



Beef Cattle Handbook



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Grass Tetany in Beef Cattle

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Grass tetany is a syndrome, primarily involving mature cattle grazing on succulent forages. It is seen in almost all parts of the world.

Occurrence and Description

Kopziekte or grass tetany was described in the Netherlands about 1930. Since that time, lactation tetany has been found in Great Britain, grass staggers in New Zealand, wheat pasture poisoning in the High Plains region of the U.S., winter tetany in West Virginia, and milk tetany in calves (Littledike et al. 1983). In the western U.S., tetany frequently occurs when lactating cows graze early spring growth of crested wheatgrass (*Agropyron desertorum* or *Agropyron cristatum*). It occurs less often as winter tetany (Bohman et al. 1980).

These local names describe either the symptoms, the physiological state of the animal, the season of the year, or the type of feed consumed as related to the occurrence of tetany. The consumption of young succulent forage is associated with grass tetany and wheat pasture poisoning. It is also typical of cattle grazing crested wheatgrass in the West. Grass staggers typifies the uncoordinated gait of animals in the early stages of tetany, while winter tetany describes tetany of cattle fed harvested winter feeds. Milk tetany is typical of young calves fed a milk diet. Lactation tetany describes the physiological state of the animal when tetany usually occurs. Typical signs of grass tetany begin with an uncoordinated gait and terminates with convulsions, coma, and death.

The most consistent clinical sign of grass tetany is hypomagnesemia, and typical grass tetany is frequently

described as hypomagnesemic tetany. Plant magnesium (Mg) levels of 0.2 to 0.25 percent constitute a safe level to prevent tetany (Grunes et al. 1970). Most investigators have accepted the level of 0.2 Mg unless some antagonist is present at a high level. The following criteria have been used to evaluate tetany danger of forage Mg for lactating or pregnant beef cows (Bohman et al. 1980).

Tetany prone	less than 0.12% Mg
Marginal	0.12 to 0.18% Mg
Adequate-nontetany state	more than 0.18% Mg

Plasma levels of Mg are described as follows:

Normal Mg	1.7 to 3.2 mg/dl
Hypomagnesemia	1.0 to 1.7 mg/dl
Tetany-prone	less than 1.0 mg/dl

A plasma level of approximately 1.7 mg/dl is the renal threshold for Mg. When plasma levels are less than 1.7, little Mg is excreted in the urine. Thus, urine composition has been used to evaluate the Mg status of the animal:

Magnesium supply	Mg in urine (mg/1)
Adequate to liberal	> 100
Inadequate	20 to 100
Severe deficiency, danger of tetany	< 20

Many metabolites are involved in the expression of the syndrome that we call grass tetany. Limited dietary intake of Mg is the primary cause of tetany in the west. In Nevada and other western states, many forages are

low in Mg. In fact, the tetany-prone areas may be mapped by the Mg content of the forage. Often these tetany-prone areas are also the same areas that have crested wheatgrass seedings. Succulent crested wheatgrass has been reported to have .08 percent Mg (Stuart et al. 1972). With winter tetany, non-legume hays average 0.12 percent Mg or lower; many of these hays are as low as .03 to .05 percent Mg (Bohman et al. 1980). In contrast, Mg, even in tetany-prone areas, is not usually this low elsewhere (Bohman et al. 1983; Grunes 1983; Grunes et al. 1970).

In addition, plasma and forage calcium (Ca) may both be low with tetany. Calcium has been involved with tetany as indicated by the so-called "tetany ratio," $K/(Ca + Mg)$, on an equivalent basis. If this ratio is greater than 2:2, the forage is classified as tetany-prone. Thus, a low content of either Ca or Mg or both could create a high ratio. Hypocalcemia, rather than hypomagnesemia, is probably the major problem associated with wheat pasture poisoning (Bohman et al. 1983; Hom 1983; Littledike and Bohman 1984).

The availability of Ca or Mg may be modified by other dietary factors. High dietary intake of nitrogen (N), potassium (K), and aconitic acid have been associated with tetany even with a marginal intake of Mg and/or Ca. This has been demonstrated with both supplemental K (Newton et al. 1972) and with high K pastures.

When cattle graze on immature cereal grains, the percent K in the forage is high (3 to 5 percent) while Ca and Mg are marginal. This also created a high tetany ratio, 2.2 to > 3.0. When pastures are fertilized with high levels of nitrogen, ruminants grazing the pastures usually have lower serum Mg (Sell and Fontenot 1980). Forage N content was high when tetany occurred on cereal pastures (Bohman et al. 1983). Some have questioned the role of dietary N on Mg availability.

When N has been added to the diet of animals by itself, it has little effect on Mg absorption. In grazed forage (Kemp 1983), N is positively associated with forage higher fatty acids (HFA). Thus, higher levels of forage N indicate higher levels of HFA and total lipids, which suggests an increased formation of Ca and Mg soaps that are indigestible, and that consequently lower the available Ca and Mg for the animal. The addition of vegetable fats to the diet has lowered plasma Mg (Wilson et al. 1969). High levels of transaconitic acid in the plant have also been associated with tetany (Bohman et al. 1969; Grunes et al. 1970).

Predisposing Conditions of Tetany

Mature animals are far more susceptible to grass tetany than younger ones because of their inability to mobilize Mg from their bones to meet the need for homeostasis in the body fluids. Prolonged administration of KCl, however, will lower both plasma Ca and Mg even in the young animal (Martin et al. 1983). The slow depletion of plasma Mg and Ca probably precludes the occurrence of tetany in younger animals. Tetany has been seen in younger animals, but rarely.

Tetany usually occurs when the grass or cereal grains are immature and rapidly growing; usually this means that most cases are observed in the spring months.

Tetany usually occurs near parturition or until approximately 2 months postpartum, and the frequency usually increases with older cows. Young animals and steers rarely get tetany.

Tetany occurs most frequently in beef cows grazing pastures. Cool, rainy weather generally accelerates the occurrence of this malady.

Tetany seldom occurs when legumes or legume grass mixtures are a major portion of an animal's diet. Legumes may contain twice or more the concentration of Mg as do grasses grown on the same soil.

Pastures heavily fertilized with high levels of nitrogen or pastures with high soil K are more likely to produce tetany-prone pastures, but tetany will occur under other conditions also.

Preventing Tetany

Although tetany is caused by a metabolic deficiency of Mg and Ca, it is usually not possible to prevent it with supplemental Mg and Ca in mineral mixes. These minerals, especially Mg, need to be supplied on a daily basis, and the consumption of mineral mixes by all animals is usually not consistent enough to prevent tetany in a herd of animals, although it will help. This problem is accentuated in large pastures. Cattle should have access to a high Mg mineral mix while grazing tetany-prone pastures.

If the initiation of grazing is delayed, less tetany will occur. Many times this is not possible to control. Frequently, the tetany-prone pasture is the only feed available to the livestock producer at that time, so the producer has little choice. Magnesium is more available in mature plants than in younger ones.

Graze less susceptible animals on high risk pastures. Steers, heifers, dry cows, and cows with calves over 4 months old are less tetany-prone. Including legumes in pasture mixes will decrease the incidence of tetany in grazing cattle.

Cattle that develop tetany are more prone to do so again. They should either be culled or placed on a different management program.

If cattle will consume dry feeds on succulent tetany prone pastures, these feeds will decrease the incidence of tetany. The dry feeds may also be used as a carrier to get additional Mg and Ca into the animal at this critical time.

If the drinking water can be controlled, spiking the water with a soluble Mg salt is an effective way to supply this mineral to grazing animals. Magnesium oxide, a common source of magnesium, is insoluble in water and cannot be used for this purpose. Magnesium acetate, magnesium chloride, and magnesium sulfate (Epsom salts) are soluble and can be used.

Treatment

Many animals afflicted with grass tetany die before symptoms are seen. The interval between the first signs of

tetany and death can be as short as 4 to 8 hours. When symptoms are observed, there is little opportunity to get other help or medicinals if they are not readily available to treat the animal. The treatment most frequently recommended at this time is the intravenous injection of calcium magnesium gluconate (200 to 500 ml). Several commercial preparations are available. These should be administered carefully to avoid a toxic reaction.

An Mg enema is one suggested emergency treatment for affected cattle (Bell et al. 1978). Dissolve 60 grams of magnesium chloride in 200 ml of water, place it in a collapsible plastic bottle, and attach it to a plastic tube (an A.I. tube works well) for administration. Plasma Mg has increased from .65 to 2.22 mg/dl in 20 minutes using this procedure. In addition, it is less expensive and safer to use, and does not require the aseptic techniques that intravenous injections do.

Animals in an early tetany stage should be handled carefully to avoid creating additional stress. If an animal goes down or is down with tetany, either of the above two treatments can usually be administered without undue problems. If tetany occurs, take one or more of the following steps as soon as possible:

1. Immediately treat affected animals as previously described.
2. Get supplemental Mg into all of the animals in the herd as soon as possible. At this time, mineral supplementation is not the method of choice. This step does not guarantee that all cows will get Mg immediately. If the animals are familiar with concentrates, feed this fortified with Mg so that each animal consumes 1 to 2 ounces of magnesium oxide daily or the equivalent. If the animals are not familiar with concentrates, they will probably not eat it soon enough to prevent an outbreak. Adding Mg to the water under the conditions described earlier will work.
3. Move the herd quietly to more mature pastures or pastures containing legumes.
4. Move the herd from the tetany-prone pastures to a location where they could be fed hay, preferably legume hay.
5. If tetany is anticipated, but has not yet been seen, watch the herd closely; take blood, urine, or forage samples to predict the tetany status of the animals, and be prepared to act. Previous nutritional history will not modify the response of animals to a tetany situation. To prevent this malady, Mg must be supplied on a daily basis when tetany-prone conditions exist.

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