

# Nutrition and Health Info Sheet: Omega-3 Fatty Acids

For Health Professionals

## What are omega-3 fatty acids?

Omega-3 fatty acids are a group of fatty acids important for human health. There are three main types of omega-3 fatty acids: eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), and alpha linolenic acid (ALA), which is converted in our bodies to EPA or DHA after consumption. High concentrations of omega-3 fatty acids are found in fish and plant oils, in addition to human milk and eggs from chickens fed a fishmeal diet.<sup>1</sup> The current recommendations put forth by the American Heart Association, among other national groups, is to consume at least two servings of fish per week, preferably fatty fish, providing an average daily intake of 450-500mg of EPA and DHA.<sup>2</sup> This recommendation is consistent with the Dietary Guidelines for Americans 2015-2020 to consume at least eight ounces or up to 12 ounces (2 to 3 servings) of fatty fish per week.<sup>3</sup>



Image via Pixabay <https://pixabay.com/en/salmon-dish-food-meal-fish-518032/>

## What are the beneficial effects associated with omega-3 fatty acids?

### Role of Omega-3s in Inflammation and Chronic Disease Prevention

Inflammation is a process used by the body to fight infection, however when inflammatory processes are uncontrolled, they can contribute to chronic disease progression.<sup>4</sup> Omega-3 fatty acids can reduce inflammation in the body, helping the body maintain homeostasis.<sup>5</sup> Chronic inflammation is prevalent and occurs in many chronic diseases such as diabetes, cardiovascular disease, asthma, depression, autoimmune diseases, and some cancers.<sup>6</sup> Current research also suggests that a diet deficient in omega-3 fatty acids could negatively impact brain development in a fetus.<sup>7</sup>

## Omega-3 and Pregnancy



There are various beneficial effects associated with omega-3 fatty acid consumption and pregnancy outcomes. An abundant amount of DHA accumulates during the later stages of fetal development. This accumulation of DHA is important for the neural and retinal development in the fetus. Omega-3 and other long-chain polyunsaturated fatty acids are contained in inflammatory cells, which alter immune function and inflammation.<sup>8</sup> Adequate omega-3 consumption during pregnancy, specifically DHA supplementation, also lowers the combined severity of cold symptoms in infants.<sup>8</sup> Lastly, adequate omega-3 fatty acid consumption during pregnancy also benefits the mother. There are several proposed mechanisms underlying these outcomes including changes to cell membranes, eicosanoid production, and gene expression.<sup>9</sup>

## What is the omega-3 fatty acid content of commonly consumed fish and plant oils?<sup>10</sup>

Table 1: Omega-3 fatty acid content of commonly consumed seafood.

Fish (raw)	ALA (mg/3oz)	EPA (mg/3oz)	DHA (mg/3oz)
Catfish	46	14	48
Clams	13	37	54
Cod	0	19	38
Crab	7	24	0
Flounder or Sole	15	93	117
Grouper	8	23	187
Haddock	2	39	31
Halibut	9	56	109
Herring	88	603	733
Lobster	37	87	58
Mahi Mahi	4	17	75
Orange Roughy	3	13	3
Oyster	139	230	300
Pollock	0	17	36
Red Snapper	3	43	221
Salmon	126	733	938
Shrimp	2	26	26
Tilapia	38	6	100
Tuna, canned	1	8	56

Table 2: Omega-3 fatty acid content of commonly consumed plant oils.

Plant Oils	ALA (mg/1tbsp)	EPA (mg/1tbsp)	DHA (mg/1tbsp)
Olive Oil	46	14	48
Soybean Oil	923	0	0
Canola Oil	1,279	0	0
Corn Oil	158	0	0
Walnut Oil	38	6	100
Flaxseed Oil	6,703	0	0
Coconut Oil	3	0	0

Table 3: Omega-3 fatty acid content of commonly consumed nuts and seeds.

Nuts/Seeds	ALA (mg/1Cup)	EPA (mg/1Cup)	DHA (mg/1Cup)
Brazilnuts	24	0	0
Pine Nuts	151	0	0
Pistachio	261	0	0
Walnuts, black	3,346	0	0
Almonds	4	0	0
Peanuts	37	0	0
Pumpkin and Squash Seeds	155	0	0
Sunflower Seeds	103	0	0
Flaxseed	38,326	0	0

## What are the current recommendations for fish consumption?

As previously mentioned, the American Heart Association recommends eating a variety of fish (particularly fatty fish) at least two times a week for people without coronary heart disease (a serving is 3 ounces of cooked fish). For people with coronary heart disease, the recommendation is 1 gram of omega-3 fatty acids per day (preferably from fatty fish).<sup>11</sup> However, some species of fish are high in mercury, a metal that can negatively impact brain development in young children and developing fetuses (see tables 4 and 5).



## What is the mercury content of fish and shellfish commonly eaten in the United States?<sup>12,13</sup>

Because of the mercury danger, the United States Food and Drug Administration and the United States Environmental Protection Agency recommend not eating swordfish, tilefish, king mackerel, or shark for women who are pregnant, breastfeeding, or of childbearing age and for children and teens less than 17 years old.

These groups may eat up to 12 ounces per week of a variety of fish low in mercury, but they should limit the amount of albacore tuna and tuna steaks or fillets to no more than 6 ounces per week.<sup>14</sup> Overall, the health benefits of eating fish outweigh the potential risks, especially when the above safety recommendations are followed.<sup>15</sup> Mercury content of commonly consumed seafood can be found in table 4.

## What fish have high levels of mercury?<sup>4,13</sup>

There are four species of fish with high levels of mercury: king mackerel, swordfish, shark, and tilefish. As mentioned above, it is recommended that vulnerable populations do not consume these species of fish. More information regarding mercury and omega-3 fatty acid content of these can be found in table 5.

Table 4: Mercury content of commonly consumed seafood.

Fish	Mercury (mean ppm)
Catfish*	0.025
Clams*	0.009
Cod*	0.111
Crabs*	0.065
Flounder or sole* †	0.05
Grouper	0.448
Halibut †	0.241
Herring* †	0.084
Lobster	0.107
Mahi mahi	0.19
Orange roughy	0.571
Oysters* †	0.012
Pollock* †	0.031
Red snapper	0.166
Salmon (fresh frozen)* †	0.022
Scallops*	0.003
Shrimp*	0.009
Tilapia	0.013
Tuna (canned light)* †	0.128
Tuna (fresh frozen) †	0.144

Note: Be sure to check local advisories regarding the safety of the fish you catch<sup>14</sup>.

Advisories for California water bodies can be found at <http://oehha.ca.gov/fish/advisories>.

\* Indicates fish and shellfish with lower levels of mercury<sup>13</sup>

† Indicates fish and shellfish highest in omega-3 fatty acids.

Table 5: Mercury and omega-3 fatty acid content of high-mercury species of fish.

Fish	Mercury (ppm)	ALA (mg/3oz)	EPA (mg/3oz)	DHA (mg/3oz)
King mackerel	0.730	0	116	150
Swordfish	0.995	24	91	550
Shark	0.979	24	269	448
Tilefish	1.45	0	72	293

## Acknowledgements:

Karrie Heneman, PhD contributed to this Fact Sheet.

## References:

1. Jenkins DJ, Josse AR. Fish oil and omega-3 fatty acids. *CMAJ*. 2008 Jan 15;178(2):150. doi: 10.1503/cmaj.071754.
2. Vannice G, Rasmussen H. Position of the Academy of Nutrition and Dietetics: dietary fatty acids for healthy adults. *J Acad Nutr Diet*. 2014 Jan;114(1):136-53. doi: 10.1016/j.jand.2013.11.001.
3. U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015 – 2020 *Dietary Guidelines for Americans*. 8<sup>th</sup> Edition. December 2015. Available at <http://health.gov/dietaryguidelines/2015/guidelines/>.
4. Minihane AM, et al. Low-grade inflammation, diet composition and health: current research evidence and its translation. *Br J Nutr*. 2015 Oct 14;114(7):999-1012. doi: 10.1017/S0007114515002093.
5. Yates CM, et al. Pharmacology and therapeutics of omega-3 polyunsaturated fatty acids in chronic inflammatory disease. *Pharmacol Ther*. 2014 Mar;141(3):272-82. doi: 10.1016/j.pharmthera.2013.10.010.
6. Omega-3 Fatty Acids, Fish Oil, Alpha-linolenic Acids. Mayo Clinic. <http://www.mayoclinic.org/drugs-supplements/omega-3-fatty-acids-fish-oil-alpha-linolenic-acid/background/hrb-20059372>. Updated Nov 1, 2013. Accessed Oct 20, 2016.
7. McNamara RK, Carlson SE. Role of omega-3 fatty acids in brain development and function: potential implications for the pathogenesis and prevention of psychopathology. *Prostaglandins Leukot Essent Fatty Acids*. 2006 Oct-Nov;75(4-5):329-49.
8. Imhoff-Kunsch B, et al. Prenatal docosahexaenoic acid supplementation and infant morbidity: randomized controlled trial. *Pediatrics*. 2011 Sep;128(3):e505-12. doi: 10.1542/peds.2010-1386.
9. Riediger ND et al. A systemic review of the roles of n-3 fatty acids in health and disease. *J Am Diet Assoc*. 2009 Apr;109(4):668-79. doi: 10.1016/j.jada.2008.12.022.
10. U.S. Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory. USDA National Nutrient Database for Standard Reference, Release 28. Version Current: Sep 2015. <http://www.ars.usda.gov/nea/bhnrc/ndl> Accessed Sept. 30, 2016.
11. Kris-Etherton PM, et al. Fish consumption, fish oil, omega-3 fatty acids, and cardiovascular disease. *Circulation*. 2002 Nov 19;106(21):2747-57.
12. Fish, levels of mercury and omega-3 fatty acids. American Heart Association. [http://www.heart.org/HEARTORG/HealthyLiving/HealthyEating/HealthyDietGoals/Fish-and-Omega-3-Fatty-Acids\\_UCM\\_303248\\_Article.jsp](http://www.heart.org/HEARTORG/HealthyLiving/HealthyEating/HealthyDietGoals/Fish-and-Omega-3-Fatty-Acids_UCM_303248_Article.jsp). Updated Oct 6, 2016. Accessed Oct 20, 2016.
13. Mercury Levels in Commercial Fish and Shellfish (1990-2010). U.S. Food and Drug Administration. <http://www.fda.gov/Food/FoodbornellnessContaminants/Metals/ucm115644.htm>. Updated Oct 8, 2014. Accessed Oct 20, 2016.
14. What You Need to Know About Mercury in Fish and Shellfish. U.S. Food and Drug Administration. <http://www.fda.gov/Food/FoodbornellnessContaminants/Metals/ucm351781.htm>. Published Mar 2004. Updated Jun 10, 2014. Accessed Oct 20, 2016.
15. Mozaffarian D, Rimm EB. Fish intake, contaminants, and human health: evaluating the risks and the benefits. *JAMA*. 2006 Oct 18;296(15):1885-99.

The University of California prohibits discrimination or harassment of any person on the basis of race, color, national origin, religion, sex, gender identity, pregnancy (including childbirth, and medical conditions related to pregnancy or childbirth), physical or mental disability, medical condition (cancer-related or genetic characteristics), ancestry, marital status, age, sexual orientation, citizenship, or service in the uniformed services (as defined by the Uniformed Services Employment and Reemployment Rights Act of 1994: service in the uniformed services includes membership, application for membership, performance of service, application for service, or obligation for service in the uniformed services) in any of its programs or activities.

University policy also prohibits reprisal or retaliation against any person in any of its programs or activities for making a complaint of discrimination or sexual harassment or for using or participating in the investigation or resolution process of any such complaint.

University policy is intended to be consistent with the provisions of applicable State and Federal laws.

Inquiries regarding the University's nondiscrimination policies may be directed to the Affirmative Action/Equal Opportunity Director, University of California, Agriculture and Natural Resources, 1111 Franklin Street, 6th Floor, Oakland, CA 94607, (510) 987-0096.

Copyright © The Regents of the University of California, Davis campus, 2016. All rights reserved. Inquiries regarding this publication may be directed to [cns@ucdavis.edu](mailto:cns@ucdavis.edu). The information provided in this publication is intended for general consumer understanding, and is not intended to be used for medical diagnosis or treatment, or to substitute for professional medical advice.