

Mineral Nutrition Concepts

R. Greg Stewart, MS, DVM, PhD The Lowly Shepherd

Feed Minerals

Environment

& Stressors

Health Immunity

IN THE WILD----- NATIVE STATE

- Metabolic Cycles
- Reproductive Cycles
- Seasonal Cycles



soluble acid

Animal Design

- Physiology
- Social
- Anatomy

DOGMA

- All mineral nutrition is <u>local</u>. There are areas of deficiency and toxicity geographically.
- Soil testing
- Forage testing
- Hay testing-high rainfall and number of cuttings-dilution of minerals significant effect
- Liver testing

First Question: What species?

Wool sheep or shedding hair sheep. What breed? Copper deficiency versus toxicity

Extensive System : Native diets, forages, browse, mast, or Intensive System with artificial diets ?

ANY ATTENTION PAID TO ESSENTIAL FATTY ACIDS?



Nutrition - Sheep

- Many new breeders have not had previous ruminant livestock experience.
- Maintaining a healthy rumen is the foundation of all wellness in this species.
- Metabolism changes occur throughout the year.
- This can vary 250% during the year for both sexes.
- Mineral nutrition must be adjusted to metabolism and growing conditions.
- Optimum mineral nutrition is required for efficiency in body and hair coat, wellness, immunity, parasite wars and reproduction.
- When animals are consuming growing roughage or harvested roughage they will consume trace minerals as needed.
 Frequently an increase in mineral consumption is evident during these times.

Calendar

Concept of cycles figuring out when not to feed them.

Sheep Life Stage Nutrition



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NO BLACK HOSES









THE CONTRIBUTION OF THE EWE

- Proper number of feti (FETUS)
- Incubator
- Microbiome (normal)
- Fetal programming -explain
- Placentation type Syndesmochorial cotyledonary
- Quantity and quality of colostrum
- Quantity and quality of milk
- Nurture / protection Omega 3

Evaluate: Feeds / Forages / Soil in pens if growing crops

Who believes "If a little is good, a lot is better"?

MINERAL NUTRITION – weaning issues – stress resilience

No yellow sulfur salt blocks

Milk transfer efficiency

Cu –

Se ++

I - variable by season

Colostrum concentrations much higher for most microminerals

COLOSTRUM

- Energy
- Protein structural and immune
- Fats
- Minerals
- CELLS functional WBCs migration mucosal immunity
- 60 proteins of the complement system
- Chitotriosidase
- VEGF

- Vitamins
- Hormones
- Growth factors
- Enzymes/peptides

MILK COMPARISON

	Deer	COW	EWE	HUMAN	WHALE
Dry Matter	25.0	12.8	18.2	12.5	57.2
Crude Protein	34.8	27.3	24.7	8.0	21.3
Fat	41.6	28.9	39.0	35.2	74.0
Lactose	17.6	38.3	26.4	56.0	2.3
Ash	6.0	5.5	4.7	1.7	2.5

Created by Dr. Woody Lane for a seminar by Southern Veterinary Services held at Triple JJJ Ranch, Somerville, TX, January 2008

NUTRITIONAL NEEDS





Peak immunoglobulin transfer from neonatal gut is 4 – 12 hours post partum

INCREASING COLOSTRUM QUANTITY

INCREASING COLOSTRUM QUALITY

Antibodies and Serum Components for Defense



- Any normal ewe that dies in labor.
- Harvest all fresh colostrum from ewe
- to use later/refrigerate 2-3 days or freeze(1-2 years).

Maiden ewes – lambs serum Ig << 2's<3 yr old serum same but transfer less

WHAT IS THE FAILURE OF PASSIVE TRANSFER?

HOW DOES IT HAPPEN?

- Lamb stealing
- Premature lambs and/or poor quality and quantity of colostrum
- Lack of colostrum production
- Weak cold lambs unable to nurse
- Hot weak lambs unable to nurse
- Lost lambs
- Improper lamb dam bonding







Innate immunity fetus-

phagocytosis and neutrophils late gestation functional capacity declines in late gestation due to an increase in fetal cortisols 20% of the lambs create 80% of the flock problems.

Pathogen factories increasing challenge..



Prevention of congenital (early) infections









MATERNAL MICROBIOTA Early Microbiome From:

- Birth canal
- Licking /cleaning
- Udder Teat Cistern

<u>MICROBIOME</u> Newborn GIT -- Sterile





HOST ADAPTED **STRAINS** FEED ADDITIVES **Probiotics Prebiotics**

DO NOT BE MISLED by studies performed in non-ruminant species that are extrapolated and used in ruminants.

TOPICS:

- sources of minerals organic vs inorganic
- absorption of minerals organic vs inorganic
- Does increased absorption correlate to increased performance? Ex: Se Me Ruminants

Effects and absorption of minerals is governed by type of roughage and carbohydrate constituents in the diet.

Co – the concept of the "sweet spot" Supplementation vs absorption and utilization

Co – (a) deprivation causes massive increases in succinate levels in Rumen (acidosis)

In other words– changes in rumen function as a result of mineral deficiency

(b) decrease in VFAs production (propionate) is the result. Propionate – main source of energy. Appetite . Growth.

Primary Plant Metabolites versus Secondary Metabolites in diet.

Reading labels

Aafco.org



Oxides, Sulfates, Chelates,

All species minerals versus species specific minerals:

Consumption must be calculated on a per head per day basis.

Nu<u>trition</u>

Deficiency of:

- P
- |
- Cu
- Mn
- Mg
- Se
- Ca
- Long standing Vit A
- Energy

Prevention of abortion Weak lambs Stillbirths

Macro Minerals	Micro Minerals	
Na	I	
Cl	Fe	
Са	Cu	
Р	Мо	
Mg	Со	
К	Mn	
S	Zn	
	Se	
	FI	



When you see Clinical Disease:

You already have experienced abnormalities in the "submerged" compartments

SUBCLINICAL DEFICIENCY

📕 Immunity

Reproduction Function

🚺 Growth

Antler and horn Development

11 Higher Cost of Production

Metal	Required for	Deficiency	Toxicity
Copper	Enzymes for repro	Immune Suppression	
Cu	Metabolism of Fe	Repro:• Fertility ↓• Twins• Implantation• Semen quality• Libido ↓• Placenta necrosis	Hemolytic crisis
	Connective tissue maintenance	Newborns Cold stress CNS issues Poor growth rate	
	Hoof tissue maturity	Hoof problems	
	Immunity (copper level into milk are low)	growth rate and type 1 collagen	
	Hair coat/Antler development	Anemia	
	Parasite resistance	Poor growth rate/weight loss	
		Hair coat issues Antler issues	
		Parasite resistance 👢	

Metal	Required for	Deficiency	Toxicity
Selenium	Antioxidant (w/ Vitamin E)	Immune Suppression	Abortion
	Tissue repair	Repro. function	Sperm defects
Se	Cellular damage and repair	Muscle degeneration (white muscle disease)	Newborn milk
	Immune function w thyroid hormone	Silent Heats	Blind staggers ? (Plants) Lameness, polioencephalomalacia
	Metabolism	Cystic ovaries	Abnormal gait movement
	Reproduction		Respiratory distress
	Circulation		Diarrhea
	Muscle function		Emaciation (wasting)
	Complex w heavy metals to make harmless		Anemia
	Very efficiently transferred into milk!!!		Poor repro. function
	Requirements increase with: High legume diets, high sulfur intake, low vitamin E intake, presence of heavy metals		

Metal		I	Required for	Deficiency	Toxicity
-	Zinc		Sexual maturity	Abortion	
	Zn		Onset of Estrus	Fetal mummy	
L			Skin integrity	Low birth weight	
			Lining of repro tract	Poor sperm quality	
			Repair after fawning	Prolonged labor	
			Implantation of embryos	pica	
			Hoof health w copper		
			Antler development		

T3 Determinate of metabolic rate. Interacts with insulin, GH, corticosterone, and regulatory proteins of exocrine origin

The seasonality of reproduction (ov) is related to seasonal changes in thyroid activity.

Male cooperation is likely facilitated by a thyroid response to change in day length.

Thyroid dysfunction: fertility, embryo/fetal development, post natal mortality, growth depressions, skin, low milk yield.

Not predicted by traditional methods T4, T3, T4:T3

Interaction with Se

deficiency.





Mineral References

Source: DCPAH/CVM/MSU 2015 Dr. Tom Herdt

	Whitetail Deer	Sheep (all)
	ug/g or ppm	Dry liver sample weight
Cobalt	0.39	0.30-0.60
Copper	347	75-300
Fe	733.3	200 - 600
Mn	8.77	6.0 - 12.0
Мо	0.832	1.5 - 3.0
Se	*4.28	1.0 - 2.5
Zn	189.11	60 270

comment





Suttle 2010



Goiter/Growth Rate Thyroid function/ Inflammation Heart rate Body Temperature Protein Production (inc. calcitonin)



Cu Se Zn

Antlers Hoof health Haircoat Skin Ca

Со

Cu

Mg

Mn

Ρ

Se

Zn

Nerve Function



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