Complex Carbohydrates and Sugars

Background

Many complementary foods for infants and young children are cereal-based, and starch is the principal carbohydrate and energy source within them. Complex carbohydrates are an integral part of the human diet. Derived from plant material they include fiber (nonstarch polysaccharides), lignin, and starch. They have a range of physiologic effects in the gastrointestinal tract, and a common characteristic is that they are not fully digested in the small intestine and they pass to the colon where they are subject to fermentation by the colonic microflora. Current evidence suggests that they are important dietary components and essential for health, but little is known about how they are handled in the gut of children.¹

There is therefore a need for greater understanding of the physiology of the digestion of starch and other complex carbohy-
drides contained in weaning foods, both in vivo and in vitro. Studies in this area need to be informed by dietary surveys of the complex carbohydrate intakes in infancy and childhood. To determine the optimum amount and type of complex carbohydrate in the diet, studies aimed at defining their beneficial and adverse effects, both on the physiology of the digestive system, handling of other nutrients, and systemic effects, should be done.

Simple sugars (monosaccharides, disaccharides, and short oligosaccharides) are digested by disaccharidases and other hydrolyases in the small intestine, and their component monosaccharides are transported actively across the small intestinal epithelium. Most complex carbohydrates are partially digested in the small intestine and also fermented by anaerobic bacteria in the colon. The colonic bacterial flora changes during infancy, in part under the influence of the weaning diet, and the patterns of short-chain fatty acids (SCFAs) produced through fermentation also change. Oligosaccharides (particularly fructo- and galacto-) stimulate the growth of Bifidobacteria, and may be termed prebiotics. There are oligosaccharides in human milk, and these and other complex carbohydrates in the diet may have prebiotic properties that regulate patterns of colonic microflora, and thereby the products of fermentation that can have beneficial biologic effects.

There is therefore a need to more fully understand the ontogeny of the colonic microflora in infancy, and its dietary regulation and effects. Although the physiology and biochemistry of fermentation has been extensively studied in ruminants, much less work has been done in humans, especially in infants. A focus of studies should be on the potential prebiotic effects of dietary carbohydrates that may have a beneficial effect through the selective stimulation of the growth and/or activity of the colonic microflora.

Research Issues
1. Improved understanding of the physiology of digestion of starch in complementary foods in vitro and in vivo.
2. Characterizing the dietary intakes of complex carbohydrate in infancy and childhood.
3. Identifying better long- and short-term beneficial and adverse effects of dietary fiber in infancy.
4. What is the ontogeny of colonic microflora and its dietary regulation?
5. Characterization of the physiology and biochemistry of fermentation and biologic contributions and fates of SCFAs in infancy.
6. What are the prebiotic properties of complex carbohydrates and their potential health benefits in infants?

Lawrence T. Weaver MD, FRCP
Department of Child Health
University of Glasgow
Glasgow, Scotland

REFERENCES
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Lawrence T. Weaver
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