



**Guideline for medical interventions**  
**Veterinary Medicine**  
**Large ruminant Medicine and surgery Guidelines**

## **Metabolic disorders- hypomagnesemia**

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## Definition

**Hypomagnesemia** is a metabolic disease of cattle characterized by **low magnesium concentration in blood and cerebrospinal fluid**, leading to neuromuscular hyperexcitability, tetany, convulsions, and sudden death. It commonly affects **lactating cows grazing lush pastures** and is often called:

- Grass tetany
- Grass staggers
- Lactation tetany

The normal serum magnesium: **1.8–2.4 mg/dl while in Hypomagnesemia: <1.2 mg/dl**

## Etiology

Magnesium cannot be stored efficiently in the body; therefore, cattle depend on **daily dietary intake**.

**Primary causes:**

## 1. Low dietary magnesium

Occurs in:

- Rapidly growing pastures
- Spring grass
- Winter wheat pasture

## 2. Reduced magnesium absorption

Due to:

- High potassium intake
- High nitrogen fertilization
- High calcium intake
- Low sodium

## 3. Increased magnesium requirement

Occurs in:

- Early lactation
- Stress
- Cold weather
- Transport

## 3. Predisposing Factors

Risk increases with:

### Animal factors:

- Older cows
- Lactating cows
- High milk producers
- Beef cows more than dairy in pasture systems

### Nutritional factors:

- Lush green pasture
- High potassium grass
- Heavy nitrogen fertilization
- Low fiber diet
- Low magnesium intake

**Environmental factors:**

- Cold weather
- Rain
- Sudden pasture changes
- Stress

**Pathogenesis**

Magnesium plays a critical role in neuromuscular stability, enzyme systems and energy metabolism. Magnesium acts as a natural calcium antagonist and inhibitor of acetylcholine (ACh) release at the neuromuscular junction, promoting muscle relaxation

When magnesium decrease, acetylcholine release increases increasing neuromuscular excitability and the nerve cells become hyperactive. Therefore, the animal showed muscle tremors, convulsions, tetany. Death due to respiratory failure.

It is important to mention that unlike calcium, magnesium regulation depends mainly on dietary absorption, not hormonal control. Therefore, diarrhea can induce hypomagnesemia.

**Clinical Signs**

**Peracute form:**

- Sudden death

- No prior symptoms
- Often found dead near pasture

**Acute form:**

**Early signs:**

- Nervousness
- Hyperexcitability
- Ear twitching
- Muscle tremors
- Stiff gait

**Progressive signs:**

- Ataxia
- Aggression
- Bellowing
- Teeth grinding
- Hypersensitivity to sound and touch
- Convulsions
- Paddling movements
- Opisthotonos (star gazing)
- Frothing at mouth
- Nystagmus

**Terminal stage:**

- Recumbency
- Coma
- Death from respiratory failure

**Clinical Examination Findings**

### Typical findings:

- Increased heart rate
- Increased respiratory rate
- Normal or elevated temperature
- Muscle rigidity
- Hyperesthesia
- Convulsions triggered by stimulation

### Diagnosis

#### Clinical diagnosis:

##### History:

- Grazing pasture
- Lactating cow

##### Signs:

- Convulsions
- Hyperexcitability

#### Laboratory diagnosis:

##### Blood findings:

- Low serum magnesium (<1.2 mg/dl)
- Sometimes low calcium (combined deficiency)

CSF magnesium: More accurate indicator.

Urine magnesium: Low.

### Treatment

This is an **emergency condition**.

#### 1. IV magnesium therapy

Given as:

- Magnesium sulfate solution
- Often combined with calcium

Example:

**Calcium magnesium borogluconate:** Dose: 500 ml slow IV.

## 2. Subcutaneous magnesium

Provides sustained effect (Mg sulphate 10% SC)

## 3. Sedation (if severe convulsions)

- Diazepam
- Xylazine (carefully)

## 4. Environmental management

- Keep animal quiet
- Avoid stimulation
- Move slowly
- Reduce noise

Stress may trigger fatal convulsions.

## Prevention

### Nutritional prevention:

#### 1. Magnesium supplementation

Recommended intake: **20–30 g Mg/day**

- Magnesium oxide
- Mineral mixes
- Feed supplements

#### 2. Pasture management

- Avoid heavy nitrogen fertilization
- Avoid excessive potassium fertilization

- Provide mixed forage
- Provide hay with pasture

### 3. Mineral supplementation methods:

- Mineral blocks
- Water medication
- Concentrate supplementation
- Pasture dusting with MgO

### 4. High risk period prevention:

- 2–4 weeks after turnout
- Early lactation
- Cold weather

### Differential Diagnosis

| Disease                   | Key distinguishing signs       |
|---------------------------|--------------------------------|
| Milk fever                | Flaccid paralysis, low calcium |
| Rabies                    | Behavioral change, aggression  |
| Nervous ketosis           | Acetone odor                   |
| Lead poisoning            | Blindness, diarrhea            |
| Polioencephalomalacia     | Cortical blindness             |
| Tetanus                   | Rigid paralysis                |
| Organophosphate poisoning | Salivation and diarrhea        |
| Meningitis                | Fever present                  |
| Brain abscess             | Chronic neurological signs     |

### Prognosis

Good prognosis if:

- Treated early
- Animal still standing
- Mild signs

**Poor prognosis if:**

- Repeated convulsions
- Recumbency and Delayed treatment

Mortality: Can reach **30–90% if untreated**

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