Mineral Sources for Bovines

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Magnesium and Grass Tetany

Since grass tetany will be covered by a later speaker, I will confine my remarks primarily to our experience in reducing the incidence and severity of grass tetany (hypomagnesemia) under spring and fall green grass grazing conditions by force-feeding magnesium oxide. Magnesium oxide is preferred to magnesium sulfate (Epsom Salt) because of lower cost and better palatability of magnesium oxide compared to magnesium sulfate. Also, magnesium oxide contains approximately 54 percent magnesium compared to approximately 10 percent in magnesium sulfate and the magnesium is reported to be more available in magnesium oxide.

Our goal has been to get from 1.5 to 2.0 ounces of magnesium oxide per head per day into cattle for two weeks before the anticipated trouble and continuing through the grass tetany season. Where pelleted supplements or protein blocks are being fed, this is accomplished by adding magnesium oxide to the formula in the following proportions:

Supplement Per Head Per Day	Magnesium Oxide To Add/Ton Supplement
lbs.	lbs.
2	100
3	70
4	50
5	40
6	35

Adding 200 pounds of magnesium oxide per ton of supplement and feeding one pound per head per day has been tried, but at this concentration palatability and consumption were reduced. Therefore, a minimum of two pounds of supplement per head per day is used to get the desired consumption level of magnesium oxide. Where pellets or blocks are not being fed, mixing salt 50-50 with magnesium oxide and feeding no other salt or mineral has also been helpful. Adding magnesium to formula minerals can also be successful if adequate

consumption is obtained. The most satisfactory program has been adding the magnesium oxide to supplements fed daily. However, even this program is not always successful as on occasions cattle will discontinue eating supplements when lush green grass appears.

Minerals for Reducing Incidence of Urinary Calculi

Ammonium chloride is the one feed additive for which claims have been established for reducing the incidence of urinary calculi. Levels are 0.75 to 1.25 ounces per head per day for range cattle, 1.0 to 1.5 ounces per head per day for fattening cattle, and 0.25 ounce per head per day for sheep. It is quite effective when adequate consumption is obtained. Ammonium chloride is classified as a "new drug." Formula feed companies must have an approved new drug application to incorporate ammonium chloride in supplements and rations. Because of low palatability of ammonium chloride, consumption problems sometimes develop. Ammonium chloride is more expensive than other potential products for reducing incidence of urinary calculi.

For several years a preventative measure of force-feeding two ounces of salt and one ounce of potassium chloride per head per day to wintering steer calves and to steer calves and yearling steers in feedlots has been quite successful in reducing incidence and severity of urinary calculi. This has been true on steers coming from areas known to be "calculi problem" areas. When one pound of supplement is fed per head per day, salt is added at 250 pounds per ton and potassium chloride at 125 pounds per ton to give the two and one ounces respectively. No palatability problems have been encountered under either feedlot or range conditions.

More recently, field observations have indicated that ammonium sulfate fed at about the same levels as recommended for ammonium chloride is also effective in reducing incidence and severity of urinary calculi. The research reported from Texas with lambs rates ammonium sulfate as being number two to ammonium chloride in effectiveness. Ammonium sulfate is quite reasonable in price, apparently more palatable than ammonium chloride, and is not classified as a "new drug." All three of the products listed above are soluble and can therefore be adapted to liquid supplements.

Ammonium chloride has an equivalent crude protein value of approximately 160 percent compared to approximately 131 percent for ammonium sulfate. Ammonium sulfate has the advantage of carrying 24 percent sulfur as a sulfur supplement to non-protein nitrogen when needed.

No official claims have been established for potassium chloride or ammonium sulfate to reduce the incidence of urinary calculi. Both products are considered "GRAS" (generally recognized as safe) by the Association of American Feed Control Officials.

Sodium Bentonite – A Ruminant Potential

Sodium bentonite, once scorned and frowned upon as a cheap, inert filler (dirt) when it appeared in formula feed as a pellet binder, and in minerals as a carrier, is rightfully gaining its place as a respectable product in the list of available ingredients for livestock feeds. This has come about from research with both beef and dairy cattle. Sodium bentonite has the unique property of absorbing nearly five times its weight of water, and at full saturation occupies a volume of 12 to 15 times its dry bulk. In contrast, calcium bentonite does not possess water absorption and expanding capacities to the same extent. The main sodium bentonite deposits in the United States currently being mined are in Northeastern Wyoming. Bentonite deposits in other parts of the United States are largely calcium bentonites. Water suspensions of sodium bentonites give a pH of 8.5 to 10.0 which puts it on the basic side. Sodium bentonite has the ability to absorb ammonia in high concentrations and release it at lower concentrations. This buffering ability indicates potential benefits in ruminant rations (silage).

Results from reports on feeding bentonite to ruminants have been inconsistent. Factors which have probably been involved in lack of consistency include (1) failure to distinguish between sodium and calcium bentonite; (2) levels fed; (3) granulation of bentonite; and (4) methods of feeding. More research needs to be done to define conditions under which response can be expected from bentonite in ruminant rations. However, results from recent research warrant consideration of sodium bentonite under many conditions.

Until 1966 I was one of the "condemners" of bentonite in ruminant rations. At that time my interest was sparked by the observation of a Wyoming feelot operator. Cattle were on a supplement with a high level of urea. When the cattle finished at the bunk after each feeding, even before going to the water trough, they would go to the back of the lot and lick red clay along and under the fence line. We started feeding sodium bentonite free-choice and the dirt eating stopped. This indicated that after eating the cattle had an "uneasy" paunch and were craving a "soother." Sodium bentonite may well come to be known as "the cattle buffer of choice."

Since 1966, American Colloid Company of Skokie, Illinois, has sponsored research in both feedlot cattle and dairy cattle rations. From their plant at Belle Fourche, South Dakota, a special sodium bentonite product, "Volclay Crumbles," has been developed specifically for ruminant feeding. Time does not permit review of specific research results. Detailed reports on each research project are available from American Colloid Company.

In brief, under many conditions, inclusion of sodium bentonite in cattle growing and finishing rations has resulted in increased gains, improved feed efficiency, and lower cost of gains. One of the big visual advantages has been that it has been quite effective almost without exception in reducing, and in most cases eliminating, dirt eating in

feedlot cattle. This is the only product I have encountered which has been consistent in this respect.

The program used to incorporate sodium bentonite into rations is to include it at 2 percent of the ration, replacing an equal amount of grain, and feeding it free-choice in addition where possible. Field observations indicate that when fed free-choice in addition to 2 percent in the ration, finishing cattle on high concentrate rations will increase daily consumption as the period progresses. At times steers at the end of the finishing period have been consuming as high as one pound of sodium bentonite per head per day free-choice. Limited observations indicate that higher responses may be expected from sodium bentonite on high-moisture rations (silage and/or high-moisture grains) than on dry rations. Observation in research tests have indicated cattle going on feed will voluntarily reduce free-choice roughage consumption quicker with sodium bentonite in the concentrate.

Dairymen continue to be faced with high cost roughages in comparison to grains. They wish to feed as little roughage as possible, but, of course, when the roughage (fiber) content of the ration gets too low, then low-fat test milk results. Pelleting of the concentrate and/or roughage portions of the ration also tends to reduce fat test. Products which have been used to hold up the fat test on fat-depressing rations include sodium bicarbonate at 0.8 to 1.0 pound per head per day, or magnesium oxide at approximately 0.4 pound per head per day, or combinations of these two products. Other recommendations include sodium bicarbonate at 1 percent of the concentrate or magnesium oxide at 0.5 percent. They do help, but frequently tend to reduce ration consumption, particularly sodium bicarbonate. Magnesium oxide may tend to cause scouring.

New reports from controlled tests at Wisconsin indicate sodium bentonite is useful in holding up fat test of milk when cows are on fat depressing rations. Sodium bentonite incorporated in the concentrate at 5 percent (100 pounds per ton) was equal to sodium bicarbonate in holding fat test. This amounted to consumption of approximately one pound per head per day of sodium bentonite. The beneficial effect of sodium bentonite appeared to be related to a change in rumen fermentation back to that resembling a normal ration. Sodium bentonite maintained a higher proportion of acetate to proportionate in the rumen than when bentonite was not fed with the fat depressing ration.

Under field conditions, sodium bentonite incorporated in rations plus free-choice feeding has been observed to reduce soil eating in dairy herds. Sodium bentonite was added to the feeding program of a dairy herd that had dropped in feed consumption and milk production but not fat test. Analysis of alfalfa hay revealed 18 to 20 percent protein and cows were receiving a high protein supplement in addition. Reducing protein in supplement and adding bentonite improved feed consumption and milk production. Ammonia absorbing properties of bentonite could have been beneficial.

Since research results available appear favorable for sodium bentonite, and since sodium bentonite would cost less per cow per day than sodium bicarbonate, or magnesium oxide, it appears that sodium bentonite should receive consideration where low fat test problems occur. Currently, sodium bentonite is being shipped from western South Dakota into Florida for dairy rations so there must be some benefits. With both beef and dairy rations, when bentonite replaces grain, ration cost is generally decreased—not increased.