BALANCED DAIRYING
-Production-

Texas Agricultural Extension Service
The Texas A&M University System

Managing Anionic Salt Programs in the Close Up Dry Cow Pen

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The most critical time in the production cycle of a dairy cow is the first few days postpartum. A smooth transition from the dry period into lactation is critical in achieving high peak milk production. Cows that experience a metabolic disorder are less productive and more susceptible to secondary health disorders such as ketosis, mastitis, retained placenta, displaced abomasum and uterine prolapse.

A primary post-calving management goal is control of subclinical hypocalcemia and "droopy cow syndrome". Cows that do not expel fetal membranes in a timely fashion have poor appetites and do not milk well. Consider the changes cows experience around calving: hormonal profiles are shifting, the fetus relocates prior to birth, decreasing gut capacity, and the mammary gland is preparing for lactation. And then she is expected to go from producing no milk to producing over 70 pounds of milk per day within a few weeks.

At calving, a cow giving 20-25 pounds of colostrum loses 23 grams of calcium in a single milking or about nine times the amount present in her entire plasma calcium pool. Nearly two-thirds of all mature cows are hypocalcemic at calving. If plasma calcium pools aren't maintained, hypocalcemia follows. Calcium plays a vital role in smooth muscle contraction. Therefore, postpartum subclinical hypocalcemia affects the reproductive tract's involution process, as well as gut motility. Normal blood calcium is 8 to 12 milligrams per decaliter (mg/dl). When blood calcium is reduced to 7.5 or 5 mg/dl, abomasal motility can be reduced 30 and 70%, respectively. Reduced abomasal motility from low blood calcium leads to depressed feed intake and displaced abomasum.

Traditionally, hypocalcemia was thought to be caused by improper dietary calcium levels in the dry period. It was thought that high calcium intakes during the dry period (greater than 70 grams calcium per day) would suppress the cow's ability to mobilize bone stores at calving, thereby inducing milk fever.

However recent research suggests potassium may play a significant, if not primary, role in subclinical and clinical hypocalcemia. If prepartum diets are high in calcium or potassium, consider an anionic salt program in the close-up dry cow ration.

Anionic salts are minerals that have a high proportion of anions. Anions are negatively charged and cations are positively charged. Living tissue maintains a balance of anions and cations to achieve neutrality. However, certain cations and anions have a large effect on metabolic processes in the body. In particular, the cations sodium and potassium and the anions chloride and sulfur are considered to be major ions influencing acid-base status in the body. The dietary cation-anion difference (DCAD) concept quantifies the major cations and anions in diets. A negative DCAD diet contains more equivalents of anions than cations, a zero DCAD diet indicates balanced equivalents, and a positive DCAD diet contains more cation equivalents.

Research recommends a DCAD of –10 to –15 milliequivalents per 100 g dry matter for close-up dry cows. To calculate DCAD in milliequivalents per 100 g ration dry matter, use the following formula:

[(% sodium/0.023) + (% potassium/0.039)] – [(% chloride/0.0355) + (% sulfur/0.016)]

A ration formulated using typical forages and concentrates generally has a positive DCAD. Adding

anionic salts (magnesium sulfate, calcium sulfate, ammonium sulfate, calcium chloride, ammonium chloride, and magnesium chloride) is the only means of achieving a negative DCAD. These salts should be used only for the close-up dry cow group. Do not feed heifers anionic salts. The potential dry matter intake (DMI) depression is of greater concern than possible benefits from feeding anionic salts to heifers. Springing heifers normally have fewer problems with milk fever and hypocalcemia, making anionic salts less beneficial for them.

Determining DCAD helps estimate the influence a diet has on acid-base status of the animal. Anionic diets induce a subacute metabolic acidosis. The actual mechanism by which anionic salts improve post-calving calcium status is unclear. However, several systems respond to this dietary manipulation and work together to stabilize plasma calcium pools. These systems include the kidney (controls urinary calcium excretion), the intestine (absorbs dietary calcium), and bone (stores calcium).

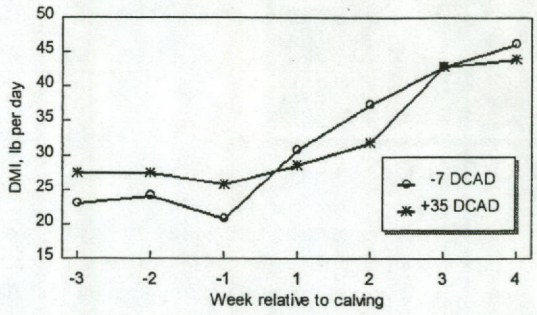
Feeding negative DCAD diets three weeks prior to calving has been successful in increasing blood calcium. Research also shows that cows fed negative DCAD diets consumed more feed in early lactation (Figure 1). Research from the University of Idaho showed cows fed a negative DCAD diet had lower intakes prepartum, but greater intakes postpartum compared to cows fed a positive DCAD diets. Furthermore, the negative DCAD diet increased blood calcium, apparently offsetting any negative effect of reduced intake in the prepartum period.

When selecting anionic salts, consider the source. Some have higher bioavailability, thus increasing the likelihood of sufficient mineral absorption. Do not use sodium chloride and potassium chloride because they are neutral salts and contribute both anions and cations to the balance, so they have no effect on DCAD.

While dietary DCAD is relatively easy to calculate, monitoring urine pH of close-up dry cows is a tool to determine the impact of diet on acid-base status of the animal. The desired effect of feeding anionic salts is to decrease blood pH, which usually increases blood calcium. Urine pH drops with blood pH, making it a good indicator of blood pH.

Urine pH can be quickly and easily monitored on the farm using pH paper or a pH meter. The desired urine pH of close up cows consuming negative DCAD rations is between 5.5 and 6.5. If urine pH is greater than 6.5, the DCAD level needs to be lower. This can be done by decreasing dietary potassium levels or by increasing the sulfur or chlorine content of the diet. A urine pH less than 5.5 means anionic salt intake is too high and should be reduced to avoid reducing feed intake, displaced abomasum, and kidney overload. Table 1 matches urine pH range with metabolic status.

Figure 1. Effect of DCAD on DMI around calving.



Joyce et., 1997. Journal of Dairy Science, 80:2866.

Because problems can occur when anionic salts are fed, carefully monitor the close-up pen and control over feeding of anionic salts. Feed total mixed ration to ensure adequate intake of anionic salts. Feed the diet free choice, with animals having access to feed throughout the day. In general, do not pasture dry cows being fed anionic rations because the total feed intake cannot be controlled or monitored.

Field reports indicate some herds have had serious health problems in cases where anionic salts were fed. In severe cases animals have died when anionic salts were misfed, probably due to reduced DMI from excessive anionic salt feeding. These cases stress the importance of accurately monitoring feed intake of prepartum cows.

Unless DMI is measured and consumption of anionic salts monitored, feeding of anionic salts is not recommended. Dry matter intake normally declines as parturition nears, so anionic salts can further depress DMI to the point where metabolic disorders arise. Significant reductions in DMI near parturition can predispose animals to metabolic disorders such as displaced abomasum, milk fever, and ketosis. Only close-up dry cows should be fed anionic salts, which necessitates a minimum of two dry cow groups. Also, as mentioned before, separate springing heifers from cows and feed a diet without anionic salts. Anionic salts may be appropriate in herds experiencing problems with metabolic disorders such as milk fever, retained

Table 1. Relationship of dietary DCAD, urine pH, and metabolic status of dairy cows.

Close-up Ration DCAD	Urine pH of Close-up Dry Cows	Acid-Base Status of Close-up Dry Cows	Calcium Status of Fresh cows
Positive	8.0 to 7.0	Alkalosis	Low Blood Calcium
Negative	6.5 to 5.5	Mild Metabolic Acidosis	Normal Blood Calcium
Negative	Below 5.5	Kidney Overload Crisis	

Davidson et al., 1995. Hoard's Dairyman 140:16:634.

placentas and abomasal displacements. Even in well managed herds, with cows in proper body condition and low incidences of clinical milk fever and ketosis, an additional 500 to 1,000 pounds of milk in the subsequent lactation may be gained by avoiding subclinical hypocalcemia.

Summary

Feeding negative DCAD diets the last three weeks of the dry period can help reduce droopy cow syndrome. ***Failure to follow guidelines, particularly in regards to farm specific ration formulation, intake monitoring, and urinary pH evaluation, can do more harm than good.***

MAX SUDWEEKS RETIRES

After 18 years of dedicated service with the Texas Agricultural Extension Service, Dr. E. Max Sudweeks, Professor and Extension Dairy Specialist retires January 31, 1999. He began his career as a County Extension Agent in Utah in 1965. Upon receiving his Ph.D. in Nutrition and Biochemistry from North Carolina State University in 1972, he served as Assistant Professor in Ruminant Nutrition at the University of Georgia Experiment Station. He came to Texas in 1981 and has worked at the Overton Research and Extension center.

While an Extension specialist, he primarily worked the Northeast Texas area but has served the entire state in recent years. His focus was on dairy management specializing in nutrition. He has participated in many field days, demonstrations and worked directly with a large number of producers in the Northeast Texas region. In recent years, he was involved in evaluating the profitability of pasture-based herds. He also served as dairy superintendent at many county and regional shows and contests.

Dr. Sudweeks served as Dairy Superintendent at the State Fair of Texas and Superintendent of the Collegiate Judging contest at Fort Worth. He was instrumental in forming the Texas Anima Nutrition

Council, the first Texas association to bring together nutritional consultants and educators who work with the Texas dairy industry. Internationally, he has served as a dairy industry advisor in Brazil and Taiwan.

Dr. Sudweeks and his family intend to continue living in Overton. *Thanks, Max, from your many friends and colleagues for the difference you made to the Texas Dairy industry.*

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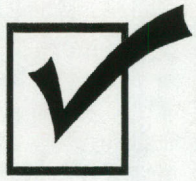

April 7-10, 1999 — Western Dairy Conference, Las Vegas Nevada
Contact: Alexis Park Hotel - (702) 796-3300

May 6-7, 1999 — Mid-South Ruminant Nutrition Conference, Irving, Texas
Contact: Ellen Jordan - (972) 952-9212

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