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## Dairy

### Feed Flavors In Milk

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Undesirable flavors in milk cause large monetary losses to Oklahoma dairy farmers each year. Among the most prevalent of these are feed flavors (including those caused by wheat pastures), oxidation (often called flat, cardboard, or metallic), and rancidity (called fishy or bitter). Lipase, an enzyme present in cows' blood and milk, has long been thought to cause rancid flavors; and recent evidence in the literature indicates that this enzyme might also be related to oxidized flavor and perhaps to feed flavors as well (1).

The purpose of the present study was to relate changes in the energy level of a cow's feed to the lipase activity in her milk. These feed changes also were studied in relation to changes in the charge on the milk proteins as measured by fractionation on DEAE cellulose. In preliminary work involving one Holstein cow, the animal first was fed a ration calculated at 100 percent of her "normal" energy requirements according to Morrison's Standards in a restricted roughage ration. This ration consisted of 28 lb of concentrate and 15 lb of average quality alfalfa hay. After two weeks, the cow was changed to a "maintenance" ration containing about 60 percent of her energy requirements. This ration consisted of 16 lb of concentrate and 20 lb of hay. After about three weeks on this ration, the milk developed a strong odor with a flavor sometimes described as "oxidized" and at other times as "strong feed." During this time, lipase

activity in the milk decreased from 3.4 to 1.7 units per ml; and the charge on the separable proteins changed markedly—compare Figures 1 and 2.

The cow's ration then was increased, and she was allowed to eat as much as she wanted—which consisted of approximately 32 lb of concentrate and 20 lb of hay—or about 120 percent of her normal energy requirements. After the change, the protein pattern of the milk changed immediately (Figure 3), but the undesirable flavors persisted for 24

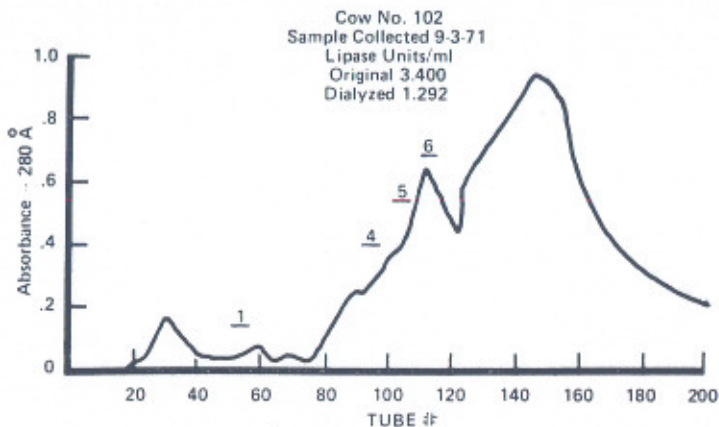


Figure 1. Chromatograph of milk protein on DEAE cellulose when Holstein Cow 102 was on a "normal" ration.

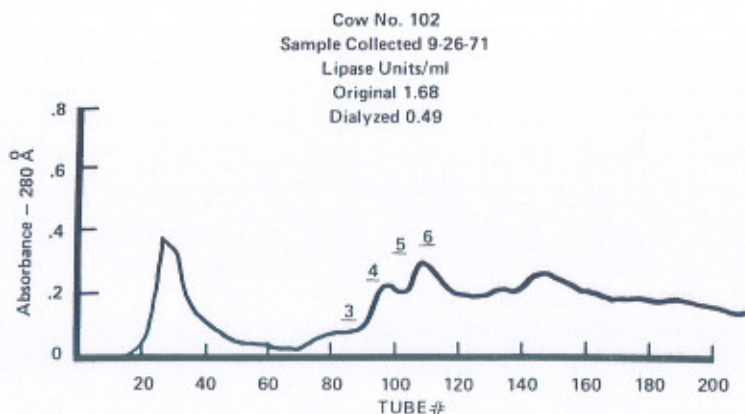


Figure 2. Chromatograph of milk protein on DEAE cellulose after Holstein Cow 102 had been on a "maintenance" ration for 24 days.

hours. After 48 hours, the protein patterns of the milk were back to normal, and the undesirable flavors had disappeared (Figure 4). Later work indicated that undesirable milk flavors were often associated with a change in energy level of the ration rather than with the composition

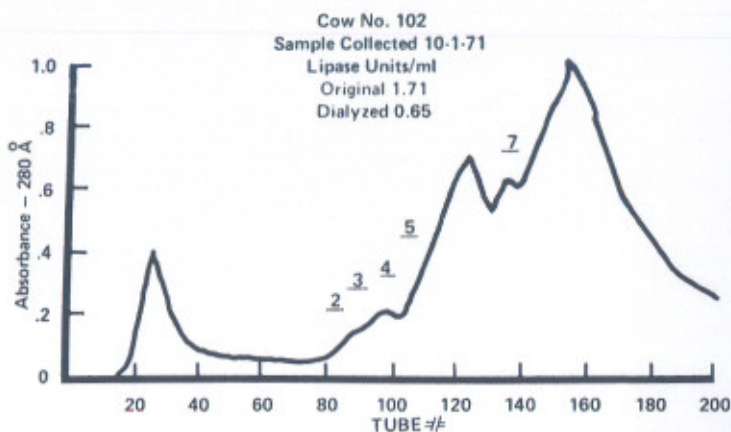


Figure 3. Chromatograph of milk protein on DEAE cellulose the day that Holstein Cow 102 was changed from a maintenance ration (60 percent of normal) to one containing 120 percent of the energy in a normal ration.

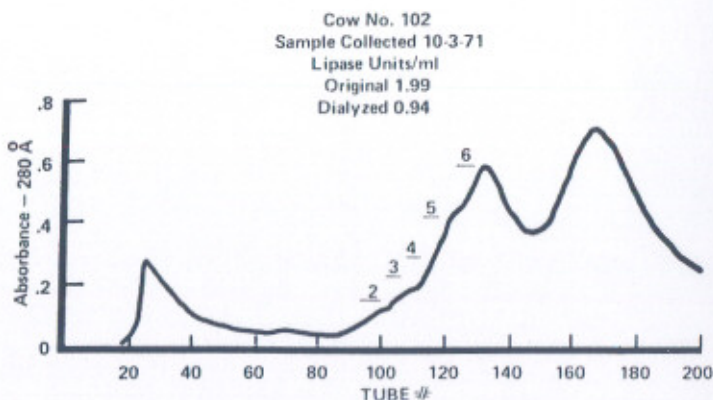


Figure 4. Chromatograph of milk protein on DEAE cellulose 48 hours after Holstein Cow 102 had been on a ration containing 120 percent of the energy in a normal ration.

of the ration itself. This work is continuing using other cows in an effort to learn more about the exact causes of these undesirable flavor changes in milk.

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## Emulsifiers In Foods

J. B. Mickle

The studies concerning emulsifiers in foods at Oklahoma State University have developed several new food products during the last decade. These include low calorie spreads as well as solid and liquid cake shortenings. At present the research is aimed at developing a new type of candy base incorporating milk products.

Candy products are now on the market which can be used as bases for fudge-type candies. These bases contain all the ingredients necessary for this type of candy except the flavoring—the nuts or chocolate, etc. However, the products presently on the market do not include milk fat or any other milk ingredient.

Current research is aimed at determining the proper ingredient ratios using milk powder and fat together with the appropriate processing temperatures for the product. Emulsifiers appear to improve the texture of the candy, though there are problems with flavor; and the optimum amounts of these ingredients have yet to be worked out. It will be necessary to study the flavor, texture, and hardness of these products under various storage conditions over a period of time before it can be determined whether this type of candy base has commercial applicability.

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