

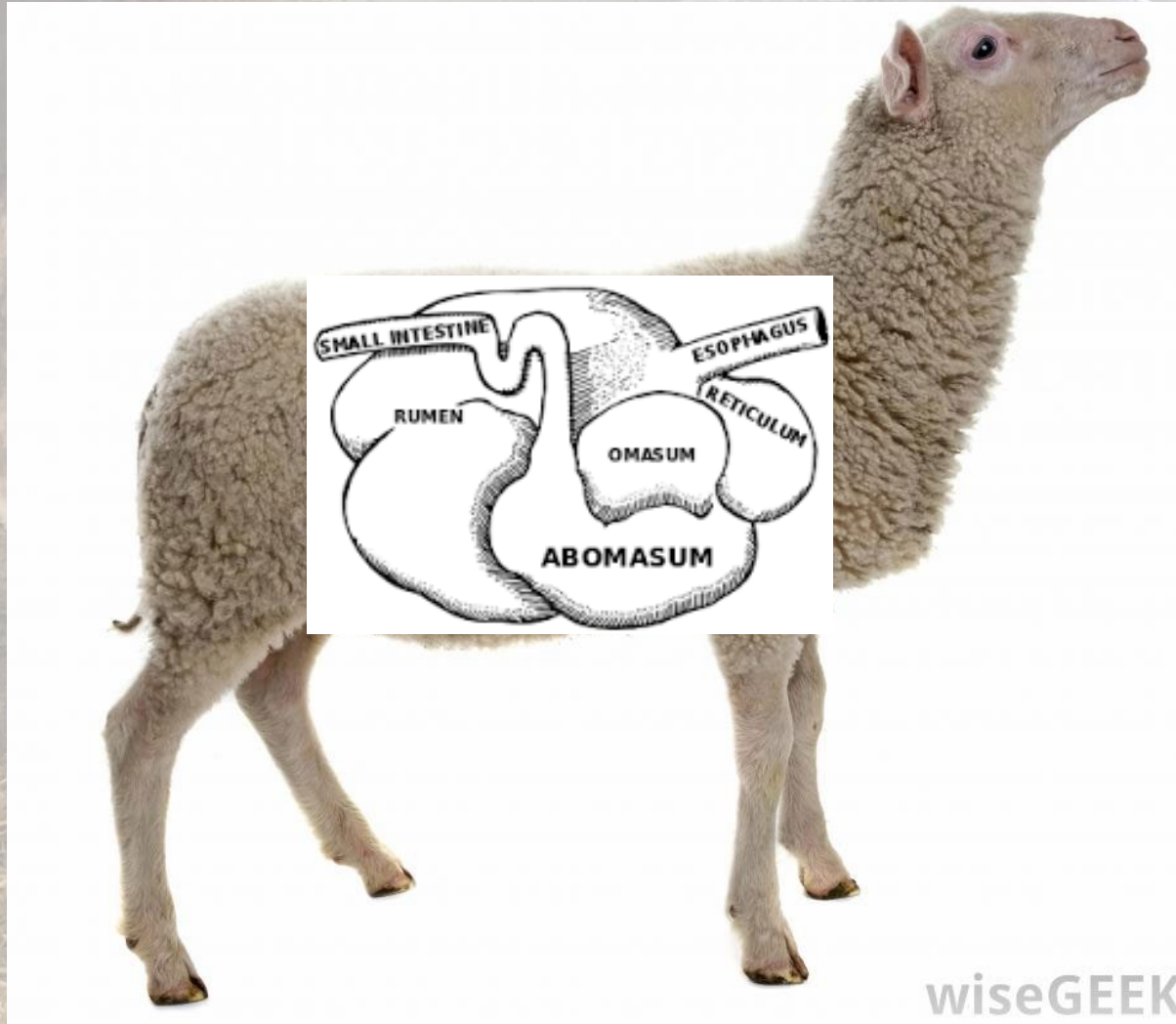


Sheep and Goat Management: Nutrition

Alison Crane, Ph.D.

KSU Sheep and Meat Goat Specialist

Digestive System





Nutrient Requirements

- Change with:

- Weight
- Stage of Production
- Level of Production
- Age

- Change with:

- Climate
- Level of Wool Production
- Physical Activity
- Diseases and Parasite Load
- Body Condition

Nutrients

- Water
- Energy:
 - Carbohydrates
- Protein
- Vitamins
- Minerals



Water

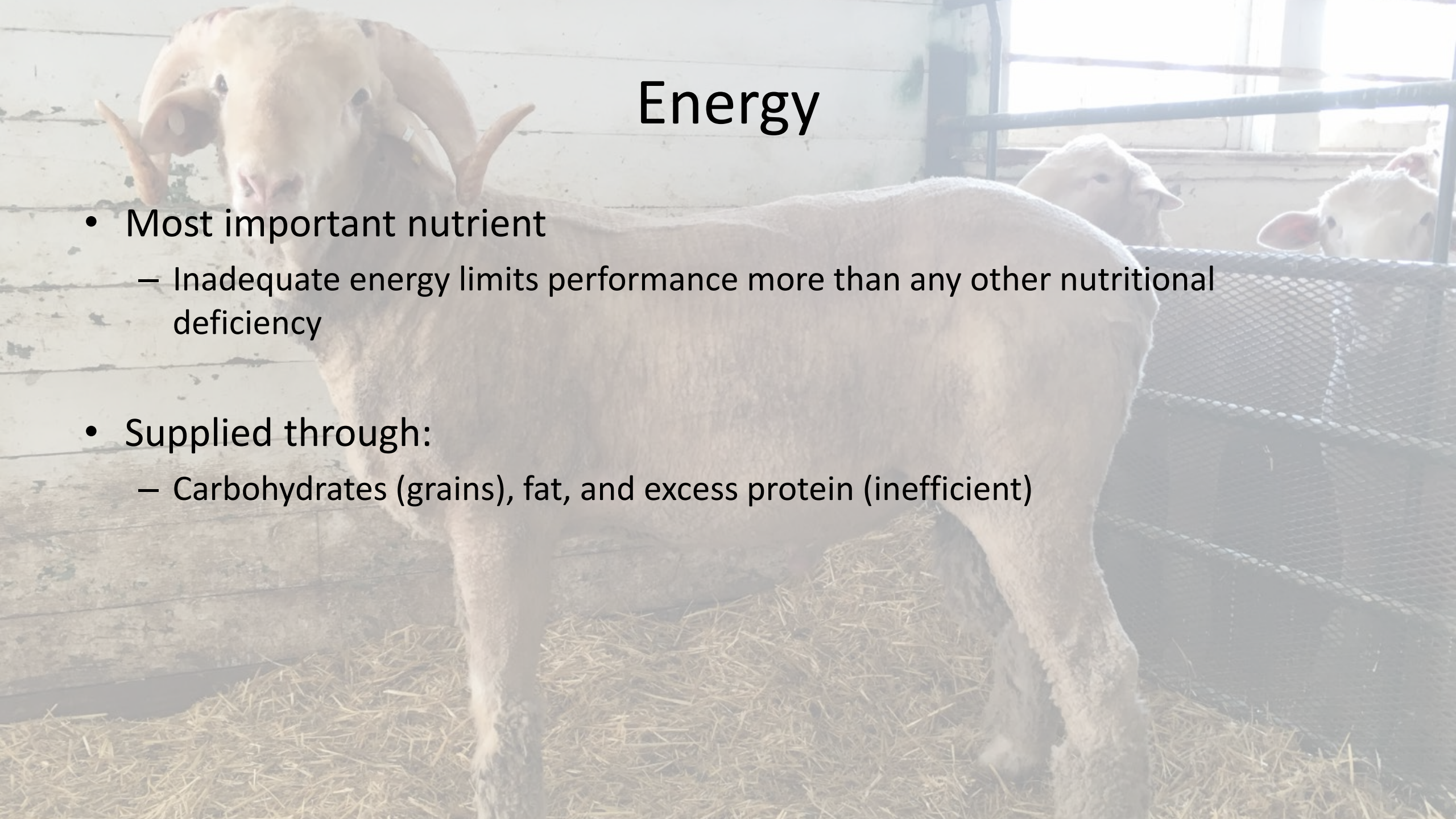
- Water is extremely important to the animal's health and performance
 - Coolant
 - Transporter
 - Acts in chemical reactions
- For every 4 lbs of DM consumed, 1-1.5 gallons of water should be consumed
 - Typical ewe water consumption: 0.72 in winter, 2.2 summer

Energy

- Digestible Energy (DE; Mcal)
 - Basis for energy requirements
 - Maintenance, Lactation, and Growth
- Metabolizable Energy (ME; Mcal)
 - $ME = 82\%$ of DE
- Total Digestible Nutrients (TDN; % or lbs.)
 - 1 lb. TDN = 2 Mcal of DE

Energy

- Most important nutrient
 - Inadequate energy limits performance more than any other nutritional deficiency
- Supplied through:
 - Carbohydrates (grains), fat, and excess protein (inefficient)



Energy

- Concentrates and roughages serve as the major source
- Commonly the most limiting nutrient
- High concentrate diets:
 - >ADG and FE than high forage diets at similar ME levels
- High intake animals have heavier digestive tracts and internal organs at the same age as low intake animals

Protein

- Dietary protein → ruminal microorganisms → microbial protein → amino acids
- This is important because:

Quantity is most often more important than quality!!!

- Microbial protein is commonly adequate, however with low quality forage, additional protein might be required
- Overfeeding protein is expensive!

Protein



- Sheep and goats have higher protein requirements per body weight than other ruminants
- Under very high production, bypass protein may increase productivity
- More expensive than energy feeds
- Can use non-protein nitrogen (NPN)

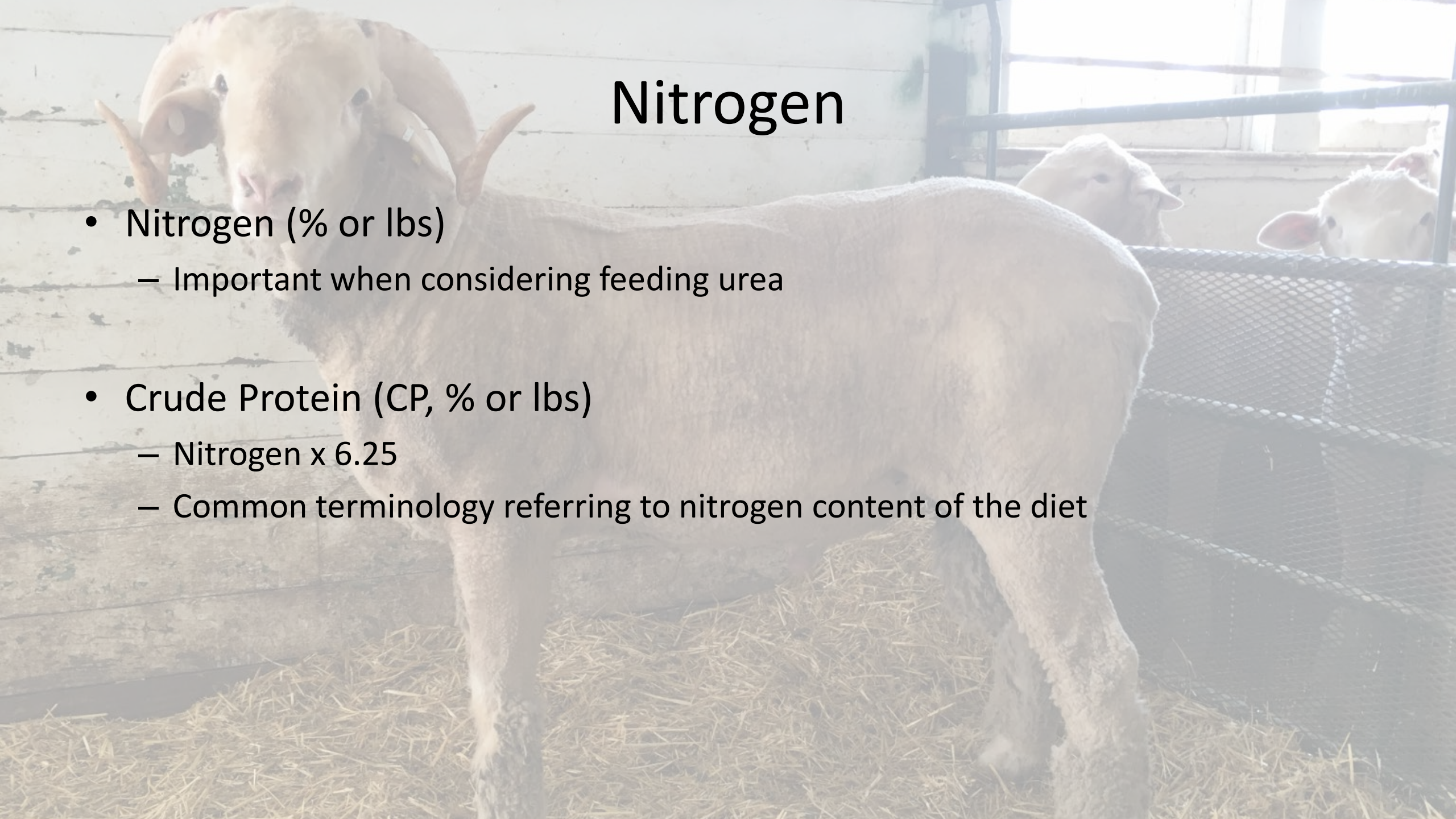
Bypass Proteins



- Low Bypass:
 - Soybean meal, casein, sunflower meal, peanut meal
- Medium Bypass
 - Cottonseed meal, dehydrated alfalfa meal, dried brewers grains
- High Bypass
 - Corn gluten meal, feather meal, fish meal

Nitrogen

- Nitrogen (% or lbs)
 - Important when considering feeding urea
- Crude Protein (CP, % or lbs)
 - Nitrogen \times 6.25
 - Common terminology referring to nitrogen content of the diet



Nitrate Poisoning

- Drought stricken, frost damaged, or heavily fertilized fields may contain forages with high nitrate levels
 - Need to be tested!
 - **1-3% potassium nitrate indicates that feeds should be blended**
 - Can be deadly!

MAJOR POINTS



BREEDING: EWE AND RAMS



Rams

Breeding

- **Also maintain condition**
 - Breeding is the most stressful time
 - BCS higher prior to breeding
- **Early growth:**
 - Heavy concentrate feeding vs. Slow growth
 - Bent legs, wool, etc.
- **Maintenance**



Overall Ewe/Doe Management

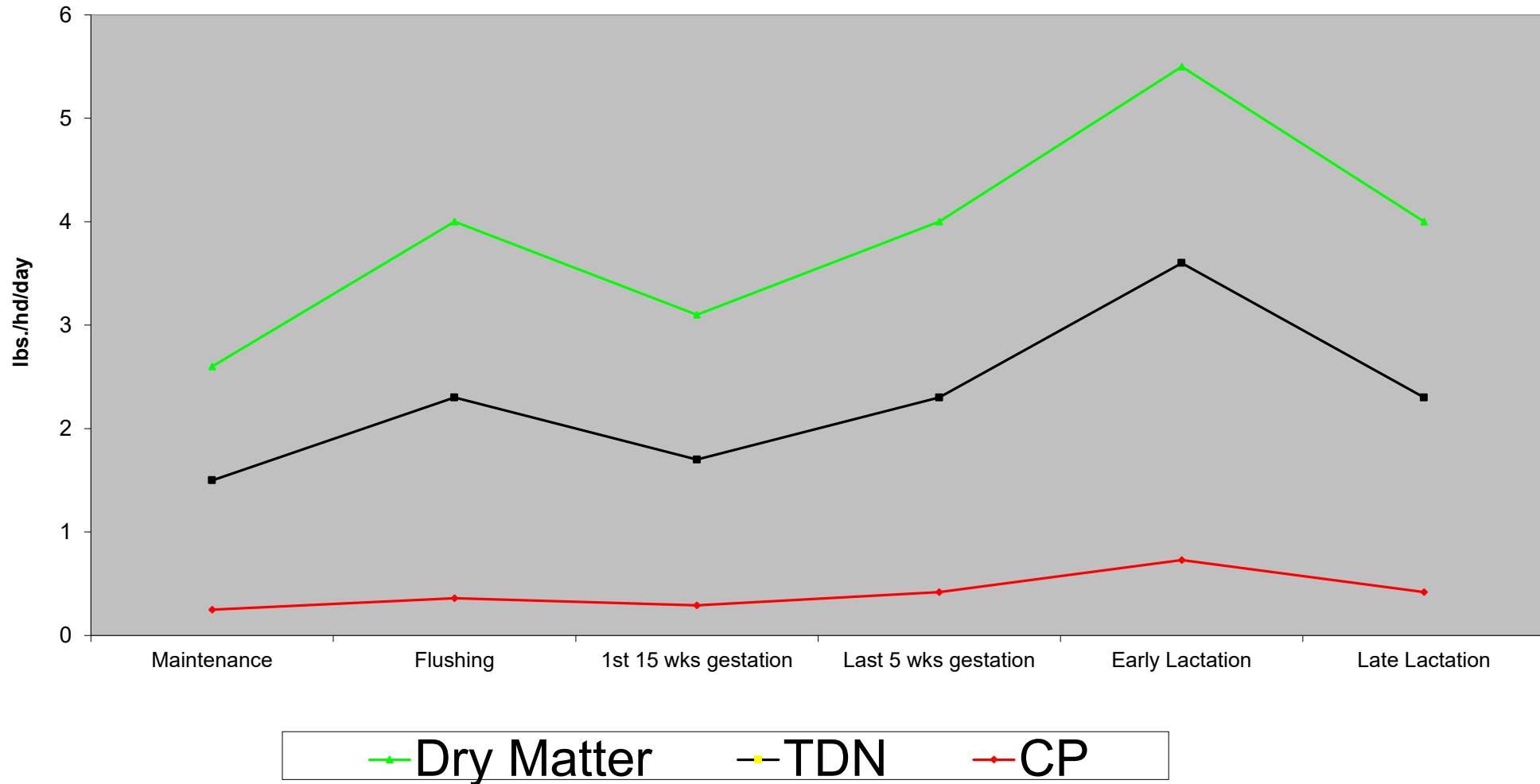
The quantity & quality of what sheep/goats eat (nutrition or energy intake) controls their fatness (body condition),

Which in turn directly affects a number of production factors including:

Lamb/kid survival

Fiber production of both females & their progeny

Ewe/Doe Diets, Production Stage



Ewe/Doe Management

- Establishing target BCS at breeding and lambing/kidding increases flock performance and future management
 - Feeding
 - Prevent common health issues
 - Toxemia
 - Calcemia
 - Dystocia

Pregnancy Toxemia

- Ketosis/Pregnancy disease/Lambing sickness/twin-lamb/kid disease
- Principal: low blood sugar (glucose), (-) energy
- Onset: triggered by stress
 - Nutritional
 - Inclement weather
- Most prevalent:
 - When carrying 2+ lambs or kids
 - Ewes/does that are extremely fat or excessively thin
 - 1-3 wks prepartum

Preg Tox

- Prevention
 - BCS of 3 at breeding; Aim for BCS 3-3.5 at parturition
 - Plan for 3-4# good quality hay (>10% CP) and 1.5# grain/hd daily in late gestation
 - Fetal Counts (feed)
 - Do not allow free-choice feeding in first 4 mos of pregnancy
 - Supplement concentrates in last 2-4 wks of gestation or access to lush pasture
 - If severe weather, may increase to 2-3# grain/hd/d divided into 2 feedings
 - Parasite management

Preg Tox Treatment

- Glucose drench
 - 60-100 mL/d for 3 days
 - Can add CA, insulin, and potassium
 - Can also had electrolyte solutions
- Offer good quality hay & oats
- Sometimes induction necessary
 - Dexamethasone (20 mg, IV or IM)
 - Occurs within 24 to 72 hrs (36 hrs)

Hypocalcemia or Milk Fever

- Cause: decreased calcium intake when requirements increase
- Timing: Late gestation, early lactation
 - 6 wks prior to 10 wks post-parturition
 - Commonly: 1-3 wks prepartum
- Target: Ewes/does carrying multiples
- Can be concurrent with preg tox
- Nutrition and mobilization
- <5% of flock, up to 30%

HC or Milk Fever

- Treatment:
 - Ca Borogluconate IV (50-150 mL of 23% solution)
 - Oral or SQ administration to prevent relapse
 - Can cause arrhythmias
 - Can mix
 - Above with:
 - With 1 L of a 5% dextrose solution
 - Administer over 10 min period

Outcomes



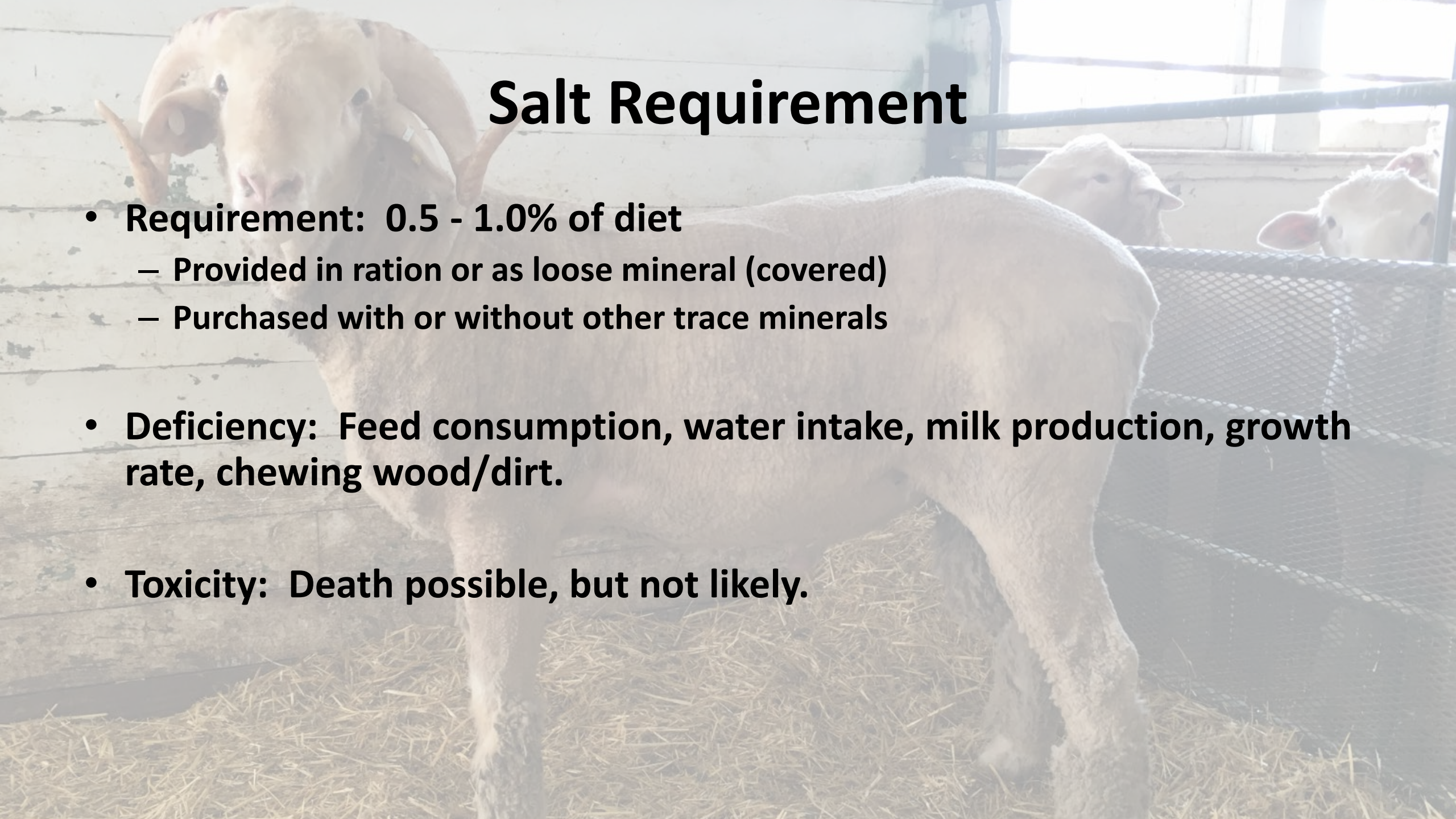
Feed Additives

Animal	Additive	Reason
Lamb	Chlorotetracycline	Gain, feed efficiency, enterotoxemia
Breeding ewes	Chlorotetracycline	Vibrionic abortion
Sheep	Oxytetracycline	Gain, feed efficiency, scours prevention and treatment, enterotoxemia
Sheep	Lasalocid	Coccidiosis
Lambs	Decoquinate	Coccidiosis
Lambs	Ammonium Chl.	Urinary calculi
Sheep	Thiabendazole	Roundworms

A photograph of a white ram with large, curved horns standing in a pen. The ram is the central focus, looking towards the camera. In the background, other sheep are visible behind a metal fence. The setting appears to be an indoor or semi-enclosed farm area with a concrete floor and a white wall.

Minerals

- **Sixteen essential minerals:**
 - Required for skeletal and nervous systems, health, growth, and reproduction
- **Minerals of importance:**
 - Salt, calcium, phosphorus, magnesium, potassium, sulfur, copper

A white ram with large, curved horns is the central focus, standing in a pen. In the background, other sheep are visible behind a metal fence. The setting appears to be an indoor or semi-enclosed farm area with a concrete floor and a wooden wall.

Salt Requirement

- **Requirement: 0.5 - 1.0% of diet**
 - Provided in ration or as loose mineral (covered)
 - Purchased with or without other trace minerals
- **Deficiency: Feed consumption, water intake, milk production, growth rate, chewing wood/dirt.**
- **Toxicity: Death possible, but not likely.**

Calcium Requirement

- **Requirement: 0.2 – 0.82% of diet**
 - Most forages are adequate
 - Ground limestone, dicalcium phosphate
- **Deficiency: Abnormal bone development (rickets), tetany (muscle spasms), urinary calculi. Late gestation and early lactation.**
- **Toxicity: Not likely, but may cause deficiency in other minerals.**

Phosphorus Requirement

A large ram with curved horns stands in a pen, looking towards the camera. In the background, other sheep are visible behind a metal fence. The setting appears to be a farm or a veterinary clinic.

- **Requirement: 0.16 – 0.38% of diet**
 - 2:1 to 7:1 calcium to phosphorus ratio
 - Most grains are excessive
 - Dicalcium phosphate
- **Deficiency: Rickets, slow growth, decreased appetite**
- **Toxicity: Urinary calculi in rams and wethers!**
 - Treat with 7-10 grams/head/day of ammonium chloride

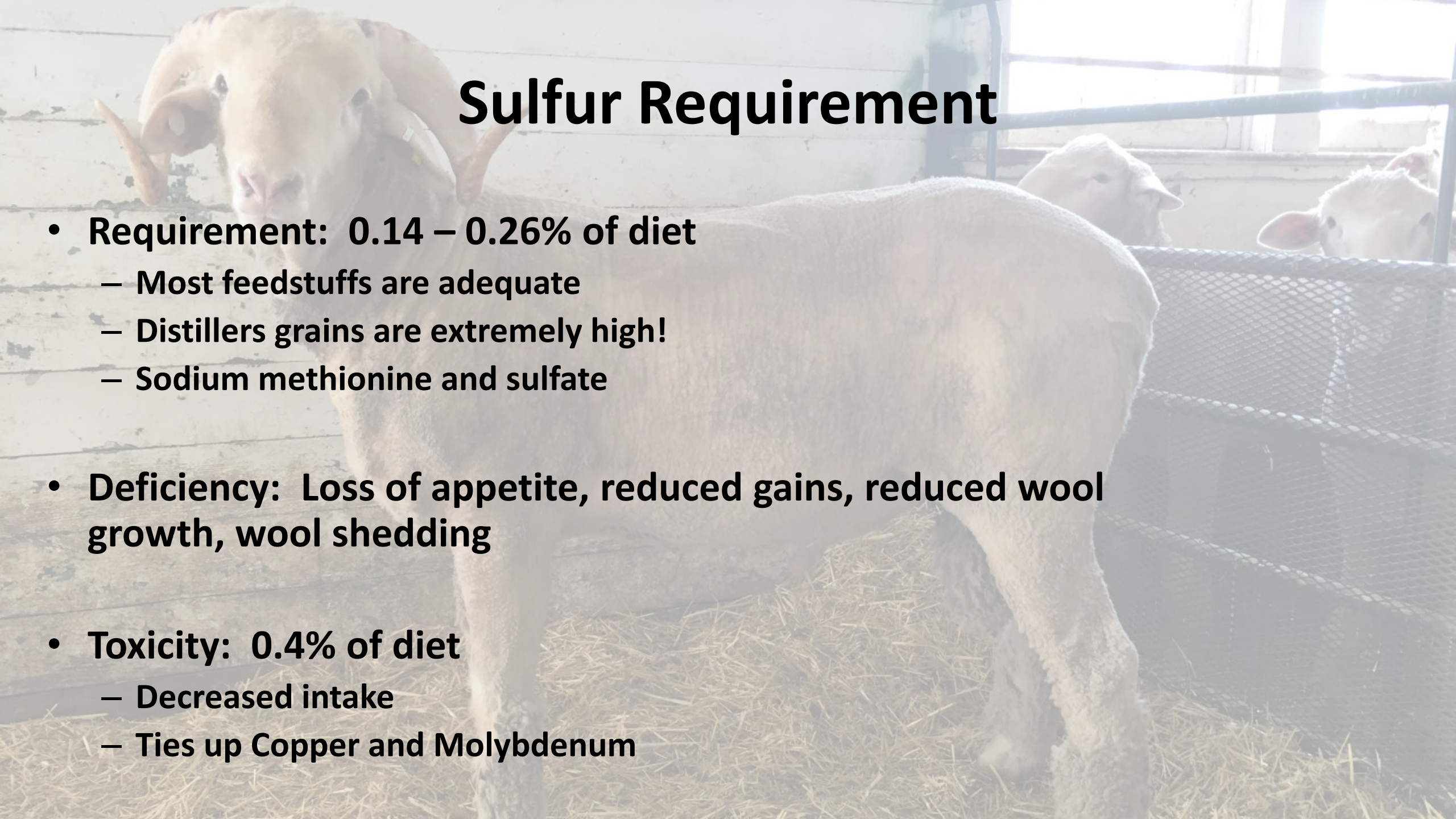
Magnesium Requirement

- **Requirement: 0.12 - 0.18% of diet**
 - Plant protein sources
 - Magnesium carbonate, oxide, and sulfate
- **Deficiency: Skeleton, tetany (frothing at mouth, falling on side, salivation, decreased appetite, death)**
 - Lactating ewes grazing spring grass (high potassium)
- **Toxicity: Not likely**

Potassium Requirement



- **Requirement: 0.50 – 0.80% of diet**
 - Most forages are adequate, grains may be low
 - Potassium chloride or sulfate
- **Deficiency: Listlessness, stiffness, convulsions, death**
- **Toxicity: 3% of diet dry matter causes depression of Mg absorption (tetany)**

A white ram with large, curved horns is the central focus, standing in a pen. In the background, other sheep are visible behind a metal fence. The scene is set in a well-lit indoor facility, likely a farm or research station.

Sulfur Requirement

- **Requirement: 0.14 – 0.26% of diet**
 - Most feedstuffs are adequate
 - Distillers grains are extremely high!
 - Sodium methionine and sulfate
- **Deficiency: Loss of appetite, reduced gains, reduced wool growth, wool shedding**
- **Toxicity: 0.4% of diet**
 - Decreased intake
 - Ties up Copper and Molybdenum

Copper Requirement

- **Requirement: 7 – 11 ppm**
 - Most feedstuffs are adequate, but Sulfur and Molybdenum tie up copper
 - Copper sulfate (0.5% of ration)
- **Deficiency: decreased immune status, swayback, stringy wool, infertility**
- **Toxicity: 25 ppm**
 - Red blood cell breakage, death!
 - Don't use mineral supplements for other animals!
 - Drenching with 100 milligrams of ammonium molybdate and 1 gram of sodium sulfate.



Vitamins

- **All sheep require vitamins A, D, and E.**
- **Lambs may also require B complex.**
 - **After rumen develops, microorganisms synthesize these vitamins.**
- **Vitamin C is synthesized by body tissues.**

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Vitamin A Requirement

- **Requirement: 21 IU/lb live weight**
 - Green forages contain B-carotene which is converted to Vit. A
 - Grains are poor sources
 - Vitamin A, D, and E injection prior to lambing
- **Deficiency: Growth retardation, retained placenta, reproductive failure, night blindness, dead lambs.**
- **Toxicity: Not likely**

Vitamin D Requirement

A photograph of a white ram with large, curved horns standing in a pen. The ram is the central focus, looking towards the camera. In the background, other sheep are visible behind a metal fence. The setting appears to be an indoor or semi-enclosed farm area with a concrete floor and a white wall.

- **Requirement: 252 IU/100 lb live weight**
 - Sun-cured hay
 - Grains are poor sources
 - Vitamin A, D, and E injection prior to lambing
- **Deficiency: Rickets**
- **Toxicity: Not likely**

Vitamin E Requirement

A photograph of a white ram with large, curved horns standing in a pen. The ram is the central focus, looking towards the camera. In the background, other sheep are visible behind a metal fence. The setting appears to be an indoor or semi-enclosed farm area with a concrete floor and a wooden wall.

- **Requirement: 9 – 10 IU/lb of diet**
 - Vitamin E or selenium injection
 - Alfalfa is a good source
 - Vitamin A, D, and E injection, especially for lambs
- **Deficiency: White muscle disease**
 - Stiff rear legs, arched back, tuck-up rear legs
 - Same affect as selenium deficiency (not a huge problem in ND)
 - Corn diets can contribute to deficiency (high Vit. E)
- **Toxicity: Not likely**

Vitamin B Complex Requirement

Thiamine, B₂, niacin, B₆, pantothenic acid, folic acid, B₁₂, biotin, and choline

- **Requirement:** Not required in diet, synthesized in rumen.
- **Exception:** Polioencephalomalacia in early-weaned and feedlot lambs on high-concentrate diets
 - Treat with Thiamin injection
 - Symptoms: Down on side, paddling with feet, head thrown back

Urolithiasis

- **Obstruction in urethral tract; males**
 - **Dietary imbalance, water restriction, urine pH**
 - **Ca Carbonate stones:** diets low in Phosphorus and Mg
 - **Silica:** high silicone content, combined with Cu and Zn deficiencies
 - **Struvite:** grain-based diets, high in phosphorus, lo in Ca
 - **Urine pH < 7.0 (silicate), >7.0 (apatite, calcium, struvite)**
 - **Symptoms:**
 - Depression, stretching, tail swishing, pain during urination, dribbling urine, appearance of bloat (water belly)
 - Urine crystals on prepuce, rectal prolapse
 - **Treatment:**
 - Rarely medical, sometimes can be dissolved
 - Usually: penile amputation, perineal urethrostomy, urethrotomy



Rumen Acidosis



- **Rapidly fermentable starch/sugar in excess**
 - Lactic Acid = overproduced
 - Decline in rumen pH
 - pH promotes lactobacillus bacteria, make more LA
 - **Leads to: dehydration, hypovolemic shock**
 - Rumen imbalance, irritation
 - Bacteria and toxins can enter circulation
 - Systemic Acidosis
 - **Why?**
 - Sudden changes in diet (amount, type, weather, etc.)

Rumen Acidosis

- **Signs: 12-36 h after ingestion**
 - Anorexia, depression, weakness,
 - Bloat, diarrhea, acute laminitis
 - Chronic: laminitis, foot abscesses, some neurological signs
 - Polioencephalomalacia
- **Treatment:**
 - Shock, dehydration, acidosis, toxemia, removal of feed
 - IV Sodium bicarbonate (5%), NSAIDS
 - Convert to roughage
 - Rumen transfaunation
 - Thiamine supplementation



Ration Balancing Software

- **OSU Ration Software:**

<http://agecon.okstate.edu/meatgoat/>

- **Other software:**

<http://agecon.okstate.edu/meatgoat/record.asp>

- <https://msusheepration.montana.edu/>

- Brands (Iowa State)