Minerals and Vitamins for Goats and Sheep

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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

- Dry: 0.4% for Cal, 0.3% for Phos
- Lactating: 0.6 for Cal, 0.4 for Phos
- 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].
### Influence of pH on Availability of Plant Nutrients

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<tbody>
<tr>
<td></td>
<td>Nitrogen</td>
<td></td>
<td>Phosphorus</td>
<td></td>
<td>Calcium</td>
<td>Magnesium</td>
<td>Iron</td>
<td>Manganese</td>
<td>Boron</td>
<td>Copper and Zinc</td>
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</tbody>
</table>

*Source: 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 hemogoblin, 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%
<table>
<thead>
<tr>
<th>Mineral</th>
<th>Requirement</th>
<th>Toxicity</th>
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<tbody>
<tr>
<td>Iodine</td>
<td>.10-.80 ppm</td>
<td>50 ppm</td>
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<tr>
<td>Iron</td>
<td>30-50 ppm</td>
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<td>Copper</td>
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<tr>
<td>Molybdenum</td>
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<td>Cobalt</td>
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<tr>
<td>Manganese</td>
<td>20-40 ppm</td>
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<tr>
<td>Zinc</td>
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<tr>
<td>Selenium</td>
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<td>Fluorine</td>
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<td>60-150 ppm</td>
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Forage Mineral Deficiencies in AR

- Selenium  60% of hay samples
- Copper      52% of hay samples
- Zinc        41% of hay samples
- Magnesium 30% of forage samples
- Calcium 27% of forage samples
- Phosphorus 19% of forage samples
## Mineral Supplementation, ppm in diet

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<th>Min Req Goat</th>
<th>KYMin</th>
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<tr>
<td>Intake</td>
<td>1.6%</td>
<td>1.6%</td>
<td>.0625%</td>
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<tr>
<td>Co</td>
<td>.1</td>
<td>3.8</td>
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<tr>
<td>Cu</td>
<td>10</td>
<td>28</td>
<td>12.0</td>
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<tr>
<td>I</td>
<td>1.0</td>
<td>7.2</td>
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<tr>
<td>Fe</td>
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<tr>
<td>Mn</td>
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<tr>
<td>Se</td>
<td>.2</td>
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<td>$</td>
<td>9.95</td>
<td>5.42</td>
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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