Milk Fever Control in the United States

By J.P. Goff and R.L. Horst

Peripartuient Diseases and Immunology Research Unit, National Animal Disease Center, USDA-Agricultural Research Service, Ames Iowa 50010.

Introduction
The incidence of milk fever on American dairies is variable but a recent national survey suggested that 5.9% of cows will develop clinical milk fever each year in the United States. The disease is reported to be higher on dairies with less than 100 cows (7.3%) than in dairies with more than 200 cows (4.3%) (NAHMS 1996). It has been estimated that the typical case of milk fever will cost the producer $334 (Guard 1996). This cost is incurred because 8% of affected cows do not recover from milk fever, 12% of those that do recover are subsequently culled, and the average milk loss in recovered cows vs. non milk fever cows is 300 – 500 kg for that lactation. Cows with milk fever are 3 times more likely to develop displaced abomasum and ketosis and nearly 9 times more likely to develop coliform mastitis (Curtis et al. 1983).

Historical control measures for hypocalcemia
Traditionally the preferred method of controlling milk fever was to place the cow on a low calcium diet prior to calving. At first the results of this intervention were quite good. Generally the change in diet involved removing high calcium alfalfa from the diet and replacing it with grass hay or corn silage. The result was to decrease calcium intake from 90-120 g / day down to 40-60 g calcium / day. However in time the results of this intervention were less beneficial. We have subsequently worked on the dietary cation-anion difference theory of milk fever.
In hindsight we now believe that 40-60 g calcium / day intake is still too high to initiate parathyroid hormone release – the mechanism of action of the low calcium diets. The best evidence for the utility of the low calcium diets was provided by experiments in which diet calcium was limited to less than 25 g / day (Goings et al. 1974, Green et al. 1981). When diet calcium is this low the parathyroid gland is stimulated before calving, causing bone calcium mobilization and production of 1,25-dihydroxyvitamin D before calving so the cow is prepared to meet the calcium demands of lactation. It is unlikely that the switch from alfalfa to grass hays and corn silage was inducing a true calcium deficiency prior to calving to turn on parathyroid secretion before calving. It is more likely that the switch actually reduced dietary cation-anion difference. Twenty years ago, alfalfa crops were the only forages typically fertilized with potassium. As a result the switch away from alfalfa also reduced dietary potassium content. This was an effective approach for some years. However as American dairies became larger and land available for the spreading of waste did not increase we began to see manure spread on grass pastures as well as alfalfa. It is now common for grass hays to be as high or higher in potassium than the alfalfa crops. The effectiveness of these grass hay diets for prevention of milk fever also seems to have been reduced. It is unfortunate that the landmark studies of the Norwegian scientists who demonstrated the effectiveness of anion addition to diets were essentially ignored outside Scandinavia (Ender et al. 1971). In 1984 Block (1984) rekindled interest in the effect of cations and anions in milk fever and many subsequent studies demonstrated that the addition of anions to a diet could reduce the incidence of milk fever. In 1997 our laboratory provided direct proof that it was high prepartal dietary potassium and not high dietary calcium that caused hypocalcemia at calving. A growing body of evidence suggests that the high potassium diets induce a metabolic alkalosis in the cows interfering with the action of parathyroid hormone. Addition of anions to the diet is designed to induce a compensated metabolic acidosis in the cows to restore parathyroid hormone sensitivity of the tissues.

Current control measures
Nearly 90% of American dairy cows are maintained in confinement with all of their ration brought to them each day. About 3/4 of farms are using a total or partially (hay fed separately but corn silage mixed with grain, minerals etc.) mixed ration. Nearly the same percentages are utilizing a professional nutritionist to help formulate rations. At least 90% of these nutritionists are aware of the potential problems of high potassium forages, and try to utilize low potassium rations in close-up dry cows. Most are also aware that dietary magnesium must be increased in the prepartum cow to allow calcium homeostasis and most professional nutritionists have increased prepartum dietary magnesium concentration to 0.35-0.4%. Most professional nutritionists are aware that addition of anions can further reduce hypocalcemia in cows. However, our informal survey suggests only about 1/3 of dairies are utilizing anionic salts. However, on larger farms (>1000 cows) 60-70% utilize addition of anions. The number of cows fed anions prepartum has risen dramatically in the last 2-3 years, and appears to continue to be on the rise. When first introduced the “anionic salt” solution was embraced by some of the more progressive dairy producers. It worked well on some farms, had little effect on others, and caused ill effects (ketosis, displaced abomasum, and retained placenta) on more than a few farms. Initially the anionic salts chosen were salts such as ammonium chloride and sulfate, calcium chloride and sulfate and magne-
sium sulfate. The main problems revolved around reductions in dry matter intake as a result of the poor palatability. Occasional overdose of salts also was occurring. Overdosing with anions results in uncompensated metabolic acidosis, which greatly reduces feed intake, and this effect can be disastrous if it occurs during the last critical days before calving. In the last 2-3 yrs, we have realized that sulfate salts are not as acidogenic as chloride salts, and that monitoring urine pH can be an effective means of determining whether the proper amount of anion has been added to the ration. In addition more palatable commercial forms of anion supplements have become available. Surprisingly the most palatable of these commercial preparations hark back to the original work of the Norwegian scientists who discovered that when cows were fed forages treated with hydrochloric acid as a preservative they did not develop milk fever. Using these hydrochloric acid treated feedstuffs costs about $9-14/ cow. The main problems preventing more confinement dairies from utilizing anion addition to rations are: 1. an inability to separate heifers from cows (heifers do not need anions to control hypocalcemia and are likely only to suffer a reduction in feed intake) and 2. smaller producers who cannot make a total mixed ration to feed the 4-5 cows that they might have at any one time that are eligible to be fed the close-up dry cow ration. While the new generation of anion supplements is more palatable they remain difficult to utilize without a total mixed ration.

References


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