Infant Formulas: The Role of Low-Protein Formulas

Ekhard E. Ziegler, MD
Department of Pediatrics, University of Iowa, Iowa City, IA, USA
E-Mail ekhard-ziegler@uiowa.edu

The healthy infant’s need for protein decreases sharply during the first few months of life. This declining need is reflected in the decreasing protein concentration of breast milk. Although the infant’s need for energy also changes with advancing age, the energy content of breast milk remains constant because the infant is able to regulate his/her energy intake by varying the volume of milk taken. The protein intake of the infant, on the other hand, is primarily determined by the protein concentration of the feeding. By having a decreasing protein content, breast milk meets the infant’s protein needs while avoiding an excess of protein intake over the infant’s needs.

In figure 1 the protein requirement of the infant as determined by the factorial method is compared with the intake of protein obtained by a typical breastfed infant. It is evident that the intake of the breastfed infant closely matches the infant’s needs for protein. Now, the protein content of formula is set to meet the needs of the infant when they are at their highest, in the first two months of life. But soon thereafter the infant receives more protein than he/she needs, and the gap becomes larger and larger, as illustrated in figure 2. It is to be noted that in this figure protein needs and protein concentrations of formulas are expressed per 100 kcal. Also, protein needs are shown with an upper limit (‘safe intake’) [1] which represents the needs of 97% of all infants. It is evident that protein intakes from typical formulas exceed protein needs by a margin that increases as the infant gets older.

Lower-protein formulas have been developed in recent years as new dairy technologies have made it possible to improve the biological quality of formula protein. It is evident from figure 2 that low-protein formulas provide less of an excess of protein than conventional formulas. These low-protein formulas support normal growth and lead to serum chemical parameters close to those of the breastfed infant. However, a really close match between protein intake and need cannot be achieved unless formulas are developed that mimic the changing protein content of breast milk.

Protein intakes are commonly higher than needed in late infancy [2]. High protein intakes have been linked to adiposity in childhood [3] and consumption of a high-protein formula has been shown in a controlled trial to lead to increased adiposity at one and at two years of age [4]. A consensus is therefore emerging that protein intakes of infants should best be kept as low as those of the breastfed infant.

References

---

**Fig. 1.** Protein requirement determined by the factorial method compared to protein intake of the breastfed infants.

**Fig. 2.** Requirement and safe intake for protein in g/100 kcal [1] and protein concentration of formulas.