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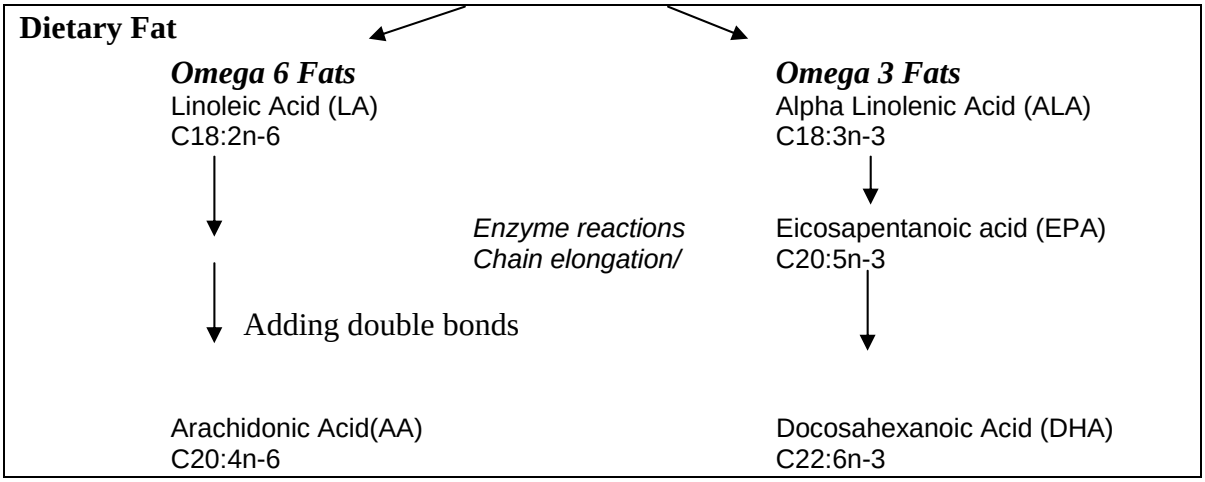
LONG CHAIN POLYUNSATURATED FATS (LCPs)

* Long chain polyunsaturated fatty acids (LCPs) are highly unsaturated fats with a chain length of 20 carbons or more and contain more than 2 double bonds in their structure. The polyunsaturated fats found in food are usually about 18 carbons in length and can be converted in the body by enzymes to LCPs.

* The most commonly known LCPs are **DHA** (docosahexanoic acid), **AA** (arachidonic acid) and **EPA** (eicosapentanoic acid). DHA and EPA are made from the ***omega 3 fatty acid,*** alpha linolenic acid (ALA), while AA is derived from the ***omega 6 fatty acid*** , linoleic acid (LA).

Figure 1. Conversion of Polyunsaturated Fatty Acids to LCPs of the Omega 3 and Omega 6 series.



*Omega 3 fatty acids are found in fish (salmon, tuna, mackerel, sardines, herring, mullet, trevally, bream, gemfish, snapper) spinach, soybeans, walnuts, linseed, egg yolk, lean red meat, breast milk and canola oil. They help protect against heart disease by reducing blood pressure, cholesterol, and thrombosis. They are also said to protect against cancer, to relieve arthritis and to reduce asthma.

*Omega 6 fatty acids are predominantly found in polyunsaturated oils and margarines (safflower, sunflower, corn, cottonseed and soybean). They are also found in organ meats (liver), breast milk, infant formula, lean meat, eggs and small amounts in fish. Like omega 3 fatty acids, omega 6 fatty acids protect against heart disease by lowering cholesterol. They also lower blood pressure and reduce the risk of stroke by decreasing platelet aggregation and clotting activities. Linoleic acid is an essential fatty acid for everyone - infants, children, adolescents and adults.

* The LCPs are essential components of cell membranes, enhancing nerve signalling, transmission and communication. They are found in high concentrations in the grey matter of the brain (cerebral cortex) and in the retina of the eye and are precursors of eicosanoids (prostaglandins, prostacylins, thromboxanes, leukotrienes), powerful chemical messengers that regulate many body processes.

* Recent research has focused on the importance of docosahexanoic acid (DHA) for the infant's developing brain. The concentration of DHA in the infant's brain tissue increases 3-5 times during the last trimester of pregnancy and continues to accumulate during the first 40 weeks of life. A good maternal diet consisting of foods containing DHA (eggs, red meat, fish) and its precursor alpha linolenic acid will ensure the developing baby gets adequate amounts of DHA. After birth, DHA must be obtained from breast milk or infant formula.

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* Breast milk contains the LCPs, DHA and AA as well as their precursors ALA and LA. The amount of DHA and AA in breast milk varies depending on the mother's diet. DHA is highest in the breast milk of those mothers eating lots of seafood and lowest in the breast milk of those mothers consuming only vegetarian foods.

* Mainstream infant formulas contain the precursors LA and ALA but no AA or DHA. Infants must use their own enzymes to convert the LA and ALA to the LCPs. As LA and ALA compete for the same enzymes to make their respective LCPs, this conversion is dependent on the ratio of LA to ALA. Therefore the amount of AA and DHA an infant can synthesise is limited by the ratio of LA:ALA of the formula. The European Society for Paediatric Gastroenterology and Nutrition (ESPGAN) and FSANZ's Standard for Infant Formula 2.9.1 recommend that the ratio of LA:ALA is no less than 5:1 and no more than 15:1 for optimum conversion.

* Although term infants can make LCPs from their precursors, the question has been raised as to whether they can produce enough for their needs and whether infant formulas should be supplemented with LCPs. Results of studies conducted to date have been far from conclusive.

1. Studies comparing the DHA content of the brain and red blood cells of breast versus formula fed infants have shown that breast fed infants have greater amounts. This has been used to explain why in some studies, children breast fed as infants have scored better in intelligence tests than those who were formula fed. However intelligence is influenced by many factors. Other factors in breast milk such as iron and nucleotides may also be important and the influence of genetics, social and environmental factors cannot be overlooked.

2. Some studies have shown, while others have not, that visual acuity (response of the eye to light and a measure of neural maturity of the visual pathway) is better in breast fed than formula fed infants.

3. Data from trials comparing infants fed mainstream formula versus those fed formula supplemented with DHA alone or with DHA and AA have yielded varying results with some showing benefits with supplementation on various measures of neural maturity (visual acuity, intelligence) while others show no effect. This could be due to differing levels of supplementation, assessment methods, fat blends, small numbers in the study, length of trial period etc. Despite conflicting results on neural development, infant growth patterns were similar whether fed supplemented or unsupplemented formula.

While more trials are needed to determine whether supplementation of LCPs provides a specific benefit for term infants, no hazardous effects have arisen from supplementation.

* Food Standards Australia New Zealand (FSANZ), Food Standards Code, *Standard for Infant Formula 2.9.1,* permits the addition of LCPs as an optional ingredient and in specified quantities. Heinz Nurture Gold Starter and Heinz Nurture Gold Follow - on Formulas contain LCPs. The source of LCPs in Heinz Nurture Gold is tuna oil.

* Preterm infants benefit most from supplementation with LCPs and as such preterm formulas are supplemented with LCPs.

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