



# Seafood for Health Information for Healthcare Providers

A joint project of Oregon State University, Cornell University, and the Universities of California, Delaware, Florida, and Rhode Island

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## The Seafood Message

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- ◆ Seafood (fish and shellfish) is a nutrient-rich food containing high quality protein, long-chain polyunsaturated fatty acids (omega-3) and important vitamins and minerals.
- ◆ Seafood is the main dietary source of the heart-healthy omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).
- ◆ Research over the past 20 years closely links seafood consumption to a number of health benefits, including improved coronary health in adults and improved cognitive and visual development in infants and children.
- ◆ The main health risk from seafood is exposure to pathogens. To ensure seafood safety, proper preparation and cooking methods must be followed.
- ◆ Studies have shown that the health benefits of seafood outweigh the risks from contaminants such as traces of mercury or PCBs, and eliminating seafood from the diet can have negative effects on human health.
- ◆ National recommendations by the U.S. Food and Drug Administration, USDA Dietary Guidelines Advisory Committee, and American Heart Association are to eat a variety of seafood twice a week. However, only about one in five Americans currently follow these recommendations.
- ◆ Several groups, such as older adults, pregnant women, children, and immuno-compromised individuals, will also benefit from consuming seafood twice a week, see *Guidelines for Consumers* in this reference guide.
- ◆ Visit <http://seafoodhealthfacts.org> for current facts on balancing the benefits and risks of seafood.

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## Seafood Consumption in the United States

Americans eat more than 350 different species of fish and shellfish. Most of the seafood that we purchase in the marketplace is from marine waters and aquaculture, ranging from the Bering Sea near Alaska to shrimp ponds in Indonesia. Greater than 80% of seafood consumed in the United States is imported from over 130 different countries. In addition, both marine and freshwater aquaculture have grown rapidly and about half our seafood is from farmed sources. Federal law requires that all retailers must list the country of origin on their fresh or frozen seafood products and whether the item is wild caught or farm-raised.

With many seafood varieties to choose from, it can be difficult for the health practitioner to understand the range of potential benefits and possible risks of seafood consumption. The good news is that the most commonly consumed seafood in the U.S. present little risk to the consumer from contaminants such as mercury, while offering numerous nutrition benefits. Furthermore, most of the risks of seafood consumption involve microbiological concerns that can be prevented through proper handling, storing, and cooking.

Seafood has been an important part of the human diet for centuries. Recent scientific information shows that many components of seafood are critical for a healthy and well-balanced meal for the whole family.

### Top Commonly Consumed Seafoods Based on U.S. per capita consumption, 2006-2008

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Shrimp



Canned Tuna



Salmon

Pollock

Tilapia

Catfish

Crab



Cod

Clams/Pangasius/Scallops



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Source: National Marine Fisheries Service (2009)

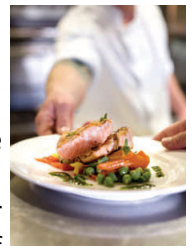
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For more information, visit our website:

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## Seafood Health Benefits



Seafood is a high-protein food that is lower in calories, total fat, and saturated fat when compared to other protein-rich animal foods. High in vitamins and minerals, seafood has been shown to have numerous nutrition and health benefits. For example, recent studies have shown that eating seafood can decrease the risk of heart attack, stroke, and hypertension. Seafood also provides essential nutrients for developing infants and children.

### ◆ Calories and Protein

Seafood is a low-calorie protein source. Most low-fat species of fish, such as cod, flounder, and sole, contain less than 100 calories per 4-ounce cooked portion, and even fattier fish like mackerel, herring, and salmon have about 200 calories per serving.



Seafood is a complete protein source.

It contains enough of the essential amino acids, which our bodies need for growth and repair. A 4-ounce serving of fish or shellfish provides about 30-40% of the average daily recommended amount of protein. The protein in seafood is also easier to digest because seafood has less connective tissue than red meat and poultry.

### ◆ Fat and Cholesterol

Seafood is low in total fat and saturated fat. Most fish and shellfish contain less than 5% total fat, and even the fattier fish, such as mackerel and king salmon, have no more than 15% fat. Furthermore, a large proportion of the fat in seafood is polyunsaturated, including omega-3 fatty acids, which have added health benefits.

*Omega-3s* are essential fatty acids that are required for healthy human development. These organic compounds are not produced in substantial amounts by the human body and must be obtained from dietary sources. Scientific evidence suggests that the marine-derived long-chain omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) can help reduce the risk of heart disease and contribute to brain and

vision development in infants. While omega-3s from plant sources, called alpha-linolenic acid (ALA), is a precursor to EPA and DHA, it is converted at rates of less than 10% in the human body and is not associated with the same powerful health benefits as omega-3s from seafood. United States health organizations recommend 250 mg of EPA/DHA per day. The American Heart Association recommends 1000 mg of EPA/DHA per day for patients with coronary heart disease. Fish with medium to high levels of omega-3 fatty acids include oily ocean fish such as salmon, herring, mackerel, and sardines.

*Cholesterol* is present at varying amounts in most animal foods. Current dietary recommendations suggest limiting cholesterol intake to 300 milligrams (mg) per day. Almost all fish and shellfish contain well under 100 mg of cholesterol per serving, and many of the leaner types of fish have less than 60 mg.

### ◆ Vitamins and Minerals

Fish is a natural source of B-complex vitamins, vitamin D and vitamin A (especially oily fish). Fish contains minerals such as selenium, zinc, iodine and iron. Selenium is a potent antioxidant that protects against cell damage and may help to counter any negative effects of mercury. Small fish eaten whole, such as canned sardines and anchovies, are an important source of calcium needed for bone development.

#### Health Benefits Linked to Seafood and EPA/DHA\*

##### **Heart**

- ◊ Reduces the risk of cardiovascular disease
- ◊ Helps protect against heart attack and sudden death
- ◊ Decreases blood triglyceride levels

##### **Eyes**

- ◊ Contributes to visual acuity

##### **Brain**

- ◊ Contributes to neurological development in infants and children

##### **Pregnancy**

- ◊ Increases duration of gestation

##### **Muscles**

- ◊ Helps build muscles and tissues

*\*Seafood Choices: Balancing benefits and risks; Institute of Medicine of the National Academies (2007)*

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# Seafood Safety



## ◆ Foodborne Illness

When it comes to seafood safety, consumers should focus on limiting exposure to bacteria that grow when seafood isn't stored and cooked properly.

When seafood is properly handled and cooked, the risks from pathogens are minimal. Poor handling practices, cross-contamination, and lack of proper temperature control can lead to foodborne illness.

### Proper handling reduces risk of foodborne illness:

- Refrigerate seafood below 40°F until ready for use.
- Separate cooked and raw seafoods and wash utensils before re-using to avoid cross-contamination.
- Wash hands before and after handling any raw or cooked seafood.
- Cook seafood to an internal temperature of 145°F for at least 15 seconds.
- Properly cooked seafood should be moist and a solid color throughout.
- Avoid storage temperatures between 40-140°F.



### Raw or partially-cooked seafood

- Raw seafood and uncooked marinated dishes are commonly served as ceviche and sushi (sashimi) dishes, or as oysters and clams on the half-shell.
- Raw fish and shellfish may contain naturally-occurring pathogens or parasites, such as *Vibrio*, *Salmonella*, and *Listeria*.
- Freezing at low temperatures prior to serving raw seafood can help kill any parasites present, but freezing does not kill all pathogens. The safest route is to thoroughly cook the seafood.
- Lightly smoked seafood is only partially cooked and may still contain pathogens.

### The following consumers should not eat raw or partially-cooked fish or shellfish:

- Pregnant women
- Young children
- Older adults
- Immuno-compromised individuals
- Individuals with decreased stomach acidity

## ◆ Seafood Toxins

Toxins can occur naturally in some types of seafood and are not destroyed by cooking. To reduce potential health risks, purchase seafood from reputable sources, handle it properly, and use caution when eating fish and shellfish that you have caught in unfamiliar waters.

### Shellfish Toxins

- Shellfish toxins are produced during algae blooms. They can cause gastrointestinal and/or neurological problems. Recreational harvesters should check local advisories for warnings.

### Finfish Toxins

- Ciguatoxin occurs in some tropical reef fish. It causes gastrointestinal, neurological, and respiratory problems.
- Histamine is a toxin produced when certain types of fish are not properly chilled. It can cause an allergy-like reaction when the fish is eaten.

## ◆ Allergens

Finfish and crustaceans can cause an allergic reaction in some people. Current regulations require that all foods that contain any of the major food allergens must be properly labeled. Patients are often only allergic to a certain species and can safely eat other types of seafood.

## ◆ Environmental Contaminants

*Man-made pollutants:* PCB and pesticide concerns in seafood are primarily for recreational fish caught in local ponds, lakes, rivers and shores rather than the open ocean or aquaculture. Exposure can be lowered by up to 40% by removing the skin and trimming the fat. Recreational and subsistence anglers, along with pregnant women and children who eat large amounts of fish caught by family or friends, are at greatest risk. Most commercial species of fish are well below federal limits for these contaminants.

*Mercury* occurs in the environment as a result of natural processes and human activity. Mercury can accumulate in the food chain, so larger and older fish tend to have higher concentrations of mercury than smaller, short-lived species, such as salmon, pollock, shrimp, catfish, or shellfish. Most commonly consumed seafood in the United States is low in mercury.

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# Seafood in Perspective



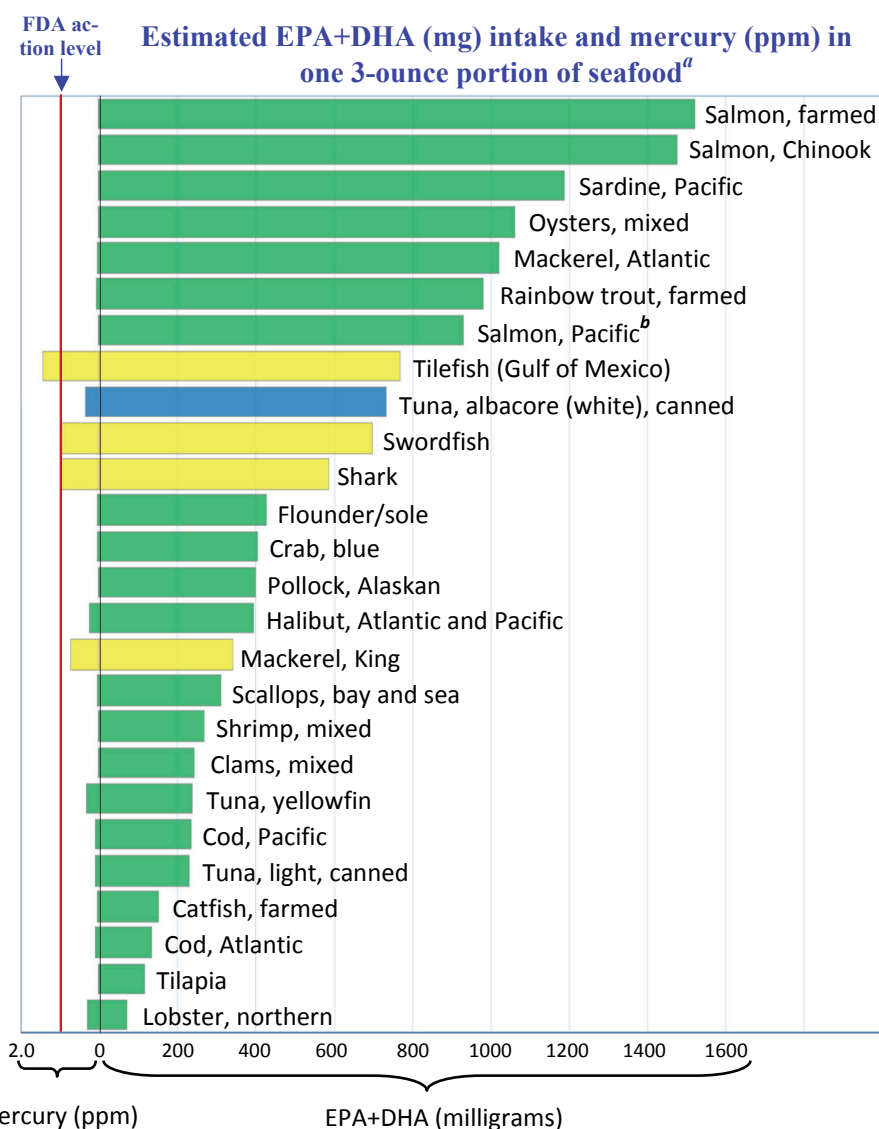
## Risk-Benefit Analysis

Many people have questions about whether or not they need to worry about mercury or other contaminants that have been found in trace amounts in seafood. Recent risk-benefit studies have investigated the overall health effect from eating seafood. These studies consider low-level contaminants such as mercury and the positive health benefits nutrients including EPA and DHA. Overall, these studies have demonstrated that the benefits of seafood consumption greatly outweigh the risks. For specific risk-benefit analysis studies, reference the sources on the back of this guide and on our website (<http://seafoodhealthfacts.org>).

For most people, the risk from mercury in the fish and shellfish is not a health concern. The U.S. Food and Drug Administration (U.S. FDA) and the U.S. Environmental Protection Agency (U.S. EPA) are advising women who may become pregnant, pregnant and breastfeeding women, and young children to avoid some types of seafood — shark, swordfish, king mackerel and tilefish, and to limit intake of white (albacore) tuna fish to 6 ounces per week. Seafood is always part of a healthy diet and the guidelines for consumers on the next page can help people make healthy seafood choices.

## Maximizing Benefits

- ◆ Consumer should eat 8 ounces or more of a variety of seafood per week for good health.
- ◆ U.S. health organizations recommend a daily EPA+DHA intake of 250 mg for most consumers and 1000 mg for people with cardiovascular disease.
- ◆ FAO/WHO experts recommend a daily DHA of at least 200 mg for pregnant or breastfeeding women.
- ◆ Pregnant women should eat *at least* 8 ounces and up to 12 ounces of a variety of seafood per week.
- ◆ The chart to the left shows the average level of EPA+DHA and concentration of mercury in a 3-ounce portion of seafood.
- ◆ All seafood highlighted in green is well below the U.S. FDA action level of 1.0 part per million (ppm) for mercury in seafood, indicated by the red line on the chart.
- ◆ Albacore (white) tuna is highlighted in blue. It is a good source of EPA+DHA but has moderate levels of mercury. Sensitive groups (see *Guidelines for Consumers*) should only eat up to 6 ounces per week.
- ◆ The four seafood species highlighted in yellow are higher in mercury and should not be eaten by sensitive groups.



<sup>a</sup>Figure adapted from the Institute of Medicine's *Seafood Choices Fact Sheet* (<http://www.iom.edu/Reports/2006/Seafood-Choices-Balancing-Benefits-and-Risks.aspx>).

<sup>b</sup>Average of coho, chum, sockeye, and pink salmon

<sup>c</sup>USDA *Dietary Guidelines for Americans, 2010*; U.S. Food and Drug Administration; U.S. Environmental Protection Agency; American Heart Association; Food and Agriculture Organization of the United Nations/World Health Organization (FAO/WHO) and Institute of Medicine of the National Academy of Sciences.

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# Guidelines for Consumers

One serving = 4 ounces of cooked fish or shellfish (about the size of the palm of your hand)

## Healthy teenagers and adults



- ◇ Should eat 8 or more ounces of a variety of seafood per week
- ◇ Can reduce their risk for cardiovascular disease by eating seafood regularly
- ◇ Can have added benefits from seafood high in EPA and DHA
- ◇ May eat raw or partially cooked seafood at their own risk

## Women who are or may become pregnant or who are breastfeeding



- ◇ Should eat *at least* 8 ounces and up to 12 ounces of a variety of seafood per week, which includes canned light tuna, salmon, shrimp, pollock, and catfish
- ◇ Mothers and their infants can benefit from seafood, especially types high in EPA and DHA
- ◇ Can eat up to 6 ounces of albacore (white) tuna per week
- ◇ Should avoid large predatory fish such as shark, swordfish, tilefish, or king mackerel
- ◇ Should not eat raw or partially cooked seafood

## Children 12 years and under



- ◇ Should eat about 8 ounces of a variety of seafood per week
- ◇ May benefit from eating seafood, especially types high in EPA and DHA
- ◇ Can eat up to 6 ounces of albacore (white) tuna per week, as part of their total weekly seafood intake
- ◇ Should avoid large predatory fish, such as shark, swordfish, tilefish, or king mackerel
- ◇ Young children should not eat raw or partially cooked seafood

## Immuno-compromised individuals and older adults



- ◇ Should eat a variety of seafood at least twice per week
- ◇ Can reduce their risk for cardiovascular disease by eating seafood regularly
- ◇ Can have added benefits from seafood high in EPA and DHA
- ◇ Should not eat raw or partially cooked seafood

## All individuals who eat recreationally-caught fish or shellfish



- ◇ Some local river systems and inland lakes may contain higher levels of contaminants
- ◇ These contaminants can accumulate in the local fish and shellfish populations
- ◇ State and tribal environmental programs and the department of health test local waters and issue fish and shellfish consumption advisories
- ◇ Before eating recreationally-caught seafood, check with the State Health Department for advisories or visit <http://epa.gov/waterscience/fish/states.htm>

Sources: 2010 Dietary Guidelines for Americans; U.S. Environmental Protection Agency (EPA), American Heart Association (AHA), and Institute of Medicine of the National Academy of Sciences (NAS).

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## Sources

### Health Organization Recommendation

- American Heart Association. <http://www.americanheart.org/presenter.jhtml?identifier=3071550>
- USDA. *2010 Dietary Guidelines for Americans*. <http://www.cnpp.usda.gov/dietaryguidelines.htm>
- Food and Agriculture Organization of the United Nations/ World Health Organization Expert Consultations Omega-3 intake: [http://www.who.int/nutrition/topics/FFA\\_summary\\_rec\\_conclusion.pdf](http://www.who.int/nutrition/topics/FFA_summary_rec_conclusion.pdf)

### Seafood Nutrition

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### Risk-Benefit Analysis

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- USDA National Agriculture Library Food Safety Info Center <http://fsrio.nal.usda.gov>
- U.S. Food and Drug Administration Fish and Fishery Products Hazards and Controls Guide <http://www.fda.gov/food/guidancecomplianceregulatoryinformation/guidancedocuments/seafood/fishandfisheriesproductshazardsandcontrolsguide/default>
- U.S. Food and Drug Administration Seafood Information <http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/ConsumerInformationAboutSeafood/default.htm>

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## Additional Information

### Allergen Information

<http://www.fda.gov/Food/ResourcesForYou/Consumers/ucm079311.htm>

### Bacteria and Foodborne Illness Education Campaign

<http://www.fightbac.org>

### NOAA FishWatch U.S. Seafood Facts

<http://www.nmfs.noaa.gov/fishwatch/>

### Omega-3 Learning for Health and Medicine

<http://www.omega3learning.purdue.edu/>

### Raw Shellfish Safety

<http://safeoysters.org>

### Seafood Health Facts

<http://seafoodhealthfacts.org>

### State Advisories on Locally Caught Fish and Shellfish

<http://epa.gov/waterscience/fish/states.htm>

### U.S. Food and Drug Administration Bad Bug Book

<http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/default.htm>

### U.S. Food and Drug Administration Mercury Advisory

<http://www.fda.gov/Food/ResourcesForYou/Consumers/ucm110591.htm>

### U.S. Food and Drug Administration Mercury Levels in Commercial Fish and Shellfish

<http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/FoodbornePathogensContaminants/>



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