Sanford Medical Center

Aunt Cathy's Guide to:

Choosing Appropriate Infant Milks and Formulas

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Part 4: Thinking about When to Recommend Whole Milk, Low Fat (2%) Milk or Skim Milk before Age Two

A. What percent of calories is provided by fat in each type of milk?

At a time when many American infants were often being fed skim milk, Fomon et al, (1974) showed that young infants fed skim milk as their major food drank about 1.5 times the amount normally taken, in an effort to get adequate calories. This was a concern for several reasons:

1. The amount of protein would be very high because skim milk provides 40% of calories as protein. This is much more than in whole milk (20%) or human milk (7%.) Because so much of the baby's energy would be derived from protein, there would be a large amount of nitrogenous waste produced that must be excreted via the kidney (i.e., it would contribute to a high "Renal Solute Load").

In the first months of life, this can result in dehydration because of the obligatory loss of water to excrete the waste products; sometimes the loss of fluid can be more than the baby can afford. In very young infants or in those with special health problems, including those with growth failure, diarrhea, or fluid limits, a high "Renal Solute Load" can be dangerous. It becomes much less of an issue in an older baby or child who is growing normally.

2. The **volume of milk** required to achieve a particular caloric intake is about twice as much for skim milk compared with whole milk or human milk. Some children, as noted above, simply could not take in enough volume to maintain appropriate fat stores and to grow. I call that problem "Tiny Tummy Syndrome." However, they will try hard to take in the calories they need and so they do increase the volume of milk, resulting in an even higher net protein intake provided in inadequate calories.

3. The essential fatty acid content of cow's milk was discussed earlier in the infany feeding section and there is a chart there of EFA levels indifferent types of cow's milk. The same applies here. **The major point is that NONE of these milks (skim, 2% or whole) have much in the way of essential fatty acids, so it is not a reason to insist on whole milk for a child.**

What About after One Year? Whole? 2%? Skim?

After one year, whole cow's milk has been recommended for most children until age two. This recommendation is being seriously reconsidered at this time. **Lower fat milks can also be appropriate** based on a particular child's caloric requirements and the presence of other sources of fat in the diet. A complete review of this topic is beyond the scope of this paper, but it is useful to note that the global "whole-milk-to-age-two" concept is a public health guideline, and it is not intended to tie the hands of qualified health care professionals who determine that an individual child would be better served by using 2% or even skim milk. As shown later**, there are no magic qualities of cow's milk fat that make it an essential component of a child's diet.**

Consider that the breast-fed baby receives no cow's milk fat at all, nor does the formula-fed baby because the fat is replaced by vegetable oils. So why, at age one, would a child suddenly "need" milk fat? And unlike human milk, infant formulas provide no cholesterol (the precursor to myelin) at all. Interestingly, the milk fat is not the baby's primary source of cholesterol, so skim milk is not very different in regard to pre-formed cholesterol content than whole milk. (See chart on the next page.)

As noted earlier, cow's milk fat is a poor source of essential fatty acids, including those leading to production of DHA, a major fat involved in brain development. It is no more beneficial to the myelinization of a child's brain than any other source of acetate (the 2-carbon unit that is the substance from which cholesterol and then myelin are produced.) Acetate can be made from any calorie source … carbohydrate, protein or fat. **Interestingly, the reason I am given most often by health professionals for insisting on whole milk for a toddler is because "he needs it for brain development." Unfortunately, all that milk fat only provides a lot of calories and not the truly and directly brain-building components DHA or cholesterol.**

It is useful to consider that children have a growth schedule to keep, and if for some reason calories are inadequate, the child will burn fat stores to continue to grow in length and continue brain-building operations. If calories remain inadequate, linear growth will next be compromised and available energy will be preferentially used for brain-building. What this means is a child with inadequate calories will not have to make a judgment like "Gosh! I just can't decide! Should I make a brain or a fat bottom?"

Anyway, it means that one could conclude that a child of appropriate/normal weight and apparent fat stores would have adequate calories for brain-building.
When I see a little "Three-Roller" toddler (related to the number of rolls of fat on thighs) in my office, I do not worry that he would be at risk of getting inadequate calories "for his brain" if I switch him to skim milk from whole.

Consideration of these issues can allow for safe and intelligent departures from the "whole milk until two" recommendations, even as we wait for official changes to come from professional associations.

This is especially true when insisting on feeding a high fat milk is contrary to the child's best interests, as is often the case with children with handicaps that decrease mobility, or overweight children whose caloric intake is clearly already generous.

The negative effect of whole milk on the overall nutritional quality of the diet

Many American toddlers are already consuming a generous amount of calories as fat from other food sources. **The use of whole milk also actually decreases the amount of other foods that a child with a normal appetite would consume.** If our model is that healthy infants will control their intake of calories to match their caloric requirements (and it is,) then feeding a diet that is higher in calorie-to-nutrient ratio would certainly decrease the over-all nutrient content.

Here is a simple example:

The calories in 4 oz whole milk is equal to the calories in
4 oz skim milk + 4 oz strained carrots.

They provide the same calories. Which provides more nutrients?

Insisting on using a high fat milk with a chubby toddler is generally not in his/her best interest. One consideration might be whether this would encourage excessive caloric intake, but the more likely response of an otherwise healthy child is that he/she will simply eat less food in general to obtain the appropriate (lower) number of calories, so **the nutrient:calorie ratio of the diet will decline.**

This is especially non-helpful if the parent tells you that the child's usual diet features foods already high in fat like macaroni and cheese, french fries, potato chips, butter, gravy, peanut butter and hot dogs [I know … there is a choking issue with these last two especially that is very real. But the fact is, in real life many babies and toddlers are commonly fed these foods: "I give it to him because he really likes it."]

If the rest of the child's diet is described as above, it is already a very generous source of fat. It would be hard to come up with a logical reason why one would want to increase it further by insisting that the baby use whole milk simply because he/she is "not yet two."

Is there a risk of essential fatty acid deficiency if we give skim milk before age two instead of whole milk? No, for these reasons:

1. **There is the same risk of EFA deficiency** whether one uses whole, 2% or skim milk because, as shown earlier, none of these milks is a good source of essential fatty acids.

2. **For "normal, healthy children" who were either breastfed or fed commercial formulas for the first year, both feeding products provided generous EFAs and the child's fat stores would therefore contain generous amounts.** This assumes that the child has reasonably appropriate "normal healthy" fat stores upon visual inspection; an emaciated child would of course be at greater risk of EFA deficiency … but that child is not a member of the "normal, health children" group and a lot of rules will be different.

3. **Ironically, an example of the primary exception to the assumption of good EFA stores in a child with reasonable fat stores would be one who was switched to milk (whole, 2% or skim) at age 6 months or so of age**. That child will have had 6 months of EFA-free milk, so his/her fat stores are less trustworthy in this regard. In terms of stored EFA fat at least, we ARE what we eat!

There is also an historical perspective to consider:

When the "whole milk until age two" recommendation was established, <u>there was no WIC Program</u>, and many poor children actually got too few calories to grow and develop well.

Skim milk costs a few cents less per gallon, so the poorest families chose it. The AAP "whole milk" recommendation was an attempt at that time to remedy that situation to at least improve the adequacy of <u>calories</u> during this important period of brain development. <u>That is ALL it addressed</u>.

The WIC Program was established in the late 1970s to encourage breast-feeding by giving food to low-income nursing mothers, and by funding replacement of cow's milk (of any kind) for non-nursing infants with far more nutritious commercial formula. This particular poverty-related health problem has long ago disappeared … no poor babies in America have to be fed skim milk

because of financial need. But the whole milk recommendation remains with us in spite of considerable evidence that it is really not ideal, and sometimes frankly suboptimal. It takes a long time for official positions to be changed.

The protein and micronutrient content of skim, 2% and whole milk is quite comparable. Vitamins A and D are equally fortified in all three. <u>The only real difference is the calorie content</u>:

Per 8 fluid oz	Protein (g)	Calories (Kcals)	Cholesterol (mg)	Calcium (mg)	Phosphorus (mg)	Vit. D (iu)	Vit. A (iu)	Vit. B2 (mg)	Potassium (mg)
Skim milk	8.4	86	4	300	300	100	500	0.3	406
2% Low Fat milk	8.1	121	18	297	232	100	500	0.2	399
Whole milk	8.2	159	33	291	228	100	500	0.4	370

(data from Pennington, J. <u>Bowes & Church's Food Values of Portions Commonly</u> <u>Used 16th Ed</u>.)

Interpretation of the chart above:

The difference in the cholesterol content is not a very significant, especially as we know that infants fed formula instead of mother's milk receive no pre-formed cholesterol at all for the first year. This means that infants apparently can make their own cholesterol to myelinate their brains and for normal formation of cell membranes. The exceptions are those with a rare metabolic defect called Smith-Lemli-Opitz Syndrome which interferes with the ability to make cholesterol.

The protein and micronutrient differences are also not significant.

The difference in calories <u>is</u> significant:

A teaspoon pat of butter has about 36 kcals.
The difference between skim and 2% milk is 35 kcals.
The difference between 2% and whole milk is 38 kcals.

So, one could picture their relative caloric and fat value as follows:
Skim milk = 8 oz Skim Milk
2% milk = 8 oz skim milk with a pat of butter floating in it.
Whole milk = 8 oz skim milk with 2 pats of butter floating in it.

Comparison of Skim Milk, 2% Low Fat Milk and Whole Milk

Today in the USA, the situation is quite different from the situation in the early 1970s described above. Because of programs like WIC, more babies are being breastfed, and no non-breastfed baby has to use skim milk instead of formula to save a few pennies and in the process receive only half the calories per oz.

It is also interesting to note that there is **a priority system among the body's tissues**, and a child's calories will be preferentially used for brain development at the potential cost to other tissues. Therefore, if a child has normal-to-generous fat stores on board one can assume that calories, at least, are sufficient for brain development. [Think of it this way: A toddler who takes in too few calories to meet all of his/her needs will NOT choose to have "thunder thighs"(also called "two-rollers") instead of a well-made brain.] The misunderstanding of this situation often leads to inappropriate use of high fat milk out of concern "for his brain."

See **"Aunt Cathy's PMS System of Baby Formula Decision-Making"** on the next page for a quick example of problem solving that uses the "Whole-2%-or-Skim" issue as an example.
