

The influence of Omega-3 Fatty acid intake on premature infants

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Abstract: Based on the metabolism principle of omega-3 fatty acids in the body, this study will mainly study whether pregnant women can reduce the risk of premature delivery by taking dietary omega-3 fatty acids. Now, studies are pointing to omega-3 fatty acids as a new way to lengthen pregnancy and improve infant health. This paper will be divided into six parts: basic introduction of omega-3 fatty acids, the impact of premature birth on later children, the impact of omega-3 fatty acids on pregnant women, the impact of omega-3 fatty acids on infants, and the introduction of the development and innovative products of omega-3 fatty acids for pregnant women and infants.

1. Introduction

Medically, premature delivery refers to a baby's delivery three weeks or more before the expected date of delivery, which is also a "premature baby." Premature delivery also increases the risk of many diseases in new-born babies, such as visual impairment, developmental delay, neurological dysfunction, and other diseases [1]. Severe cases will directly lead to death, and premature birth is one of the main causes of death in Russian children under five years of age. Therefore, avoiding premature birth has become a topic of discussion among pregnant women and their families all over the world. There are many factors that lead to preterm birth. For example, nutritional factors taken by pregnant women during pregnancy, environmental factors during pregnancy, and objective factors will all promote the occurrence of preterm birth.

Recently, studies have pointed out that pregnant women during pregnancy intake of fatty acids and some trace elements do not meet the recommended intake during pregnancy, will directly affect the time of pregnancy and the occurrence of a variety of problems in the baby [2]. Dietary omega-3 fatty acids were associated with a 42% reduction in preterm birth (<34 weeks' gestation) and an 11% reduction in preterm birth (<37 weeks' gestation). If the results are correct, they could solve a major problem for pregnant women.

Based on the basic functions of omega-3 fatty acids and their effects on pregnant women, this report will summarize the research progress of intake of omega-3 fatty acids on premature delivery according to the authoritative conclusions in recent years. Finally, some authoritative studies on omega-3 fatty acids will be described.

2. Basic information of omega-3 fatty acids

2.1 The Structure of Omega-3 fatty acids

Omega-3 fatty acids are unsaturated fatty acids found in leafy green vegetables, vegetable oils, and fish oils. Polyunsaturated fatty acids are generally considered "healthy fats." This is due to the presence of multiple stable double bonds in the chemical structure of unsaturated fatty acids. According to the structure of carbon atoms, omega-3 fatty acids are divided into "short-chain omega-3 fatty acids" and "long-chain omega-3 fatty acids". Omega-3 fatty acids are mainly divided into α -linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

ALA is a "short-chain omega-3 fatty acid" found in vegetable oils. The Omega-3 fatty acids are composed of 14 to 18 carbon chains with three cis (Z) double bonds (starting from the methyl end)

(shown in Figure 1). ALA only occurs in plants and is the precursor for the production of Omega-3 fatty acids. In the body, ALA can be converted into EPA and DHA for human needs. In addition to being converted into EPA and DHA, ALA can also be stored as energy. Therefore, ALA cannot be synthesized by the human body, so it must be obtained from the diet. A large number of studies have found that ALA has been proven to have a good therapeutic effect in the treatment of diseases, including heart disease (CVD), stroke, brain development, neurological diseases, anxiety, etc. [3].

In addition to ALA, EPA and DHA are the two most common forms of Omega-3 fatty acids. EPA and DHA are "long-chain omega-3 fatty acids" found in fish oil and some seafood.[4](Figure 2) Unlike ALA, EPA and DHA can exist in multiple systems in the body, the most important of which is the cell membrane. At the same time, DHA is also an effective lipid medium for many metabolites. Like ALA, EPA and DHA cannot be self-synthesized, so they must be obtained in the form of food [5].

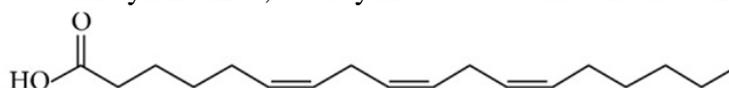


Figure 1. The structure of a-linolenic acid.

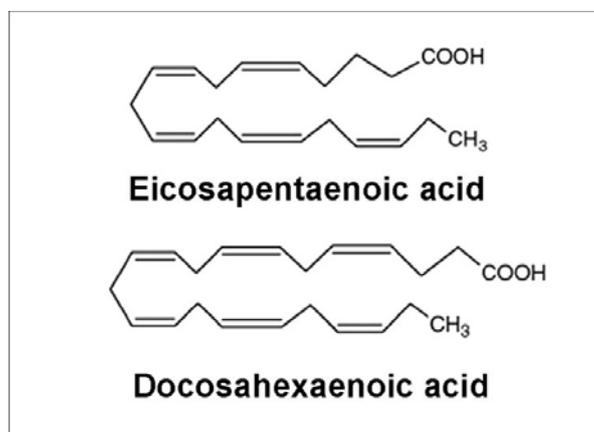


Figure 2. The structure of eicosapentaenoic and docosahexaenoic acid.

2.2 Sources and bioavailability of omega-3 fatty acids

As mentioned above, Omega-3 is divided into ALA, EPA and DHA. The source of ALA is mostly plant-based, and the content of flaxseed is relatively abundant [6]. The food sources of EPA and DHA are mostly fish oil, seafood, and nuts.

As we all know, Omega-3 fatty acids can play a better bioavailability during the growth of children, including the brain and retina. But it should be noted that for babies (especially premature babies), they have poor bioavailability of Omega-3 fatty acids [7]. This comes from the ability of dietary fat to play a crucial role in the development of infancy. During the fetus and lactation period, the main way for the fetus or baby to obtain Omega-3 fatty acids is mainly milk. The mother's body is rich in basic EPA and DHA for the normal development of various tissues of the fetus's body. For premature babies, the intake of Omega-3 fatty acids is significantly less than that of full-term babies, which leads to an increased risk of certain diseases in premature babies.

In the early stages of a baby's life, the choice of dietary fat is particularly important, including basic cholesterol metabolism, neurodevelopment, and a series of activities related to cell membranes [8].

In addition, since what our human body usually lacks is not polyunsaturated fatty acids, but enzymes required for metabolism and transport, it is recommended to obtain ALA and LA (omega-6 fatty acids) in the simplest way. (As shown in the figure below) This comes from the fact that ALA cannot be synthesized by our human body, so when the body consumes more unsaturated fatty acids, both EPA and DHA can be produced through ALA. The reason why it is recommended that pregnant women supplement a large amount of omega-3 fatty acids comes from the differences in metabolism and hormones. Compared with men, women can convert ALA into EPA and DHA faster for fetal growth [9].

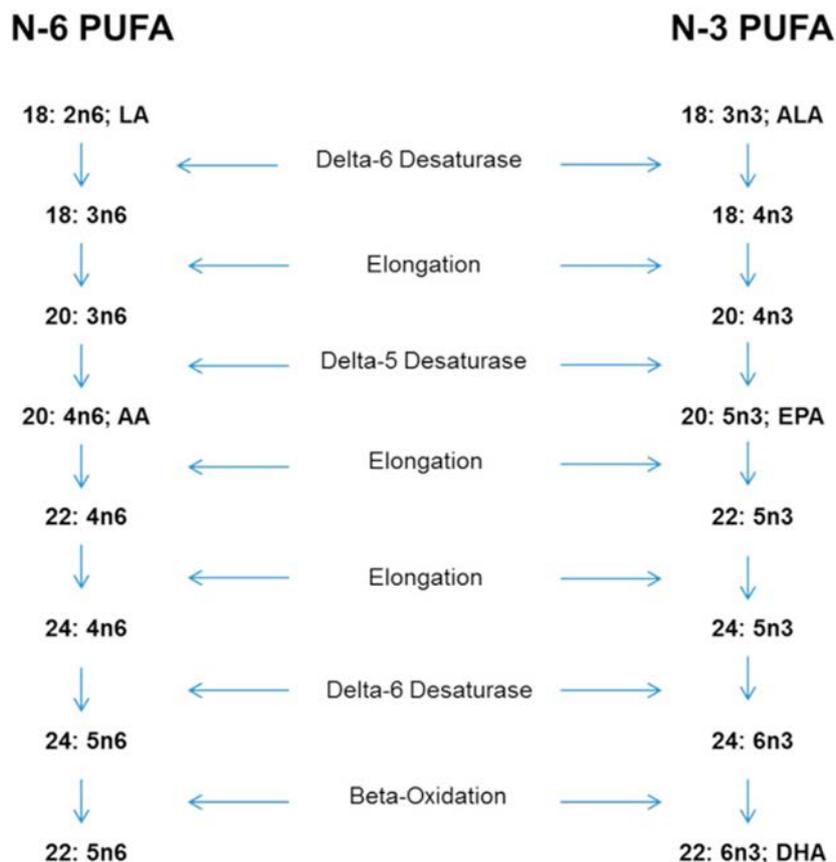


Figure 3. Metabolism of essential polyunsaturated fatty acids, including omega-6 unsaturated fatty acids. AA: arachidonic acid; ALA: α -linolenic acid; DHA: docosahexaenoic acid; EPA: eicosapentaenoic acid; LA: linoleic acid; PUFA: Polyunsaturated fatty acids.

3. The influence of premature birth on later growth of the child

3.1 Brain function (cognitive power)

The effects of omega-3 fatty acids start during pregnancy, during lactation, during childhood and during adolescence. Omega-3 fatty acids play a critical role in the development and functioning of a child's brain [10]. In addition, it plays a strong supporting role in the development of nerve and vision.

EPA and DHA are essential for the development of brain and cognitive functions. EPA and DHA affect fetal brain development through venous blood when the baby is still placental [11]. In addition, higher intake of omega-3 fatty acids during pregnancy mainly affects the development of brain and neural tissue. DHA is a major component of cell membranes in the body's central nervous system and is built up with the fetal brain during its formative years, the last trimester of pregnancy. DHA Effects in Brain Development and Function.

Thus, taking omega-3 fatty acids during pregnancy can protect the brain and nervous system of infants.

3.2 Mental Health

The health effect of Omega-3 fatty acids in the body has been affirmed, and more and more people pay more and more attention to it, and its attention is getting higher and higher. In addition to having a positive effect on the development of the brain, the intake of Omega-3 fatty acids also it is directly related to mental health. For the connection to mental health, the extensive physiological functions of Omega-3 fatty acids are closely related to the nervous system, including neurogenesis, neurotransmission, and some nerve-related diseases [4].

All of these are in fact closely related to the intake of nutrients in the usual diet. There is evidence that the structure of the diet is an important factor leading to the occurrence of mental disorders. However, fatty acid is an organic compound with the largest content in the brain, distributed in the central nervous system, affecting a variety of complex and specific physiological behavior and psychological regulation of the human body, and the reactions generated will change according to different ages and genders.

3.3 Language Skills

The early stages of life, especially the first 1,000 days, should be considered as the most critical period for brain development. During this period, stem cells in the embryo determine whether they can develop into a normal brain. The developing brain accounts for about 80% of the entire brain development [11].

Language skills are indispensable in the development of the brain. Good language skills can enable children to establish better understanding, learning, and expression skills. In the early stages of infants and toddlers, children usually cry to convey their self-message. Studies have shown that at about 6 months, infants and young children can recognize some familiar voices, such as caregivers.

For premature babies, this series of abilities seems to be restricted by the underlying brain structure, leading to overall cognitive impairment in this type of premature babies [4]. As mentioned above, language ability first constitutes in the last trimester of pregnancy. It starts with hearing. For example, when the fetus is in the womb, the mother will transmit information to the fetus's inner ear through the rhythm and tone of speech, so that the fetus can understand the mother tongue early [12]. Therefore, compared with full-term babies, premature babies suffer from language impairment due to the angle of hearing recognition. The content of Omega-3 fatty acids plays a vital role in the early development of the fetus, especially DHA plays a great role in a series of related issues of language structure [13].

4. Protection of Omega-3 fatty acids for pregnant women and babies

4.1 Pregnant Woman

In fact, whether for pregnant women or normal people, Omega-3 fatty acids play an essential healthy and positive role in the human body. But it is even more important in the group of pregnant women, because for pregnant women, omega-3 fatty acids not only play a good role in protecting the health of the pregnant woman, but also play a vital role in the fetus in the womb.

First, during the perinatal period, Omega-3 fatty acids are critical to the fetus's neurodevelopment and anti-inflammatory function [14]. DHA participates in the growth of the fetus's central nervous system. In addition, it is also an important part of cell membrane formation and is responsible for the transmission and division of signal pathways [8]. Usually the concentration is higher in the retina. Secondly, the intake of maternal omega-3 fatty acids is directly related to whether the nutrients in the blood circulation of the fetus satisfy the neurodevelopment of the fetus. When the baby is about 18 months old, all the DHA accumulated in the mother will be used in the development of the central nervous system and brain.

4.2 Infant

Omega-3 fatty acids, such long-chain polyunsaturated fatty acids, play a vital role in the development of children. First of all, as mentioned above, DHA and EPA in Omega-3 fatty acids are the main factors in the growth process of the brain. Saturated fatty acid. [15] However, infancy is a critical period for brain formation. Professor Dobbing and numerous studies have shown that from the last three months of pregnancy until the child is two years old, this period is the critical time for the two major organic compounds, DHA and EPA, to grow wildly in the brain and penetrate into the nervous tissue [16].

In the study, it was found that if Omega-3 fatty acid supplements are taken early during pregnancy, this will have a positive effect on the child's later brain development. In a meta-analysis, subjects were divided into full-term babies and premature babies. It was found that preterm babies (under 18 months)

had poorer neurodevelopment than full-term babies and had visual results. Difference. This comes from the way that unborn babies and breastfeeding babies obtain DHA is limited to breast milk. However, it has been found that long-term intake of high-dose DHA needs to reach about 0.35%, which will have a beneficial effect on the vision of premature infants [10].

Based on such unsaturated fatty acids, the importance of Omega-3 fatty acids to infants, especially for infants who are under month or premature, it is recommended that the intake of Omega-3 fatty acids (mainly DHA) reach the total fatty acid level in the first 6 months 0.45%~1.5%. It is recommended that pregnant women supplement DHA daily in the range of 200 to 300 mg during pregnancy [17].

5. Intake of Omega-3 fatty acids may improve the risk of premature birth

Based on the various benefits of omega-3 fatty acids for pregnant women and babies, the nutrient is also thought to be effective in improving preterm birth, thereby avoiding a host of adverse problems associated with preterm birth.

In the early 1980s, Danish researchers found that Flo women who ate a diet rich in omega-3 fatty acids lasted four days longer to become pregnant than women who ate less. Fatty acids in the diet. And the average weight varies a lot [18]. Studies have found that it's all about diet. Omega-3 fatty acids are often consumed in the diet, and this nutrient affects the metabolism of endogenous prostaglandins. The prostaglandins are key to how long a woman can give birth. In the study, only significant amounts of omega-3 fatty acids in pregnant women were found to have an impact on the timing of labor and fetal weight.

Prolonging labor by consuming more omega-3 fatty acids has been proven in many experiments around the world. In addition to the Danish trial, the researchers also conducted a controlled trial with pregnant women in Norway. They found that umbilical cord babies with higher LEVELS of DHA were born 9.3 days longer than babies with the lowest levels. This suggests that omega-3 fatty acids can indeed influence the timing of delivery through a pregnant woman's intake, thereby reducing the risk of premature delivery [19].

However, the mechanism by which omega-3 fatty acids increase pregnancy length and birth weight is still being investigated. But have found that was established by molecular factors during pregnancy and childbirth, usually in the early and late pregnancy, pregnant women in vivo proinflammatory cytokines have been increasing, there is no doubt that the change had a huge impact on the fetus and pregnancy progress, but when the Omega 3 fatty acids increase the expression of inflammatory cytokines in pregnant women will also be adjusted [20]. Supplements of omega-3 fatty acids are therefore recommended to prolong pregnancy. This is a better method and has been proved.

6. Innovation production of Omega-3 fatty acids

In recent years, the development trend of global food has undergone great changes. Functional foods stand out from traditional foods. Various nutrients and phytochemicals in food are believed to be effective in improving the occurrence of some diseases. And a lot of clinical and epidemiology have pointed out that there is an inevitable connection between disease and nutrient deficiency. With the support of authoritative organizations, everyone gradually turned their attention to food.

For food companies, the focus on nutrients is even more so, because this new perspective directly affects the entire manufacturing chain. Therefore, in recent years, many food companies have injected new elements into the research and development of traditional foods and adopted new innovative methods. Adding therapeutic or defensive chemicals or nutrients to traditional foods.

The perinatal period and baby food have always been a topic of concern because the initial stage of the child is the key to growth. In recent years, many innovative foods have been born, such as a milkshake developed by an Australian company for babies over 6 months old. This milkshake is different from the traditional milkshake. It uses oatmeal and fresh fruit syrup technology to replace glucose. The product has a sugar-free but sweet taste. It is also rich in nutrients such as high oatmeal,

omega-3 fatty acids and vitamin C. In addition, there are now many foods for pregnant women that are rich in high-quality omega-3 fatty acids, among which DHA is easy to sell as a single nutrient, and its popularity is extremely high.

7. Conclusion

Various studies have confirmed that omega-3 fatty acids play an important role in a mother's diet, not only in promoting early fetal development, but also in reducing preterm birth in pregnant women. In this article, we describe three health benefits of omega-3 fatty acids for newborns: brain development, mental development, and language skills, all of which need to be developed in early childhood. For pregnant women, omega-3 fatty acids diet also play a crucial role, because the baby get nutrition from pregnant women in the early days, so when during pregnancy can even add omega-3 fatty acids cannot only help children to various aspects of development, using the mechanism at the same time also can affect the length of the pregnancy, to avoid the premature phenomenon, so as to reduce the risk of children suffering from various diseases. Nowadays, there are also many new supplements of omega-3 fatty acid for infants and young children in the market. Although there are a large number of supplements for you to choose from, there are still some diseases caused by omega-3 deficiency, and there are also obstacles in the choice and dosage of pregnant women. Therefore, in order to effectively solve this series of problems, a lot of propaganda or research is needed to provide guidance for pregnant women more clearly.

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