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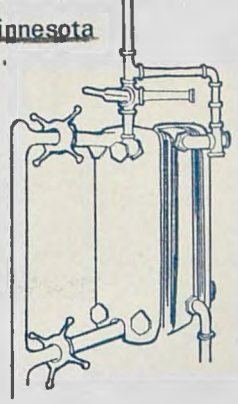
3. MINNESOTA DAIRY PRODUCTS PROCESSOR



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RANCIDITY REVISITED

In the past year or two we have received a growing number of inquiries regarding problems of hydrolytic rancidity. Though we have no data to verify the point, we have reason to believe that the defect is increasing. Perhaps, then, some review comments are in order, together with a few pointers on control measures.

WHY NOW?

There may be a number of reasons why rancidity is increasing. And while we hesitate to point fingers, some possible causes come readily to mind. Among them must be considered the sharp rise in numbers of pipeline milkers. This is a step in the right direction, because pipeline systems seem the answer to efficient milking and the maintenance of a sound profit base in times of high labor cost. However, pipelines also are capable of certain amount of milk abuse, which can result in rancidity. Coupled with conditions such as poor quality feed, or lack of feed, or even extra high levels of feeding for those better cows that need it, there is a tendence for milk supplies to be susceptible to this defect. With a few controls some of these problems can be nipped in the bud.

SOME BACKGROUND INFORMATION

First, a brief review. Hydrolytic rancidity is a breakdown of butterfat (a splitting off of fatty acids) by naturally occurring lipase enzymes. Sometimes the defect is referred to as "lipase" flavor or "wintry" flavor, the latter because of its more frequent occurrence during winter months with cows on dry feed. Rancid milk has a pungent (barny) odor and a bitter, unclean flavor.

Some pertinent facts include:

1. The defect occurs primarily in raw milk. Pasteurization will prevent any further increase in rancidity, but will not eliminate the flavor and odor previously developed.

2. Milk susceptibility to rancidity varies. Some cows produce milk that will go rancid simply on cooling. Usually the number of cows producing this kind of milk in any given herd (except under conditions of starvation diets and/or advanced lactation) is so small that good quality milk outweighs the bad and detectable off-flavors do not occur.

3. Conditions causing rancidity are (a) agitation and foaming, (b) cooling, re-warming (to 80 -90 F.), and recooling of milk (c) homogenization (of raw milk) and (d) mixing pasteurized-homogenized milk with raw milk.

4. Some bacteria produce lipase enzymes that may cause rancidity, but rancidity of raw milk is rarely due to bacteria. A high quality, low-bacteria count milk can be highly rancid and most objectionable, due entirely to natural milk lipase triggered by items listed in (3) above.

SOME CONTROL MEASURES

All milk can be made to go rancid by severe abuse. Agitation and foaming is usually the cause. In pipeline milkers this will generally be true. But pipeline systems vary in construction, and what is true for one may not be true for another. Still, some attention to a few details can be helpful. We pass the following along for your consideration:

1. A pipeline filled with milk during milk transfer does not permit air incorporation, thus reducing the tendency to cause rancidity. Transfer systems acitivated to pump milk only when the transfer tank is full, can be beneficial; a system for releasing milk from the milk jar acts in much the same way. Risers--areas in the line where milk is raised from a low to a higher level--are potential sources of aeration and foaming in partially filled lines.

2. When milk is raised from udder level directly to a milk line over the cow's head, a source of rancidity exists whenever the method of moving milk allows aeration to take place. In this regard, the higher the line the greater the chance for significant rancidity development. Milk lines should never be higher than 7 feet from floor to pipeline level, even if it means sloping the floor. Experience suggests that higher line levels lead invariably to rancidity problems. Very high lines appear to be satisfactory only for milk transfer set-ups, when milk is drawn or pumped through the line in a continuous slug.

   Another good reason for keeping lines at minimum heights is to protect against vacuum fluctuation at teat-end, a major cause of mastitis. Extra high lines nearly always lead to problems of this kind.

3. This brings up another issue. Heavy milking cows, from mere volume of output, may flood the milking cluster--the claw--with milk. This,too, causes vacuum instability, the condition predisposing to mastitis. And for this reason there is a temptation to "help things along," to speed up milk flow through the claw by widening the air intake hole or introducing new holes in the tubing at claw level. If the net result is to

promote more aeration and more foaming, we would advise strongly against it. At some point, perhaps only when feeding conditions or stage of lactation or other factors begin to support production of susceptible milk, the odor of rancidity may arise.

One advantage of a very high milk line would seem to be avoiding damage to the line by frisky cows or cows jumping each other during heat periods. Line damage may occur and dented lines can be difficult if not impossible to clean and sanitize. But this is often a price that must be paid. Either that or some kind of protective barrier might be erected near the line, especially over walkways where cow traffic is heaviest.

There are other controls--air tight inflations and pipeline joints, minimizing splash in bulk tanks, placing strainers on the pressure side of the line, etc.--but the suggestions here are good starting points. And if it's possible to avoid a problem at the outset, do so. Keeping pipelines low to the cow's head can be a step in that direction.

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