your Health! – Catch and Eat Cleaner Fish! tri-fold brochure

Blank map of the coast with limited identifiers

Module Four:

Overheads

How chemicals can affect your health

Health effects of DDTs and PCBs

Pregnant and nursing mothers, women of childbearing age, young children

Suggested Handouts

OEHHA fact sheet on PCBs

Module Five:

Overheads

Purpose of fish consumption or health advisories

Covers of CDFG Sport Fishing Regulations booklets (for marine and freshwater areas)

OEHHA's Sport Fishing Advisory booklet or OEHHA's Sport Fish Advisories for Southern California

Protect Your Health! – Catch and Eat Cleaner Fish! tri-fold brochure

Fish Contamination Zone Map

Pictures of fish species by zone

Pictures of signs posted by Los Angeles County and City of Long Beach

Handouts

Picture of a white croaker

Pictures of queenfish, yellowfin croacker, and black croaker

Felt backdrop of tri-fold brochure, 19 components of fish, meal portion, and wording from inside the tri-fold brochure

Module Six:

Overheads

Safer fish preparation and cooking methods

Pictures of different fish dishes

Materials for a cooking demonstration: fresh fish, cutting boards, knives, water, etc.

Handouts

Fish recipes

Safer Fish Preparation and Cooking Guide

Module Seven:

Overheads

Sources of Mercury

Small fish being eaten by big fish --- people exposed

Fish fillet – preparation/cooking DO NOT decrease methylmercury

Health effects

Women, infants, young children

Fish Contamination Zone Map

Pictures of portion size estimates

Pictures of shark, swordfish, king mackerel, and tilefish

Handouts

US FDA and US EPA materials on Mercury in Fish for Women,

OEHHA fact sheet on Methylmercury in Sport Fish: Answers to Questions on Health Effects

EHIB brochure (English only) and LA County (English and Spanish)

brochure on Mercury

Module Eight:

Overheads

Government Programs – US Food and Drug Administration, CA Dept. Health Services/Food and Drug Branch

Identifying fresh fish

Storing seafood safely

Preparing seafood safely

Handouts

US Food and Drug Administration handout – “Critical Steps Toward Safer Seafood”

Safer Fish Preparation and Cooking Guide

Module Nine:

Overheads

Fish eating algae

Fish Poisoning Syndromes – PSP, ciguatera, domoic acid

Examples of recent warnings for Sport Harvested Mussels, domoic acid

Vibrio vulnificus

Scrombroid Poisoning

Appendix B

Resources Available for Safer Fish Consumption

1. Mercury in Fish Handout (EHIB/CDHS, 3/2005) (8.5"x11") Two page handout providing safety guidelines for women and children on eating fish bought from stores or restaurants and fish caught by family and friends. Available in: English, Chinese, Spanish and Vietnamese. PDF files available for download from: <http://www.pvsfish.org/library/edumaterials.html>



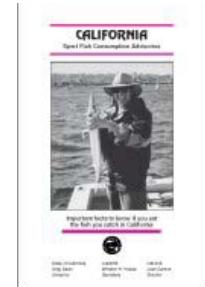
2. Mercury in Fish Postcard (WIC and EHIB, 6/2005) (9"x5.5") Developed by CA WIC Supplemental Nutrition Branch. Low-literacy color postcard describing guidelines for women and young children on eating fish bought from stores or restaurants and fish caught by family and friends. Available in: English, Spanish, Chinese, Vietnamese, Tagalog, Cambodian, Hmong, Korean, Lao, Mien, and Russian. PDF files available for download from: <http://www.pvsfish.org/library/edumaterials.html>



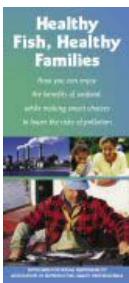
3. Mercury in Fish Brochure (OEHHA/CalEPA, 3/2005) A brochure that provides recommendations and information to reduce mercury exposure from fish. Describes sources and health effects of mercury, fish that are lower in mercury, tips to choose safer fish and recommendations for women of childbearing age, children and other adults. Available in English. PDF files available for download from: <http://www.oehha.ca.gov/fish/hg/index.html>



4. California Sport Fish Consumption Advisories (OEHHA/CalEPA, 6/2001) A brochure that provide specific advice for fish taken in areas where high levels of chemicals have been found in fish and general advice on how to reduce exposure to chemicals in sport-fish. Available in English, Spanish, Khmer, Chinese, Korean, Vietnamese, Laotian. PDF files available for download from: <http://www.oehha.ca.gov/fish/fishlang.html>



5. Healthy Fish, Healthy Families Brochure (PSR, 3/2005) Developed by Physicians for Social Responsibility and Association of Reproductive Health Professionals. Provides overview of concerns regarding mercury and PCBs, and safer cooking techniques. Also includes expanded color-coded list of fish. Available in: English, Spanish, Chinese, and Vietnamese. PDF files available for download from: <http://www.pvsfish.org/library/edumaterials.html>



6. Protect Your Health! Catch and Eat Cleaner Fish! (FCEC, 2/2003) Developed by the Fish Contamination Education Collaborative. A tri-fold that provides fish consumption recommendations based on state and local advisories to reduce exposure to mercury, DDTs and PCBs. Available in:



English, Spanish, Chinese, Chomorro, Ilokano, Khmer, Korean, Tagalog and Vietnamese.
PDF files available for
download from: <http://www.pvsfish.org/library/edumaterials.html>

7. Safer Fish Preparation and Cooking Guide (FCEC, 2006) Developed by the Fish Contamination Education Collaborative. Provides recommendations for safer preparation and cooking of fish. Available in English. PDF file available for download from <http://www.pvsfish.org/library/edumaterials.html>



8. **Fish Contamination Education Collaborative Intro Brochure** (FCEC, 5/2003)

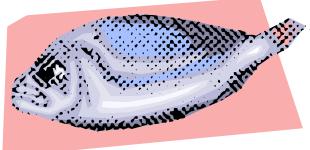
Developed by the Fish Contamination Education Collaborative. Provides information about the Palos Verdes Shelf, EPA Superfund Site, and the Collaborative that was established to provide outreach and education to reduce exposures of populations to site-related chemicals of fish and conduct education to most affected populations to they can make informed, health-protective decisions. Available in: English, Spanish, Korean, Chomorro and Vietnamese. PDF files available for download from: <http://www.pvsfish.org/library/edumaterials.html>

Appendix C

Government Programs for Regulating Store Bought Fish and Shellfish

1. The US Food and Drug Administration (US FDA) developed a seven-step prevention program in 1997 that focuses on identifying hazards that occur during the processing, repacking, and storing of seafood before it reaches the retail store. Although seafood retailers are exempt from the program, the US FDA encourages retailers to apply the program's food-safety principles.
2. The US FDA also sets standards for seafood contaminants. They have established a legally binding safety limit for PCBs and guidelines for safety limits for six pesticides (including DDTs), mercury, paralytic shellfish poison and histamine (histamine is a chemical responsible for scombroid poisoning).
3. The US FDA has a seafood sanitation program in 23 shellfish producing states and nine countries. The program exercises control over all sanitation related to the growing, harvesting, shucking, packing and transportation of oysters, clams, and other shellfish.
4. The Food and Drug Branch (FDB) of the California Department of Health Services and county environmental health departments conduct investigations, inspections, and random product sampling in retail stores. The FDB also conducts education, training, and certification programs for both industry and consumers.

Appendix D



Module Nine: Non-Chemical Contamination by Naturally Occurring Toxins

Objectives:

By the end of this module, participants will be able to:

1. Describe naturally occurring toxins, viruses and bacteria in fish and shellfish that can affect health;
2. Identify symptoms of illnesses associated with naturally occurring toxins, viruses, and bacteria;
3. Identify ways to prevent exposure to naturally occurring toxins, viruses, and bacteria.

Learning Points:

1. Fish can also be contaminated by naturally occurring toxins, such as bacteria, viruses and parasites, which can cause fish poisoning syndromes: paralytic shellfish poisoning, ciguatera fish poisoning, domoic acid poisoning, vibrio vulnificus poisoning, and scromboid poisoning
2. Individuals with illnesses that can compromise their immune system should avoid eating raw seafood.
3. These poisonings can cause serious health problems so if exposure to any of these toxins is suspected, it is critical to seek immediate medical attention.
4. People who harvest or collect their own shellfish or catch their own fish should check with the local health department for advisories about naturally occurring toxins.

Materials:

Overheads/PowerPoint slides 1-21 (Module 9)

Teaching Method(s):

- Lecture/discussion, using PowerPoint slides

Introduction

So far we have discussed how contamination from chemicals in the fish you eat can affect your health. Another type of contamination in fish and shellfish comes from naturally occurring toxins, bacteria and viruses, and parasites. Mollusks like clams, mussels, and oysters feed by filtering water through their systems, so they are more likely to pick up and store bacteria or viruses from the water, some of which can cause acute or immediate illnesses and even death. It is important to know about some of the most common ones and how to avoid becoming ill or sick from them.

Fish Poisoning Syndromes: Paralytic Shellfish, Ciguatera, and Domoic Acid

Most of the natural toxins in fish are produced by naturally occurring algae (phytoplankton). They build up in guts of shellfish and fish when they feed on large blooms of algae that produce toxins or other fish that have eaten algae. There is no visible, taste, or odor difference between fish or shellfish with toxins and those without. Cooking does not destroy the toxins, so the best way to avoid the toxins is to follow specially issued advisories or warnings. Common fish poisoning syndromes include paralytic shellfish poisoning (PSP), ciguatera fish poisoning, and domoic acid poisoning.

Paralytic shellfish poisoning, or PSP, is associated with consumption of mussels, oysters, clams, and scallops, and guts or viscera of crabs and lobsters. PSP affects the central nervous system, causing tingling around the mouth and fingertips within a few minutes to a few hours after eating toxic shellfish. These symptoms are typically followed by loss of balance and coordination, slurred speech, and difficulty swallowing. In severe poisonings, muscular paralysis and death from asphyxiation can occur. It is absolutely critical to seek medical care immediately if PSP exposure is suspected.

The **ciguatera toxin** is more commonly found in fish like barracuda, mackerel, and snapper from warm and tropical water areas. The symptoms of ciguatera begin within 6 hours after contaminated food is eaten. They include nausea, cramping, vomiting, headache, flushing, and tingling or numbing sensation on the lips, tongue, or mouth. In more severe cases, cold objects feel hot and hot objects feel cold.

Domoic acid is another naturally occurring toxin that can be found in clams, mussels, scallops, oysters, and organs or guts of anchovies and sardines, and crab. Symptoms of domoic acid poisoning can occur within 30 minutes to 24 hours after eating toxic seafood. In mild cases, symptoms may include vomiting, diarrhea, abdominal cramps, headache, and dizziness. These symptoms commonly disappear within several days. In severe cases, the individual may experience lung secretions, breathing difficulty, confusion, disorientation, unstable blood pressure and irregular heartbeat, seizures, permanent loss of short-term memory, coma, and even death.

If you suspect exposure to PSP, ciguatera toxin, or domoic acid, it is critical to seek immediate medical care. The California PSP hotline number is: **800-553-4133**.

People who harvest or collect their own shellfish or catch their own fish should check with the local health department to see if any advisories or warnings about naturally occurring toxins have been issued. The California Department of Health Services warns people to not eat mussels they harvest themselves from May 1 through October 31 in all areas of the California coast, including bays and estuaries. In some areas, local health departments post warnings, but the absence of posted warnings does not mean the mussels are safe. Other warnings or advisories may be issued depending on levels of the natural toxins detected, such as for domoic acid.

Commercially harvested shellfish are not included in the warnings. All commercial shellfish harvesters in California are certified by the California Department of Health Services and must follow strict requirements to ensure that all oysters, clams, and mussels sold in stores are free of toxins. Commercial harvesting is stopped immediately if potentially dangerous levels of toxins are found.

Vibrio vulnificus

Vibrio vulnificus is a naturally occurring bacteria that can be found in warm coastal waters. **Thorough cooking can destroy this bacteria.** Eating raw shellfish, like oysters, mussels or clams, with hot sauce or lemon, or while drinking alcohol **does not kill** the bacteria. Health risks are highest for people who eat raw shellfish whose immune systems might not be able to fight off infections. People with any of the following health conditions should avoid eating raw shellfish: liver disease, chronic alcohol use, cancer, AIDS, Hodgkin's disease, diabetes, chronic kidney disease, reduced stomach acidity.

Symptoms associated with an infection caused by *Vibrio vulnificus* include sudden chills, fever, nausea, vomiting, stomach pain, swelling and pain in the legs. It can also cause blood poisoning which can lead to death within two days.

Scromboid Poisoning

Scromboid poisoning results when certain bacteria build up in fish and form too much of a protein called histamine. Cooking does not affect histamine. The best way to avoid it is to make sure the fish you eat is very fresh. Take special care in handling, washing, icing, and refrigerating the fish to prevent bacterial growth.

Symptoms, which can include flushed skin, headaches, dizziness, nausea, and rashes, can occur within minutes to two hours after fish has been eaten.

Parasites

Parasites like nematodes or roundworms and tapeworms or flukes can also be of concern in seafood. Thorough cooking usually kills parasites. People with immune disorders should be especially careful to avoid eating raw seafood.

You should contact a physician immediately if any of the symptoms of poisoning appear from toxins. For more information, contact the US Food and Drug Administration Food Safety Information Hotline at 800-332-4010, or check their website at <http://www.cfsan.fda.gov/>