EDITORIALS

Premie nutrition: mother's milk may be best

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The survival rates of infants born prematurely have increased dramatically in recent years. Now, more than 90% of infants of about 28 weeks' gestational age born and cared for in perinatal centres are expected to live.[1] Furthermore, with modern management most of them will not experience severe respiratory distress syndrome and nearly all will have the potential for normal intelligence.[2] Although there are no randomized controlled studies to support the view that nutrient intake will influence the ultimate outcome for these infants, there are good theoretical considerations to support it. Thus, it is some years since cystathione reductase[3] and cysteine sulfinic acid decarboxylase[4] deficiencies were described in the liver of premature infants and since the potential for taurine deficiency[5] was reported. Also, abnormalities of plasma amino acids and urea nitrogen in low-birthweight infants receiving standard formulas have been described.[6,7] Mineral deficiencies occur[8] and, more recently, measurements of levels of specific long-chain fatty acids in the fetal brain have indicated that attention must be given to this aspect of nutrition for low-birthweight infants.[9] With increased survival of these infants dietary deficiences of phosphorus (W. Andrews: unpublished data, 1980), zinc[10] and copper[11] have all been described.

In responding to these and other potential problems of nutrition in low-birthweight infants a major consideration has been the definition of the correct goal for their postnatal nutrition. There are two main schools of thought: one, that the aim should be to achieve growth and accretion rates similar to those of the fetus in utero;[12] and the other, that the most important aim should be a nutrient balance that avoids excessive demands on the immature gut and the development of abnormalities of amino acids and their derivatives in the plasma, with the expectation that later postnatal growth will probably make good any minor deficiencies of early physical growth that might result from such a conservative regimen.[13] The final answers have certainly not been found yet, and much research remains to be done in this area. As discussed in more detail in the statement on nutrition of the low-birthweight infant by the nutrition committee of the Canadian Paediatric Society in this issue of the Journal (pages 1301 to 1311), research to date shows that formulas intended for the term infant are inadequate if given unmodified to the preterm infant. Moreover, the administration of formulas based on cow's milk, with their 18:82 lactalbumin:casein ratio, high proportion of poorly digested saturated fatty acids, relatively low electrolyte content (if modified for the neonate) and, often, high iron content, is also inappropriate. Formula manufacturers have modified their products accordingly, and have recently released new products that they hope will provide sufficient nutrients to permit retention and growth rates similar to those of the fetus in utero. Published research on these new formulas has been minimal.[14] Bearing in mind the large number of iatrogenic ills that have befallen the low-birthweight infant in the past, it is certainly to be hoped that the release of these formulas has not been precipitate. Preliminary, and mainly observational, trials have been undertaken, but only carefully randomized controlled studies of these new formulas will resolve any doubts.

Are there any alternatives to formula? For many years some hospitals in Europe have had organized extensive systems for collecting and banking human milk.[15,16] Recommendations for such banking were recently published by the nutrition committee of the American Academy of Pediatrics.[17] For many hundreds of prematurely born infants such human milk has appeared to provide the essentials for growth. Here again, however, there are data indicating that this source of nutrients is not entirely appropriate.[18,19] Mature milk donated by mothers who gave birth at term contains nutrients that meet the growth requirements of their young infants, who will be at least 1 month post term. These requirements are inevitably different from those of infants delivered 2 or 3 months prematurely. For example, protein requirements for growing small preterm infants has been calculated to be approximately 2.54 g/100 Cal[20] (0.61 g/100 kJ); mature human milk contains less than 1.0 g/dl.[21] Similar calculations can be made for other nutrients. Furthermore, heat treatment of pooled human milk is

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often so inappropriate that the preparation finally fed to the infant bears little resemblance to the original product[22] and, if correct precautions are not taken, is potentially dangerous.[23]

An obvious source of milk for the preterm infant, a source that was overlooked for many years, is the infant's mother. Is her milk likely to be more suitable? The evidence to date indicates that this may well be so. In a series of studies Atkinson and colleagues[24-26] demonstrated that the milk of a mother who gave birth before term contains adequate amounts of protein, energy and most minerals to meet her infant's growth requirements. In addition, of course, the mother's milk, especially if given fresh to her infant, has numerous anti-infective properties.[27] However, if the requirements are based on rates of intrauterine accretion the mother's milk is not ideal since, for example, it contains insufficient calcium and phosphorus.[26] None the less, it does contain significant amounts of the long-chain essential fatty acids shown to accumulate in the brain and liver of the infant.[28] The deficiencies demonstrated in mother's milk so far can probably be remedied by a dietary supplement. Certainly the nutrient deficiencies are much easier to correct than the absence in formulas of immunoglobulin, leukocytes, essential fatty acids and free amino acids. Many mothers find it difficult to express milk in the early postpartum days, and relatively few are helped with the crude manually operated pumps that are widely used. We have found the newer electric pumps,* designed to emulate an infant's sucking movements, to be much more successful; most of the mothers in our unit are able to produce ample milk for their infants for at least the first postnatal month, regardless of the newborn's gestational age. In addition to providing essential sustenance to their infants, there is no doubt that the mothers derive great emotional satisfaction from their success in providing milk for their babies.

Because many questions remain to be answered regarding the appropriate "formula" for the newborn premature infant the statement of the nutrition committee of the Canadian Paediatric Society is in the form of guidelines only. Firm recommendations and a table giving the quantitative daily requirements in the "ideal" formula would not be appropriate in the present state of knowledge.

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*Details about the Egnell breast pump can be obtained by writing to PO Box 1601, Williamsburg, Ont. K0C 2H0 or by telephoning (613) 535-2098.