Nutrient Deficiencies and Toxicities

AG 240
Water Deficiency Symptoms

- Reduced feed intake and productivity
- Weight loss due to dehydration
- Increased excretion of nitrogen and electrolytes such as sodium and potassium
Carbohydrate Deficiencies

- Inadequate energy is one of the most common nutritional problems of ruminants
- Starvation
Carbohydrate Deficiencies

- Ketosis
  - Excess amount of ketones in blood and tissues
  - Also known as hypoglycemia
  - Breakdown of tissue protein for energy
  - Common in animals requiring high amounts of energy
    - Cattle in peak lactation
    - Late pregnancy in sheep
General Symptoms of Ketosis

- Loss of appetite
- Loss of body weight
- Increased water consumption
- Decreased milk production
- Abortion
- Acetone smell on animal’s breath
- DEATH
Carbohydrate Deficiencies

- Diabetes Mellitus
  - More common in humans
  - Insufficient insulin production by the pancreas
    - Some genetic propensity
Fat/Lipid Deficiencies

- Ruminant
  - Generally not a fatty acid deficiency because of ruminant microbes
Fat/Lipid Deficiencies

- Monogastric
  - Most common in poultry
  - Reduced growth and reproductive performance
  - Edema, subcu hemorrhages (bruising)
  - Poor feathering in chickens
  - Scaly skin in swine
Protein Deficiencies

- Poor growth rate
- Reduced milk and egg production
- Infertility
Protein Deficiency Notes

- Severity of symptoms is related to the severity of the deficiency
  - Subclinical deficiencies are relatively common
- Usually associated with other nutrient deficiencies
Protein Toxicity

- Not a problem in monogastrics if have access to adequate water
- More common during periods of lush growth in spring months
- Be cautious if feeding NPN

- AA toxicity
  - Methionine is depressing at high levels
Beware of feeding NPN.....

- Without adequate supply of CHO
- If consuming low quality forage
- If animal is not adapted to NPN source
- Feed is not properly mixed
  - Especially Urea
- Why?
  - Ammonia levels exceed what the liver can handle
Specific Feedstuff Concerns

- Corn
  - Mycotoxins
    - Fungal growth
  - Symptoms
    - reduced feed intake
    - poor growth
    - diarrhea
    - chronic exposure can cause liver damage
Specific Feedstuff Concerns

- Wheat
  - Essential Fatty Acid balance
  
  Wheat versus Corn

Source: “Applied Animal Nutrition”; Cheeke
Specific Feedstuff Concerns

- Sorghum
  - Tannin
    - astringent
  - Affects digestive absorption
  - Bird resistant sorghum is high in tannins
  - Tannin content can be reduced in feed processing
Sorghum Con’t

- Prussic Acid
  - Glycosides
    - Converted to prussic acid during drought or frost damage
  - Cyanogenic glycosides
    - Sorghum converts this to cyanide
Specific Feedstuff Concerns

- **Raw Soybeans**
  - Toxic to humans and animals
  - Toxins include protease inhibitors, lectins, goitrogens
  - Toxins are killed by heating
Specific Feedstuff Concerns

- **Cottonseed**
  - Gossypol found in yellow pigment in cotton seed
    - Actually a natural pesticide
  - Seed is processed to leave the gossypol in the CSM
  - CSM is heat processed to “bind” gossypol
  - Ruminants should not be fed more than 9% dietary CSM
Cottonseed

- Symptoms
  - Gossypol damage is cumulative
  - Ruminants are more tolerant
    - Calves are more susceptible
Cottonseed

- Symptoms con’t
  - Heart liver and lung damage after long exposure
  - Olive green yolks in stored eggs

Source: “Applied Animal Nutrition”; Cheeke
Specific Feedstuff Concerns

- Sweetclover
  - Molding converts coumarin to dicoumarin
    - A mycotoxin that has anticoagulant properties
Moldy Sweetclover Hay
Results of Moldy Sweetclover Hay

Also known as “bleeding disease”

Treatment:
Vitamin K
Blood Transfer
Specific Feedstuff Concerns

- **Rapeseed**
  - Contains glucosinolates that may induce goiter

- **Canola meal**
  - Comes from low-glucosinolate rapeseed
Rapeseed and Canola Meal

- Depressed growth, goiters and enlarged livers in swine
- Poor egg production or off-flavored eggs from layers
- Enlarged thyroid in chick embryos
Tolerance of Rapeseed and Canola Meal

- Poultry and swine and other non-ruminants can tolerate 5-10% rapeseed/canola meal in their diets.
- Ruminants can generally tolerate diets of 10% rapeseed/canola meal.
Disorders related to Grasses

- Nitrate Poisoning
- Grass Tetany
- Tall Fescue Toxicosis
Nitrate Poisoning

- Associated with plants that are heavily fertilized with nitrogen
  - Grasses and vegetables accumulate nitrates
Nitrate Poisoning Facts

- Levels of .5 % (DM basis) or more nitrate is potentially dangerous
- Levels of 1.5% will cause acute poisonings
- Cattle are most susceptible; Horses least susceptible
Nitrate Poisoning

- Nitrates are converted to nitrites in the GI tract
  - Nitrates are not very toxic
  - Nitrites are quite poisonous

- Nitrites convert hemoglobin to methemoglobin
  - Methemoglobin cannot carry oxygen
Nitrate Poisoning Symptoms

- Oxygen deficiency
  - Labored breathing
  - Bluish mucous membranes
  - Convulsions
  - Dark brown/chocolate blood
Grass Tetany

- Also called “grass staggers”, “wheat pasture poisoning”

- Not just magnesium deficiency
Grass Tetany

- Spring grass tends to be very low in magnesium and cattle are in later stages of gestation or early lactation (higher requirements)

- High N fertilization and cold, wet weather intensifies problem
Grass Tetany Symptoms

- Symptoms characterized by very low blood levels of magnesium
  - High levels of potassium in the blood are common
Grass Tetany Acute Symptoms

- Run blindly, stagger and fall
- Convulsions
  - Running motion of feet
Grass Tetany **Acute** Symptoms

- Coma
- High mortality rate
  - 6-10 hours from onset of symptoms
  - Treatment must begin before coma stage
Grass Tetany Less Acute Symptoms

- Undue excitement
  - Muscular twitching
  - Grinding teeth
  - Excess salivation
  - Eyelid twitching
- Incoordination
- Loss of appetite
Treatment of Grass Tetany

- Calcium gluconate IV
  - Fortified with magnesium and phosphorous
  - Administer slow because of effect on heart
Treatment of Grass Tetany

- Move animal to dry feed for 5 days
- Do not work animals until symptoms go away
Preventing Grass Tetany

- Remove from green pastures and feed dry hay
- Mineral mixes with added Mg
- Dust pastures with Mg Oxide
Tall Fescue Toxicosis

- Tall Fescue
  - Endophyte fungal infestation that produces toxic alkaloid substance
  
  - This same fungus is responsible for the good nutritional benefits of Tall fescue
Tall Fescue Toxicosis Symptoms in Cattle

- Roughened hair coat
- High body temperature
- Rapid breathing
- Excessive salivation
Tall Fescue Toxicosis Symptoms in Cattle

- Fescue foot

Blood flow to peripheral tissues is decreased
Tall Fescue Toxicosis Symptoms in Cattle

- Necrosis of extremities

Tips of ears can also be affected
Tall Fescue Toxicosis Symptoms in Cattle

Cattle grazing tall fescue spend less time grazing and more time in the shade or standing in water.
Tall Fescue Toxicosis Symptoms in Brood Mares

- Prolonged gestation
  - Up to 13 months or more
  - Fetus continues to grow
  - Foals may appear to be immature

- Abortion
  - Premature separation of chorion
Tall Fescue Toxicosis Symptoms in Brood Mares

- Dystocia
- Thickened placenta
- Retained placenta
- Aglactia
  - Suppression of lactation