Lipids in Complementary Foods

Background

A number of unresolved questions exist with regard to the optimum quality and quantity of the lipid content in the total infant diet after the first 4 to 6 months of life, and hence also in complementary foods. Lipids usually supply the major portion of energy in the diet of young children and of the energy stored in the organism. Some 40% to 55% of the energy content of human milk are comprised by lipids, whereas complementary foods tend to be rich in carbohydrates but relatively low in fat; therefore, the proportion of dietary energy provided by lipids tends to drop considerably with the introduction of complementary foods. Because dietary fat content and energy density are associated, concern has been raised as to whether low-fat content in the diets of infants and young children might compromise growth. Dietary lipids modulate the mouthfeel of foods and carry aromas; hence, the effects of lipids on organoleptic food qualities may contribute to the development of food choices and eating habits. It has been questioned whether there might be disadvantages of low-fat diets for infants and young children with respect to the supply of polyunsaturated fatty acids (PUFAs), liposoluble vitamins, and other antioxidants as well as on gastrointestinal functions. As well as the amount of lipids, the nature of the dietary fatty acids might modulate energy metabolism and hence infant growth and body composition. The effects of reducing fat intake from the seventh month of life onwards have been carefully studied by Simell and coworkers in a cohort of more than 1000 Finnish infants. Families were advised to reduce dietary saturated fat intake, based on the assumption that such an early intervention might be beneficial for risk reduction of later heart disease. At low dietary fat intakes of about 29% of energy intake, childhood up to the age of 36 months was not adversely affected in this carefully supervised group of infants and young children from an affluent society. However, it is not known whether adaptive mechanisms, such as a change in physical activity and total energy expenditure, may have been utilized to maintain normal growth. Thus, it is not known whether a similar fat intake would be safe in less affluent populations, particularly in infants stressed by high rates of infection or diarrhea.

The widely accepted assumption that a restriction of total lipid intake in young children might be beneficial for prevention of cardiovascular disease at a later age, has been challenged because beneficial effects on lipoprotein metabolism are expected only from the reduction of saturated and trans-fats, but not of total lipids. In this respect, it remains controversial whether there are sufficient benefits to justify a strict limitation of dietary cholesterol intake in infancy, or whether in fact there might also be biological advantages of some dietary cholesterol intake. Total fat intake is also associated with the intake of liposoluble antioxidants such as vitamin E that are considered to reduce oxidation of circulating cholesterol and low-density lipoproteins and, thereby, long-term cardiovascular risk. Epidemiologic studies in a population born in the 1920s raised the possibility that poor growth during the first year of life, which might result from diets with a very low fat and energy content, even increases the risk of cardiovascular mortality later in life. Moreover, the question has been raised whether the intake of lipids relative to protein during infancy might be associated with later development of obesity. Longer duration of breastfeeding, which provides a relatively high lipid/protein ratio, is associated with a lower probability of overweight and obesity at school age, whereas the early feeding of diets with low lipid/protein ratios has been associated with higher body mass indexes at later ages. A particular group of dietary fatty acids, the so-called conjugated linoleic acids, have been reported to reduce body weight and fat deposition in animal models. Whether similar effects exist in children is not known.

In addition to its implications for growth, body composition, and cardiovascular health, dietary lipid intakes for infants and young children are important for the provision of relatively large amounts of liposoluble vitamins and of PUFAs. Conventional concepts on adequate intakes of liposoluble vitamins with complementary foods have recently been challenged by findings on major beneficial effects of additional vitamin A intakes on child health in less privileged populations. However, our present knowledge is not enough to define optimal amounts and forms of liposoluble vitamin intakes with complementary foods. PUFAs are indispensable components of structural lipids in the cell membranes of tissues and, thereby, modulate membrane functions such as membrane fluidity, activity of membrane-bound enzymes and receptors, metabolite exchange, and signal transduction. Moreover, the dietary PUFA supply modulates eicosanoid metabolism and immune functions. The postnatal dietary supply of long-chain polyunsaturated fatty acids such as arachidonic and docosahexaenoic acids with breast milk or breast milk substitutes has been associated with the development of visual function and complex cognitive functions. It is not known to which extent the supply of PUFA beyond the first months of life might affect the composition of plasma and tissue lipids, and possibly development.

Research Issues

Questions for further research with respect to the lipid supply with complementary foods include:

1. What are the optimal amounts of lipids in complementary foods to provide an adequate source of energy to meet the needs for energy expenditure, fat oxidation, and fat deposition and thereby support physiologic growth?
2. To which extent does the quantity and quality of dietary lipid intake modulate energy metabolism and body composition on a short- and long-term basis?
3. To which extent do dietary lipids modulate gastrointestinal functions in the latter part of infancy?
4. What is the relationship between lipids in foods, organoleptic food qualities, and the development of food choices and eating habits?
5. Is there a significant effect of the quantity and quality of lipids provided by complementary foods, and by the overall diet in infancy, on the risk of cardiovascular disease later in life?
6. What are the adequate intakes, and forms of supply, for essential liposoluble vitamins, n-6 and n-3 polyunsaturated fatty acids?

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ACKNOWLEDGMENTS

This work was supported in part by Deutsche Forschungsgemeinschaft, Bonn, Germany (Ko 912/5-2) and by Bayerisches Staatsministerium für Arbeit und Sozialordnung, Familie, Frauen und Gesundheit, München, Germany

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Lipids in Complementary Foods
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*Pediatrics* 2000;106;1294

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