LCPUFAs as Conditionally Essential Nutrients for Very Low Birth Weight and Low Birth Weight Infants

Metabolic, Functional, and Clinical Outcomes—How Much is Enough?

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KEYWORDS

• Preterm • Low birth weight infants • Very low birth weight infants • LCPUFA
• Randomized controlled trials • Development

KEY POINTS

- Preterm infants have a high requirement for preformed dietary docosahexaenoic acid (DHA), approximately three times the concentration in mature human milk or infant formula, if they are to meet the in utero rapid accumulation of DHA that normally occurs in late pregnancy.
- Long-chain polyunsaturated fatty acid (LCPUFA) intervention trials before 2000 mostly assessed whether infant formulas that lacked LCPUFA should be supplemented to the equivalent concentrations of DHA and other LCPUFAs typically found in human milk of women from Westernized societies.
- Trials of LCPUFA-supplemented formulas demonstrate that supplementation with at least 0.3% total fatty acids as n-3 LCPUFA improved visual development, especially in infants born less than 30-weeks gestation or with birth weights less than 1500 g.

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- Attention is now focused on determining whether there is added advantage to meeting the in utero accumulation rate of DHA.
- The largest intervention trial to date indicates that higher dose DHA may improve cognitive scores, reduce the risk of developmental delay, and reduce the risk of bronchopulmonary dysplasia in the smallest and most immature infants.

INTRODUCTION

In examining the effects of long-chain polyunsaturated fatty acids (LCPUFAs) on the clinical and developmental outcomes of preterm children, it is considered it logical to evaluate the early trials of formula feeding in relatively healthy low birth weight (LBW) and very low birth weight (VLBW) infants separately from the more recent controlled trials that assessed higher doses of LCPUFA. In particular, the roles of long-chain n-3 fatty acids (ie, eicosapentaenoic acid 20:5 n-3 [EPA] and docosahexaenoic acid 22:6 n-3 [DHA]) in more immature, sicker preterm infants are considered.

The early randomized controlled trials of LCPUFA interventions were designed to assess whether the infant formula for preterm infants required supplementation with n-3 and n-6 LCPUFA. At that time, formulas were devoid of all LCPUFA and contained only the precursor essential fatty acid (EFA), n-3 alpha-linolenic acid 18:3n-3 (ALA), in small amounts and much larger quantities of the n-6 EFA, linoleic acid 18:2 n-6 (LA) (Fig. 1).

These trials, limited to preterm infants who were exclusively fed formula from the time enteral feeding began, compared formulas containing only precursor EFAs with those supplemented with LCPUFA. Initial studies focused only on n-3 LCPUFA supplementation through fish oils. Later studies included the n-6 LCPUFA arachidonic

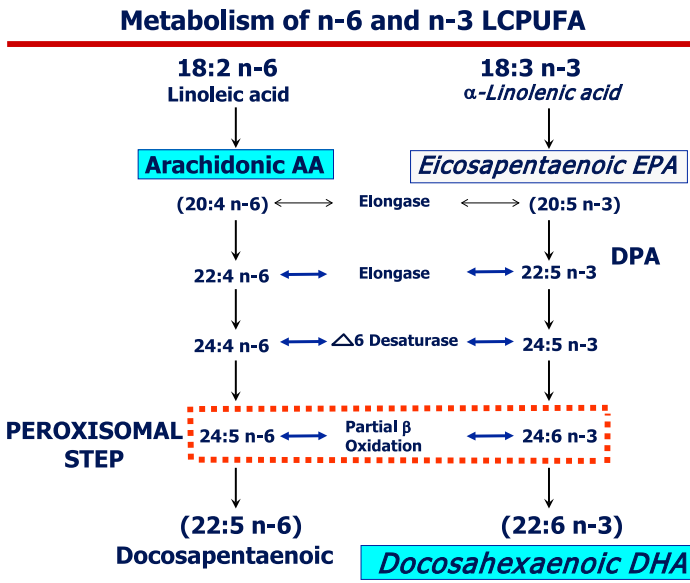

Fig. 1. Schema showing the metabolism of n-6 and n-3 essential fatty acids to their long chain polyunsaturated fatty acid derivatives.