A Research Note

COMPOSITION OF RAW AND PROCESSED SKIMMILK

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ABSTRACT

Many processors make a more palatable skim milk by adding nonfat dry milk solids and/or lactose. Compared to the skim milk portion of raw milk, processed skim milk contained more solids not fat and its freezing point was lower. The data do not indicate many, if any, processed samples in the study with added lactose, other than that contained in the added nonfat dry milk solids.

Consumers object to the flat, watery taste of skim milk, and processors have attempted to overcome this criticism by slightly concentrating the skim milk or by adding nonfat dry milk solids and/or lactose to the skim milk before final processing. During the 12-month period April, 1969 to March, 1970, approximately one-half of the skim milk sold in the Knoxville market contained added milk solids. In certain selected Federal Order Markets, sales of skim milk with added solids far exceed sales of plain skim milk. Labels on such products often specify what alterations in composition have been made. In this study an attempt was made to determine the differences which exist in the composition of raw and processed skim milk.

PROCEDURE

During July, August, and September, 1969, 71 samples of raw milk collected from tank trucks or milk storage tanks in Middle and East Tennessee areas were analyzed for solids-not-fat (SNF) by drying, for lactose by the method of Barnett and Tawab (1), for chloride by AgNO₃ titration, and for freezing point depression by means of a thermistor type cryoscope. During this same time period, 90 samples of processed skim milk and modified skim milk were collected from retail outlets in the same areas and examined in a similar manner. Solids-not-fat, lactose, and chloride concentrations in the raw whole milk were converted to their corresponding concentrations in skim milk by dividing by 1 — the fat concentration.

RESULTS AND DISCUSSION

Table 1 shows correlation coefficients between SNF, lactose, and chloride concentrations and freezing point depressions on raw whole milk and on processed skim milk. Correlations on the raw milk were so low that no relationship was established. A similar statistical analysis of the relationship between components in processed skim milk (Table 1) showed all relationships to be positive and highly significant (P < 0.01), meaning that the probability of these relationships occurring by chance alone was less than 1%. Absence of a correlation coefficient of significance, even at the 95% level of confidence on the raw milk and the presence of correlation coefficients at the 99% level on processed milk differs from normal expectations. However, if the addition of components of skim milk is practiced by some processors and not by others, the range in the concentration of such components among the samples would be greater than is true of raw milk. Wider ranges in SNF concentration, freezing point depression, and chloride concentration in the processed skim milk than in the skim milk portion of the raw milk possibly contribute to the larger, more consistent correlations between composition and freezing point depressions in the pasteurized skim milk because of a relatively smaller error of measurement associated with wide as compared to narrow distributions.

Higher average values in the freezing point depression, SNF concentration, and chloride concentration of processed skim milk compared to raw skim milk illustrate that solids were added to many of the samples of skim milk before final processing. The frequencies of distribution of the lactose concentration in the skim milk portion of the raw milk and in processed skim milk were similar. The slightly higher lactose concentration in the processed skim milk might, in most instances, be attributable to the addition of SNF. A comparison of the ratio of lactose to SNF
concentration between the two milk sources indicate that few, if any, processed skimmilk samples had lactose added, other than the lactose contained in any SNF that might have been added.

Of interest in this respect is the influence of added SNF or lactose on the chloride concentration in the resulting skimmilk. Aqueous solutions containing 10% nonfat dry milk solids or 10% lactose were found to contain 0.132 and 0.005% chloride, respectively. Thus, the addition of commercial lactose to skimmilk contributes a negligible amount of chloride, but nonfat dry milk solids would be expected to increase the chloride concentration in proportion to the amount added.

The distribution frequencies of chloride concentration in the skimmilk portion of the raw milk and in processed skimmilk were similar. However, several samples of processed skimmilk contained more chloride than would be expected if none were added before processing. The logical conclusion is that this chloride was added with the SNF, especially since a correlation coefficient of 0.85 (Table 1) was noted between the concentrations of SNF and chloride. The chloride: lactose ratio indicated that few, if any, samples were fortified with lactose only.

The taste of milk, especially low fat milks, can be improved materially by the addition of SNF (2, 4, 5). Pangborn and Dunkley (9) report that small increases in lactose concentration (0.33%) can be detected two times out of three, whereas, an increase of 0.6% added SNF is required for the same response. A recent report showed that adult males preferred skimmilk fortified with 2% lactose to plain skimmilk (3). The improvement in the flavor of skimmilk caused by addition of either nonfat dry milk solids or lactose, their relative price, and other merits of lactose as an additive as discussed by Nielsen (8), suggest that more dairy processors, with regard for labeling laws, might well consider addition of lactose as a measure to increase the nutritive value of the product as well as the consumer appeal.

**REFERENCES**