What is the Best Dose/Ratio of Omega-3 for Adults and Children?

By Dennis D. Embry, Ph.D., president/senior scientist, PAXIS Institute

Often I get questions and emails about this, after my talks about the prevention of mental, emotional, behavioral, and related physical disorders across North America.

The general rule comes from lots epidemiological research about human evolution and the rates of morbidity (sickness) and mortality (death) among modern, wealthy democracies.

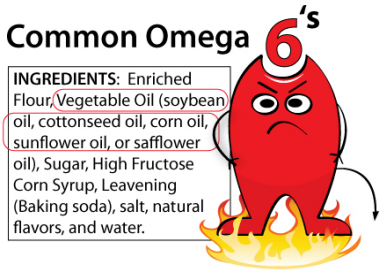
First, evolutionary scientists have pretty well proven that our big brains, which are roughly 50% to 60% fat by weight, are mostly intended to be omega-3. Reconstructive studies analyzing African game and food sources of our ancient ancestors show that this could not have come from killing and eating land animals (*1-4*). The Rift Valley in Africa where modern humans appear to have evolved is rich in easily gathered foods very high in omega-3, which do not require dangerous hunting (*1*). Men, women, and children could easily gather foods high in omega-3 in this area of our species natal Eden.

Second, societies with the longest lifespans and lowest rates of many causes of early death or disability tend to have dietary ratios of 2-to-1 or 4-to-1 of omega-6 to omega-3 in their diets. You can read and excellent paper (free) at the National Library of Medicine (www.pubmed.gov) by colleague and friend Dr. Joseph Hibbeln at the National Institutes of Health (*5*). Based on current data, Americans as group have one of the worst dietary ratios of omega-6 to omega-3, around 20-to-1 to 30-to-1. This varies by region, with areas of the South and mid-Western states with worst ratios, with military service members having an exception adverse ratio in general that is now linked to the rise in suicides by Pentagon funded research (*6*).

The best diets for longevity tend to be the traditional Mediterranean diets (*7-12*) or diets high in fish consumption (*5, 13*). Eating two or more servings of oily fish during pregnancy improves the health and development of children through at least age 8 (*14*), which has caused the EPA to begin the process of amending its recommendations about eating fish during pregnancy.

Balancing Your Omega-6 and Omega-3 Ratios

The first step to improving your overall health (and helping create a sustainable fishing culture), is to reduce your dietary consumption of omega-6. This is harder in North America, because of all the invisible sources of omega-6 in our diets. You might wonder what does the “six” stand for? It is notation for six-carbon atoms. Here is a good way to remember to reduce your omega-6 intake with this visual image I created. Example omega-6s are circled.



These seed oils (often incorrectly labeled "vegetable oils" to make them sound better are everywhere in packaged, manufactured foods, bakery goods, and fast-foods. They are also invisible in many store-bought and restaurant foods you'd never guess. The best oil to cook with is olive oil. It is a monounsaturated oil, called omega 9.

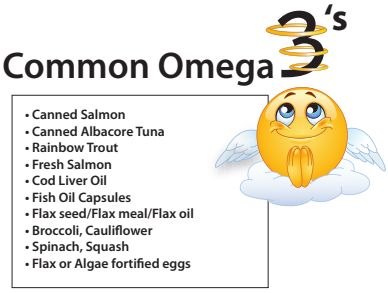
For example, most whole chickens in the grocery store have more than 13,000 mg. Turkey likewise tends to have high levels of omega-6 as does pork, lunch meats, breaded fried fish, store-bought and most dressings including mayonnaise, etc. Most branded candy bars, cookies, etc. have lots of omega-6. Margarine is, of course, made from omega-6. You can learn more about what foods have high levels of omega-6 by visiting, http://bit.ly/omeg6foods. Personally, we tend to buy breads made with no oil, and are now being able to buy chicken that is NOT fed any seed—but raised like chickens lived. They taste better. Organic doesn't mean a thing when it comes to poultry, pork or beef in terms of lower omega-6 and higher omega-3 in the meat. Organic corn or soybeans fed to those creatures has just as much omega-6. True free-range or grass fed meats do have much more omega-3 and lower omega-6s, as below.

TABLE 3.1 Omega-3 Content (Percentage) in Meats: Grass- v. Grain-Fed Animals

Animal Food	Omega-3 Fat as Percent of Total Fat	
	Feedlot	Free Range/ Pastured/Wild
Beef	0.60	2.90
Bison	1.50	5.40
Chicken eggs	.03	9.00
Elk	—	5.00
Pork	0.02	5.90
Salmon	17.00	20.00

SOURCE: For details, see References under Koizumi, Rule, Simopoulos ("Evolutionary Aspects . . ."), and USDA.

So what about increasing omega-3 by what one eats? That is possible, as that is the way our ancestors got their omega-3s.



The above is just a snapshot of foods relatively high in omega-3. And what does the 3 on omega-3 mean? It means three carbon atoms. In general for Americans, less omega-6 and more omega-3 is best for physical health, wellbeing, and mental health based on research by the National Institutes of Health (*5*)

If you want to know about foods higher in omega-3, please check out: http://bit.ly/omega3food.

What about supplements? See the next page

Omega-3 Supplements

First, please note that neither PAXIS Institute nor I receive ANY funding from companies selling supplements of any kid. In general, the more a supplement is touted on TV, the higher the probability it is over-priced and lack of independent research.

Second, for more than 100 years, grandmothers in many countries had their grandchildren take cod-liver oil. That ended in the mid-1950's with the advent of water-based chewable vitamins. Cod-liver oil is high in both omega-3 and vitamin-D; those cartoon-character TV show vitamins had little of either, since both vitamin D and omega-3 are lipid (fat) based.

Third, this change corresponded with the huge rise in consumption of omega-6s, as farmers and others were trying to figure out what to do with the massive amounts of seed used to create nitrates for ammunition in World War II. Most omega-6 oils (soybean, canola, cottonseed, "vegetable", etc.) are made by using solvents, such as Hexane (a colorless flammable liquid derived from the fractional distillation of petroleum). Olive oils (omega-9) are not, rather just pressed. Thus, the ratios of omega-6 shot up while the omega-3s shot down as a ratio.

Thus, many people find it necessary and/or convenient today to use supplements. I do, myself, take two-high quality gel caps per day that are very close to two (2) full grams of omega-3 per day, higher in EPA over DHA. The front of the bottle says, 1400 mg (and 980 mg actual omega 3). It's about $15 on sale at Costco, for 130 capsules—for two months for me. There is an FDA approved version of omega-3, which doctors can prescribe.

What should be the dose of omega-3? Well, there is no official report on that. Most of the scientists I talk to who are in the field suggest about 2 grams for Americans, because of our high-background of omega-6 in our diet. Why? Well, the body preferentially processes omega-6 or omega-3s, based on the ratios of intake (*15*). The table on the next page summarizes common labels for different qualities of omega-3 supplements.

For children, this might mean about a gram per day of active ingredient of omega-3 if they eat like most American children—including school lunches. Most school lunches have historically been exceptionally high in omega-6. For example, I analyzed the school breakfast and lunch menus for a major US city afflicted with a history of youth violence. Without being able to render the meals like my lab scientist colleagues do at the National Institutes of Health, we used the recipes to guestimate that an average day had 22 grams of omega-6 for breakfast and lunch. To "balance" that back, a child would have to consume 7-grams of omega-3—which represents 21 cod-liver gel caps. The adverse effects of too much omega-6 and too little omega-3 on children's cognitive development is becoming more and more clear, especially with experimental studies that change the ratios (*14, 16, 17*). There are fortunately products that are child friendly, which have good quality ingredients such as:

- Omega Swirl by Barlean's oils (720 mg per serving);
- Coromega Omega-3 Squeeze Packets (different flavors, 650 total EPA and DHA)
- Nordic Oil's Omega-3 Fishies (250 mg of EPA and DHA)

The "gummies" with flaxseed or similar oils tend to lack enough true long-chain omega-3s to have much benefit.

Note: for folks worried about a study that was touted as showing omega-3 increased prostrate cancer, please take a breath. That study has been ripped to shreds for very good reasons. Here is the Medscape review: http://www.medscape.com/viewarticle/808402

Example of Low Quality Supplement

Supplement Facts	**30 Mg Total Omega-3**
Serving Size: 2 gummies	
Servings per Container: 90	
Total Omega-3 Fatty Acids	
EPA (Eicosapentaeonic Acid)	25 mg
DHA (Docosapentaeonic Acid)	5 mg

Example of Average Quality Supplement

Supplement Facts	**300 Mg Total Omega-3**
Serving Size: 1 Softgel	
Servings per Container: 90	
Total Omega-3 Fatty Acids	
EPA (Eicosapentaeonic Acid)	180 mg
DHA (Docosapentaeonic Acid)	120 mg

Example of Good Quality Supplement

Supplement Facts	**600 Mg Total Omega-3**
Serving Size: 1 Softgel	
Servings per Container: 90	
Total Omega-3 Fatty Acids	
EPA (Eicosapentaeonic Acid)	400 mg
DHA (Docosapentaeonic Acid)	200 mg

Example of Higher Quality Supplement

Supplement Facts	**980 Mg Total Omega-3**
Serving Size: 1 Softgel	
Servings per Container: 90	
Total Omega-3 Fatty Acids	
EPA (Eicosapentaeonic Acid)	700 mg
DHA (Docosapentaeonic Acid)	280 mg

Warning: Do Not Waste Your Money on Formulations that Promote Omega 3, 6 and 9 in one bottle. Most Americans need to reduce omega 6 (which you get in just about every thing we eat), and omega-9 is found in olive oil—so just use that instead.

P.O. Box 31205, Tucson, AZ 85751 (p) 520.299.6770 (f) 520.299-6822 www.paxis.org

References Cited

1. C. L. Broadhurst, Y. Wang, M. A. Crawford, S. C. Cunnane, J. E. Parkington, W. F. Schmidt, Brain-specific lipids from marine, lacustrine, or terrestrial food resources: potential impact on early African Homo sapiens. *Comparative Biochemistry & Physiology* **Part B, Biochemistry & Molecular Biology. 131**, 653-673 (2002); published online EpubApr (
2. S. L. Spector, M. E. Surette, Diet and asthma: has the role of dietary lipids been overlooked in the management of asthma? *Annals of Allergy, Asthma, & Immunology* **90**, 371-377; quiz 377-378 (2003); published online Epub2003 Apr (
3. M. A. Crawford, M. Bloom, S. Cunnane, H. Holmsen, K. Ghebremeskel, J. Parkington, W. Schmidt, A. J. Sinclair, C. L. Broadhurst, Docosahexaenoic acid and cerebral evolution. *World Review of Nutrition & Dietetics* **88**, 6-17 (2001).
4. M. A. Crawford, M. Bloom, C. L. Broadhurst, W. F. Schmidt, S. C. Cunnane, C. Galli, K. Gehbremeskel, F. Linseisen, J. Lloyd-Smith, J. Parkington, Evidence for the unique function of docosahexaenoic acid during the evolution of the modern hominid brain. *Lipids* **34 Suppl**, S39-47 (1999).
5. J. R. Hibbeln, L. R. Nieminen, T. L. Blasbalg, J. A. Riggs, W. E. Lands, Healthy intakes of n-3 and n-6 fatty acids: estimations considering worldwide diversity. *American Journal of Clinical Nutrition* **83**, 1483S-1493S (2006); published online EpubJun (
6. M. D. Lewis, J. R. Hibbeln, J. E. Johnson, Y. H. Lin, D. Y. Hyun, J. D. Loewke, Suicide deaths of active-duty US military and omega-3 fatty-acid status: a case-control comparison. *J Clin Psychiatry* **72**, 1585-1590 (2011); published online EpubDec (10.4088/JCP.11m06879).
7. A. Trichopoulou, T. Costacou, C. Bamia, D. Trichopoulos, Adherence to a Mediterranean Diet and Survival in a Greek Population. *The New England Journal of Medicine* **348**, 2599-2608 (2003).
8. A. P. Simopoulos, The importance of the ratio of omega-6/omega-3 essential fatty acids. *Biomedicine & Pharmacotherapy* **56**, 365-379 (2002); published online EpubOct (
9. A. P. Simopoulos, The traditional diet of Greece and cancer. *European Journal of Cancer Prevention* **13**, 219-230 (2004); published online EpubJun (
10. A. P. Simopoulos, Evolutionary aspects of diet, the omega-6/omega-3 ratio and genetic variation: nutritional implications for chronic diseases. *Biomedicine & Pharmacotherapy* **60**, 502-507 (2006); published online EpubNov (
11. A. P. Simopoulos, The importance of the omega-6/omega-3 fatty acid ratio in cardiovascular disease and other chronic diseases. *Experimental Biology & Medicine* **233**, 674-688 (2008); published online EpubJun (
12. A. P. Simopoulos, The omega-6/omega-3 fatty acid ratio, genetic variation, and cardiovascular disease. *Asia Pacific Journal of Clinical Nutrition* **17 Suppl 1**, 131-134 (2008).
13. C. M. Albert, H. Campos, M. J. Stampfer, P. M. Ridker, J. E. Manson, W. C. Willett, J. Ma, Blood Levels of Long-Chain n-3 Fatty Acids and the Risk of Sudden Death. *The New England Journal of Medicine* **346**, 1113-1118 (2002).
14. J. Hibbeln, J. M. Davis, C. Steer, P. Emmett, I. Rogers, C. Williams, J. Golding, Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood (ALSPAC study): an observational cohort study. *The Lancet* **369**, 578-585 (2007); published online EpubFebruary 17, 2007 (DOI:10.1016/S0140-6736(07)60277-3).
15. M. Haag, Essential Fatty Acids and the Brain. *Canadian Journal of Psychiatry* **48**, 195-203 (2003).
16. A. J. Richardson, Omega-3 fatty acids in ADHD and related neurodevelopmental disorders. *International Review of Psychiatry* **18**, 155-172 (2006); published online EpubApr (
17. A. J. Richardson, P. Montgomery, The Oxford-Durham Study: A Randomized, Controlled Trial of Dietary Supplementation With Fatty Acids in Children With Developmental Coordination Disorder. *Pediatrics* **115**, 1360-1366 (2005); published online EpubMay 1, 2005 (10.1542/peds.2004-2164).