OmegAvail™ Ultra DHA

Highly concentrated DHA from fish oil in its natural triglyceride form

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OmegAvail™ Ultra DHA contains highly concentrated DHA from fish oil in its natural TG (triglyceride) form. As with all DFH TruTG™ fish oil products, OmegAvail™ Ultra DHA is comprised of a minimum 90% natural TG-bound omega-3 oils. Each softgel provides 500 mg DHA + 110 mg EPA for optimal DHA status.

DHA (docosahexaenoic acid) is an omega-3 fatty acid which plays an important role in human physiology and is thought to have had a large impact on human evolution. DHA is not technically an essential fatty acid since the human body can synthesize very small, although insignificant, amounts of it from its short chain omega-3 precursor ALA (alpha linolenic acid) with approximately 0.1-1% efficiency.[26,35] However, there is ample evidence which shows that in order to support optimal health and alleviate various pathological conditions, additional DHA along with EPA (eicosapentaenoic acid) should be obtained from diet and/or nutritional supplements.[15,30,52,54]

Evolutionary and Paleolithic Diet Evidence

Anthropological researchers found evidence that high DHA intakes by hominids supported the growth of larger brains and superior vision acuity throughout their 2.5 million year evolution towards modern man. Table 1 lists the average content of EPA and DHA from three typical Paleolithic diets. Researchers believe that the diet types 2 and 3, which contained 50%-100% foods derived from aquatic environments, were more likely to promote better survival of the species due to heightened mental, visual and psychomotor function.[36] **These diets contained an average of 2.9-7.3 g of DHA/day and a DHA/EPA ratio ranging from 2:1 to 3:1.** The Paleolithic diet derived large amounts of DHA from animal brains, fish, other aquatic animals, reptiles, grass-fed meats, and mother's milk. In modern diets DHA may be found in fish and other marine animals, certain algae, grass-fed animals, yolk from chickens fed high DHA meals, and mother's milk. Table 2 lists the typical contents of EPA and DHA for various fish types.

Modern intakes of DHA in the US average 70mg/day and are 7 to 100 times lower than typical Paleolithic diets which supported optimal brain function and survival.[36]

TABLE 1: Comparative intakes of EPA, DHA, and omega-3/omega-6 balance in Paleolithic versus modern diets[36]

Diet Types (normalized to 2200 kcal/day)	average DHA intake[36]	average EPA intake[36]	average EPA+DHA intake	average RBC % EPA	average RBC % DHA	average RBC % EPA+DHA	average risk of CVD[37,38]
Paleolithic diet type 1: 100% land-based foods[36]	**500mg**	800mg	1.3g				
Paleolithic diet type 2: 50% land/aquatic foods[36]	**2.9g**	1.1g	4g				
Paleolithic diet type 3: 100% aquatic foods[36]	**7.3g**	2.3g	9.6g				
Modern diet in US (Institute of Medicine recommends at most 160mg EPA+DHA)[39]	**70mg**	50mg	120mg			3.84%[49]	45%
Modern diet in Japan[40]			680mg				12%
Modern diet of Greenland Eskimos[37]	**5.1g**	4g	9.1g	6.4-7%	**5.2-7%**	11.7-14%[42,43]	3.5-7%

Table 2: EPA and DHA content in various fish				
Fish (100g=approx 3oz)[52]	EPA (g)	DHA (g)	EPA+DHA	DHA/EPA ratio
Blue fish	0.25	0.52	0.77	2.1
Cod, Atlantic	0.06	0.12	0.18	2.0
Cod, Pacific	0.08	0.14	0.22	1.8
Mackerel, Atlantic	0.9	1.4	2.3	1.6
Salmon, Atlantic - Wild	0.32	1.11	1.43	3.5
Salmon, Atlantic - Farmed	0.86	1.1	1.96	1.3
Salmon, Coho - Wild	0.43	0.66	1.09	2.3
Salmon, Coho - Farmed	0.36	0.82	1.18	2.3

Physiological roles of DHA

1. DHA is a structural molecule in all cell membranes. It provides the highest fluidity possible due to it having the greatest number of double bonds among all polyunsaturated fatty acids. This makes the cell membranes very receptive to surrounding signals produced by other cells, such as neurotransmitters, immune signals and hormones.[15,30,26]
- DHA is an important component of neuronal cell membranes (40% of total PUFA content), where it is complexed with phosphatidylserine, phosphatidylethanolamine and phosphatidylcholine.[25,27]
- DHA is an important component of the eye's retinal epithelial cells and photoreceptors in the macula. It is critical to vision and comprises 35% of fatty acids in the photoreceptors.[15,30]
- As a component of mitochondrial membranes, DHA supports better ATP production by enhancing the electron transport system, as demonstrated in heart cells[48] and brain cells.[38]

2. DHA is a precursor to docosanoids (regulating molecules):[15,24] Docosanoids are similar in structure to the eicosanoids derived from EPA and have anti-inflammatory, immune regulatory and protective actions in the context of various inflammatory responses. Two types of docosanoids:
- **Neuroprotectin D1** – specific to brain protection against ischemia, oxidative stress
- **Resolvins D1-D4** – produced during the resolution phase of acute inflammation and support adequate termination of inflammatory processes throughout the body

Benefits of DHA

The potential benefits from a higher intake of DHA versus EPA are also supported by studies showing that various conditions improve from supplementation with a high DHA formulation (1-4 g), where EPA supplementation could not produce similar results when compared side by side.[21] Other studies have observed a correlation between a high DHA status in the body and lower risk of various pathological conditions.[15,30] A DHA level of up to 7 g was evaluated to be safe,[20] while the highest average Paleolithic diet intake was calculated to be around 7.3 g.[36]

Pregnancy and breast feeding: [12,13,19,22,42,43]
- DHA promotes optimal brain formation and function, vision and psychomotor development. Infant formula recommendations are 0.3% DHA, with at least 0.3% AA (arachidonic acid) or slightly higher.
- DHA helps to reduce risk of premature delivery.
- DHA helps to reduce postpartum depression related to DHA depletion.

Early development of brain/eyes: DHA supplementation is especially needed for those who did not receive adequate DHA during infancy and breastfeeding. DHA helps support the significant brain growth occurring prior to 5 years of age, as well as optimal brain function, learning, attention, mood, and control of hyperactivity.[13]

Autism: DHA may alleviate specific autistic behaviors in regards to social interactions when supplemented along with AA. Doses used in studies (such as 240 mg of AA and 240 mg of DHA for 16 weeks) did not change plasma DHA and may have been too low to show the true potential of DHA supplementation for autism.[9]

Adult brain function improvement: DHA helps improve brain ATP production and mental task performance.[23, 28]

Dementia: DHA status is associated with a lower risk of dementia.

Cancer treatment support: DHA enhances apoptosis of cancer cells when given with chemotherapy, as shown in vitro and in vivo studies.[32-35]

Inflammation: DHA inhibits expression of COX-2 while EPA acts as a substrate for COX-2 competing with AA. DHA inhibits PGE2 production much more so than EPA. DHA-derived docosanoids support termination of acute inflammatory responses and mediate some of the aspirin anti-inflammatory actions.[15,21]

Cardiovascular benefits: DHA reduces triglycerides and platelet aggregation similarly to EPA. Unlike EPA, it may increase HDL levels and the particle size of HDLs and LDLs, reduce resting heart rate and risk of arrhythmias, and may cause small reductions in blood pressure. DHA may cause small elevations in total LDL levels, but does not increase total LDL particle number or ApoB levels. Thus the overall effect of DHA supplementation is considered to lower CVD risk.[2,3,5,16,17] EPA supplemented alone has not been found to elevate total LDL.[4,28,29,31]

Depression: Unlike DHA, supplementation with EPA improved depression scores in many studies. However, DHA is crucial to optimal brain function, so a combination of EPA+DHA may be warranted with a high EPA/DHA ratio, based on individual testing and assessments.[1,7]

Macular degeneration and retinitis pigmentosa: DHA is a critical structural component of the macula and retinal epithelium.[24]

Recommended Dosages
Current official recommendations for EPA and DHA may be insufficient for supporting optimal infant brain development and vision function, and minimizing cardiovascular risks.

The optimal recommendations for EPA+DHA intake, their ratio, and absolute values have not been clearly established and are still a subject of great debate. DHA and EPA body stores established during gestation, infant feeding and throughout lifetime, along with biochemical individualities, are all factors to consider when attempting to optimize an individual's EPA and DHA status.

In the face of the available scientific evidence, the clinician has to decide what would be the appropriate intake of EPA and DHA for each patient depending on their age, diet, EPA and DHA body stores (from blood tests), health status and genetics. A combination of supplements from fish oil and a high DHA formula may be a prudent approach. For example, if one were to supplement with approximately 3 g of fish oil for decreasing triglycerides and improving other CVD factors (as listed above), they could combine 1 g of regular fish oil such as 2 softgels of OmegaAvail™ Ultra (providing 600 mg EPA + 400 mg DHA) with 2 more grams of DHA from 4 softgels of OmegaAvail™ Ultra DHA (providing 2000 mg DHA+400 mg EPA), thus achieving a total intake of 1000 mg EPA+2400 mg DHA, with a ratio of DHA/EPA=2.4.

IOM (Institute of Medicine) has not issued a recommendation for EPA and DHA adequate intake (AI), but only for ALA to be 1.1/1.6 g (female/males). ALA is the only omega-3 fatty acid recognized as truly essential. IOM recommends as an equivalent alternative that 10% of the ALA requirement may be satisfied with 110 mg/160 mg EPA+DHA (female/male).[41,44] This is as if ALA and EPA+DHA would be physiologically equivalent. The American Dietetic Association recommends 500 mg EPA+DHA/day, while the American Heart Association recommends 1000 g of EPA+DHA only for those with pre-existing heart disease. Oddly enough they do not recommend this amount for primary prevention. The FDA has approved a prescription fish oil at doses of 2-4 g (EPA+DHA) for lowering triglycerides but only for patients with triglycerides >500mg/dl, which is an unreasonably high threshold. The relative contribution from EPA or DHA is not specified by any of these organizations, probably because they consider them physiologically equivalent. However if one were to supplement with EPA by itself, no significant amount of DHA would be derived from it. Supplementation with DHA alone would result in 10% conversion to EPA.[45]

DHA supplementation can be optimized by testing blood levels of DHA, an indicator of DHA whole body status.
Total lipid extracts or phospholipids from plasma or erythrocytes are considered scientifically valid biomarkers of body stores of DHA, EPA, AA and other omega fatty acids status.[18] Both plasma and erythrocyte DHA levels have been correlated with the DHA content of brain, cardiac, and other tissues.[18] Higher levels of red blood cell DHA are associated with higher test scores using the Hopkins Verbal Learning Test regarding memory and learning skills in school children 7-9 years of age.[55]

During pregnancy and lactation, DHA is sometimes transferred at the cost of lowering maternal stores. One study showed that an equilibrium can be reached between mother and fetus/infant if the mother's RBC concentration of DHA is maintained around 6%[6] or 8%[11] as proposed by two different researchers. Kuipers RS concludes from his research that the 8% RBC DHA concentration may also be optimal for adults in general.[11]

A 1999 workshop organized by the NIH, lead by Simopoulos AP,[46] an avid researcher in the field of omega-3 fatty acids, proposed a recommendation of 300 mg DHA/day for pregnant and breastfeeding women. In light of the research discussed above, this level of intake would clearly not be sufficient. The NIH workshop also proposed that 660 mg of EPA+DHA would be adequate for adults.[47] This is unlikely optimal in the light of research published by Harris WS. He has substantiated, with many epidemiological studies, the validity of a marker called OM-3 IX (omega-3 Index), which represents RBC %EPA+%DHA. Harris found that as OM-3 IX increased towards 8%, the cardiovascular risks were lowered and reached a plateau. However, his studies have not researched the contribution of EPA versus DHA, and did not propose an ideal EPA/DHA ratio. In addition, it is not clear if the 8% threshold for OM-31 IX is optimal for other physiological functions such as brain, eyes, immunity, and inflammation. For example, modern Eskimos were found to have 11.7%-14% EPA+DHA.[42,43] They also have a significantly lower cardiovascular risk (3.5-7%) than Japanese (12%) or Americans (45%).[37,38]

Individuals that display a much higher plasma EPA than DHA may greatly benefit from high DHA supplementation. Genetic polymorphisms may be responsible for an imbalanced incorporation of EPA and DHA in cell membranes or excessive retroconversion of DHA to EPA (keep in mind EPA to DHA conversion is typically insignificant). Low DHA may also be due to diets low in fish but high in vegetarian short chain omega-3 oils which may covert at the rate of 8-20% to EPA in the body, but yield an insignificant amount of DHA (0.1-1%).[37,38] DHA intake and DHA status (body stores) should be looked at in the context of all other relevant fatty acids such as EPA, ALA and the omega-6 fatty acids linoleic acid and arachidonic acid.[10]

Consider combining OmegAvail™ Ultra DHA with Phosphatidylserine, GPC, or Brain Vitale™.

Supplement Facts

Serving Size 1 softgel

Amount Per Serving		% Daily Value
Calories	10	
Calories from Fat	10	
Cholesterol	20 mg	2%*
Omega-3 Fatty Acids		
EPA (Eicosapentaenoic Acid)	110 mg	†
DHA (Docosahexaenoic Acid)	500 mg	†

*Percent Daily Values are based on a 2,000 calorie diet.
†Daily Value not established.

Other Ingredients: Natural lemon flavor, lipase, mixed tocopherols; bovine gelatin, glycerine, water, annatto (natural color) (softgel ingredients).

Contains fish (anchovies and sardines).

For a list of references cited in this document, click the related research link on the product landing page at http://mkt.s.designsforhealth.com/techsheets/OmegAvail_UltraDHA_ref.pdf