

# Nutrition/Feeding

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Some slides by Dennis Hancock, U.S. Dairy Forage Research Center  
Some slides from Susan Schoenian, UMD Extension (retired)

# Introduction

Feed – accounts for  
60% or more of total  
production costs

Nutrition impacts  
production greatly –  
reproduction, milk  
production and  
growth

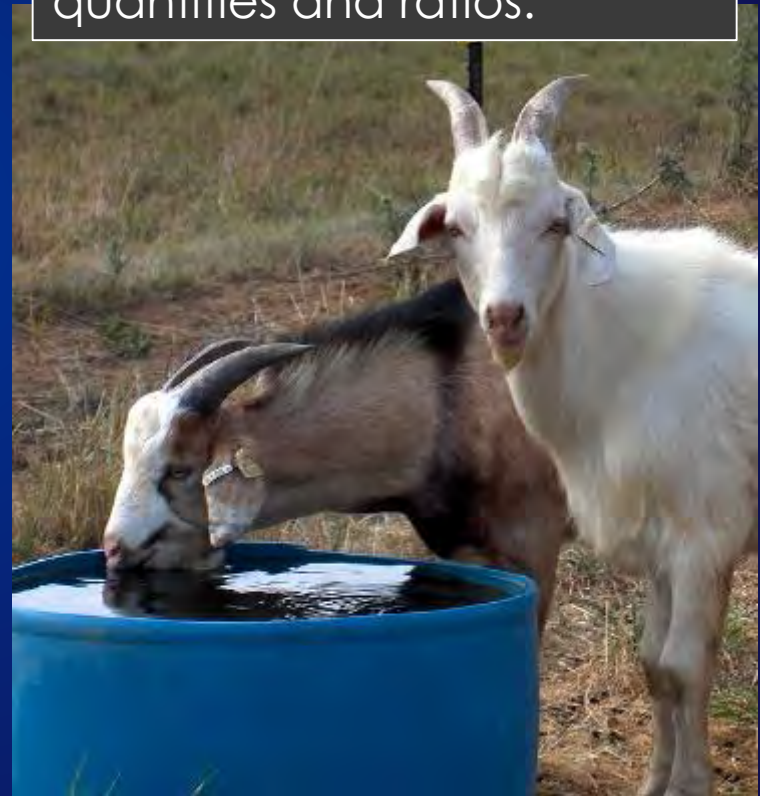


# Essential nutrients

- ▶ Energy (can be limiting)
  - ▶ Carbohydrates
    - ▶ Sugar, Starch, FIBER
  - ▶ Fat
- ▶ Protein (expensive)
- ▶ Vitamins & Minerals

Also: Water (most critical)

Livestock do not require specific feedstuffs; they require nutrients in certain quantities and ratios.



# Forage basics

- ▶ Soil health/fertility (soil tests)
  - ▶ Enough nutrients for healthy plants/good yields
  - ▶ Optimal pH (target 6.0 to 6.8, near neutral); need appropriate pH to get the most out of fertilizer
  - ▶ Good water storage and drainage
  - ▶ Low disease and pest pressure



[www.caes.uga.edu](http://www.caes.uga.edu)

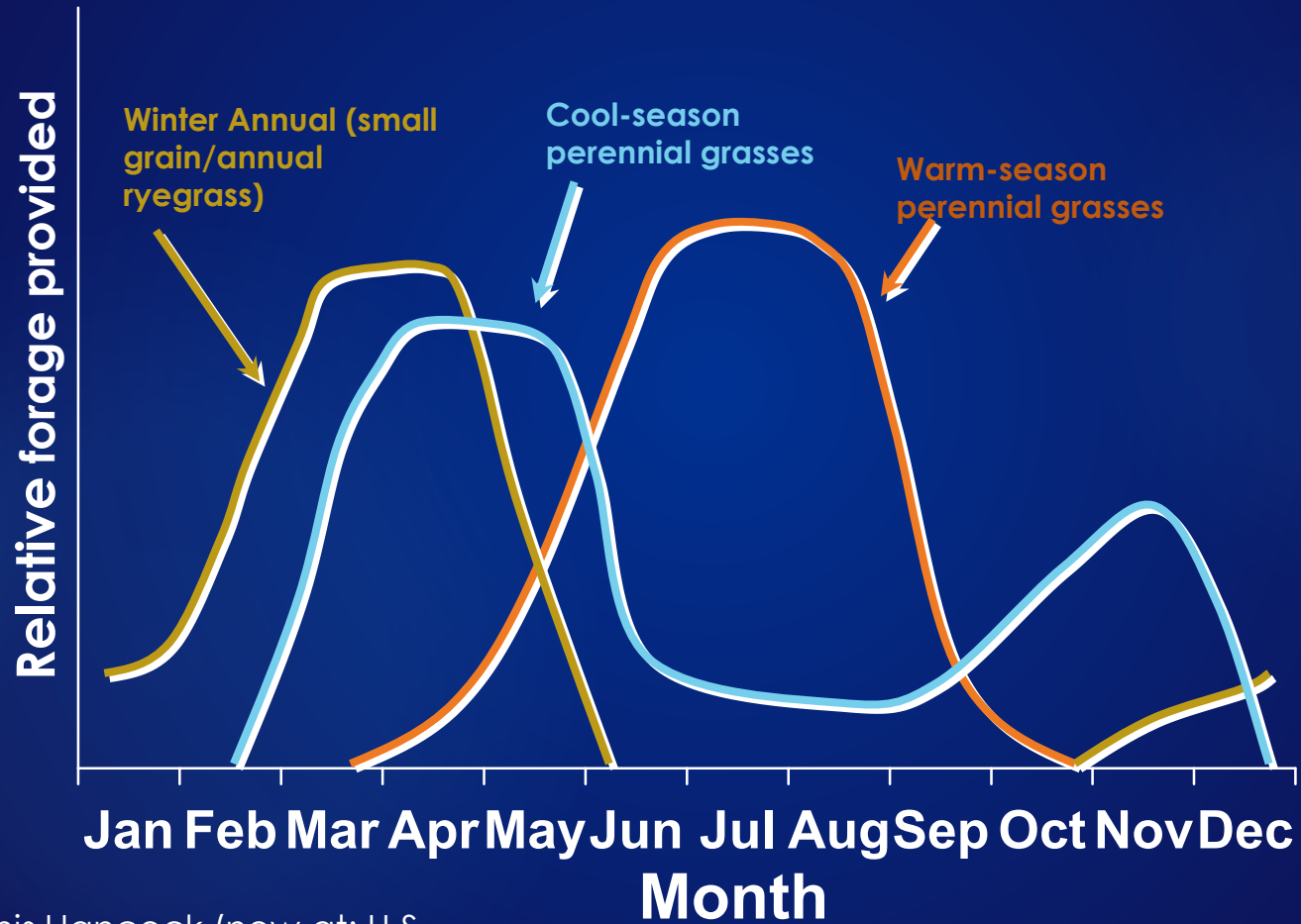
# Forages

- ▶ Perennials (come back season-to-season)/  
Annuals (one growing season only)
- ▶ Warm Season/Cool Season
- ▶ Grasses/Legumes (fix nitrogen, usually have good protein levels)



A quality loose mineral designed for species is recommended, regardless of the forages used.

# Forage Distribution



Slide: Dennis Hancock (now at: U.S. Dairy Forage Research Center)

# Stocking Rates on 2 - 2.5 Acres



Pasture Type	Cows	Sheep	Goats	Cows + Goats
Excellent Pasture	1	5-6	6-8	1 + 1-2
Brushy Pasture	0.75	6-7	9-11	0.75 + 2-4
Silvopasture	0.5-0.75	4-6	6-8	0.5 + 2-4
*Brush Eradication		Can be used	9-15	0.5 + 6-8

Slide: Dr. Dennis Hancock, formerly at UGA

# Introduction

Will consume from 2-4% body weight per day on a dry matter basis (not counting water weight)

Need to provide required nutrients in what they eat; if higher in nutrients, may be able to feed less (reverse not necessarily true)





# Nutrient needs depend on



- ▶ Size (weight)
- ▶ Sex
- ▶ Age
- ▶ Genetics
- ▶ Stage and level of production
- ▶ Climate, environment, and activity
- ▶ Body condition

# Generalities

- ▶ Younger animals need more nutrients, and if they cannot eat a lot (smaller), what they eat needs to have more nutrients (esp. protein).
- ▶ Late gestation (last 3-5 weeks), the babies are growing very fast – higher needs then and since full of babies, needs to have more nutrients (esp. energy).
- ▶ Lactating animals need more nutrients (esp. energy, protein)
- ▶ Larger framed, fast-growing breeds need more nutrients than smaller framed.

# Meat Goat Needs\*

	Protein (CP)	Energy (TDN)
Mature buck – 2% BW	7%	53%
Dry to Early gestation doe (110 lb) – 2-2.5% BW	7-9%	55%
Late gestation (twins)-2.7% BW	13%	66%
Early lactation (twins)-3.0% BW	12.5%	55%
Growing kids (30 lb, max ADG) – does/wethers		
Boer, 4.0% BW	25%	89%
Local, 4.0% BW	21%	89%
Growing kids (66 lb, avg growth), 3% BW	13.5-15%	66-67%

\*Based on dry matter intake as a percentage of body weight indicated in the table (NRC, 2007)

Dr. Niki Whitley, Fort Valley State University; updated 4/2/16

Compared to sheep: 7-19% CP; 53-79% TDN

# SHEEP Needs

	Protein (CP)	Energy (TDN)
*Rams (220 lb, maintenance)	7%	53%
*Dry ewe (132 lb)	7%	53%
Late gestation (twins) 2.75% BW	10%	66%
Early lactation (twins) 3% BW	15%	67%
Weanling (4 mon, 66 lb, max ADG )		
Early maturing - 5% BW	12%	79%
Late maturing - 3% BW	19%	66%
*Yearling ewes (88 lb)	8%	66%

\*Based on dry matter intake (feed without water) of *around* 2% of body weight, or BW, unless otherwise noted (NRC, 2007); from Dr. Niki Whitley, Fort Valley State University

Compared to cattle: 6-17% CP; 45-80% TDN

# What to feed?

- ▶ Many (most) feedstuffs contain more than one of the nutrients. Have to balance the diet for needs.
- ▶ Feedstuffs vary considerably in nutrient content.
- ▶ No single feedstuff can supply all essential nutrients that an animal needs to survive and thrive.



# Carbohydrates (energy)



- ▶ Nutrient needed in the greatest quantity.
- ▶ Dietary excess is stored as fat.
- ▶ Expressed as
  1. TDN - total digestible nutrients
  2. ME - metabolizable energy
  3. NE - net energy [maintenance, gain, and lactation]

# Energy content of feeds

## High

- ▶ Cereal grains (76-88%)  
Corn, barley, wheat, sorghum, rye, oats
- ▶ By-product feeds (76-90%)  
Soy hulls, distiller's grains, corn gluten, wheat middlings
- ▶ Fats/Oils (>100%)

## Moderate

- ▶ Corn silage (65-72%)
- ▶ Haylage (50-60%)
- ▶ **Good quality pasture (60-70%)**
- ▶ Good quality hay (50-60%)

## Low

- ▶ Low quality hay (40-50%)
- ▶ Low quality pasture (< 50%)
- ▶ Straw (40-48%)
- ▶ By-products (<40%)  
cottonseed hulls, peanut hulls, oat hulls

Feedstuff	% TDN
Urea	0
Oat straw	48
Bahiagrass	50
Bermudagrass	53
Grass silage	61
Dry beet pulp	75
Barley	84
Corn	88
Bread by-product	91
Distiller's grains	92
Fat	195

# Fat content of feeds

Feedstuff	% EE
Urea	0
Dry beet pulp	0.7
Barley	2.1
Alfalfa hay, mid-bloom	2.3
Orchardgrass hay	3.3
Corn	4.3
Fescue pasture	5.5
Corn distiller's grains	10.5
Whole cottonseed	17.8
Whole soybeans	18.8
Fat	99

- ▶ Fat cheapest energy source; 2.25x that of carbs
- ▶ Used to raise energy level of feed, improve flavor, texture, and palatability
- ▶ Source of heat, insulation and body protection
- ▶ Essential fatty acids
- ⇒ Can manipulate to change nutritional profile of meat

Ruminant diets are typically < 4% fat



# Protein



- ▶ Source of essential amino acids.
- ▶ Excess dietary protein is converted to energy, then fat.
- ▶ Expressed as
  - ▶ CP - crude protein
    - ▶ DIP – degradable intake protein
    - ▶ UIP – undegradable intake protein
  - ▶ MP - metabolizable protein [microbial protein + UIP]

# Protein content of feeds



Feedstuff	% CP
Wheat straw	3
Corn grain	9
Bermudagrass	10
Bahiagrass	10
Barley	12
Alfalfa hay, mid bloom	17
Crystalyx ® protein tub	18
Distiller's grains	29
Soybean meal	49
Fish meal	66
Urea	288

# Alternative feeds

Feed	% DM	% TDN	% CP	% Ca - % P
Beet pulp (wet)	17	76	11	.68 - .08
Bread by-product	68	91	14	.09 - .18
Corn stalks	80	59	5	.35 - .19
Grain screenings	90	65	14	.25 - .34
Kelp (dried)	91	32	7	2.72 - .31
Poultry litter (dried)	87	64	25	3.0 - 2.5
Potatoes, cull	21	80	10	.03 - .24
Pumpkins, cull	10	85	16	.24 - .43
Soybean hulls	90	77	12	.55 - .17
Whole cottonseed	91	95	23	.14 - .64
Whole soybeans	88	93	40	.27 - .64

# Minerals and Vitamins

- ▶ Minerals are a necessity; can feed: **free choice, loose** or block; mix in feed; buy a protein pellet with minerals added or a complete ration
- ▶ Mineral needs could differ by geography
- ▶ Copper
  - ▶ Goats have higher requirements than sheep/possibly cattle
  - ▶ Cu:Mo ratio should be 5:1 to 10:1
- ▶ Ratios can be more important (i.e. **Ca:P** of 2:1 up to 4:1, never less than 1:1)



# Ca and P content of feeds

Dry matter basis	Ca	P	Ca: P
Corn	0.02 percent	0.30 percent	0.07
Barley	0.06 percent	0.38 percent	0.16
Soybean meal	0.28 percent	0.71 percent	0.39
Orchardgrass hay	0.32 percent	0.30 percent	1.07
Fescue pasture	0.48 percent	0.37 percent	1.30
Soybean hulls	0.55 percent	0.17 percent	3.24
Alfalfa hay, mid-bloom	1.4 percent	0.24 percent	5.83
Dried kelp	2.72 percent	0.31 percent	8.77
Dicalcium phosphate	22 percent	18.65 percent	1.18
Bone meal	27 percent	12.74 percent	2.12
Ground limestone	34 percent	0.02 percent	1700

# Vitamins

Water soluble: B & C

Fat soluble: A, D, E , & K

- ▶ Ruminants have a dietary requirement for Vitamin A, D, and E; usually get it from diet
- ▶ Vitamin K and B-vitamins are manufactured by rumen microorganisms under normal circumstances
- ▶ No dietary requirement for Vitamin C (synthesized in animal tissues)
- ▶ Sources of vitamins; feed/natural sources; vitamin packs; mineral mixes, blocks, tubs
- ▶ Requirements increase with age.



# Vitamin sources

Vitamin	Feedstuff
$\beta$ -carotene (vitamin A)	Green, pasture forage; dehydrated hay; cured hay, vitamin supplements
D	Ultraviolet irradiation, sun-cured hays, vitamin supplements
E	High quality legume hay, dehydrated alfalfa, wheat germ, vitamin supplements
K	Green, leafy feedstuffs (K1). K2 synthesized in rumen
B	Not required in diets of ruminants



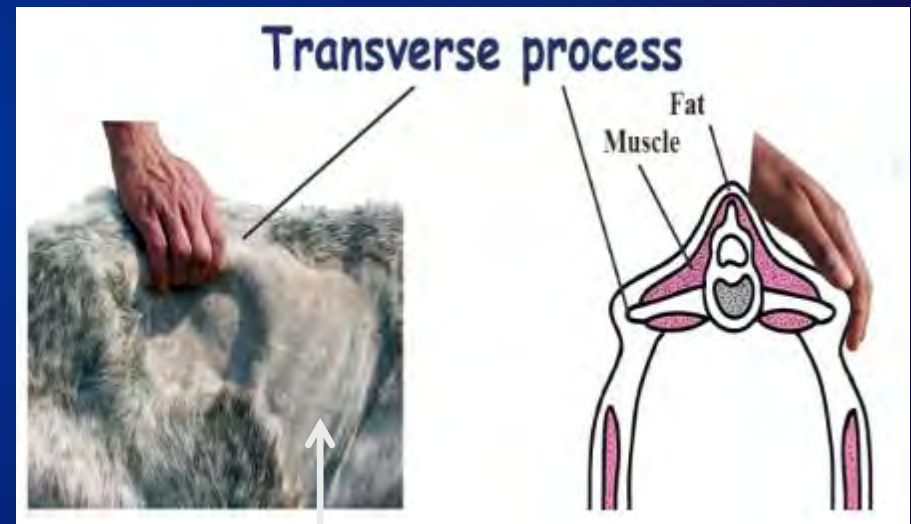
# Know needs and feeds: when to use?

- ▶ When the animal feed requirements are higher than pasture/browse and/or hay can support.
  - ▶ In a drought or other food shortage (overstocking)
  - ▶ Late gestation
  - ▶ Early lactation, maybe throughout
  - ▶ Development of replacement animals (females)
- ▶ When you want/need to maximize performance.
  - ▶ Flushing (feed more energy 3-6 weeks before breeding) to increase ovulation rate
  - ▶ Creep feed for young kids
  - ▶ Feedlot situation for growing/finishing kids



# Body Condition Scoring (BCS)

- ▶ Must get your hands on them
- ▶ At least backbone and ribs
- ▶ Goats – sternal fat



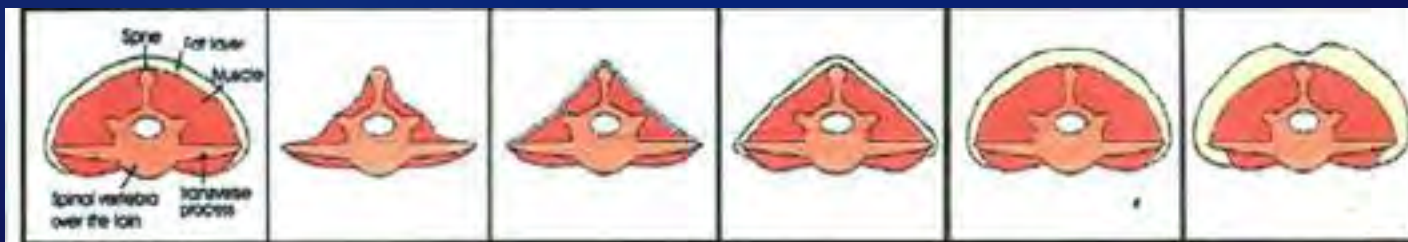
[www2.luresext.edu/goats/library/field/bcs07.pdf](http://www2.luresext.edu/goats/library/field/bcs07.pdf)  
Langston University (Kika de la Garza) has a good video of goat BCS)

Ribs

The goat pictured is a BCS 1

# Body condition scores

	Backbone/top of spine	Side of backbone	Muscle	Fat
<b>1</b>	Individually clearly felt, sharp, obvious	Fingers easily pass underneath	Very little	No
<b>2</b>	Form a smooth line with deep undulations	Smooth round edges	Concave	Very thin
<b>3</b>	Only slightly detectable undulations	Well covered have to push firmly to get fingers underneath	Not concave Not convex	Moderate
<b>4</b>	Only detectable with firm pressure	Cannot be felt at all	Maximally developed Convex	Thick
<b>5</b>	Not detectable			Very thick



Score:

1

2

3

4

5



BCS 2

BCS 3

BCS 4

# General Feeding

- ▶ Should weigh feeds/hay provided
- ▶ Store to keep out animals and keep clean/dry
- ▶ Make sure enough feeder space/pasture
- ▶ Monitor parasites/general health care



# Nutritional disorders/issues

- ▶ Grass Tetany
  - ▶ Low availability of Mg in straight grass lush pastures (feed high Mg mineral, feed hay before putting out on it)
- ▶ Prussic acid poisoning in some forages
  - ▶ Frost/drought damaged sorghum and crosses; Johnsongrass; pitted fruits (wild cherry)
- ▶ Toxic weeds

# Nutritional disorders

- ▶ Urinary Calculi / “water belly”
  - ▶ Blockage of urinary tract with “stones”
  - ▶ Most often due to Ca:P imbalance in feed (should be 2:1)
  - ▶ More common in males castrated early and fed high grain diets
  - ▶ Can add 0.5% ammonium chloride to the diet
  - ▶ Alfalfa is high in Ca and helps balance a diet or can add limestone to the diet

# Nutritional disorders

- ▶ Bloat (gas build-up)
  - ▶ Legume bloat (fresh alfalfa for example)
  - ▶ Grain bloat (when TDN:CP ratio is low - 6:1 is recommended).
- ▶ Prevent
  - ▶ Feed hay before grazing; avoid am grazing; feed roughage or ionophore with grain diets
  - ▶ use legumes less likely to cause (arrowleaf/berseem clover, crownvetch, cowpea, soybean, etc.)
  - ▶ Use an antifoaming agent (poloxalene; such as Bloat Guard® )



# Nutritional disorders

- ▶ Acidosis (grain overload)
  - ▶ Too much energy feed too fast; lactic acid build-up in blood
  - ▶ Avoid changing feeds quickly; have plenty of feeder space; baking soda out for them when feed high grain?
  - ▶ *Clostridium perfringens* over growth is often seen with acidosis as well and can cause potentially fatal enterotoxemia



# Nutritional disorders

- ▶ Scours / Enterotoxemia (overeating and/or bloody scours)
  - ▶ *C. Perfringens* type C and/or D (B?) over-grows produces toxins
  - ▶ Vaccinate (2x/year?); do not change diets quickly; treat with anti-toxin after exposure; probiotics in feed?
  - ▶ Treat with antibiotics, fluid therapy...



# Nutritional disorders

- ▶ Scours / Coccidiosis
  - ▶ Protozoan parasite; damages gut wall (can be permanent – “poor doers”)
  - ▶ Crowded, dirty areas
  - ▶ Always around, can get some immunity
- ▶ Prevent
  - ▶ Decoquinate (deccox), and ionophore antibiotics such as monensin (Rumensin®) and lasalocid (Bovatec®)

Treatment: Amprolium (Corid, Amprol; overdose-Polio, death); Sulfa drugs



# Prevention/Treatment

- Merck Vet Manual (sheep/other countries):
  - Diclazuril (Vecoxan®) - 1 mg/kg oral preventative (once 6–8 wk old/just before weaning or twice at 3-4 wk old & 3 wk later)
  - Single dose **toltrazuril\*** (Baycox®) at 20 mg/kg – treatment reduces oocysts for 3 wk
  - Sulfaquinoxaline 0.015% concentration in drinking water at for 3–5 days for lambs (VFD)

\*Research indicates toltrazuril may be more effective than diclazuril (which may require a treatment 3 weeks later); must work with vet/VCPR



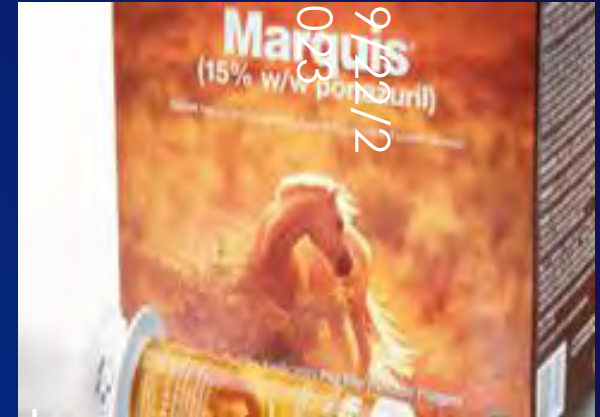
# Treatment/Prevention

- Sulfa drugs (**work with your vet**)-
  - 12.5% Sulfamethazine (i.e. Sulmet®), oral drench: 50 lb lamb: 1.5oz first day, 0.75oz next 2 days (25 mg/lb first day, 12.5 mg/lb next 2 days)
  - Sulfamethazine bolus (i.e. Sustain III®), calf bolus 1 per 50lb
  - 12.5% Sulfadimethoxine (i.e. Albon®, Di-methox®), oral drench: 25 mg/lb first day, half that next 2-4 days (i.e. per 50 lb: 10cc first day, 5cc next days)



# Treatment/Prevention

- More recent research:
  - Ponazuril (Marquis®) at 10 mg/kg once by mouth before weaning (prevent) or as a treatment
- Natural control:
  - Sericea lespedeza (forage) has been shown to reduce cocci oocyst counts (goats and sheep)
  - Oregano essential oils (i.e. OregoStim®) have been shown to reduce oocyst counts in poultry; 500 ppm (similar to diclazuril)



# Nutritional disorders

- ▶ Polioencephalomalacia
  - ▶ Thiamine (vitamin B1) deficiency (when normal gut bugs are disturbed); high grain diets, antibiotic treatment; also overdose of amprolium/levamisole, high Sulfur in diet
- ▶ White Muscle Disease
  - ▶ Selenium deficiency; usually seen in young fast growing kids; if soils/forages low, supplement in minerals or by injection of doe before kidding or kids at birth (can kill them with overdose, take care)

# Nutritional disorders

## ▶ Parasites

- ▶ Ingest on pasture. Depending on species, symptoms from anemia, diarrhea, and death to general unthriftiness/poor growth (rough hair coat, etc).



Prevent: Integrated parasite management (pastures, animals, refugia, nutrition, browse, TST)

# Nutritional disorders

## ► Other problems

Salmonella/Listeria

Milk fever/Ketosis (ewes)

Molds/mycotoxins in feeds

Miscellaneous Vitamin/Mineral deficiencies

## Some references:

<http://www.sheepandgoat.com/metabol.html>

<http://sheepandgoat.com/feed.html>

<http://www.ag.ndsu.edu/pubs/ansci/beef/as1182.pdf>

[http://www.luresext.edu/goats/research/nutr\\_calc.htm](http://www.luresext.edu/goats/research/nutr_calc.htm)

## Ration balancer:

<http://www.luresext.edu/goats/research/nutritionmodule1.htm>



# Additional Resources

<http://pubs.ext.vt.edu/410/410-853/410-853.html>

<http://www.sheep101.info/201/feedinglambs.html>

<http://www.sheep101.info/201/feedingewes.html>

# Questions?

