

## ANTIQUALITY FACTORS

### CYANOGENETIC GLUCOSIDES (Prussic acid poisoning)

#### **The problem**

Prussic acid (hydrocyanic acid, HCN). Hydrolysis of glucosides occurs when growth is retarded by adverse environmental conditions and by bacterial action in the rumen. The resulting cyanide is rapidly absorbed into the blood. Cyanide combines with hemoglobin to form stable cyanohemoglobin which does not carry oxygen.

Animal dies of asphyxiation (cellular level).

Occurrence - HCN not normally found in plants. Plant injury from cutting, grazing, freezing or wilting. Also ruminal microflora can act on glucosides to release HCN.

Species - sorghum, sudangrass, jonhsongrass, choke cherry, goosefoot grass, white clover.

Levels -

0-25 mg HCN/100 g dry plant tissue - Safe for pastured animals

50-75 mg HCN/100 g - Safety is doubtful

> 100 mg HCN/100 g - Highly dangerous

#### **Symptoms**

Increased respiration

Increased pulse rate

Gaspings

Muscular twitching

Convulsions

Death from respiratory paralysis

Blood is cherry red color

Asphyxiation at cellular level

#### **Prevention**

Young growth most toxic

Don't graze until frosted leaves have begun to dry out.

No problem in hay or silage

Not in pearl millet or foxtail millet.

### BLOAT

## **The problem**

Stable viscous foam in rumen prevents eructation.  
USA losses \$80 million/year

## **Occurrences**

high-concentrate in feedlot  
legume hay  
grazing pastures which contain a large percentage of legumes.

Species -- alfalfa, red clover, white clover, sweetclover and alsike clover.

Species that are not a problem -- Birdsfoot trefoil, lespedeza, tropical legumes in general, and grasses

## **Cause ???**

Saponins  
Plant protein 18S

The stable foam from spherical protein molecules reach surface of the rumen fluid. The molecules uncoil, become insoluble and stabilize the foam. Tannins can precipitate the proteins.

## **Prevention**

Pasture management - <50% legume.  
Feed grass hay before turning animals out to pasture  
Feed forage containing tannins before turning out on pasture.  
Antifoaming agents - Polyoxypropylenepolyoxyethylene  
Bloatguard - poloxalene; antibiotics; natural oils (soybean, corn, peanut, or olive)

## **NITRATE POISONING**

### **The problem**

Animals eat forage with high levels of nitrate.  
Nitrate converted to nitrite in the rumen. Nitrite absorbed into the blood, converting hemoglobin to methemoglobin (incapable of oxygen transport). Animals are asphyxiated.

## Occurrences

High application on N fertilizers  
Drought  
Damage to plant -- Ps activity slows or stops  
Low light intensity  
Plant species and cultivars differ

## Subclinical nitrate poisoning

Decreased growth  
Decreased reproduction  
Decreased milk production

## Nitrate Levels in Forages

Nitrate (Dry matter basis)		
ppm	% basis	Comment
1-1000	0 - 0.1	Safe in all conditions
1000 - 5000	0.1 - 0.5	Safe for non-pregnant females. Limit to less than 50% of feed for pregnant females.
5000 - 10,000	0.5-1.0	Limit to less than 50% of ration. Expect abortions and decreased milk production.
>10,000	>1.0	Highly toxic. Death likely.

## Prevention

Provide energy supplement  
Dilute by providing other feeds  
Test forage - 'graze one cow' if no other means available  
Recognize situation where toxic compounds are likely

## Treatment

IV methylene blue solution. Converts methemoglobin to hemoglobin

1-4% solution (1g methylene blue/100 kg body weight)

## **GRASS TETANY**

### **The problem**

Magnesium deficiency or impaired utilization  
1-3% cattle and sheep lost annually  
Sporadic and localized outbreaks  
Usually involves the more mature animals  
Lactating animals (especially early lactation)  
Spring pastures  
Wet soils, cold soils

### **Symptoms**

Nervous apprehension  
Hypersensitivity  
Stiff stilted gait  
Staggering, twitching of muscles esp face and ears  
Violent convulsions  
Teeth grate  
Serum Mg 1 mg/100ml blood  
Coma  
Death

### **Forage Mg related to:**

Botanical composition  
Seasonal changes  
Fertilization treatment  
Soil temperature and soil moisture

### **Availability of Mg to animal suggested related to:**

legume>grass  
High N and K  
High Ca and P  
Fatty acids  
Organic acids  
Aluminum

## **Many factors related to grass tetany**

Mg deficiency <0.2% critical 0.25% 'safe'  
K: 2% in diet shown to decrease Mg absorption  
K:[(Ca+Mg)] >2.2

## **Prevention**

Supplement Mg to animal. 2 oz/day/animal of MgO 85% pure  
MgCl<sub>2</sub> or MgSO<sub>4</sub> in drench with H<sub>2</sub>O

## **TALL FESCUE TOXICOSIS**

### **Introduction**

Tall fescue is an important pasture species.

Nutritive value of TF comparable to other cool season species (ex. orchardgrass).

Variable animal responses to TF consumption.

### **Animal Disorders -- Symptoms and Occurrence.**

Fescue foot  
Fat necrosis  
Summer syndrome  
Reproduction problems - especially in mares at foaling

### **Causative Agent(s) of TF toxicosis**

Fungus association [*Neotyphodium coenophialum* (Morgan-Jones and Gams)  
Glenn, Bacon, Price and Hanlin]  
Formerly *Acremonium coenophialum*; Formerly *Epichloe typhina*

Alkaloids found in tall fescue:

**Diazaphenanthrene alkaloids** - perloine and perlolidine. Likely associated with lower cellulose digestion and VFA production. - produced by the plant regardless of the endophyte status

**Pyrrolizidine alkaloids** - N-acetylloine and N-formylloline. - may be related to some of the symptoms - produced by the plant but only if the endophyte is present

**Ergopeptine alkaloids** - (ergovaline and ergosine), ergosterol and ergosterol derivatives. - thought to be associated specifically with the toxicity. - produced by the endophyte

*Acremonium coenophialum* (Morgan-Jones and Gams)

Location in the plant  
Method of spreading  
Identification

Laboratory Assays: Staining test, grow-out test (for seeds), enzyme-linked immunosorbent assay (ELISA), plating and callus culture.

### **Endophyte-free varieties**

Certification

Examples: Johnstone, AU Triumph, Martin

Problems: Establishment, insects, diseases, stand longevity.

Management

Reestablish stand with fungus-free variety ?????

Dilution - seed clover or supplement

Nitrogen fertilization - use only as needed

Utilize TF when least likely to cause problems

Hay and silage - remain toxic.

Stockpiled TF remains toxic but utilization during cold weather reduces visible symptoms in cattle. Weight gains are depressed.