Minerals and Vitamins for Goats and Sheep

Steve Hart

E (Kika) de la Garza Institute for Goat Research

Langston University

11/9/2012

Goat Program at Langston University

- Web site www.luresext.edu
- Research Nutrient Requirements
- Internal Parasites
- Field Day April 26th
- Newsletter

Nutrients Required by Animals

- Energy
- Protein
- Water
- Vitamins
- Minerals

Vitamins

- Fat soluble A,D,E,K
- Vit A deficient in bleached or weathered hay or stockpiled forage
- Vitamin D sunshine vitamin
- Vitamin E linked to Selenium
- Supplements and Mineral mix
- Body stores

General Recommended Vitamin Levels

- Vitamin A 5,000 IU/lb
- Vitamin D 2,000 IU/lb
- Vitamin E 80 IU/lb

B Vitamins

- Water soluble
- Synthesized by rumen microbes
- Deficiency of Thiamin
- Polioencephalomalacia
- Coccidiostat Corid Amprolium
- High concentrate diets especially with S-Molasses

Niacin

- Useful in lactating animals
- Increases milk production
- Reduces incidence of ketosis
- Feed .25-.50 g/d

Macro minerals

- Calcium, Phosphorus, Magnesium potassium, sodium, Chloride, Sulfur
- Requirements Cal Phos
- Dry .4% .3%
- Lactating .6 .4
- Ca:P 1.3-2.0

Calcium Level .4%

- Functions in bone, muscle and nerve contractions
- Deficiency causes rickets, bowed limbs, lameness
- Vitamin D necessary for calcium absorption
- Most grains are deficient in calcium

Phosphorus Level .3%

- Function in soft tissues and bone growth, body pH
- Deficiency reduces growth, pica, depraved appetite
- Expensive feed ingredient
- May be close to adequate if poultry manure has been applied

Magnesium Level .18-.4%

- Functions as a component of bones and function of nervous and muscle system
- Major deficiency symptom is grass tetany on lush cool-season pastures
- Excitability, staggering, confulsions loss of appetite
- Feed palatable mineral with high level of magnesium

Potassium, Sodium, Chloride .8-2.0%

- Electrolytes in body
- Minerals lost in diarrhea
- Deficiency causes reduced growth, pica-depraved appetite, stiffness
- Salt is sodium chloride
- Potassium seldom deficient

Sulfur Level .2-.32%

- Functions in protein synthesis, milk and hair production
- Deficiency causes poor performance, hair loss, excessive saliva and tears
- Feeds with natural protein sources provide sufficient sulfur

Providing for Macromineral Requirements

- Necessary to know hay and grass analysis
- Many protein supplements contain macro and trace minerals and vitamins
- Mineral supplement with min 12% calcium, 7% phosphorus
- Read the label

Urinary Calculi Prevention

- No supplemental P
- Add Ca to 2.0-2.5 Ca:P ratio
- No milking ration
- Plenty of clean liquid water
- Salt
- Ammonium chloride .5%
- Biochlor 4.0 oz./day

Problems With Goat Trace Mineral Nutrition

- Mineral requirements for goats are not well known
- Sheep requirements are better known.
- May be breed differences in requirements
- Stress increases mineral requirements?
- Poor and variable intake of mineral supplements by goats

Problems With Goat Trace Mineral Nutrition

- Differences in forage mineral content
- Major affect by geology
- Soil pH affects mineral availability
- Plant species, stage of maturity and environment
- Goats consume a variety of plants

Problems With Goat Trace Mineral Nutrition

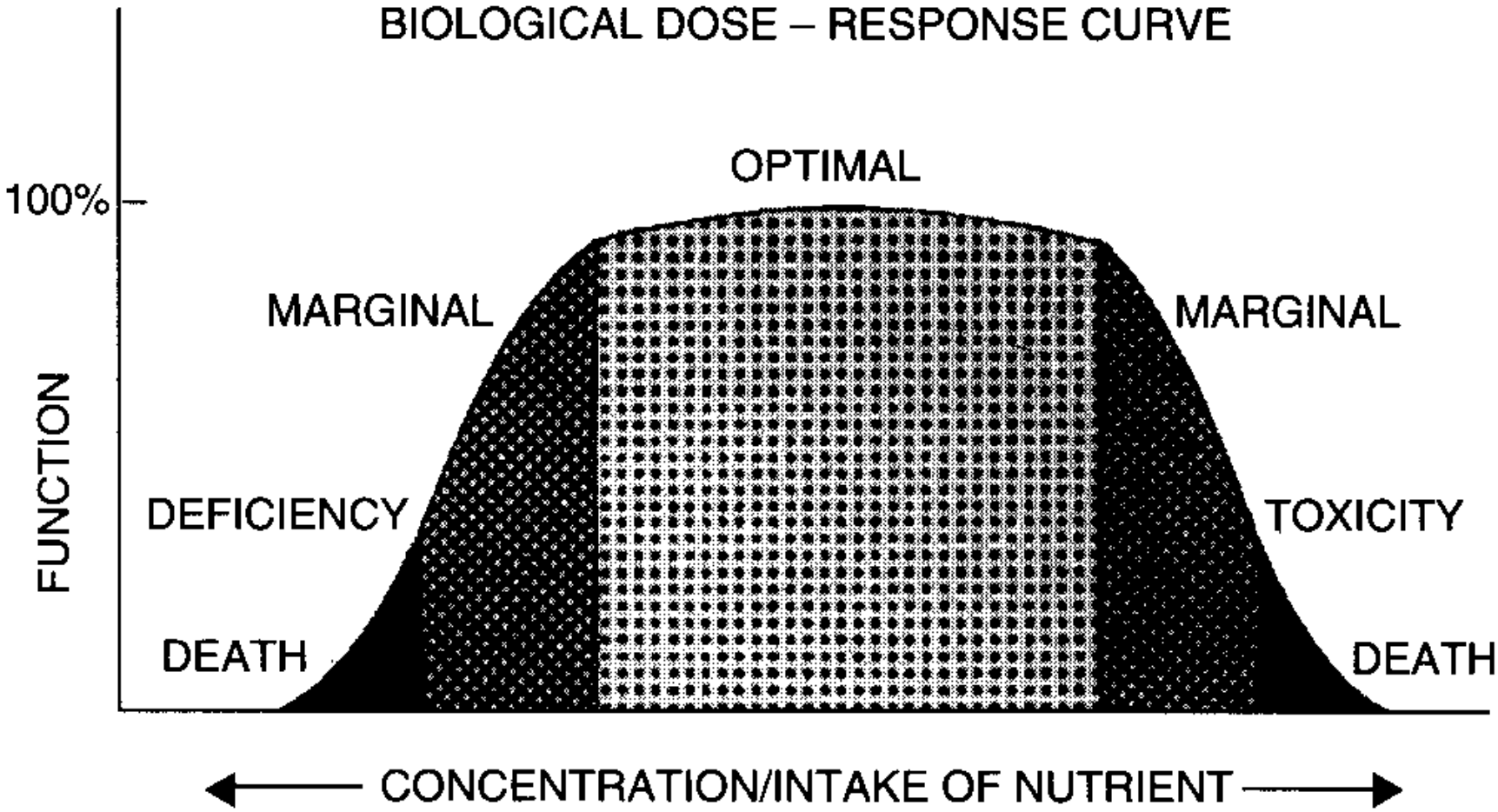
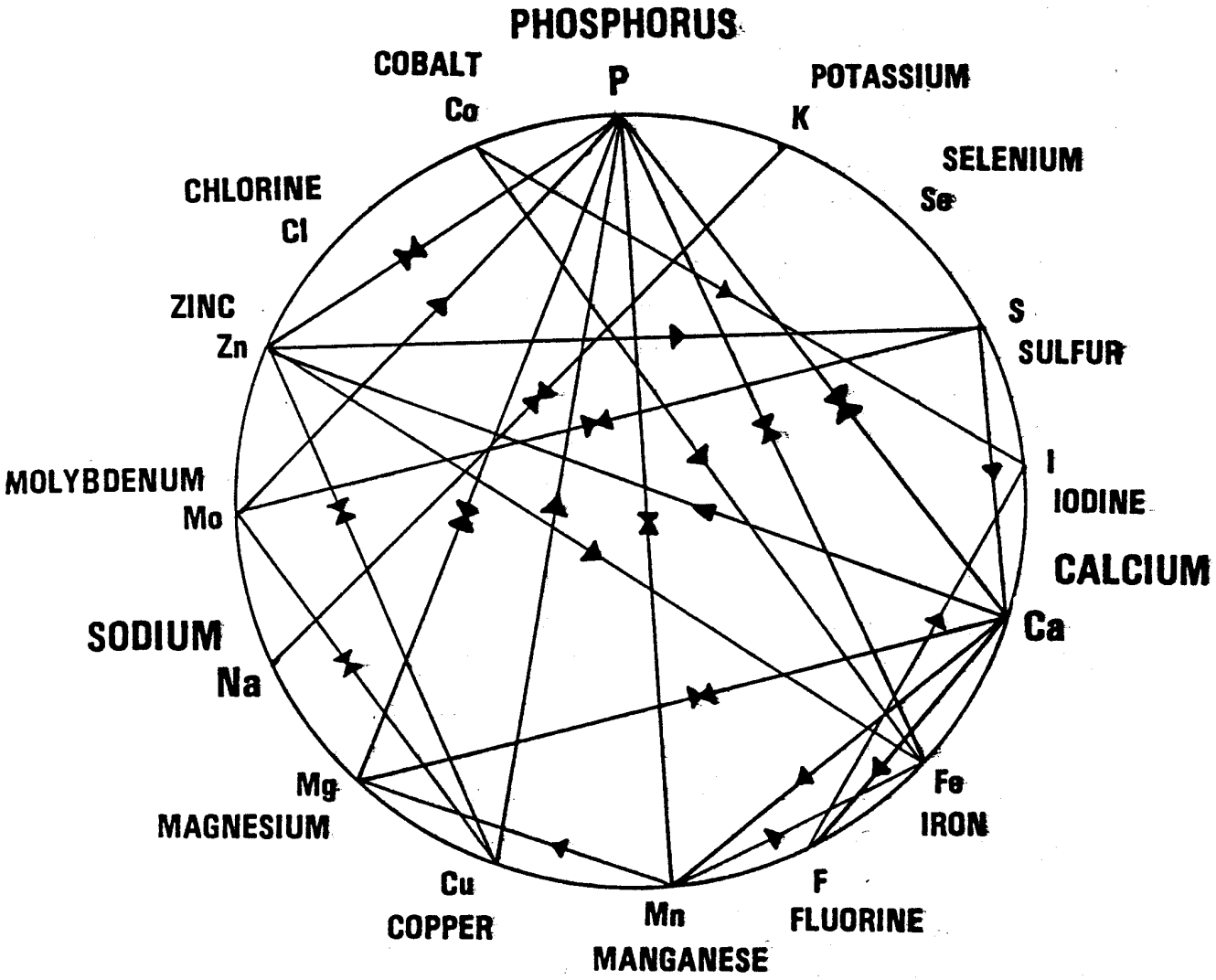
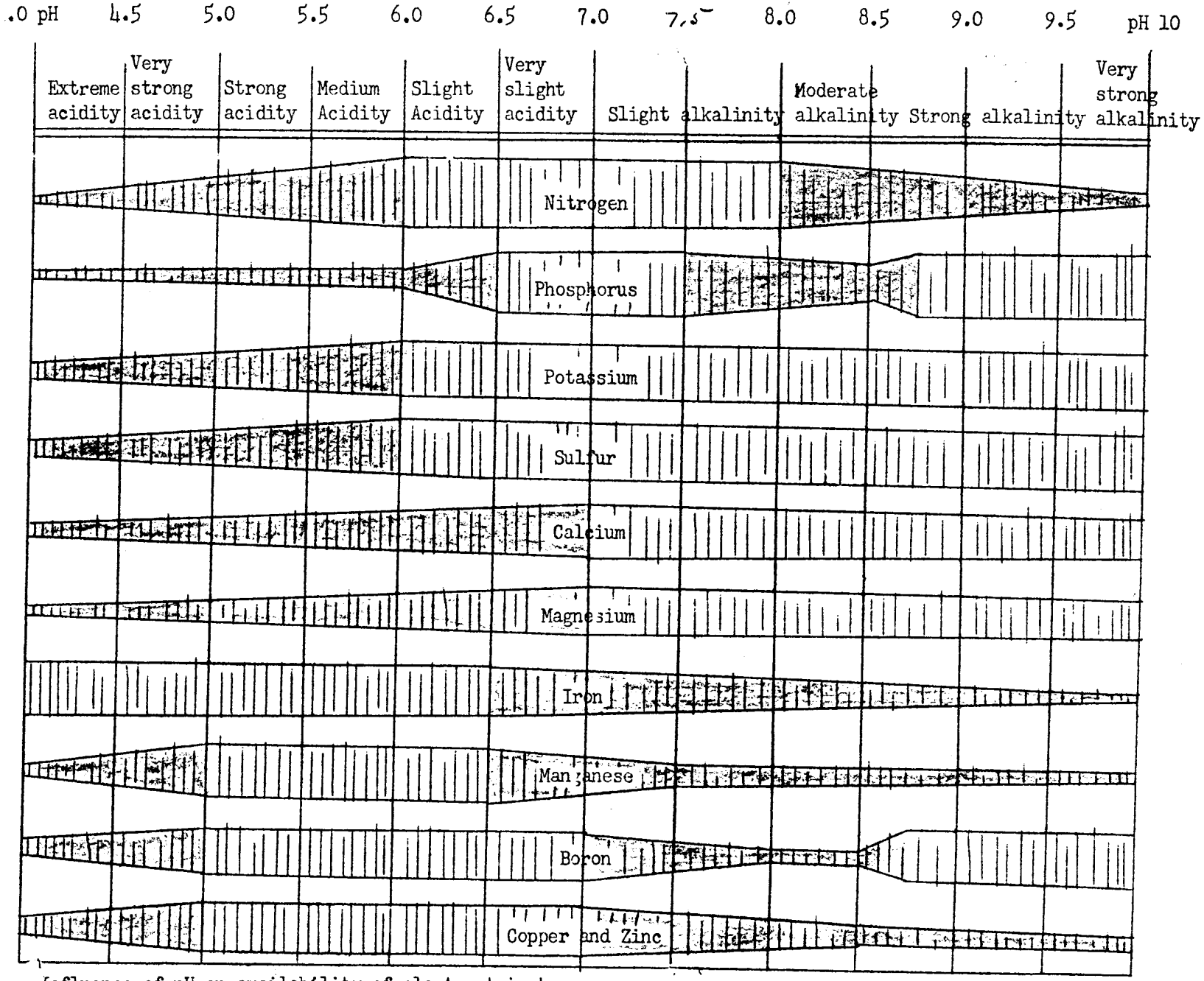


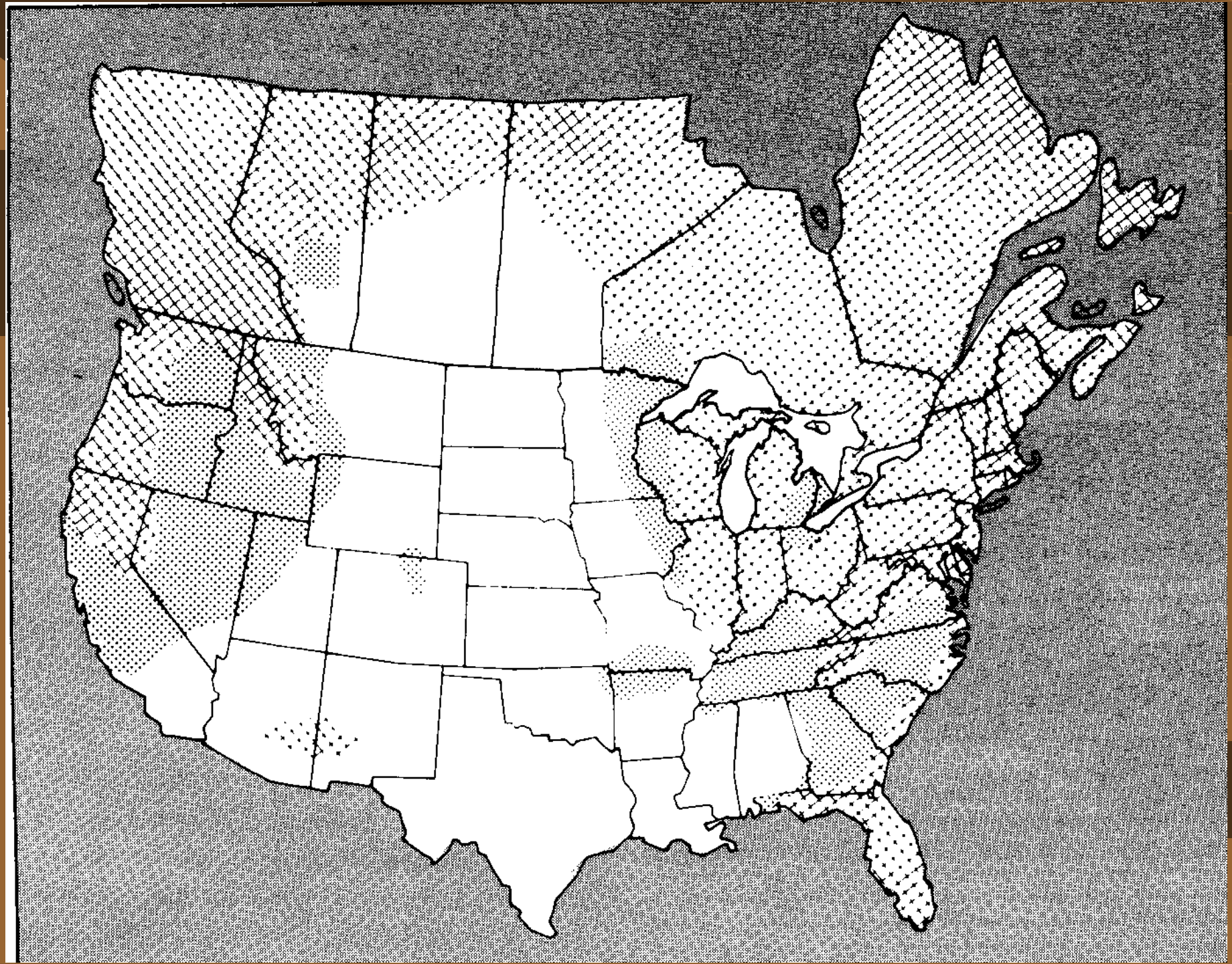
Figure 5: Dependence of animal function on intake of an essential nutrient [Courtesy of W. Mertz, U.S. Department of Agriculture, Beltsville, Maryland].

MINERAL INTERRELATIONSHIPS





Influence of pH on availability of plant nutrients
of.: S.S.S.A.P. 11:305, 1946



Trace minerals

- Iron, Iodine, Copper, Molybdenum, Zinc, Manganese, Selenium
- Beef cattle recommendations
- NY Selenium, Iodine copper (between Cayuga and Seneca lakes)
- Plant analysis
- Blood calcium, phosphorus, sodium, zinc, potassium
- Bone calcium, phosphorus, magnesium
- Liver copper iron zinc manganese, selenium, cobalt
- Custom mineral formulation

Iron Level 50-1,000ppm

- Component of hemoglobin in blood
- Deficiency results in anemia
- Iron is stored in liver, spleen and bone marrow

Copper Level 10-80 ppm Sheep 5 – 15 ppm

- Formation of hemoglobin, enzyme function
- Deficiency anemia, rough bleached hair coat, diarrhea
- Goat requirements are similar to cattle

Cobalt Level .1-10.0 ppm

- Component of Vitamin B-12
- Deficiency anemia, loss of appetite, weakness
- Deficient in the US in few small areas

Zinc Level 40-500 ppm

- Functions in immune system, skin integrity and reproduction and hooves
- Deficiency dermatitis, thick dry patches of skin, hair loss
- Often used to treat skin problems

Manganese Level 40-1,000 ppm

- Function in bone production and reproduction
- Deficiency reluctance to walk, foreleg deformity, poor reproduction, low birth weight
- Motherhood mineral

Iodine Level 1.0-50. ppm

- Functions as a part of thyroid hormone and reproduction
- Deficiency causes goiter-enlarged thyroid gland-do not confuse with thymus gland in goats
- Deficiency reproduction problems, late abortions, hairless fetus

Molybdenum Level .1-3.0 ppm

- Function in enzyme xanthine oxidase
- Deficiency is very rare
- Depresses copper absorption
- Need four times copper level as molybdenum

Selenium Level .2 – 20. ppm

- Function in reproduction and membrane integrity
- Deficiency causes white muscle disease, poor reproduction and retained placenta
- Interacts with vitamin E

Copper Toxicity

- Angora goats more sensitive
- Meat and dairy goats tolerate as much as beef cattle do
- No need for sheep/goat mineral
- Goats need more Cu than sheep
- Breed and individual differences

Copper Toxicity

- Liver content best measure
- Treat with ammonium molybdate and sulfur.
- Know what is going on in your herd with copper.
- Use a mineral with appropriate copper level.

Sheep Macromineral Recommendations

- Calcium .20-.82%
- Phosphorus .16-.38%
- Magnesium .12-.18%
- Potassium .50-.80%
- Sulfur .14-.26%
- Sodium .09-.18%

Sheep Micromineral Requirements

Mineral	Requirement	Toxicity
Iodine	.10-.80 ppm	50 ppm
Iron	30-50 ppm	500 ppm
Copper	7.-11. ppm	25 ppm
Molybdenum	.50 ppm	10. ppm
Cobalt	.1-.2 ppm	10 ppm
Manganese	20-40 ppm	1,000 ppm
Zinc	20-33 ppm	750 ppm
Selenium	.1-.2 ppm	20 ppm
Fluorine		60-150 ppm

Forage Mineral Deficiencies in AR

- Selenium 60% of hay samples
- Copper 52% of hay samples
- Zinc 41% of hay samples
- Magnesium 30% of forage samp
- Calcium 27% of forage samp
- Phosphorus 19% of forage sam

Mineral Supplementation, ppm in diet

Min Req	Goat	KYMin	Cattle
Intake	1.6%	1.6%	.0625%
Co .1	3.8	.32	+
Cu 10	28	12.0	5.0
I 1.0	7.2	.8	.6
Fe 30	200	-	15
Mn 40	200	40	30
Zn 10	200	40	6.3
Se .2	.80	.6	.22
$	9.95	5.42	1.65

Wholesale cost of providing 100 % of the minerals for a 150 lb goat

- Calcium $1.15
- Phosphorus 4.50
- Salt .40
- Magnesium 1.11
- Potassium 1.50
- Trace minerals .45
- Total $ 9.70

Providing Trace Minerals for Goats

1. Use mineral supplement containing the minerals needed-copper, zinc, and selenium
2. Monitor consumption over a period of time-calculate how long it should take to consume a 50 lb bag
3. Cattle mineral consumption can be increased with dried molasses
4. Avoid excesses and extremes

Conclusion

- Provide sufficient protein and energy to keep goats in reasonable body condition
- Provide an appropriate mineral supplement ie 13-7 and monitor consumption
- Good nutrition is the first step toward a healthy, productive goat