4532 *

Will we have milk shakes in the school lunch program?

By Joseph Tobias and V.H. Holsinger[1]

Milk shakes served à la carte may be found in a number of school cafeterias but, generally, are not part of the federally supported school lunch program. Only recently has the Food and Nutrition Service of the U.S. Department of Agriculture expressed interest in exploring the possible inclusion of shakes. Some experimental trials have been conducted to determine whether acceptable milk shakes could be produced under the imposed guidelines. Two requirements were enunciated, the first that a serving be nutritionally equivalent to 8 oz. of milk and second, that the percentage of sugar be no higher than in chocolate milk.

Nutritional equivalency presents no great problem as long as the overrun is controlled in the finished product. At 50% overrun, a 12-fluid oz. serving would yield 8 fluid oz. of air-free shake. If the formulation contained less than 3.25% butterfat, a deficiency of fat soluble vitamins could render the product less than nutritionally equivalent.

One may speculate that this would trigger the same type of vitamin fortification as required for lowfat milk. The protein content, minerals and water soluble vitamins are apt to be higher in shakes than in milk when conventional formulations are employed.

A more profound question was whether a satisfactory shake could be made with a low sugar content. A 6% sugar level was agreed on in the formulas which were developed. A typical formula contained:

3.25% fat
11.00% milk solids not fat
6.00% sugar
0.3% stabilizer
1% cocoa

The same formula was used for a vanilla shake, but without the cocoa. A lowfat cocoa, either natural or Dutch, was found satisfactory. Vanilla extract was used in both flavors, but in the chocolate shake at one-half to two-thirds of the level recommended for the vanilla shake.

Quick turnover

At first glance, the formula appears low in total solids. Past experience indicates that the product would lack stability in the freezer and become progressively coarser. However, in a school lunch situation, there is no requirement for a protracted period of stability. The time alotted for the lunch period is short, one to two hours, and during that period a large number of shakes are served. The number, in fact, is typically larger than the machine's capacity. Thus, servings would be drawn ahead of time and kept cold until the rush period. Under these conditions, a low-solids formula produces a shake with quite an acceptable texture and consistency.

Is 6% sugar enough? Obviously 9% or 11% sugar would make the product sweeter, and in a side-by-side comparison the 6% sugar level would probably lose out. However, the critical question is whether the product would be rejected or whether its acceptence would be only marginal because of its low sugar content. The only way to find out was to try it. Only one product was tested at each session and the panelists had no knowledge of its composition. They were asked to rate the product on a preference rating scale. At some sessions, a product with a commercial composition was served, at other times a product containing 6% sugar was served. The panelists were staff members at the Eastern Regional Research Center, USDA, in Philadelphia, Pa., and co-op college students who were working at the Center.

From the start, results revealed that the lower sugar content was well received. The products were not criticized for lacking sweetness or flavor. Both chocolate and vanilla shakes received high ratings, although individuals exhibited preferences for one or the other, which is a normal situation. Strawberry-flavored shakes were less successful. More sugar is required to bring out the desirable, full strawberry flavor. Panelists gave significantly higher ratings to a true fruit strawberry extract flavored shake containing 9% sugar than one with 6% sugar.

6% sugar maximum

Since the guidelines required that the composition of the finished product could not exceed 6% sugar, no flavoring containing sugar could be added to the shake mix or the frozen shake. Chocolate syrup would increase the sugar content of the shake, as would any other syrup-based flavoring. In this study, cocoa was incorporated into the mix formula for the chocolate shake. The maximum permitted sugar content was maintained because the freezer operator had nothing to add. The vanilla shake was handled in the same way.

The 11% nonfat-milk-solids (NFMS) content was found satisfactory even when 25% of the serum solids were replaced with dry-whey solids. The product still provided more proteins and other water-soluble nutrients than milk on an equivalent-weight basis. This would not be the case if the NFMS content were below 10% and a 25% whey solids substitution were made.

By calculation, the weight of the vanilla mix with the proposed com-

position should be about 8.9 lb. per gal., that of the chocolate mix 8.92 lb. per gal. The weight of a ½ pint therefore would be 8.90 to 8.92 oz. compared to about 8.60 oz. per ½-pint of milk. To insure nutritional equivalency to 8 fluid oz. of milk, the weight of the finished shake of the proposed composition must not be less than 8.6 oz., which corresponds to slightly more than 50% overrun. (Weight of 12 oz. of mix =

$$\frac{8.9}{8} \times 12 = 13.35 \text{ oz.},$$

weight of 12 oz. of shake = 8.6 oz.; overrun % =

$$\frac{13.35 - 8.6}{8.6} \times 100 = 55\%).$$

No effort was made to test different stabilizers. A commercial product was employed at a concentration recommended by the manufacturer. It may be expected that some stabilizer combinations may impart different body characteristics. Since different product attributes may aid in gaining a competitive advantage, this remains an option for the mix manufacturer to explore.

Fructose-based sweeteners that are sweeter than sugar (sucrose) are now available. They were tried and found to make the shake sweeter in a side-by-side comparison. However, the ratings obtained on a single sample test were not significantly different from the control containing the same level of sucrose. Other corn-based sweeteners were not tested. Ordinary corn syrups are not as sweet as sucrose and thus were not expected to impart adequate sweetness at the 6% level. Since corn syrup is a carbohydrate like sugar, the guidelines didn't permit use of corn syrup in addition to the 6% sugar solids.

The ultimate test was conducted in the cafeterias of two suburban Philadelphia high schools during the lunch hour. Only at one of the schools were commercial shakes previously available on an à la carte basis. The 3.25% fat chocolate mix for the two-day test was made by a commercial mix manufacturer according to the stated specifications.

The students who selected a shake for purchase as part of their lunch rated the product without any information on how this shake differed from the usual ones. Again, the acceptance ratings were high, even at the school at which commercial shakes were available. There were some complaints about the lack of other flavors, but there was no problem with the sweetness level.

Future developments could increase the sweetness of low-sugar shakes without increasing sugar content. When enzymatic lactose (milk sugar) hydrolysis (conversion to glucose and galactose) becomes an accepted and efficient technology, the whey and nonfat milk solids could provide additional sweetness equivalent to perhaps 1% to 2% sucrose. Trying a different approach, the sweeter milk solids could permit a reduction in added sugar while maintaining the same sweetness.

There is no official word at present on the status of milk shakes in the school lunch program in the vast majority of states. However, the ground has been broken by this study conducted at the request of the Food and Nutrition Service.