HYPOMAGNESEMIA (GRASS TETANY)

Dr. Naqa Saleh

OVERVIEW

- Rare
- (Ruminants) Cows & ewes
- Mostly in recently calved beef cows
- Can occur in dairy cattle (if un supplemented)
- Clinical signs: subclinical to sudden death
- Acute form: one of the few true veterinary emergencies

Etiology

Despite its vital importance there are no specific homeostatic control mechanisms for the regulation of magnesium levels

- Mg is a major intracellular cation and is important for the activity for many enzymes
- Absorption (rumen & omasum) _ (milk production + kidneys and gut excretion) = extracellular Mg level
- Factors influencing dietary Mg:

1. Soil & grass Mg level
2. High K level (as fertilizer): disrupt Mg absorption
3. High ammonia: inhibits Mg absorption (directly, indirectly by raising rumen pH)
4. Spring low fiber pastures fasten gut movement leading to less absorption

- PTH partially controls renal excretion of Mg: high PTH → conservation of Mg
- Mg reserves: large reserves esp. in the bone. Available in calves but with age mobilization decreases in short term deficits
- Lactation: consumes Mg by excreting it into milk

EPIDEMIOLOGY

- 1st two months of lactation, 4-7 years → most susceptible
- Ewes with twins, 1-4 weeks after lambing esp. after stress of movement, ….
- Frisian have lower Mg levels than Jersys
- Most common: Lactating cows after closed housing in winter turned out to grass dominant pasture
- Wheat pasture poisoning: Young green cereal crops pasture (few weeks) can induce hypomagnesemia in pregnant & lactating cattle & sheep
- Beef cow or dry dairy in pasture and inadequate nutrition esp. with no shelter in winter or changeable weather.

PATHOGENESIS

- Mg influences impulse transmission at the neuro-mascular system: Ach release, motor end-plate sensitivity, muscle membrane threshold, cholinesterase system activation
- Concurrent hypocalcemia may contribute
- Low Mg in CSF also causes abnormal nervous function

Morbidity: variable (climate condition, management)
Mortality: high (treatment available / short disease course)

CLINICAL FINDINGS

- Acute, sub-acute, chronic

***1. Acute lactation tetany*:**

- ✓ Unusual alertness
- ✓ Hypersthesia, twitching of muscles
- ✓ Staggering gaits with tetany
- ✓ Clonic convulsions for one minute: opisthotonus, nystagmus, frothing at the mouth, champing of the jaws, pricking of the ears, retraction of the eyelids
- ✓ Between episodes lies quietly but a sudden noise or touch →another attack
- ✓ Increased temperature (40-40.5 °c)
- ✓ RR & pulse are high
- ✓ Heart sound intensified and heard away from the cow
- ✓ Death within 1-5 hours due to asphyxia caused by sever contraction of thoracic and intercostals muscles

Lateral recumbency and frenzied paddling of the limbs in a cow having seizures due to hypomagnesaemia

CLINICAL FINDINGS

2. Sub-acute lactation tetany:

- ✓ A gradual onset during 3-4 days
- ✓ Wildness of facial expression
- ✓ Exaggerated limb movements
- ✓ Spasmodic urination & frequent defecation
- ✓ Decreased appetite & milk yield
- ✓ Muscle tremor & mild tetany of hind limbs & tail
- ✓ Sudden restraint may percipitate violent convulsion
- ✓ May recover within days spontaneously or progress to recumbency with similar but rather milder syndrome

CLINICAL FINDINGS

3. Chronic hypomagnesaemia:

- ✓ Many animals in affected herds have low serum Mg but do not show clinical signs
- ✓ Sudden death may occur
- ✓ vague syndrome: dullness, indifferent appetite
- ✓ May develop one obvious syndrome
- ✓ Decreased milk production
- ✓ May occur after treating subacute form

CLINICAL FINDINGS

4. Parturient paresis with hypomagnesaemia

- ✓ Described in milk fever
- ✓ Dullness & flaccidity replaced by hyperesthesia & tetany

There are no specific findings postmortem

CLINICAL PATHOLOGY

- ***Mg*** level in ***serum***: fall less than 1.2 in tetany & 1-2 in subclinical form (normal 1.7-3 mg/dl)
- ***Ca*** level in ***serum***: often reduced to 5-8 mg/dl
- In <u>wheat pasture </u>poisoning:
- ✓ Ca & Mg ↓
- ✓ K ↑
- ***CSF Mg*** level: decreased to 1.25 mg/dl
- ✓ diagnostic but not simply or safely collected (12 h after death)
- ***Urine Mg*** level: decreased, good presumptive evidence

Differential diagnosis

Cattle:

- Lightening stricke
- anthrax
- Acute lead poisoning
- Rabies
- Nervous ketosis
- Bovine spongioform encephalopathy

Sheep:

- Hypocalcemia
- Phalaris poisoning
- Stagger syndromes

TREATMENT

- Emergency case
- Sedation of convulsing cows with xylazine or barbiturates
- IV infusion of Mg (2-3 gr/cow) in 5-10 minutes
- SC inj. Of 250 ml of 20% solution to evade relapses during the next 12-24 h
- It is appropriate to use Ca containing fluids
- Oral Mg for further insurance (after regaining reflexes)
- Oral Mg is also suitable for less severe hypomagnesaemia
- Commercial drenches used as non-specific supportive enteral fluid therapy in lactating cows contain 200-250 gr Mg sulfate

Control

- High risk animals should be moved from high risk pastures and replaced by low risk animals
- Adequate Mg in the DM (3 g/kg DM for lactating cows on spring pasture)
- Magnesium oxide is the commonly used salt
- Supplementation:

✓ Cattle: Daily feeding of 120 gr is safe (180 may cause diarrhea)

✓ Sheep: Daily feeding of 7 gr/ 14 gr every other day

High-magnesium cobs being fed to at-risk beef cows.

Barley straw being provided to at-risk beef cows to slow gut transit time while grazing lush pasture.

Hypomagnesaemic tetany of calves (whole milk tetany)

- Etiology: milk as only source of nutrients (low in Mg)
- Predisposing factors:

1. Calves that chew bedding fiber that stimulates salivation and losing Mg
2. Calves fed with milk-replacer diets
3. Diarrhea in calves
4. Other diseases esp. enzootic muscular dystrophy

- Epidemiology:

1. Most commonly in 2-4 months of age or older
2. Sporadically or number of deaths within a short time

Hypomagnesaemic tetany of calves

- ***Clinical findings:***
- First: constant movement of ears , Hyperesthesia to touch, exaggerated tendon reflexes, Shaking of the head, opisthotonos, ataxia without circling followed by a droopy, backward carriage of the ears , difficulty in drinking
- Later, fine muscle tremors appear, followed by kicking at the belly, frothing at the mouth and spasticity of the limbs. convulsions follow, beginning with stamping of the feet, head retraction, champing of the jaws and falling, decrease respiratory movements , tonic and clonic movements of the limbs, involuntary passage of urine and feces protrusion and retraction of the eyeballs
- Treatment:
- Response to magnesium injections (100 mL of a 10% solution of magnesium sulfate).

TYPES OF SEIZURES

Generalized seizures

- Tonic/ clonic seizures (Grand mal seizures)
  - ✓ Tonic phase: Fall
    Unconscious
    Limbs extend rigidly
    Opisthotonos
    Apnea
  - ✓ Clonic phase: Running/ paddling movement
    Chewing
  - ✓ Visceral activity: Pupillary dilation
    Salivation
    Urination