Committee on Nutrition

The Use of Whole Cow’s Milk in Infancy

Previous statements of the Committee on Nutrition have focused on infant feeding during the first 6 months of life. The purposes of this statement are to update recommendations concerning infant feeding during the second 6 months of life and to suggest further needed research in this area.

WHOLE COW’S MILK AND IRON

The appropriate age at which unheated, whole cow’s milk (WCM) can be safely introduced into the infant diet is unknown and remains an area of controversy. In numerous reports the consumption of excessive amounts of WCM has been associated with iron-deficiency anemia. This is partly due to the fact that both the concentration and the bioavailability of iron are low in milk. Also, WCM can cause occult bleeding from the gastrointestinal tract. The process by which this occurs is unknown, but Eastham and Walker, in a review of the effects of cow’s milk on the gastrointestinal tract, classified the mechanisms involved as enzymatic, toxic, and immunologic. They suggested that the occult blood loss and exudative enteropathy syndrome following cow’s milk ingestion are more likely toxic in nature because no classic immunologic mechanism has been demonstrated. However, the exact mechanism(s) for these conditions have not been established.

Although studies have shown an association between WCM consumption and anemia, there are some difficulties in using these findings as a basis for recommendations for feeding older infants. This is because of the young age at which the infants studied were initially given WCM. In one of the studies, WCM was introduced at age 2 months; in another study WCM was introduced at less than 4 months of age, although the precise age was not mentioned; and in a third study the age was not specified. If the developing gut is more vulnerable early in life, it is possible that the deleterious effects of WCM may be avoided by delaying the age at which it is first introduced.

The consequences of feeding WCM for the first time to older infants have been examined in only one study, which will be considered here in some detail. Fomon et al. studied 81 normal infants, aged 112 to 196 days, who had not previously consumed WCM: 39 infants were fed WCM and 42 were fed either a commercial infant formula or heat-treated cow’s milk. All infants received a daily supplement containing 50 mg of ascorbic acid and 12 mg of iron as ferrous sulfate. The proportion of infants between 112 and 140 days old who had guaiac-positive stools (as determined by the Hemoccult slide [Smith, Kline Diagnostics, Sunnyvale, CA]) was significantly greater among infants fed WCM than among those fed Enfamil or heat-treated cow’s milk. The infants fed WCM also had a significantly greater number of guaiac-positive stools than the other infants. However, after 140 days of age there was no difference between groups in the number of guaiac-positive stools. Furthermore, in these infants given iron supplements, no significant differences were observed between feeding groups in mean hemoglobin, hematocrit, serum iron, total iron-binding capacity, or transferrin saturation measurements. Hematologic values did not differ significantly between infants with and those without guaiac-positive stools. Fomon et al. concluded that WCM should not be fed before 140 days of age. Although the study demonstrated no adverse effects from feeding WCM after 140 days of age, it must be noted that all infants were receiving a daily supplement of ferrous sulfate. Occult blood loss and iron status have not yet been studied in a group of older infants not receiving supplemental iron. Until such a study is conducted, the role of WCM in producing iron-deficiency anemia in older infants remains unknown.

COW’S MILK ALLERGY

Another area requiring further research is cow’s milk-protein intolerance or “allergy.” The incidence of milk-protein intolerance has been estimated at from 0.4% to 7.5% of the infant population in the first 2 years of life, depending on the strictness of the diagnostic criteria.

As is true of the reports about anemia, many cases of unheated cow’s milk-protein allergy are reported, but few are applicable to the question, at
what age is it safe to first give an infant WCM? In some studies\textsuperscript{1,8} in which infants showed allergic reactions, cow's milk frequently was introduced when the infant was less than 4 months old; in one study\textsuperscript{10} in which infants were given formulas with a cow's milk base, there were allergic reactions within the first week of life. Moreover, differentiation has not always been made between WCM and processed formula.

Even if there is agreement that 0.4\% to 7.5\% of infants have cow's milk-protein allergy, this is a relatively small proportion of the population. Whether the percentage would decrease if cow's milk protein were withheld from the infant diet for the first 4 to 6 months of life is not known. Before a definite recommendation can be made, well-designed studies are needed to evaluate the allergic response in older infants who have had no prior exposure to cow's milk protein.

**RENAL SOLUTE LOAD OF WHOLE COW’S MILK**

A third factor about which there is little direct evidence is whether the renal solute load of WCM would be too high for an older infant. A recent study (G. H. Johnson: The effect of substitution of whole cow milk for infant formula and breast milk in the diet of infants, unpublished data available from Gerber Products Co), using diet diaries, attempted to examine the theoretical effect of substituting WCM for either breast milk or formula in infants 2 to 12 months old. The solute load imposed by the original diets and the cow's milk-substituted diets of the infants surveyed were compared using estimates based on the method of Ziegler and Fomon.\textsuperscript{11} Results showed that substituting WCM for infant formula or breast milk would have resulted in an increase in urine osmolarity at all ages. However, this increase was more dramatic during the first 6 months of life (49.2\% increase) than during ages 7 to 12 months (18.2\%). The urine concentrations calculated from cow’s milk-substituted diets were well within the range tolerated by infants, if the infants had access to water during hot weather or episodes of diarrhea.\textsuperscript{12}

**DEFATTED MILKS**

The feeding of reduced-fat-content milk is not recommended during infancy. Fomon et al\textsuperscript{13} have observed that, although infants fed skim milk ad libitum continue to gain weight, they do so at a slower rate than infants fed formula or whole milk. Infants fed skim milk also show a rapid decrease in skinfold thickness, suggesting that body energy stores are being depleted. Although the consequences of rapidly decreasing body stores of fat during infancy are unknown, the effects may be unfavorable.

**USE OF SOLID FOODS**

Solid and semisolid baby foods, or beikost, may be introduced when the infant is between 4 and 6 months old, depending on neuromuscular maturation and whether the infant is satisfied with breast milk or formula as the sole source of nutrients. Solid foods should be added individually, allowing several days to a week between the introduction of each new food, so food intolerances can be identified. Infant cereals fortified with electrolytic iron are a good choice as one of the first supplemental foods. Three level tablespoons of dry infant cereal diluted with WCM or formula provide approximately 7 mg of iron. Commercially prepared combinations of cereal and fruit, which may be given to older infants after tolerance for individual components has been established, provide approximately 5 mg of iron per 4½-ounce jar.\textsuperscript{14}

Concerning the appropriate age of introduction of WCM into the infant diet, Fomon et al\textsuperscript{13} suggest that, when an infant more than 6 months old is eating approximately 200 gm of beikost daily (the equivalent of approximately 1½ jars of strained food commercially prepared for infants), there is no objection to feeding homogenized, vitamin D-fortified whole milk. As discussed here, both occult blood loss from the gastrointestinal tract and allergic reactions can occur, but most reports of these effects of introducing WCM have been in infants less than 6 months old,\textsuperscript{16} or those fed in excessive amounts.\textsuperscript{1-4}

**IRON STATUS**

The iron status of the 6- to 12-month-old infant depends mainly on whether most of the infant's calories come from human milk, an iron-fortified commercially prepared formula, or whole cow's milk, and/or on whether an iron-fortified infant cereal or an iron supplement is consumed on a regular basis.

When either human milk or WCM accounts for a major portion of the total calories ingested by older infants, an additional iron source is necessary.\textsuperscript{15} The most convenient source of iron for an infant on formula is an iron-fortified formula. For an older infant receiving human milk, cow's milk, or a formula that is not iron-fortified, the best source of supplemental iron is iron-fortified cereal.\textsuperscript{16}

**RESEARCH NEEDS**

There are many unanswered questions concerning the use of WCM in the second half year of life,
including:
1. What is the rate and variability of maturation of infant gastrointestinal mucosal function?
2. What is the relative importance of the amount and bioavailability of iron in the total diet when WCM is substituted for iron-enriched formula at 6 months of age? Does iron-fortified cereal meet the infant’s need for iron?
3. Can the change to cow’s milk when the infant is 6 months old produce anemia from occult blood loss when the milk is fed in excessive amounts and there is no iron supplementation?
4. What is the relative importance of the high-solute load of WCM in the total feeding regimen of a 6- to 12-month-old infant? For example, how much of the high-solute load of WCM is diluted out by other foods in the diet?
5. What is the relative importance of the nutrients not present in WCM but present in infant formula and breast milk, ie, essential fatty acids, tocopherol, ascorbic acid? How much of these nutrients are obtained from the other foods commonly used in the 6- to 12-month age group?

CONCLUSIONS

Breast-feeding with appropriate supplementation is the preferred method of feeding infants 6 to 12 months old. Although many mothers will continue to breast-feed or formula-feed their babies through the first year of life, there is at present no convincing evidence from well-designed research studies that feeding whole cow’s milk after 6 months of age is harmful if adequate supplementary feedings are given.

Research to answer the crucial questions discussed here must be carried out before firm recommendations can be made concerning the age at which it is safe to introduce WCM in infants’ diets. Until these questions can be answered, the following recommendations for feeding infants 6 to 12 months old pertain.

If breast-feeding has been completely discontinued and infants are consuming one third of their calories as supplemental foods consisting of a balanced mixture of cereal, vegetables, fruits, and other foods (thereby assuring adequate sources of both iron and vitamin C), whole cow’s milk may be reintroduced. The amount fed should be limited to less than 1 L daily. Most infants who are not breast-fed should be consuming a significant portion of their calories from supplemental foods after they are 6 months old; those who are not should be given an iron-fortified formula.

Reduced fat content milk is not recommended during infancy.

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