The importance of DHA during CNS development has led to the hypothesis that early diet modulation of DHA may alter the normal trajectory of brain development.

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Docosahexaenoic Acid and Neurodevelopmental Outcomes of Term Infants

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Key insights
Although there is ample evidence highlighting the importance of docosahexaenoic acid (DHA) in the development and function of the central nervous system (CNS), clinical data on the effects of dietary DHA on neurocognitive outcomes remains inconclusive. Despite the existence of clear dietary intake recommendations for pregnant and lactating women, DHA levels are insufficient even across the populations of many developed countries.

Current knowledge
DHA and arachidonic acid are long-chain polyunsaturated fatty acids (LCPUFA) essential for development and overall health. High concentrations of DHA are found within the lipid bilayer of neurons, affecting membrane fluidity and neuronal transmission. DHA also modulates the function of other membrane-bound proteins, such as enzymes, ion channels and receptors. Deposition of DHA in the brain peaks during the third trimester of pregnancy and during the first year of life, coinciding with the period of rapid brain growth. During fetal development, circulating maternal DHA is sequestered by the growing fetus. The DHA requirements of infants are met through the diet, either from breast milk or formula.

Practical implications
Despite the positive findings from some observational studies, many randomized controlled intervention trials have failed to demonstrate a conclusive benefit of maternal DHA supplementation on infant neurodevelopment. Few trials have evaluated supplementation during the lactation period. In contrast, many trials have been conducted on LCPUFA supplementation of infant formula. Regardless of the time period of the intervention, there is a large degree of heterogeneity between the studies with respect to the DHA dose, the intervention period and outcomes assessed. These trials do not demonstrate a benefit of DHA supplementation of healthy infants on child development. The individual response to prenatal DHA levels may be influenced by other factors, such as genetic background, smoking, maternal education and birth weight. This suggests that future efforts should focus on characterizing the responders to DHA to clarify the role of optimal dose and timing of potential interventions.

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