

NEW FLAX FACTS

OMEGA-3 FATS ARE ESSENTIAL FOR INFANTS

by Dr. Diane H. Morris

Infants have a high requirement for essential fats. During pregnancy, the mother's diet is the source of essential fats for the developing fetus. After birth, breast milk or infant formula supplies a variety of essential fats for newborn growth.¹

Essential Fats for Infants

Two families of fats – the omega-3 family and the omega-6 family – are vital for people of all ages, including infants. Alpha-linolenic acid (ALA) is the parent compound of the omega-3 family. ALA is essential in our diets because the human body cannot make it. The human body can convert ALA to the long-chain omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

The parent compound of the omega-6 family is linoleic acid. Like its cousin (ALA), linoleic acid is essential for infants and adults because it cannot be made in the human body. Linoleic acid can be converted to a long-chain omega-6 fatty acid that goes by the tongue-twisting name of arachidonic acid.

Although all of these omega-3 and omega-6 fats are important in human nutrition, infants have a unique need for two of them – DHA and arachidonic acid. It is not clear whether ALA has a unique role in infant nutrition, other than its recognized role in preventing an omega-3 fatty acid deficiency.² The uncertainty about ALA's unique contribution to infant health may have arisen because most clinical research over the past decade has focused on understanding the unique role of DHA in infant nutrition.

ALA in Infant Nutrition

- ALA is the essential omega-3 fatty acid, being required in our diets because our bodies cannot make it.
- Infants need ALA to grow and develop properly.
- ALA is the main omega-3 fatty acid in human breast milk.
- A unique role for ALA in infant nutrition, other than being needed to prevent an omega-3 fat deficiency, has not been determined, possibly because most research has focused on the role of DHA in infant health.

Omega-3 Fats Are Needed *in utero*

The growing fetus draws its supply of essential fatty acids from the mother through the placenta. For this reason, pregnant women must eat a diet containing ample amounts of omega-3 and omega-6 fats for her own needs and also for those of the developing fetus.³

As the fetus grows *in utero*, essential fatty acids are needed for the production of compounds called

eicosanoids, which control the immune system. The DHA and arachidonic acid derived from essential fatty acids are especially vital, as they are building materials for the structure of nervous tissue, including the brain.¹ DHA, for example, is laid down rapidly in the grey matter of the brain and in the retina of the eye during the last trimester of pregnancy and the first year of life.⁴ In these tissues, the DHA concentration can exceed 50% of total fatty acids.⁵

Infants Need Omega-3 Fats to Grow

After birth, infants obtain omega-3 and omega-6 fatty acids from breast milk or infant formula. Preterm infants, because of their earlier-than-expected births, appear to have a greater need for essential fatty acids than full-term infants.

Omega-3 Fats in the Diets of Pregnant Women

Suggested intakes of flax for pregnant and lactating women are described in the Flax Council of Canada's book, *Flax – A Health and Nutrition Primer*, which is available on the Council's website at www.flaxcouncil.ca.

Cautions regarding the eating of some species of fish during pregnancy are posted on the websites of Health Canada (www.hc-sc.gc.ca) and the U.S. Food and Drug Administration (www.fda.gov).^{27,28}

ALA Is the Main Omega-3 Fat in Breast Milk. ALA is the main omega-3 fatty acid in breast milk. ALA constituted 1.2% to 1.9% (% weight of total fatty acids) in breast milk samples taken from women in Canada (1.2%),⁶ Brazil (1.4%),⁷ and Nepal (1.9%).⁸ Breast milk contains 3-10 times more ALA than DHA, depending on the mother's diet.⁶⁻¹⁰ The breast milk of vegetarians contains less DHA than that of omnivores.²

Breast Milk is Best. Experts agree that breast milk is best for preterm and term infants. Breast milk provides calories, essential fatty acids, vitamins and other important nutrients.^{2,11,12}

Infants who are breast-fed have greater amounts of DHA in their blood, red blood cells and brain tissue than formula-fed infants. Some studies found that breast-fed infants performed better on tests of vision and cognitive development than formula-fed ones.¹³⁻¹⁵ In one study, children born to mothers who took cod liver oil (a source of DHA) during pregnancy and lactation scored higher on IQ tests at 4 years of age compared with children whose mother's diets were supplemented with corn oil.¹⁶



ALA Content of Infant Formula. In Canada, infant formula must contain not less than 500 mg of linoleic acid. A minimum amount of ALA has not been specified.¹⁷ In 2002 Health Canada allowed the use of an oil blend containing DHA and arachidonic acid in infant formula.¹⁸

In the United States, the Life Sciences Research Office (LSRO) set a range for the ALA content in infant formula of 1.75% to 4% of total fatty acids. These levels apply to infant formula for both preterm and term infants.^{2,11}

The LSRO endorsed a ratio of linoleic acid to ALA of not more than 16:1, and not less than 6:1. Upper and lower limits for the ratio were set to prevent inappropriate combinations of linoleic acid and ALA that would prevent their conversion to their respective long-chain essential fatty acids.

The source of ALA for most infant formulas is a polyunsaturated vegetable oil such as corn oil, safflower oil, or soybean oil. Canola oil is a component of some European infant formulas.² Canola and soybean oils contain modest amounts of ALA.

DHA Content of Infant Formula. The LSRO recommended a maximum concentration of DHA of 0.35% of total fatty acids in preterm infant formula. LSRO did not specify a minimum DHA content for preterm infant formula. Egg yolk, fish oils and oils produced by single-cell organisms (that is, microalgal and fungal oils) are sources of DHA and arachidonic acid in infant formulas.²

Benefits of Omega-3 Fat-Enriched Infant Formula.

Some infant formulas have been modified to contain ALA, DHA and other essential fatty acids. As a result, studies have aimed to determine whether changes in infant formula composition improve growth and developmental outcomes in formula-fed preterm and term infants.

A recent meta-analysis of clinical studies – 5 involving term infants and 3 involving preterm infants – found that infants fed an infant formula supplemented with ALA had significantly higher blood and red blood cell levels of DHA than infants fed a regular formula without ALA.¹⁹ The findings suggest that ALA-supplemented formula improves the DHA status of infants.

The findings related to DHA-supplemented formula are surprisingly mixed. Some studies have shown a benefit of supplementing formula with DHA in terms of visual acuity,^{15,20,21} while others found no evidence to support adding DHA to formulas.²²⁻²⁵

Omega-3 Fats in the Feeding of Infants

Many questions about the roles of omega-3 fats in infant nutrition remain unanswered. What is the unique role of ALA in infant nutrition? What is the

optimum mix of essential fatty acids in infant formula? For pregnant and nursing women, which diet pattern achieves the best omega-3 fat status in their growing infants? So far, research suggests that infant formula is not as good for babies as breast milk.²⁶ For pregnant women and nursing mothers, the best approach is to eat a varied diet containing ample amounts of ALA, DHA and other omega-3 fats.

References

1. Al MDM, et al. *Am J Clin Nutr.* 2000;71(suppl):285S-291S.
2. Klein CJ. *J Nutr.* 2002;132:1395S-1577S.
3. Hornstra G. *Am J Clin Nutr.* 2000;71(suppl):1262S-1269S.
4. Innis SM. *Placenta* 2005;26 (suppl A):S70-S75.
5. Institute of Medicine. *Dietary Reference Intakes, Part 1.* Washington, DC: National Academies Press, 2002, pp. 8-1 – 8-97.
6. Ratnayake WMN, Chen Z-Y. *Lipids.* 1996;31:S-279 – S-282.
7. Silva MHL, et al. *Food Chem.* 2005;93:297-303.
8. Schmeits BL, et al. *Nutr Res.* 1999;19:1339-1348.
9. Jensen CL, et al. *Am J Clin Nutr.* 2000;71(suppl):292S-299S.
10. Sala-Vila, et al. *J Nutr.* 2004;134:868-873.
11. Raiten DJ, et al. *J Nutr.* 1998;128 (suppl 11S).
12. American Dietetic Association. Position of the American Dietetic Association: Promoting and Supporting Breastfeeding. *JADA.* 2005;105:810-818.
13. Anderson JW, et al. *Am J Clin Nutr.* 1999;70:525-535.
14. Williams C, et al. *Am J Clin Nutr.* 2001;73:316-322.
15. O'Connor DL, et al. *Pediatrics.* 2001;108:359-371.
16. Helland IB, et al. *Pediatrics.* 2003;111:e39-e44.
17. Department of Justice Canada. *Food and Drug Regulations, Part 2,* section B.25.054. Available at <http://laws.justice.gc.ca>.
18. Health Canada. Letter to Martek Biosciences Corporation, October 2002. Available at www.martekbio.com/images/corporatePages/CanadaPG1.gif.
19. Udell T, et al. *Lipids.* 2005;40:1-11.
20. SanGiovanni JP, et al. *Pediatrics.* 2000;105:1292-1298.
21. Birch EE, et al. *Am J Clin Nutr.* 2002;75:570-580.
22. Fewtrell MS, et al. *Pediatrics.* 2002;110:73-82.
23. Auestad N, et al. *Pediatrics.* 2001;108:372-381.
24. Auestad N, et al. *Pediatrics.* 2003;112:e177-e183.
25. Makrides M, et al. *Pediatrics.* 2000;105:32-38.
26. Gibson RA, Makrides M. (Comment) *Pediatrics.* 2001;108:465-466.
27. Health Canada. Information on mercury levels in fish. Available at http://www.hc-sc.gc.ca/ahc-asc/media/advisories-avis/2002/2002_41_e.html. Accessed September 14, 2005.
28. U.S. Department of Health and Human Services, U.S. Environmental Protection Agency. What you need to know about mercury in fish and shell fish. Available at <http://www.cfsan.fda.gov/~dms/admeHg3b.html>. Accessed September 10, 2005.