The Latest Across the Plains

Timely Reminders

General

- Clean water sources on a weekly basis.
- Encourage water consumption (have at least 2"/hd, free-choice salt, clean weekly).
- Keep an eye on commodities contract prices the next two months.
- Have us sample hay and silage (silage greater than 4 weeks after harvest).

Beef

- Start thinking about pre-weaning calf diets.
- Feed heavier in the evenings.
- Contact your nutritionist for creep feeding options.
- With high feed prices re-implant cattle.
- Spring calving herds should be pulling bulls soon.
- Safeguard cows after 6 weeks on grass.
- Put up Shades.
- Consider heat abatement.

Unused Feed

"Those who are too smart to engage in politics are punished by being governed by those who are dumber."--Plato

Save Money $$$ Test Your Feeds

Tests are relatively inexpensive, usually costing less than $18, for the information derived. Contact our office to set up an appointment to have us pull feed samples if we have not done so yet.

What's New in the Industry

Prices of by-products are dropping and plants are competing for business.

We want to hear from you...

Do you have a question you would like one of the nutritionists to address in depth in our newsletter? Just submit your question through our website www.GPLC-Inc.com and we will get to work on it.

Calendar of Events

- **July 9-11** Wisconsin Farm Technology Days, New London, WI
- **July 11-13** 3i Show, Dodge City, KS
- **July 19-21** Four State Farm Show, Pittsburgh, KS
- **July 19-27** North Dakota State Fair, Minot, ND
- **Aug 1-11** Wisconsin State Fair, West Allis, WI
- **Aug 2-18** Indiana State Fair, Indianapolis, IN
- **Aug 6-8** Empire Farm Days, Seneca Falls, NY
- **Aug 6—8** Minnesota Farmfest, Redwood Falls, MN
- **Aug 8-18** Illinois State Fair, Springfield, IL
- **Aug 8-18** Iowa State Fair, Des Moines, IA
- **Aug 8-18** Missouri State Fair, Sedalia, MO
- **Aug 10-17** Wyoming State Fair, Douglas, WY
- **Aug 13-15** Ag Progress Days, University Park, PA
- **Aug 15-25** Kentucky State Fair, Louisville, KY
- **Aug 20-22** Dakotafest, Mitchell, SD
- **Aug 21-22** Midwest AG Industries Expo, Bloomington, IL
- **Aug 22-Sep 2** Minnesota State Fair, St Paul, MN
- **Aug 23-Sep 2** Colorado State Fair & Rodeo, Pueblo, CO
- **Aug 23—Sep 2** Nebraska State Fair, Grand Island, NE
- **Aug 27-29** Farm Progress Show, Decatur, IL

The Great Plains News Feed

Assessing the Mineral Status of Beef Cattle

By Zeb Prawl, M.S., Beef Nutritionist

Minerals continue to become increasingly recognized as essential for efficient beef cattle production. Macro minerals such as calcium, phosphorus, potassium, magnesium, and even salt have had the bulk of the attention in cattle supplements in the past. In just the last 10-15 years, the focus has shifted toward trace mineral supplementation for increasing productivity of cattle herds. Zinc, copper, selenium, and manganese have received the most attention. The nutritionists at Great Plains Livestock Consulting have written several articles on the subject in past newsletters (May/June 2012; May/June 2010; July/August 2008), documenting the function and importance of trace minerals in beef cattle diets. Numerous research studies have been conducted to test the minimum levels needed in cattle diets to sustain production, while others have been more specifically focused on items such as elevated feeding levels and the form of trace mineral and its effect on performance. As more commercially available sources of trace minerals become available, whether through the feed or by other means of delivery to the animal, it becomes more challenging to determine which and how much a producer needs to supply of a particular trace mineral to maximize production. One of the keys to help make that decision is to find out the animals' true mineral status.

One of the most common reasons to assess the trace mineral status of a ruminant is to troubleshoot a performance problem. Parameters that are sensitive to proper mineral nutrition such as calving/breeding success and immunity in a beef animal typically drop from desired levels before one starts to question the mineral status of the animal. When performance is impacted, you should be aware that looking at only the blood of the animal sometimes does not give you the best measure of the true status of a particular trace mineral. Likewise, other avenues of assessment, including milk and urine, can be quite variable and highly dependent on age, production status, and even time of eating. Assessment of the animal's true mineral status will fail if inappropriate criteria are used, resulting in misleading findings and subsequent feeding recommendations.

Blood measurements of trace minerals are frequently used in status assessment because they are directly correlated to nutritional status of some trace minerals, and probably even more so because taking a blood sample is less invasive and costly than a liver biopsy. However, there are several limitations to blood analyses. Red blood cells in cattle have a life span of approximately 160 days and because of this, mineral concentrations within the whole blood tend to change slowly. This means that a particular change in diet within the last 30 days will not be accurately reflected in whole blood alone. In addition, metabolic control mechanisms within the animal can limit the degree of changes in concentration of some trace minerals in plasma until body stores such as in the liver are substantially depleted. This means that the stored level of a particular trace mineral might be depleted because of a dietary deficiency, but due to timing of blood collection for assessment, blood and/or plasma levels for that particular trace mineral may appear to still be adequate. In addition, careful handling of blood samples is needed to prevent hemolysis (or breaking down of red blood cells) and contamination of plasma. Time is also of the essence in dealing with certain trace minerals and blood sampling. One hour is often all that you have to separate red blood and plasma before minerals begin to be released from one component and possibly absorbed by the other. When this happens, the true status of that blood component is compromised as well as true mineral status of the animal. Even collection tubes can have an influence on blood test results. For example, typical red-top clot tubes will give inaccurately high zinc concentrations due to a zinc-containing lubricant used on the rubber stoppers. The best type of tube for serum or whole blood collection is the royal blue-top tubes, as they are trace metal free.

Liver biopsies offer a more accurate assessment of many trace minerals in the beef animal. Although a more invasive procedure than collecting a blood sample, the process is still relatively simple and easily performed by an experienced veterinarian, with minimal stress on the animal. It consists of site preparation/sterilization on the right side of the animal's rib cage, a local anesthetic is given, then a very small incision is made that is no bigger than the size of a pencil eraser. A long, thin collection needle is then inserted and very small samples of liver tissue are extracted and stored for testing in special collection tubes. The area is then treated with a general antibiotic to prevent infection. No stitches are needed since the incision is so small. An experienced veterinarian can generally perform the procedure from start to finish in about 10 minutes.

Dr. Simon Timmermans, DVM, MS of VRCS from Greeley, CO performs a liver biopsy on a cow at the Ratcliff Ranch in Vinita, OK.

Photos courtesy of Kim Kohler, Ratcliff Ranch.

As all minerals are not created equal, consideration must be given to what trace mineral one is trying to assess, and then determine which method is best for true assessment of the animal.

Cobalt (Co): Because Co is an essential component of Vitamin B12, assessment of Co status of an animal will often center more on Vitamin B12 status. Both plasma and liver tissue samples can give an assessment of Vitamin B12 status of the animal, which can be correlated back to Co status. However, plasma levels fluctuate quite rapidly with Co intake as well as in response to stress and disease. Liver samples will provide a more accurate assessment of Vitamin B12 and thus Co status of the animal.

Manganese (Mn): Although not typically found to be deficient in normal conditions for a beef animal, Mn is best assessed by liver samples, then whole blood, then plasma. Plasma levels of Mn are highly volatile and fluctuate very rapidly. Liver samples, while still not a great indicator of status, offer the best chance of getting a true assessment.

Selenium (Se): Se appears to be absorbed from the gut primarily based on its dietary availability. Serum Se concentrations change rapidly due to small dietary changes. Inorganic forms of Se are absorbed and transported throughout the body at different rates from organic forms of Se such as Selenomethionine. Whole blood analysis is preferred over just serum analysis due to stability of Se in whole blood. Liver analysis for Se can also be a good indicator of whole body status.

Zinc (Zn): Zn is an element present in every cell in the body. Most Zn is present in red blood cells and thus is somewhat resistant to depletion. In blood, Zn will remain in a normal range even in conditions of clinical deficiencies. Age of the animal makes Zn accumulate differently in the liver of the animal; young animals will absorb Zn into the liver quite readily, while older, mature animals will see little change in liver concentration of Zn due to diet. In plasma though, it is quite variable and will fluctuate during excess and deficiencies. Age, stress and disease challenges also cause Zn to

fluctuate within plasma samples quite readily and must be considered when testing for Zn status of the animal.

Copper (Cu): Cu is probably the single easiest trace mineral to assess within the animal. The liver is the best place to assess status of the animal as it is the true storage place for Cu and will only release Cu when the animal is stressed or when Cu intake by the animal is insufficient for production. Only when Cu stores are depleted will you start to see a decline in serum copper levels.

While many different tests can be performed to assess the trace mineral status of an animal, it is important to know several factors about the cattle being tested, including age, stage of production, and disease challenges. It also is important to sample enough of a herd population to give representative results. In most cases, this will need to be 7 - 10% of a herd to have some confidence in your results. Knowing these factors will help an experienced veterinarian make the right decision when it comes to type of sampling to be done and how to proceed with the results. The results should also be closely examined, and again the type of sampling is an important part of interpretation of results. Blood samples will yield drastically different results from liver samples in some cases. Knowing the range of adequate mineral levels in your test results will be very important when it comes to helping develop a protocol to correct any deficiencies (or excesses) that are found. Make sure you contact your nutritionist to help in that process.

Polioencephalomalacia

By Dan Larson, Ph.D., Nutritionist

Polioencephalomalacia is a rare disease of ruminants, predominantly found in the feedlot, but also noted in grazing cattle. Polio comes from the Latin root meaning gray and encephalomalacia meaning softening, particularly of the brain, specifically the gray matter (polio-encephalomalacia or PEM). Essentially PEM is a softening of the gray matter of the brain caused by inadequate energy supply resulting in insufficient tissue metabolism. If this deficiency is corrected early enough, full recovery is possible, which is why mild cases of PEM can be treated with thiamin. However, if the disease progresses too far, tissue death occurs, followed by death of the animal. Polioencephalomalacia should not be confused with infectious poliomyelitis, more commonly known as infant **polio,** which was effectively eradicated by the Salk vaccine in the mid-1950's. Polioencephalomalacia is a noninfectious disease of cattle characterized by reduced feed intake, impaired vision, muscle tremors, and incoordination. Affected animals will press their head against inanimate objects; grind their teeth, groan, and display convulsions and recumbency. There are two forms of the disease; the acute form sporadically seen in feedlot cattle where affected animals are extensively affected, and the subacute form occasionally seen in animals on pasture. The incidence of the disease is low; however, the death rate can be high (90%) in the acute case with death occurring in about 50% of the affected animals within a few days of the disease. In the subacute form, mortality is about 50%. Animals with the subacute form may recover completely or may have a lower lifetime average daily gain.

There are two primary causes of PEM in cattle, a thiamin deficiency and excess dietary sulfur intake. The excess sulfur can come from either the feed **or the water**. Thiamin is integral to energy metabolism. The brain, due to its high demand for energy is especially sensitive to a thiamin deficiency. Thus, a thiamin deficiency does not specifically target the brain, but is rather seen in a neurological aspect first. Thiamin is supplied by two chief means in a ruminant: microbial production and from feedstuffs. However, processed or long-term stored feedstuffs have lower thiamin content, making ruminal microbial production more important. The principal problem associated with thiamin is thiamin destruction in the rumen. Thiamin may be destroyed by an increase in the amount of thiaminase in the rumen. Thiaminase is an enzyme, which may be present in two different types; thiaminase type I (produced by *Bacillus thiaminolyticus* and *Clostridium sporogenes*) and type II (produced by *B aneurinolyticus*). The latter bacteria thrive under acidotic conditions. An increase in the amount of thiaminase may occur when dietary concentrates are increased too rapidly. This change ostensibly causes the amount of thiamin to fall rapidly. Apparently, the sudden increase in rumen acidity releases the enzyme. Therefore, acidosis is clearly linked to PEM. Certain species of mold also produce high amounts of thiaminase and can lead to increased destruction of thiamin in the rumen. Excessive sulfur intake, as a consequence of high sulfur in either the feed and /or the drinking water of cattle can also lead to the destruction of thiamin in the rumen.

Excess sulfur intake has gained substantial interest in the past few years, due to the proliferation, and mismanagement, of high sulfur corn co-products. When excess sulfur is consumed, rumen microbes produce excess hydrogen sulfide gas. This condition is exacerbated by low pH, otherwise defined as acidosis. The hydrosulfides stay in the rumen fluid phase and hydrogen sulfide gas accumulates in the rumen gas cap. The hydrogen sulfide is absorbed across the rumen wall into the blood stream. This elevated level of sulfide in the blood interferes with energy production, similar to a thiamin deficiency. Since the brain has a high requirement for energy, it is one of the most affected body systems. Sulfide interferes with energy production much the same as hydrogen cyanide. Sulfides also bind with hemoglobin, creating sulfhemoglobins, reducing the oxygen carry capacity, delivering less oxygen to the tissues. In ruminants, a major percentage of gases escaping the rumen through eructation are inhaled, which can also cause lung damage in sub-clinical cases. There is also evidence that high sulfur levels may increase thiaminase activity, creating a duality between sulfur and thiamin in the rumen.

Although sulfur has recently received substantial criticism for causing PEM, acidosis and other issues not discussed here such as cobalt deficiency and amprolium represent a significant portion of PEM cases. In addition, the disease must be differentiated from similar conditions such as lead poisoning, (grass) tetany, water deprivation, antifreeze ingestion, or a vitamin A deficiency. A number of plant species, including the bracken fern, produce a thiaminase and can similar symptoms if ingested. There are also a number of infectious diseases that can cause neurological symptoms similar to PEM. Rabies can cause similar symptoms, and is common in feedlots with a raccoon or skunk problem. Thrombotic meningoencephalitis can also present very similar symptoms and is caused by a *haemophilus somnus* infection. Vaccination for this disease is difficult and can be prevalent in many feedlots. A substantial coccidiosis infection may result in a disorder known as nervous coccidiosis, presenting similar symptoms as those seen in PEM cases. Listeriosis also presents similar symptoms to PEM. Listeriosis is caused by a bacterium harbored in the intestinal tract of cattle and also found in poorly fermented silages. A large rodent population will help spread listeriosis. Making high quality silages is the best preventative for listeriosis. A number of clostridial diseases, including tetanus and enterotoxemia can also cause neurological symptoms similar to PEM.

Cases of PEM are likely a combination of sub-acute or acute acidosis, coupled with a high sulfur diet, which is why thiamin administration is often a successful treatment. However, be certain to differentiate PEM from other infectious and non-infectious diseases. If cattle are appropriately transitioned to a high-concentrate diet and bunks are managed appropriately, PEM cases should be rare. However, care should be taken to test high sulfur feedstuffs such as corn co-products, alfalfa hay, sugar beet pulp, molasses-based products, and barley processing products routinely and to adjust diets accordingly. With appropriate vigilance and diligence, PEM can remain a comparatively rare disease.

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The Great Plains News Feed

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