



Mineral Deficiencies

AG 240

Winter 2005



Importance of Minerals

- ⌚ **Skeletal development**
- ⌚ **Constituents of fat and protein that make up muscles**
- ⌚ **Enzyme systems**
- ⌚ **Maintaining osmotic pressure**



Minerals most likely to be deficient in livestock rations

- ∩ **Calcium**
- ∩ **Magnesium**
- ∩ **Sodium**
- ∩ **Phosphorous**



Calcium - Ca

∞ Interactions

- **Ratio with P should be 1-2:1 of Ca:P**
- **Also related to Vitamin D because of absorption**
- **Excess Mg decreases absorption**

Calcium Deficiency Symptoms

☿ Rickets

- In young animals
- Crooked legs
- Enlarged joints

☿ Osteoporosis

- In older animals
- Brittle, weak bones

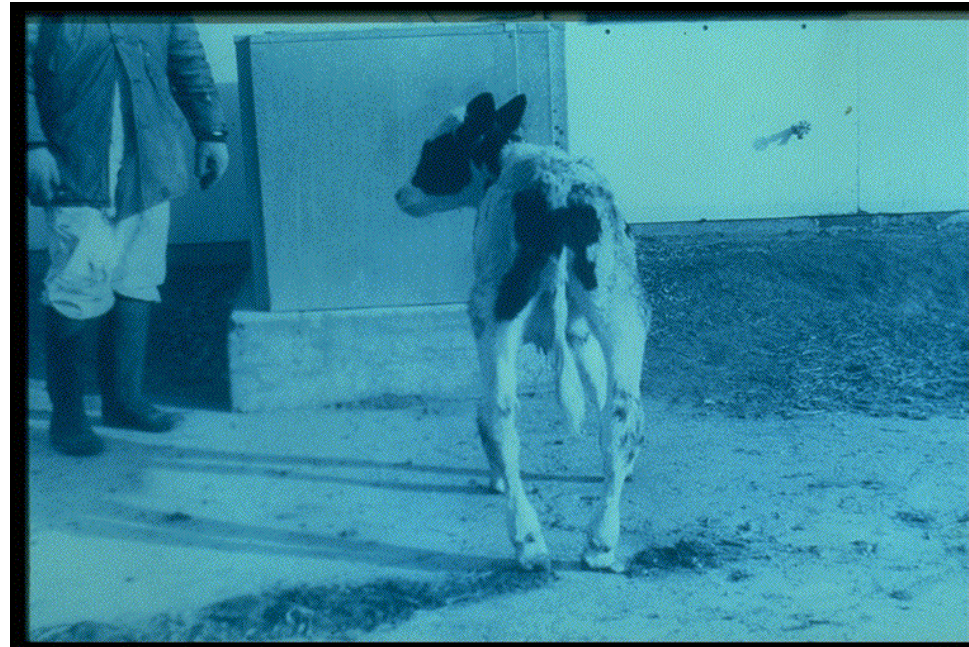


Photo courtesy of Irlbeck (CSU)

Calcium Deficiency Symptoms

- ∩ **Thin shelled eggs**
- ∩ **Milk Fever in dairy cattle**



Photo courtesy of Irlbeck (CSU)



Milk Fever Symptoms

- ∩ **Hypocalcemia**
 - **Low blood calcium**
- ∩ **Very prevalent just prior to calving**
- ∩ **Loss of appetite**
- ∩ **Nervousness**
- ∩ **Loss of consciousness and collapse**
- ∩ **Head turned toward flank**



Phosphorous - P

- ⌚ **More common in grazing species**
 - **Legumes are high in Ca and low in P**
- ⌚ **Rocky Mt region is deficient in P**
- ⌚ **Mineral most likely to be deficient in beef cattle (other than salt)**



Phosphorous Interactions

- ⌚ **Should be in a 1:1 to 2:1 ratio with Calcium**
- ⌚ **Excess Ca or Mg decreases absorption**

Phosphorous Deficiencies

⌘ **Rickets**

⌘ **Osteomalacia**



Photo courtesy of Irlbeck (CSU)

Phosphorous Deficiencies

⌚ Pica

- **Chewing bones, rocks, boards**

⌚ Decreased reproduction and growth

- **Can be severe**



Photo courtesy of Irlbeck (CSU)



Phosphorous Toxicity

- ♏ **Urinary calculi in male ruminants**
 - **“kidney stones”**
 - **Hard masses that can grow from crystals forming within the kidneys**



NACL - Salt

⌚ **Most widely fed mineral**

⌚ **Requirements vary with specie**

- **Swine .25 - .5 % of diet**
- **Cattle - 20 pounds per year**
- **Sheep**
 - **Lambs .5 pound per month**
 - **Ewes 1 pound per month**
- **Horses lose 30 grains of salt for every pound of perspiration**



NACL Deficiency Symptoms

⌚ **Craving for salt**

⌚ **Emaciation, listlessness and general poor performance**



NACL Toxicity

∞ Occurs in non ruminants

- **If NA level above 8%**

∞ Problems in poultry and swine

- **Usually related to high levels of alkali salts in water**

∞ Symptoms

- **Staggering gait, blindness**



Magnesium- Mg

∞ Interactions

- **Excess upsets Ca and P metabolism**
- **Reduces potassium retention**
- **Toxicity of Mg not likely**

Magnesium Deficiency

♏ Grass Tetany





Potassium - K

∞ Interactions

- **Excess reduces Mg absorption**
 - **Mg deficiency reduces K retention that leads to K deficiency**



Potassium Deficiency

- ⌚ **Forages have high concentrations of potassium**
 - **Therefore only a concern when high levels of grain being fed**
- ⌚ **Lethargic condition with high incidence of coma and death**



Sulfur - S

⌘ **Supplemental S may be necessary when non-protein nitrogen sources are being utilized in high grain feedlot diets**



Iron - Fe

∞ Interactions

- **Ca-P ratio influences absorption**
- **Copper required for proper metabolism**



Iron Deficiency

♁ **Always deficient in young pigs**

- **Low body reserves of Fe**
- **Milk is low in Fe**
- **Anemia results**
 - **Insufficient hemoglobin in blood so animals can't carry required amount of oxygen to body tissues**
- **Always give baby pigs iron shot**



Iron Toxicity

⌚ **Can build up over time if feeding rock phosphates or near processing mill**

⌚ **Symptoms**

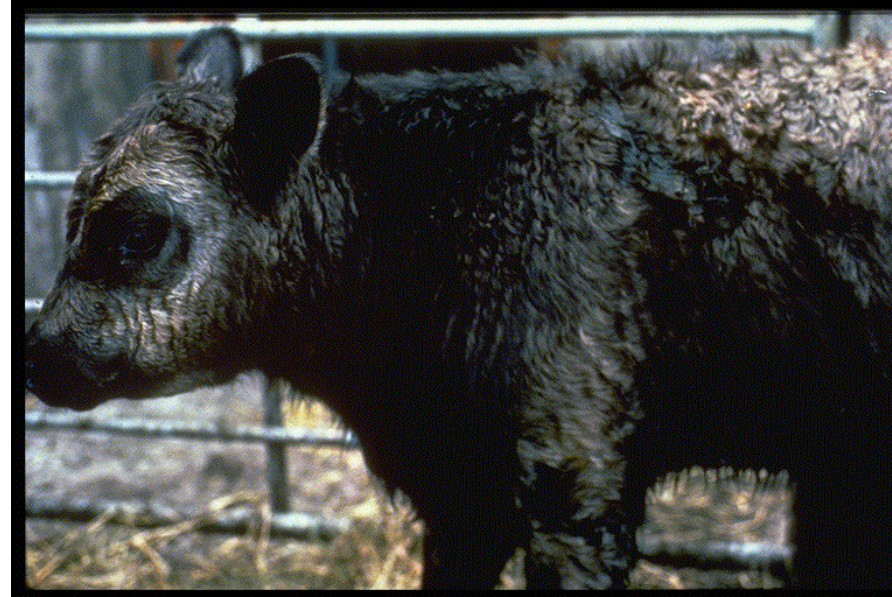
- **Enlarged soft bones**
- **Teeth that wear off rapidly**
- **Difficulty walking**

Copper - Cu

∞ Interactions

- **May be deficient because of excess amount of Mo or Sulfate**
- **Required for Fe metabolism**

Ghost eye calf
caused by high Mo



Copper Deficiency

∞ Depigmentation of hair

- Lighter than normal

∞ Loss of wool



Photo courtesy of Irlbeck (CSU)

Copper Deficiency

- ⌚ **Partial paralysis of rear quarters**
- ⌚ **Impaired breeding performance**



Photo courtesy of Irlbeck (CSU)

Copper Deficiency

- ⌚ **Nervous symptoms**
- ⌚ **Lameness**
- ⌚ **Staggered gait**



Photo courtesy of Irlbeck (CSU)



Copper Toxicity

- ♁ **Primarily in young animals that consume mineral supplements for other species**
 - **Or wrong supplement**
 - **If feed cattle salt block to sheep; it is toxic b/c too much copper for sheep**
- ♁ **Levels above 250 ppm with same symptoms as deficiency**



Copper Toxicity

⌘ Symptoms

- **Affects liver and can cause red blood cells to be destroyed**
- **Can have high death rates**

Zinc - Zn

∞ Interactions

- **Excess Zn interferes with Cu metabolism and may cause anemia**

Zinc Deficiency

⌚ Symptoms

- **Parakeratosis in swine**
 - **Dermatitis of itching, scaly skin lesions**



Photo courtesy of Irlbeck (CSU)

Zinc Deficiency Symptoms Con't

- ∞ **Poor hair or feathering**
- ∞ **Slipping of wool**



Photo courtesy of Irlbeck (CSU)



Manganese - Mn

∞ Interactions

- **Excess Ca and P decreases absorption of Mn and thus increase requirements**
- **Cereal grains (corn) are low in Mn**

Mn Deficiency

♁ Chickens and poultry mainly

- **Perosis**

- **Enlarged hock joint and bird has trouble moving**



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Mn Deficiency



♂ Impaired reproduction

- **Testicular degeneration in males; defective ovulation in females**

♂ Weakness and poor balance in swine

Iodine - I

∞ Deficiency symptoms

- **Goiter (enlargement of the thyroid gland)**
- **Stillbirths**
 - **Hairless pigs**
 - **Wool less lambs at birth**



Cobalt - Co

∞ Interactions

- **Component of Vit B12**
 - **Needed by rumen bacteria for growth and synthesis of B12**

Cobalt Deficiency

∞ Anemia

- Paleness of visible mucous membranes

∞ Causes deficiency of Vitamin B12

- Retarded growth and listlessness



Photo courtesy of Irlbeck (CSU)



Selenium - Se

- ⌚ **Essential element for in all livestock rations but in excess it is toxic**
- ⌚ **Depends on soil types and plants grown in low Se soils**
- ⌚ **Strong relationship with Vitamin E**



Selenium Deficiency

Ω White muscle disease

- **Nutritional muscular dystrophy**
- **White muscle because of increase Ca-P salt deposits**
- **Very difficult for animal to contract their muscles**
- **High death rates in young animals**

Selenium Toxicity

⌘ Symptoms

- **Elongated hooves**



Se Toxicity Symptoms Con't

- ∩ **Loss of tail and mane hair in horses**
- ∩ **Sloughing of hoof**
- ∩ **Difficulty walking**

