Nutritional Dysfunction of Grazing Animals

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“Dysfunctions” in Grazing Animals

• Pasture issues
  – Forage allowance / intake
  – Bloat

• Mineral concentration
  – Magnesium
  – Copper
  – Selenium
  – Macro/micro

• Poisonous plants
The Relationship of Grazing Pressure and Animal Performance

Gain/Animal

Gain/Unit Area

Undergrazing

Under Maximal

Optimum Range

Optimum Grazing Pressure

Overgrazing

Adapted from Mott and Moore, 1970
Relationship of Forage Allowance to Intake Potential

Forage Allowance

Lb DM / 100 lb BW

NRC
Marsh
Wheat Pasture

Allowance for 1100 lb cow

Lb DM

NRC
Marsh
Wheat Pasture
**Bloat**

- Gas that is normally produced in the rumen can not be removed.
- Results in distention of reticulo-rumen
- Frothy bloat occurs on pasture
  - Legumes
  - Winter annuals
- Plant, animal, microbes all contribute
- Treatment includes:
  - Drench with oil
  - Antifoaming agents
  - Polaxalene
  - Open the rumen
Grass Tetany – Magnesium Issue

• Occurs on lush rapidly growing forage
  – Winter annuals, ryegrass
• Imbalance of N and K relative Mg
• Inadequate plasma Mg concentration
• Inadequate Mg absorption from diet and mobilization from bone
• Mature cattle more susceptible
• Symptoms:
  – Restless
  – Stop grazing
  – Run for no reason
  – Walk with high-stepping action
  – Legs become stiff
  – Tetanic spasms
  – Chronic convulsions
  – Coma
  – Death
• Supplement with high Mg mineral
• Supplement with cereal grains
Copper

- One of the most common trace mineral deficiencies
- Cu & P most severe limitation to cattle in tropic/subtropic areas
- Usually seen in grazing situations
  - Seldom seen in grain-based diets
- Generally not due to absolute deficiency in diet
  - Antagonistic effect with other minerals
    - S, Mo, Fe
- Liver main storage organ, plasma transient measure
- Only 1-3% of dietary Cu absorbed
- Symptoms are general in nature:
  - Anemia
  - Diarrhea
  - Depressed growth
  - Infertility
  - Loss of hair coat pigment (roaning)
  - Loss of hair around eye
  - Weak, fragile bones
Trace Mineral Deficiencies

• Trace mineral deficiencies are difficult to diagnosis because symptoms are general and similar to other deficiencies
  – reduced intake, reduced performance, unthrifty, rough hair coat
• Absorption and availability of some trace minerals depends on the form of the mineral
• Mineral requirements depend on stage of production and physiology of animal
• Many interactions & antagonisms exist between minerals
• Supplement with well designed free choice mineral supplement
Poisonous Plant Problems

- Almost everyone has fields with toxic plants
- Presence of toxic plant does not mean it caused problems
- Animals can eat small amounts of most plants without harm
- Plants vary widely in toxicity
  - Toxicity = amount needed for adverse effects
- Toxicity varies during growing season
- Toxicity may vary due to weather conditions
- Animals vary widely in acceptance and susceptibility
Situations Associated with Livestock Poisonings

- Overgrazing or lack of supplemental feed
- Animals unfamiliar with pasture
- Dietary imbalances
- Recently cleared pastures or change in usage
- Incidental / curiosity
- Herbicide usage?
- Unexplained
Why Doesn’t Every Animal Suffer

• The plant may not be eaten
• Plants may not contain toxic concentration at the time
• Animals may be immune to poison
• Animals may not have eaten the poisonous part
• Plant may have been rendered nontoxic or diluted by forage/feeding management
Severity of Poisoning

- **Plant Species**
  - Determines the poisonous substance
- **Plant Parts**
  - Entire plant, leaves, stem, root, seed
- **Environment**
  - Shade, drought, frost
- **Plant Age**
  - Immature fast growing vs seeds
- **Form of Feed**
  - Hay may be safer form than pasture – prussic acid
Diagnosing Plant Poisoning

• Access to the plant
• Evidence of consumption
• Compatible clinical signs
  – History, time course, season
• Compatible post mortem findings
• Description of management conditions
• Kind and age of livestock
• Detection of toxin (+/-)
• Rule-out other problems
Common Symptoms of Poisoning

- Diarrhea
- Vomiting
- Dilated pupils
- Slow pulse / Accelerated pulse
- Labored breathing
- Coffee-colored urine
- In-coordination
- Hemorrhaging
- Ulcerated Skin
- Nervous/Trembling/Thrashing
- Paralysis
- Death
Common Poisonous Plant Problems

- Nitrate
- Cyanide
- Perilla mint
- Lantana
- Coffeeweed
- Nightshade
Nitrate Poisoning

• Corn, rye, wheat, sorghum, sudan grass, many others
• High nitrate dependant upon:
  – Species
  – Heavy fertilization
  – “Stress” of drought, cloudy weather, decreased temperatures
• Nitrate stays in dried forages, reduces in ensiled forages
• Nitrate $\rightarrow$ Nitrite in ruminants
  – Methemoglobin formation (blood cannot carry oxygen)
  – Brown color to blood
  – Animal dies from lack of oxygen
Cyanide Poisoning

- Prunus, Sorghum, Triglocin, other species
  - Johnson grass, sudan grass, sorghum, arrow grass
  - Wild black cherry, cherry laurel, chokecherry
- Plants contain prussic acid, cyanogenic glycosides
  - Release cyanide when wilted or ingested by ruminants
  - Harvested forage slowly volatilizes to reduce concentration
- Cyanide prevents oxygen release at tissue
  - “Cherry red” blood
  - Quickly develop dyspnea, weakness, paddling, seizure, death
  - If survive 60 minutes, most animals will recover
  - 100 grams cherry leaves can kill a 100 lb animal
• Cyanide intoxication on left (bright red blood)
• normal appearing blood (middle)
• blood from nitrate intoxicated animal on the right (dark red blood).
Specific Toxic Plants
Perilla mint
*Perilla frutescens*

- Perilla mint
  - annual herbaceous plant, square stems
  - contains perilla ketones
  - Also known as Beefsteak plant
- Causes pulmonary edema, emphysema
- Cattle mainly affected
  - Difficulty in breathing
  - “Grunt” when exhaling
  - May have a nasal discharge
- Occurs mainly in the late summer and fall
Lantana camara

- Toxic Principle: lantadene A & B (Pentacyclic triterpenes)
- Foliage and berries toxic
- Causes damage to liver
- Hepatogenous, photosensitization, hepatotoxic, cholestasis, GI irritation
- Used commonly as an ornamental
- Commonly escapes cultivation
- Grows in all types of soils, drought resistant
- Not well accepted by animals
  - Usually when grazing is poor

0.75-1 lb of dry leaves in 400 lb bovine
Approx. 1% of BW of green leaves
Lantana camara

• Clinical signs in cattle
  – Depression
  – Loss of appetite
  – Diarrhea, maybe constipation
  – Icterus (jaundice)
  – Photosensitization
    • Skin
    • Eyes
  – Liver failure, kidney failure
Photosensitization

• In cattle and horses, commonly will only affect the light colored hair and skin regions
Senna spp  (Formerly Cassia spp.)

- **S. occidentalis**  coffee senna, coffee weed
- **S. obtusifolia**  sicklepod

- Toxic principle: substituted quinones, other unknown toxins
- Toxin in green plant, dried plant, and seeds
- Myodegeneration
Senna spp  (Formerly Cassia spp.)

• Clinical signs
  – Anorexia
  – Depression
  – Diarrhea, straining, may have poor appetite
  – Colic, abdominal pain
  – Walk slowly
  – Weakness, may stumble when they walk
  – Can show mild muscle tremors
    • Especially the rear legs
  – Go down, unable to rise
  – If severe, coffee colored urine
  – Death
Senna spp  (Formerly Cassia spp.)

• Found along roadsides, waste areas, pastures, especially in partially shaded areas
• Prefers sandy soils, open pinelands
• Upright herb, 1-2 feet tall
• Leaves alternate, pinnately compound  
  – 4-6 obovate leaflets 1-2 inches long
• Flowers yellow and small
• Seeds in sickle-shaped pods 4-8 inches long
Senna obtusifolia

Senna fasciculata

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Crotalaria spp.

- C. spectabilis  showy crotalaria
- C. sagittalis  rattlebox, arrow crotalaria

- Toxic principle: monocrotaline (pyrrolizidine alkaloid)
- Concentrated in seed, also in leaves and stem
- Hepatotoxic

- Loss of condition, weakness, incoordination, stupor, death.
Crotalaria spectabilis
Crotalaria spectabilis
Nerium oleander

• Oleander
• Ornamental shrub or small tree
• All parts of the plant are toxic
• Contains cardioactive glycoside
  – Act like digitalis to heart function
  – Animal dies very quickly
• 1/8 lb can kill a 500 lb animal
• Cuttings, or hungry animals placed in area
Rhododendron spp.

- Rhododendrons, Azaleas, Laurels
- Toxic principle: grayanotoxin (andromedotoxin)
  - Glycoside (cardiac activity and neurotoxic)
- GI irritation, weakness, bradycardia, depression
- Coma, death
- Sheep and goats often have projectile vomiting
  - Aspiration pneumonia
Quercus spp.

• Oaks
• Toxic principle: gallotannins, pyrogallols
• Young tender leaves and buds, acorns
• Gastritis, nephritis, perirenal edema

Pl. 68-4. Quercus rubra (Red Oak)—leaves and fruits

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Solanum nigrum

- Black nightshade, deadly nightshade
- Solanum or nightshade family very large
- Contains toxic glycoalkaloids
  - Solanine, solanidine
- Unripe berries most toxic
- Plant not well accepted by most animals
- Remains toxic when dried

- Annual herb, 2-3 feet tall
- Leaves alternate, ovoid to deltoid
  - Coarsely toothed
  - 2-4 inches long, 1-2 inches wide
- Small white flowers
- Fruits black
- Found throughout the South
- Gardens, pastures, edge of woods

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Solanum nigrum

• Clinical signs
  • Loss of appetite
  • Maybe some excess salivation
  • Abdominal pain
  • Diarrhea or constipation
  • Weakness may progress to paralysis
  • Go down
  • Death
Solanum dulcamara
bittersweet nightshade
Conclusions

• Other than lack of pasture availability, other dysfunctions are more difficult to diagnose
• Trace minerals deficiencies are hard to id on the surface.
  – Provide mineral
• Poisonous plants exist
  – Good pasture management
  – Good animal management
  – Good weed management