EFFECTS OF OMEGA-3 ON BRAIN OF FETAL DEVELOPMENT

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Abstract: *This article discusses the effects of Omega-3 and DHA on the fetal brain of during development. Also how these acids affect the brain, its negative and positive aspects are studied.*

Key words: *EPA and DHA, omega-3 fatty acid, ALA, Omega-3 PUFA (EPA and DHA) daily.*

Access: Current intakes of very long-chain omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), are low in most individuals living in Western countries. A good natural source of these fatty acids. is seafood, especially oily fish. Fish oil capsules contain these fatty acids also. Very long-chain omega-3 fatty acids are readily incorporated from capsules into transport (blood lipids), functional (cell and tissue), and storage (adipose) pools. This incorporation is dose-dependent and follows a kinetic pattern that is characteristic for each pool. At sufficient levels of incorporation, EPA and DHA influence the physical nature of cell membranes and membrane protein- mediated responses, lipid-mediator generation, cell signaling, and gene expression in many different cell types. Through these mechanisms, EPA and DHA influence cell and tissue physiology and the way cells and tissues respond to external signals. In most cases the effects seen are compatible with improvements in disease biomarker profiles or health-related outcomes. As a result, very long-chain omega-3 fatty acids play a role in achieving optimal health and in protection against disease. Long-chain omega-3 fatty acids not only protect against cardiovascular morbidity but also against mortality. In some conditions, for example rheumatoid arthritis, they may be beneficial as therapeutic agents. On the basis of the recognized health improvements brought about by long-chain omega-3 fatty acids, recommendations have been made to increase their intake. The plant omega-3 fatty acid, alpha-linolenic acid (ALA), can be converted to EPA, but conversion to DHA appears to be poor in humans. Effects of ALA on human health-related outcomes appear to be due to conversion to EPA, and since this is limited, moderately increased consumption of ALA may be of little benefit in improving health outcomes compared with increased intake of preformed EPA + DHA.

Omega-3 fatty acids are essential and can only be obtained from food. However, the standard Western diet is seriously lacking in these important nutrients. The disadvantage of this omega-3 diet is complicated by a decrease in omega-3 intake by pregnant women, as the fetus uses omega-3 to accommodate its nervous system.

Omega-3 fatty acids are essential and can only be obtained from food. The requirements during pregnancy are not defined, but probably exceed the non-pregnant state. Omega-3 fatty acids are essential for the nervous development of the fetus, and can also be crucial for pregnancy time and birth weight. Many pregnant women do not get enough omega-3 fatty acids because the main dietary source of seafood is limited to 2 servings per week. In order for pregnant women to receive sufficient amounts of omega-3 fatty acids, it is necessary to consume various sources: vegetable oils, two servings of low-mercury fish per week and supplements (preferably docosahexaenoic acid DHA, obtained from fish oil).

Phospholipids of the retina and membranes of the brain have a high concentration of DHA, which is involved in visual and nervous functions, as well as in the metabolism of neurotransmitters.[1]. In the last trimester, the fetus consumes about 50-70 mg of 1 omega-3 fatty acid, dha[2], per day. Both the consumption of DHA by the mother and the circulating concentration of DHA are important factors in the concentration of dha[3] in the fetal blood. Infants accumulate DHA in the central nervous system until about 18 months of age.[4].

Unfortunately, pregnant women cannot meet their needs for omega-3 fatty acids from omega-3-rich vegetable oils and 2 servings of seafood per week. Two servings of fish per week provide only about 100 to 250 mg of Omega-3 fatty acids per day, which is 50 to 100 mg of DHA; vegetable oils supply negligible amounts of eicosapentaenoic acid (EPA) and do not contain DHA. The dietary goal of omega-3 fatty acids during pregnancy is at least 650 mg, of which 300 is dha5. So, in order to organize a deficiency of omega-3 fatty acids in the diet, pregnant women are left with mainly 2 options: fish oil supplements that contain EPA and DHA, or DHA from algae. In particular, depending on the omega-3 content of seafood consumed during the week, pregnant women need to add 400 to 550 mg of Omega-3 PUFA (EPA and DHA) daily, which should be at least 225 mg of DHA.

There is no doubt that pregnant women need at least as many omega-3 fatty acids as non-pregnant women, and possibly more dha6. Dietary recommendations for omega-3 fatty acids should be taken early in pregnancy, but they can benefit all women considering pregnancy. Taking into account concerns about mercury toxicity from excessive consumption of certain types of fish, pregnant women should consume two servings of omega-3 fatty acids from seafood per week and daily omega-3 fatty acid supplements containing only EPA and DHA or DHA. The consumption of omega-6-rich fats found in sunflower, corn and cottonseed oils should be minimized, as they become substrates competing with omega-3. Pregnant women should reduce their intake of these fats and consume fats rich in omega-3 fatty acids from marine sources.

1. Taking DHA during pregnancy may reduce the risk of preterm birth and promote healthy brain and eye development. It can also lead to more lean body mass in children at age five and improve sustained attention at preschool age.

2. DHA is utilized rapidly by the baby's brain and retina during pregnancy. Omega-3 fatty acids, especially DHA, are building blocks of the baby's brain and retina. As accumulation of DHA continues until age two, DHA intake is essential during breastfeeding and formula feeding.

3. Consuming omega-3 during pregnancy may have a benefit for maternal mental well-being. Observational data show a connection between low intake of DHA and EPA and a higher risk of depression.

4. Although many factors play a role, DHA supplementation during pregnancy may positively impact a child's risk of Childhood obesity. A 2018 study published in the American Journal of Clinical Nutrition reported that moms who took 600 mg of DHA during pregnancy had children with more fat-free body mass at age five compared to the placebo group.

5. A small study of infants living in urban, low-income environments showed better one-minute Apgar scores, higher birth weight, and better infant response to stress when moms received DHA supplementation.

Despite the recommendations from various authorities, 95% of pregnant and child-bearing-age women do not consume enough omega-3 fatty acids.. Transfer of omega-3 fatty acids through the placenta to the cord blood and fetus is impaired in GDM and preeclampsia. This is reflected in both conditions by lower cord vein DHA levels compared to normal pregnancies. Given the role DHA plays in fetal neurodevelopment, lower DHA transfer to the fetus may contribute to impaired neurodevelopment.

Although it is apparent that GDM and preeclampsia are associated with lower cord blood levels of DHA, the impact of DHA and omega-3 fatty acid supplementation on fetal neurodevelopment in this population remains unclear. In GDM, increasing DHA intake later in pregnancy did not increase cord blood levels, possibly due to impaired DHA placental transfer. Future studies in both GDM and preeclampsia need to focus on very early interventions. Such studies could elucidate the time course of serum fatty acids during pregnancy and the impact of DHA supplementation on maternal blood, placental and cord vein DHA levels. Additionally, there is a need to further link infant neurodevelopmental outcomes to omega-3 fatty acid intake. One factor that may influence the effects of omega-3 fatty acids on neurodevelopment may be socioeconomic status. Most of the studies discussed did not evaluate the impact of socioeconomic status on offspring neurodevelopment. This is a limitation, as socioeconomic status has been suggested to affect neurodevelopment and omega-3 nutrition. Future studies are needed to determine the effect of socioeconomic status on maternal nutritional interventions and offspring neurodevelopment. While DHA intake prior to and during pregnancy is important, postnatal DHA intake could be an impactful opportunity to increase delivery of DHA to the breast-fed new born baby. Interventions supporting increased DHA consumption might positively impact neurodevelopmental outcomes associated with GDM and preeclampsia.

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