

Few people know that the human brain is comprised of over 60% fat or that its most abundant fat (25%) is called docosahexaenoic acid (DHA). DHA is an omega-3 long chain polyunsaturated fatty acid (not to be confused with the hormone DHEA). It is the primary structural fat in both the gray matter of the brain and the retina of the eye. DHA is essential for brain and eye development and function.

There are very few sources of DHA in the diet. It can be made from the omega-3 oil alpha-linolenic acid (ALA) found in large quantities in flax oil, in moderate amounts in canola oil and walnuts or in small amounts in green leafy vegetables. Only about 3-5% of the alpha-linolenic acid consumed becomes either DHA or EPA in healthy individuals. Neither DHA or EPA can be converted into the other in the body. This process of converting ALA to either DHA or EPA is hindered in various disease states and requires that some people receive DHA from their diet or supplementally. Healthy individuals who consume little DHA or EPA in their diet are creating what they need from ALA if their intake of ALA is adequate.

The average American's diet, however, is now low in DHA resulting from a declining consumption of dietary sources of DHA such as fatty fish and animal organ meats. Vegetarians have lower blood levels of DHA and EPA due to its absence in foods of plant origin. Plant-based DHA supplements are available, and vegans should consider them if additional DHA is needed. Fish obtain both their DHA and EPA ultimately from the consumption of algae, which is also now more widely available to the public as the only 'plant'-based source of DHA and EPA.

Fish oils contain both DHA and EPA in varying ratios, usually with about twice as much EPA as DHA. Some conditions should be treated predominantly with DHA and others mostly with EPA. Since DHA and EPA seem to compete with each other, taking a blend of the two has proven not to produce the expected benefits in some conditions. In other words, DHA should be taken separately from EPA in some conditions and a high EPA /DHA ratio product should be used in other conditions.

A study on elderly Japanese patients demonstrated that blood levels of the omega-3 fatty acids EPA and DHA increase after prolonged consumption of ALA from a plant-based oil. The change is slow and requires about 10 months of supplementation. However, the result of the study suggests that supplementation with ALA from flax oil may to some degree have the same beneficial role as supplementation with fish oil. This news may be particularly interesting to people following a vegetarian diet or for those who do not eat fish products. [*Journal of Nutrition Science Vitaminiol, December 1999*]

Supplemental sources with high DHA/EPA ratios are now available that have been derived from algae. Sources with a high EPA/DHA ratio are derived from fish oils. Eggs are now available which contain EPA and DHA when the chickens have been fed special diets containing these fatty acids or flax seed. DHA doses are in the range of 500 to 2,500mg per day, depending on the condition being treated.

Elevated Insulin Levels DHA at 1.8gm per day improved insulin sensitivity while having no effect on insulin secretion, in a pilot study of 12 overweight adults 45-70 years old. [*Experimental Biology, April 20-24, 2002, New Orleans, Louisiana, USA; abstract*]

#### **DHA (docosahexaenoic acid) can help with the following:**

##### **MENTAL**

##### ***Tendency Toward Postpartum Depression***

US scientists found low levels of omega-3 fatty acids, especially DHA, in mother's milk and in the red blood cells of women with postpartum depression. The difference was significant compared to those without depression. The reason for this finding was related to low intake of fatty fish such as salmon and herring containing large amounts of DHA. [Hibbeln JR., Seafood consumption, the DHA content of mother's milk and prevalence rates of postpartum depression: *J Affective Disorders* 2001]

Breast milk remains the primary source of DHA for the baby and a mother's brain the primary source of DHA for the milk. Researchers found significant variations in breast-milk DHA levels around the world. The lowest concentrations were found in vegan and American mothers, and the highest in mothers who ate fish regularly. [NOAA technical memorandum, NMFS-SEFSC-367, NIH meeting on omega-3 fatty acid research, May 12, 1994]

##### **Stress**

A study performed on Japanese students during the high stress period of final exams showed that students supplemented with DHA were significantly less aggressive than students who were not supplemented with DHA. Aggression is one of many manifestations of stress along with others such as irritability, defensiveness, being critical, irrationality, overreaction and reacting emotionally.

Another small study found that the effects of DHA may be applied to people under long-lasting psychological stress to prevent stress-related diseases. [*Journal of Nutritional Science and Vitaminology* 45(5): pp.655-65. Oct 1999]

##### **Attention Deficit Hyperactivity Disorder (ADHD)**

Studies show that low DHA intake in infancy can lead or contribute to Attention Deficit Disorder (ADD) and Attention

Deficit Hyperactivity Disorder (ADHD). A preliminary double-blind placebo-controlled trial found some evidence that a supplement containing fish oil and evening primrose oil might improve ADHD symptoms [Presented at 2nd Forum of European Neuroscience Societies; July 24-28, 2000; Brighton, United Kingdom].

In a double-blind placebo-controlled trial of children already using stimulant therapy, the addition of the essential fatty acid docosahexaenoic acid (DHA) for 4 months failed to further improve symptoms. [J Pediatr. 2001;139: pp.189-196.] It remains to be confirmed whether DHA will provide any benefit in those not using stimulant therapy.

### **Risks**

Increased Risk Of **Alzheimer's/Dementia** Over 1200 patients participated in an epidemiological study which showed that people with high DHA levels were 45% less likely to develop dementia than people with low DHA levels. This suggests that proper DHA intake may reduce the risk of developing Alzheimer's.

### **URO-GENITAL**

#### ***Motherhood Issues***

Despite a growing body of evidence that docosahexaenoic acid, or DHA, is the essential structural ingredient of breast milk lacking in infant formulas, the Food and Drug Administration continues to ban its use in infant formulas in the U.S. as of 2001. A recent series of studies conducted worldwide indicate that breastfed babies have an IQ of 6-10 points higher than formula-fed babies.

Scientists and nutritional experts attribute this to DHA, an essential structural component of the brain and retina, found naturally in mother's milk. DHA has received glowing recommendations from the World Health Organization, the Food and Agricultural Organization of the United Nations and the National Institutes of Health.

Approximately 60% of the human brain is composed of fatty material; 25% of that material is DHA. Since humans cannot produce it, they must consume it. Studies show that the DHA level of women in America today is comparable to that of women in Third World countries. This is attributed to the trend against eating DHA rich foods such as fish. Fish oil is the best source of DHA and EPA.

During the last trimester of a pregnancy the mother transfers to her fetus much of the DHA needed for the development of its brain and nervous system. The DHA content in the mother's diet reflects the amount of DHA passed on to the baby. If the baby is not breastfed at all, it receives no subsequent DHA, thus hindering and impairing mental and visual acuity. DHA levels of premature infants are especially low since they miss much of that last trimester. Premature infants are also more likely to be bottlefed. If using infant formulas, make sure they contain DHA or use DHA supplementally.

In a dietary study of 119 pregnant or lactating women in the United States, the average intake of DHA was 54mg/day, only 18% of that recommended by experts. Less than 2% of these women met the FDA's recommended DHA adequate intake of 300mg per day. [Obstet Gynecol, 2000;95(4 Suppl 1): pp.S77-S78]

#### ***Pregnancy-Related Issues***

According to an article in the American Journal of Clinical Nutrition, healthy full-term infants who are breast-fed for at least four months show greater visual perception skills at early childhood than their bottle-fed counterparts. Testing revealed differences in the maturity of the brain's visual cortex, an important stage in a child's neurological development. [Am J Clin Nutr 2001;73(2): pp.316-22]

Of the 15 factors analyzed that could potentially influence that rate of visual development in infants, breastfeeding for 4 months or more independently had the greatest positive impact. The only other factor in this study that independently affected the children's stereoacuity at 3.5 years was the mother's consumption of oily fish during pregnancy.

This supports the idea that children may develop improved visual acuity and achieve a higher verbal IQ when breast-fed because they receive a fatty acid, docosahexaenoic acid (DHA) found in breast milk [Arch Dis Child Fetal Neonatal Ed 2001;84: pp.23-7]. The amount of DHA found in breast milk increases with the consumption of oily fish or when otherwise supplemented and decreases when less DHA is consumed. Indeed, testing has revealed that a child's visual acuity directly correlated with the mother's level of DHA in her red blood cells.

During the last trimester of a pregnancy the mother transfers to her fetus much of the DHA needed for the development of its brain and nervous system. As a consequence, she may lose as much as 3% of her brain mass during this time and therefore supplemental DHA may help prevent postpartum depression and ensure an adequate supply for the nursing baby.

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Vegan diets are devoid of EPA and DHA, while vegetarian diets provide small amounts in dairy products. Vegetarian and vegan women should therefore ensure their diets include sources of alpha-linolenic acid (ALA), the precursor of EPA and DHA, during pregnancy and breastfeeding. Supplemental DHA may be appropriate in some cases. It is suggested that vegans use plant oils with a low ratio of linoleic acid (Omega-6) to ALA (Omega-3), such as flax or canola, as a higher ratio may inhibit the conversion of ALA to DHA..

#### **GLOSSARY**

**DHA:** Docosahexanoic Acid. A metabolite of the omega-3 fatty acid alpha-linolenic acid.

**DHEA:** Dehydroepiandrosterone (DHEA) is a steroid produced by the adrenal glands and is the most abundant one found in humans. DHEA may be transformed into testosterone, estrogen or other steroids. It is found in the body as DHEA or in the sulfated form known as DHEA-S. One form is converted into the other as needed.

**EPA:** Environmental Protection Agency. **Also:** Eicosapentanoic Acid. A metabolite of the omega-3 fatty acid alpha-linolenic acid.