

# Nutrient Deficiencies and Toxicities



AG 240

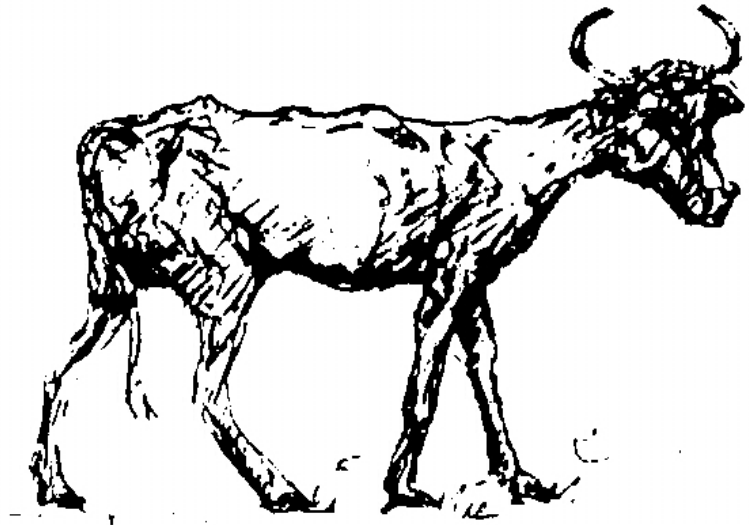


# Water Deficiency Symptoms

- 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

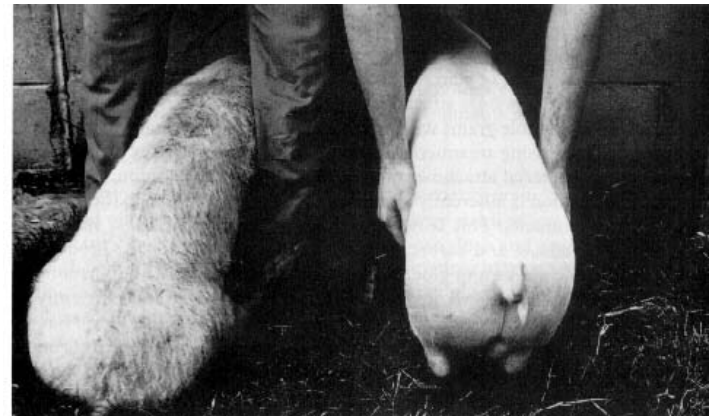
- Ruminant

- 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

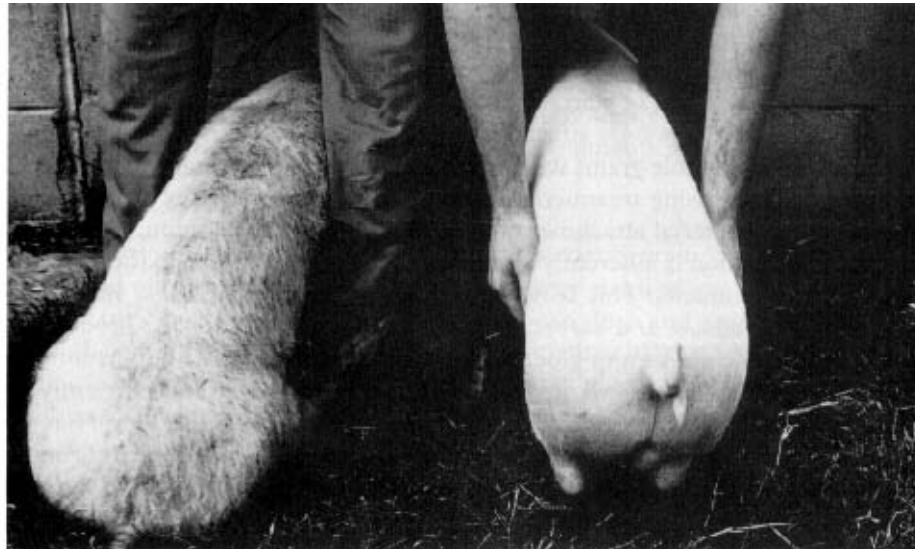
- reduced feed intake
- poor growth
- diarrhea
- chronic exposure can cause liver damage



# 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



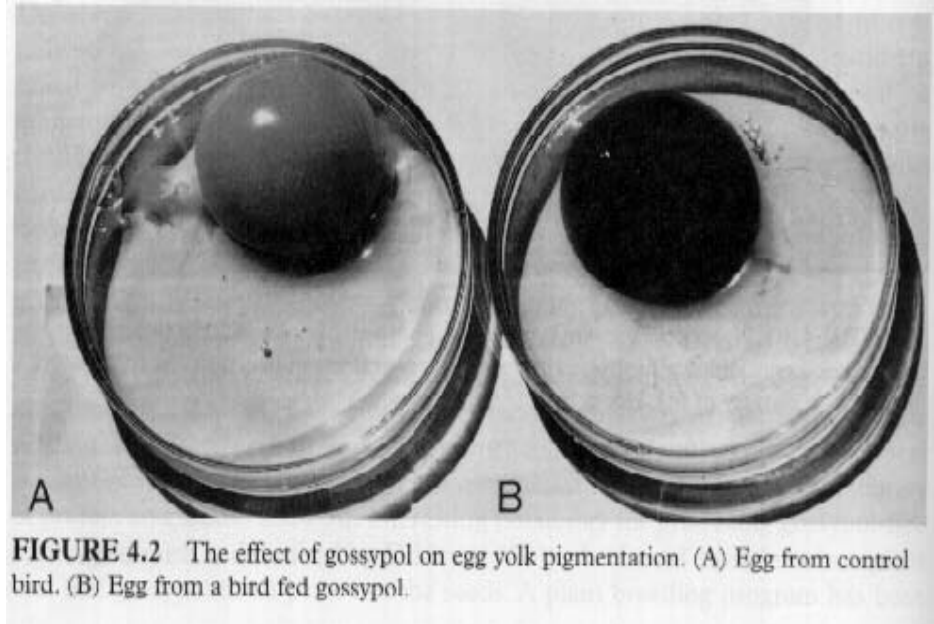
# Cottonseed

- Symptoms

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

# Cottonseed

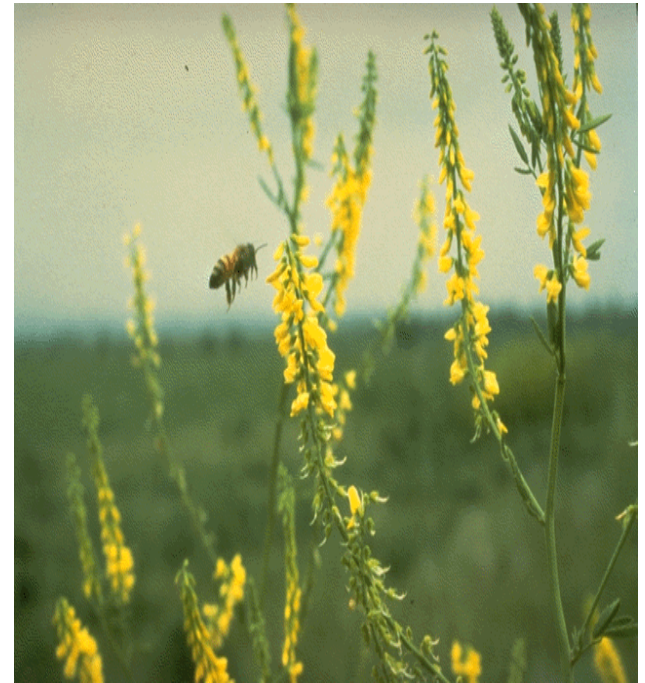
- Symptoms con't
  - Heart liver and lung damage after long exposure
  - Olive green yolks in stored eggs



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



**Treatment:**  
**Vitamin K**  
**Blood Transfer**

Also known as “bleeding disease”

# 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 can not 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