

Hypomagnesaemia [Grass Tetany] in Beef Cattle

Introduction

Hypomagnesaemia (grass tetany) is a common metabolic disorder in beef cattle caused by low magnesium (Mg) levels in blood. Tetany refers to a medical condition characterized by continuous spasm of skeletal muscle. Cows affected by grass tetany will show signs progressing from irritability, stumbling and thrashing, to coma and death. Although grass tetany is most common in older cows feeding on lush spring grass in the first few months of lactation, it is also common in finishing cattle and those raised in dry lots.

Causes of Grass Tetany

Older cows are most often prone to grass tetany for several reasons. Milk production is a constant drain on magnesium levels and cows need a daily intake of Mg to maintain adequate levels in the blood. In addition, older cows cannot readily mobilize Mg from bone stores, making them more dependent on daily nutritional intake. Cows in the first two months of lactation, especially those in spring calving beef herds, are at the highest risk because lush growing spring grass, standard forage for these lactating cows, is typically low in Mg. Spring grass has a lower Mg content than at other times of the growing season. When grass is growing fast and the soil is cool, potassium (K) is taken up by plants more readily than Mg, which leads to lower Mg content in forages.

However, signs of grass tetany can also be seen when cows are not grazing lush pasture but confined in a dry lot. Since cows have a daily requirement for Mg during early lactation, cows that go off feed can show evidence of hypomagnesaemia even though they are not grazing lush grass. Grass tetany can also be seen in finishing cattle, especially if finishing diets are marginal in Mg levels. Once an animal goes off feed they do not have any reserve Mg capacity and need daily supplementation.

Clinical Signs

Magnesium is essential for transmission of nerve impulses and muscle contraction. Unlike hypocalcemia, low blood levels of calcium, which causes a flaccid paralysis in cattle, hypomagnesaemia leads to tetanic paralysis along with

paddling and rigidity. With close observation, hypomagnesaemia can be identified prior to paralysis. Cows will show a progressive series of signs such as: restlessness, irritability, weakness, excitability, muscle twitching or trembling, incoordination or stumbling, staggering and collapse. Once down, cows will paddle and thrash with their head arched over their back. If not treated, they will become comatose and die. Extra care is necessary in handling these animals as excessive stress can lead to death, while the low blood magnesium brings about behavior changes that can cause them to become very aggressive.

Before the clinical symptoms are noticed, cows with



Early lactation cow grazing lush forage. *Photo courtesy of G. Dewell.*

hypomagnesaemia may exhibit decreased milk production. Udder edema and anemia are also seen when hypomagnesaemia is accompanied with increased potassium levels.

Diagnosis

Diagnosis of hypomagnesaemia is based primarily on cow history, clinical signs and response to treatment. Cows with grass tetany are most commonly older, at early or peak lactation and feeding on lush growing spring grass. Irritability, incoordination and spasmodic paralysis are consistent clinical signs. Typically, these cows will respond with a single treatment of an intravenous (IV) magnesium solution. However, relapse is common if dietary deficiencies aren't corrected. Remember, tetany can occur during winter in animals fed forages that are low in Mg and high in K.

Additional diagnostics can be used to confirm hypomag-

nesaemia. A serum magnesium level below 1.1 mg/dl confirms classical hypomagnesaemia. However, cows will respond with increased milk production if supplemental Mg is administered when serum is below 1.5 mg/dl. Interestingly, serum samples from cows that died from hypomagnesaemia may not have low serum Mg levels because muscle contraction during and after death push Mg back into the blood stream. Ocular fluid from dead animals can be used if the cow has only been dead for less than 6-8 hours because ocular fluid magnesium levels equal serum Mg levels at time of death. This method depends on the temperature. Rib bone calcium (Ca) to magnesium (Ca:M) ratios can be used to confirm hypomagnesaemia in animals that have been dead longer. A Ca:Mg ratio greater than 100 would indicate Mg deficiency.



Down cow with abnormal behavior and evidence of thrashing.
Photo courtesy of G. Dewell.

Treatment

Treatment of grass tetany is primarily accomplished with an IV administration of a magnesium solution. Veterinary assistance is essential because rapid administration or excessive blood levels of Mg can cause cardiac arrest. Some veterinarians may inject additional Mg solution subcutaneously to help reduce relapses. Oral or rectal administration is also recommended to insure that the cow has a source of Mg in the short term because occasionally IV treatment alone is not sufficient to prevent a relapse. Many commercial solutions to treat hypomagnesaemia also include Ca because many cows with grass tetany will also have some level of hypocalcemia since hypomagnesaemia decreases Ca mobilization.

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Cover photo courtesy of Erika Lundy.



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Prevention

Mature lactating beef cows are most at risk for grass tetany. If turn out can be delayed until grass is at least 6 inches tall, the risk for grass tetany is greatly reduced. Soils that are low in Mg and high in K are more likely to have problems. Rapidly growing lush grass that has been fertilized with nitrogen (N) and K or high application of a combination, including phosphorous (P) in NPK fertilizer, increases the risk. New grass growth in cool spring weather tends to have lower Mg levels, but incorporating legumes in the pasture will increase the Mg content of the forage in the spring diet.

Cattle at lower risk for grass tetany, stocker calves or dry cows, should be placed on high risk pastures. In the short term, prevention of grass tetany can be accomplished by supplementing Mg in the diet. Initiate Mg supplements at least two weeks prior to turn out on lush grass. High Mg mineral is not always palatable, so relying on free choice mineral intake may not be adequate. There are some indications cows that develop grass tetany may be more at risk in the future. For winter tetany or dry lot situations, attention should be focused on consistent intake of feed that is balanced to make sure adequate Mg is being supplied.

Since cows cannot readily mobilize body stores of Mg to maintain healthy blood levels, they need daily Mg supplements, especially those feeding on lush growing grass. Dry lot or finishing rations should also be evaluated. An additional problem for cows grazing early spring grass that is high in K but low in Mg is that high K compromises the active transport Mg pumps in the intestinal tract, further exacerbating the problem. An average daily intake of 30 grams of Mg is recommended for lactating cows. If K is elevated in the diet then Mg intake should be 40-60 grams. Magnesium oxide (MgO) is commonly used to provide supplemental Mg for cows. However, MgO is not the most palatable so it is usually mixed with a palatability enhancer such as distillers grains or molasses. There is tremendous variability in MgO quality. Simple bioavailability assays can be conducted to determine MgO availability.

Conclusions

Hypomagnesaemia can affect any type or age of cattle during any season; but older cows in early lactation, grazing lush forage in the spring are most at risk. Death can occur quickly and it is often difficult to provide treatment in time after clinical signs are identified. Preventative practices such as developing low risk pastures, minimizing fertilization in spring, managing cattle appropriately prior to turn out and providing supplemental Mg as needed are essential.