Common conditions seen in sheep and goats

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Pregnancy toxemia

- Pregnancy disease
- Twinning disease
- Pregnancy ketosis

Prepartum conditions affecting does
- Pregnancy disease – Twinning disease, pregnancy ketosis, pregnancy toxemia
- Pseudopregnancy or false pregnancy
- Injury – ruptured prepubic tendon or hernia
- Vaginal prolapse
- Abortions

Pregnancy Toxemia

Epidemiology
- Multiple fetuses > 2
- Mature does/ewes
  - Too thin (≤1/5) or obese (≥5/5)
  - Last trimester
Predisposing factors
- Poor-quality feed
- Weather extremes
- Stress – processing, transportation

Etiology
- NEGATIVE ENERGY BALANCE
  - Rapid fetal growth
  - ≥ Late-gestation
  - Nutritional demands
  - ~80% fetal growth in last 4–6 w of gestation
  - Fecundity = Energy requirements
    - Single: 150 %, Twins: 200 %, Triplets: 200–250%
  - Rumen capacity
  - +/- Concurrent diseases

Clinical Signs

Initially
- Lag behind
- Isolated
- Fail to escape
- Depression
- Stiff walk
- Poor appetite
Clinical Signs…

- As the condition progresses
  - Staggering gait → recumbency
  - Edema distal extremities
  - Apparent blindness
  - Teeth grinding
  - Sweet breath
  - Tachypnea
  - Muscle tremors
  - Constipation
  - ↓ Rumen contractions

Eventually
- Severe depression – comatose
- Recumbency – unable to rise
- Rumen atony
- Dehydration
- Nervous signs*: 
  - Muscle tremors
  - Opisthotonos
- Death within ~ 3–4d

Other Clinical Observations

- ↑ Incidence of dystocia
  - Fail to go in active labor – Uterine inertia
  - Ringwomb
- Poor mammary development
  - ↓ Colostrum quality & quantity
  - ↓ Milk production vs. ↑ Demand
- ↑ Neonatal mortality
- +/- Renal failure

Differentials

- Hypocalcemia
- Polioencephalomalacia
  - Thiamine deficiency
  - Sulfur toxicity
- Strongyles infestation
- Mastitis
- Enterotoxemia
  - *Clostridium perfringens* type D

Pregnancy Toxemia

- Diagnosis
  - Clinical signs
  - ↑ fetuses
  - Ketonuria
  - ± Hypoglycemia & ↑ Ketones
  - ↑ Serum BHBA* (ketones are acetoacetic acid + BHBA)
  - NEFAs > 0.4mEq/L
  - Rule out other common diseases

- Treatment
  - Stimulate appetite/ forced feeding
    - Buffet
    - Propylene glycol PO*
    - Transfaunation, AAS drench mix*
    - B- vitamins
  - Treat ketosis, acid–base, electrolytes imbalance
    - IV fluids w/ dextrose 5% +/- amino acids
    - Insulin SC: 0.4 units/kg SC SID for 1–2 days
  - Abortion or c-section
  - Treat concurrent diseases if present

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Treatment by inducing abortion

- Can induce parturition after 143 days without compromising fetal survivability, in conditions like pregnancy toxemia, vaginal prolapse and ruptured prepubic tendon.
- Does – Dexamethasone 16- 20 mg followed in 24 hours with 10 mg of Lutylase done in early induction. Parturition 24 – 36 hours. 16 mg Dex + 10 mg Lutylase – 30±5 hours.
- Ewe – 16 to 20 mg of Dexamethasone, 24 hours apart. Parturition 24 – 36 hours.
- Not recommended in final stages of Pregnancy toxemia (i.e. seizures, coma)

Induction of parturition in does with pregnancy toxemia

- Unknown breeding history.
- Measuring the bi-parietal and placentome diameter.
- Mammary gland development.
- Mammary secretion.
- Monitoring the fetal heart beat.
- Swelling and relaxation of the perineal area.

BPD vs. GESTATIONAL AGE OF GOATS (Haibel et al. 1990)

<table>
<thead>
<tr>
<th>Breed</th>
<th>GA</th>
<th>BPD</th>
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</thead>
<tbody>
<tr>
<td>Taggenburg</td>
<td>27.9</td>
<td>1.64 BPD</td>
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<tr>
<td>Nubian</td>
<td>26.8</td>
<td>1.74 BPD</td>
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<tr>
<td>Angora</td>
<td>28.6</td>
<td>1.77 BPD</td>
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<td>Pygmy</td>
<td>23.2</td>
<td>2.08 BPD</td>
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<tr>
<td>Suffolk</td>
<td>22.5</td>
<td>1.81 BPD</td>
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<tr>
<td>Finn</td>
<td>21.4</td>
<td>1.85 BPD</td>
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</tbody>
</table>

Relationships of the fetal biparietal diameter (BPD) in millimetres and gestational age (GA) in days for various breeds. (Haibel et al. 1990)

Materials and Methods

- 11 Alpine does
- 3-6 years old
- Starting at 45 days after breeding, T/A – U/S
- Weekly ultrasound exams was performed till parturition.
- Aloka 500, 3.5Mhz curve/linear probe
- Placentome size – measurement of placentome diameter done close to the fetal thorax.
- Biparietal diameter – head

Placentomes

- Placentome = caruncle (maternal) + cotyledon (fetal)
- Seen after 40 days of gestation and increase rapidly in size and diameter throughout gestation.
- Size varies between location, from the body of the uterus to the uterine horn tip
- Previous work done has shown that size of placentome has low correlation with GA after second trimester.
- In this project – placentome was measured at the level of the ribs, close to the heart.
Conclusions

- Some does consistently have larger placentomes, but increased in size throughout gestation.
- 9/11 does had twins
- 2/11 had singles and had > 50 mm placentome and biparietal diameter at the time of kidding.
- No doe had a placentome less than 41 mm in diameter at the end of gestation– placentomes were measured at the level of the ribs, close to the heart.
  - Possible cutoff value for induction of parturition >41 mm or 46 mm (average)
- Biparietal diameter was not consistently obtained in the third trimester, and is not always been a reliable measurement especially late in gestation.
- Average BPD – 48.5 mm > 44 mm (Possible cutoff value).

Pregnancy Toxemia

- Prevention
  - Ensure good body condition
  - Score at breeding
  - Good nutrition in late gestation
  - Energy dense
  - Parasite control !!!
  - Ultrasound pregnancy check – 40 to 50 D
  - Separate dams with >2 fetuses from the rest
  - Ketostix on urine
  - Plasma BHB levels

Prevention

- Does should be on an increasing plane of nutrition the last 8 weeks of pregnancy. Should gain weight (9 lbs. for a single, 15 lbs. for twins).
- Exercise – especially if the doe is fat.
- May want the obese doe at breeding to loose weight during the first 2 months of pregnancy.

Pseudopregnancy (Hydrometra or Mucometra)

1. Seen in dairy goats and also does synchronized for off season breeding.
2. Have been in heat, may or may not been bred.
3. Elevated progesterone – CL
4. Appear to be pregnant – ‘Cloud Burst’ at the end of five months
5. Hemorrhagic discharge
6. Ultrasound: Real time ultrasound – fluid filled
7. Usually will conceive subsequently, but can recur
8. Treatment – prostaglandin
9. Early diagnosis
Injury
- Older does
- Fighting
- Head butting
- Leading to hernia or ruptured prepubic tendon

Vaginal prolapse
- Older does in late gestation
- Pygmy does
- Moldy or estrogenic feed
- Lack of exercise in small pens
- Obese does (BC>4) with excess fat in the pelvis causing laxity to the ligaments
- Hereditary aspect to the laxity of pelvic ligaments
- Tail docking in ewes
- Reduce the prolapse, retaining suture or retaining device
- Up to 40% will die, the rest are prone to dystocia and stillbirths
- Induce parturition
- Cull the affected animals and their daughters

Other metabolic conditions
- Polioencephalomalacia
- Floppy kid syndrome
- Goitre

Floppy kid syndrome
- Cause unknown
- 3 to 10 days of age
- Profound muscular weakness
- Cannot nurse – no control of their tongue but can swallow
- No diarrhea, dehydration or dyspnea

Diagnosis
- Clinical signs
- Age
- Laboratory findings
- Response to treatment

- ↑ bicarbonate – base deficit 20±5 mEq
- ↓ blood pH (7.13±11)
- Normal chloride
- Metabolic acidosis
- ↑ anion gap (31.2±3.7)
- ↓ L-lactate and ↑ D-lactate
Differential diagnosis
- White muscle disease
- Colibacillosis
- Enterotoxaemia
- Septicemia
- Abomasal bloat

Treatment
- Kids fed milk by stomach tube
- Mild cases oral bicarbonate or Pepto-Bismol
- Two teaspoons of baking soda with half teaspoon of common salt in 1 liter of water. Give 2 – 3 ounces, 3 times a day.
- Improvement should be seen < 48 hours

Severe cases
- Blood chemistry is helpful
- Base deficits: -12 to -25
- 4 Kg kid with 20 base deficit - 48 mEq HCO₃⁻
  (1 Tsp 64 mEq of HCO₃⁻ orally)
- 1.3% NaHCO₃ I/V.
- Recovery within 24 to 48 hours

Polioencephalomalacia
- High grain diet
- Feed high in molasses
- Moldy hay
- Sudden change in feed
- Deworming with levamasole
- Amprolium & sulpha drugs
- Increase level of sulfates in the water

Clinical signs
- Sudden loss of appetite
- Depression
- No fever
- Rumen motility decreased
- Temporary blindness
- Head pressing
- Star gazing – aimless walking
Clinical signs – contd

- Grinding teeth
- Muscle tremors
- Hyper excitable
- Down - convulsions, nystagmus, opisthotonus

Thiamine 10 mg/kg four times/day
- Dexamethasone 0.1 mg/kg – cerebral edema
- Correct the acidosis [ grain ]
- Rehydration– fluids and dextrose
- Seizures – diazepam 0.5 to 1.5 mg/kg
- Improvement 4 to 6 hours

Diagnosis

- Clinical signs
- History
- Response to treatment
- Laboratory – Pyruvate in the urine and blood↑, ↑ transketolase
- DD – Listeriosis, enterotoxaemia, rabies, tetanus, pregnancy toxemia.

Prevention

- Concentrate levels
- Provide adequate roughage
- Provide thiamine in the diet = 1.5 to 4 mg/kg in the feed
- Check sulfur content of water and forages
- Monitor – Treatment after amprolium and anthelmintics

Goiter

- Milk goiter
- Seen Commonly in Boer, Nubian and Pygmy kids
- Goats raised in iodine deficient regions. (NE)
- Heavily fertilized pastures
- Ingestion of compounds like thiourea and thiouracil
- Seen in animals ingesting Brassica family, mustard family (kale, rape), legume family (peanuts, soybean, white clover, prune family (cherry, apricots) and sorghum
- Hereditary

Clinical signs

- Kids born to does on iodine deficient diet or have consumed goitrogenic plants.
- Swelling of the thyroid glands in kids will appear about a week old, increase in size to about 4 months and then regress. (weaning)
- Dry skin
- Retarded growth
- Tendon laxity
- Does - infertility, irregular estrous cycle, ▼ conception, abortions and weak kids.
- Male - ▼ libido and semen quality.
**Diagnosis**

- Clinical signs
  - Iodine levels ▼ serum, plasma and milk
  - ▼ Thyroxine
  - ▼ treatment
  - Prevention
  - Pregnant does third trimester have free access to trace mineral salt containing iodine.
  - Deficient areas – trace minerals with iodine.
  - Pregnant does in third trimester 2 ml Lugol’s iodine topical.

**Other conditions seen**

- Splay legs
- Contracted tendons
- Obstructive urolithiasis
- Impaction
- Bloat
- Hypocalcemia
- Copper toxicity

**Splay legs / contracted tendons**

- Weak kids and lambs
- Iodine deficiency
- Vitamin E / Selenium deficiency
- Nerve damage
- Location in the uterus
- Rule out floppy kid syndrome

**Obstructive urolithiasis**

- Rams and Bucks
- Wethers
- High grain diet
- Cold weather
- Water intake

**Calculi in goats**

- Apatite — Calcium phosphate
- Struvite — Magnesium ammonium phosphate
- These two are the most common forms of calculi seen in goats
- Oxalate → Certain plants like poke weed, pigweed, thistle etc
- Carbonates - legumes
- 95% have multiple stones

**Predisposing factors**

- Decreased water intake
- High grain diet
- Genetics
- Early castration [Length and diameter of the urethra]
Clinical signs

- Fever
- Increased heart and respiration
- Restless
- Tail switching
- Colicky signs

Clinical signs – contd

- Straining to urinate
- Blood tinged urine
- Urine crystals [preputial opening]
- Ruptured urethra [swelling of the sheath]
- Ruptured bladder [uremia]

Site of Obstruction

- Urethral process – Ov/Cap
- Distal sigmoid flexure – Bo, Ov/Cap
- Distal pelvic urethra
- Rarely ureter

Treatment

- Medical – early
  - Urinary acidifiers orally or injecting into the bladder
  - Orally ammonium chloride 250mg/kg or glacial acid or walpole’s solution into the bladder
  - Salt blocks
  - Antispasmodics or relaxants – smooth muscle and retractor muscle
    Acetromazine: 0.05 - 0.1 mg/kg (I/V or I/M)
    Diazepam: 0.1 mg/kg
  - Anti-inflammatory drugs
  - Vitamin C may help in dissolving the calculi

Walpole’s solution

- Glacial acetic acid
- Ultrasound guided 18 gauge 2 inch I/V catheter into the bladder.
- About 150 ml of urine is removed.
- Equal amount of glacial acetic infused.
- Check pH (5).
- Aspirate and re-infuse if necessary
- Monitored for 24 – 48 hours
- Repeat the treatment if not urinating

Surgical

- Urethral process amputation
- Urethrostomy
- Perineal urethrostomy – salvage
- Perineal urethrostomy with penile amputation – salvage
- Cystotomy – retrograde flushing of the urethra
- Tube cystostomy
**Urethrotomy**

- EARLY CASES-Breeding animal
- Incision over sigmoid
- Identify stone and crush

**Urethrotomy**

- Urethrotomy w/ closure
- 3-0 absorbable monofilament

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**Perineal Urethrostomy**

- Salvage procedure in 4-H project wethers and lambs

**Percutaneous Tube Cystostomy**

- Lumbo-sacral epidural (lidocaine 2%)
  - Small ruminants: 1 ml / 15 lbs
  - Cattle: 1 ml / 200 lbs
- Diazepam: 0.2 mg/kg IV
- Right lateral recumbency
- Ultrasound guided

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**Cystotomy**

- Pre-op considerations
  - Retrograde catheter in urethra
  - Anesthesia → general
  - Gas > Injectable
  - Dorsal recumbency
  - Ventral paramedian incision
  - Enter abdomen on midline

**Cystotomy**

- Incision bladder
  - Ventral aspect
- Remove stones
- Hydropulsion to achieve patency
  - Normograde
  - Retrograde
  - Need assistant!
**Cystotomy**

- Hydropulsion…
  - With occlusion
  - With lidocaine (1%)
- Closing
  - Bladder
    - Inverting pattern
    - 3-0 or 2-0 absorbable
    - Laparotomy site

**If can’t relieve → Tube Cystostomy**

- Indication: breeding/pet animal
- Goals
  - Urine diverted
  - Correct metabolic problem - fluids
- Pre-op considerations
  - Anesthesia
  - Local, epidural, general anesthesia
  - Antibiotics
  - Approach/position
  - Size of Foley catheter?

**Tube Cystostomy → Technique**

- Laparotomy
- Urinary bladder
  - 2 Stay sutures
  - Stab incision into apex
    - Suction of urine
    - Remove calculus
- Body wall
  - Stab incision
    - 2-4 cm lateral to laparotomy site
  - Insertion of Foley catheter into bladder lumen

**Tube Cystostomy → Technique**

- Fill balloon of Foley w/ saline
- Purse-string
  - Urinary bladder – Foley catheter
- Apposition of bladder wall against body wall
- Chinese finger trap
  - Skin-Foley catheter
- Close laparotomy site

**Tube Cystostomy → Post-op**

- Prevent pulling of Foley
  - Suture Foley to skin
  - Collar
- Heimlich valve
- Antibiotics
  - Beta-lactams
- NSAID’s*
- Fluids (IV, PO)
- Ammonium chloride PO
### Prevention
- Good quality hay and trace minerals
- Calcium to phosphorus 2:1 to 2:5:1 in the diet
- Salt up to 4% of the diet
- Clean fresh water
- When good quality hay is not available, grain is fed with dicalcium phosphate or calcium carbonate
- Urinary acidifiers like ammonium chloride is fed at the level of 2% in the diet or 10 grams per day.
- Delay castration

### Impaction
- Poor quality hay
- Foreign body – plastic bags, ropes, etc.
- Access to water
- Hardware disease – wire
- Peritonitis – Liver abscess, ulcer
- Vagal indigestion

### Treatment
- Mineral oil
- Magnet
- Oral fluids
- Vitamin B complex
- Rumen transformation
- Rumenotomy

### Bloat
- **Gas** – obstruction, mass, increase grain diet
- **Frothy** – Rapidly growing grass or pasture heavily fertilized
- Full left flank
- Pain and discomfort
- Respiration increased

### Treatment
- Emergency
- **Gas bloat** – Stomach tube Trocar – left side
- **Frothy bloat** – Mineral oil Vegetable oil Mild detergent Poloxalene

### Hypocalcemia
- Pregnancy toxemia
- Dairy goats
- Off feed
- Ataxia
- Mild bloat
- Down
- Seen < 24 hours after kidding or lambing
Down

- Hypothermia
- "S" curved neck
- Pupils dilated
- Very dull heart beat
- Muscle twitching

Treatment

- Intra-venous calcium [100ml - 23% calcium gluconate]
- Subcutaneous calcium
- Oral calcium preparation

Copper Toxicity

Information provided by Dr Melanie Boileau

Mineral Interactions

- Rumen: Copper, molybdenum & sulfur form thiomolybdates
- Small Intestines: Calcium, iron and zinc ↓ absorption
- Liver: Zinc & iron alter hepatic storage of copper
- Soil: Alkaline soil ↓ copper absorption in plants

Sources of Copper

- Concentrates or minerals for Bo, Eq, Po, poultry
- Copper sulfate foot bath
- Copper piping or plumbing
- “Natural fertilizer”
  - Slurry from swine units
  - Poultry litter
  - Copper containing algaecides or fungicides
- Overdose
  - Parenteral adm. of Copper salt/Copper wire boluses
  - Monensin can ↑ intestinal absorption of Cu

Pathophysiology

- Simple
  - Excess dietary copper exceeds liver’s metabolic capacity
  - Acute vs. chronic
- Hepatogenous
  - Plant toxins damage hepatic parenchyma
  - Lower threshold for copper toxicity
- Phytogenous
  - Graze plants with ↑ Cu:Mo (>10:1) ratio for extended period of time
  - Subterranean clover
Copper...

- Pathogenesis...
  - Hepatogenous
    - Plant toxins damage liver; *Senecia, Heliotropium*
    - Liver flukes
    - Increases hepatic affinity for Cu
  - Phytoprogenous
    - Grazing plants with elevated Cu:Mo for long periods
    - Often young, rapidly growing plants
    - *Trifolium* spp., subterranean clover
  - Intestine → proteins → liver
    - Copper binds with the protein→ ceruloplasmin
    - Accumulates in hepatic lysosomes over weeks/months
    - Necrosis of parenchymal cells, swelling of Kupffer cells

- Chronic Cu accumulation (weeks-months)
  - Low dietary Mo, SO₄, Zn
  - CuMo complex
  - Excretion in urine

- Stressors* induce release of Cu → clinical signs
  - Excessive Cu → Storage in lysosomes
  - Hemolysis* & hepatocellular necrosis
  - Hemoglobinuria
  - Renal Failure**

Animal susceptibility

- From most to least susceptible
  1. Sheep
    - Merino most prone to copper toxicity
  2. Camelids
  3. Cattle
  4. Goats
    - Pigmy goats prone to copper deficiency
  5. Pigs
  6. Horses

Acute Intoxication in Sheep

- Clinical signs
  - Anorexia, weakness, dehydration
  - Tachycardia, tachypnea
  - Icteric, pale, or brownish mucous membranes
  - Red serum, dark brown to red urine
  - Bruxism, diarrhea
  - Neurologic signs
    - Blindness, opisthotonos, seizures
    - Sudden death

Acute Intoxication in Goats

- Clinical signs
  - *Intravascular hemolysis is uncommon*
  - Neurologic signs – hepatic encephalopathy
  - Boer Doe*

Chronic Intoxication...

- Often asymptomatic
  - Sheep & Goats
    - Dullness, weakness
    - Abortion
  - Camelids
    - Lethargy, inappetence
    - Ataxia
**Antemortem Diagnosis**

- Anemia (Heinz bodies)
  - Hemoglobinemia
  - Methemoglobinemia (< 5%)
- ↑ Serum bilirubin
- ↑ Liver enzymes: GGT, AST, LDH, SDH
- ↑ Blood ammonia
- Hemoglobinuria & proteinuria
- ↑ Copper levels
  - Serum, liver, feedstuff (incl. mineral mix)

**Diagnostic Value of Various Samples**

- **Serum**
  - Safe to collect
  - ↓ rapidly after hemolytic crisis
- **Liver**
  - Liver biopsy risks
  - ↓ rapidly after hemolytic crisis
- **Kidney**
  - Postmortem collection
  - Label inaccuracies
  - Better for acute toxicity
  - Less rewarding with chronic accumulation
- **Feed**
  - Label inaccuracies
  - Better for acute toxicity
  - Less rewarding with chronic accumulation

**Toxic copper levels (ppm)**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Sheep</th>
<th>Camelids</th>
<th>Cattle</th>
<th>Goat</th>
</tr>
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<tbody>
<tr>
<td>Feedstuff</td>
<td>&gt; 20</td>
<td>&gt; 20-30</td>
<td>&gt; 50</td>
<td>&gt; 80</td>
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<tr>
<td>Serum</td>
<td>&gt; 2</td>
<td>&gt; 2</td>
<td>&gt; 4</td>
<td>&gt; 1.2 - 7.5</td>
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<tr>
<td>Liver biopsy</td>
<td>&gt; 250</td>
<td>&gt; 250</td>
<td>&gt; 250</td>
<td>&gt; 250</td>
</tr>
</tbody>
</table>

**Postmortem Diagnosis**

- Generalized icterus
- Watery blood; petechial hemorrhages on serous surfaces
- Abomasum – irritated, hemorrhage and edema
- Intestinal contents and feces ± bluish green
- Enlarged friable yellow liver; "nutmeg" appearance
- Swollen dark brown to bluish-black kidneys
  - "Gun metal"
- Red urine

**Treatment Guidelines**

- In case of acute hemolytic crisis
  - Nasal O₂
  - Packed RBC's or whole blood transfusion
  - Vitamin E x 10 d orally (2000 IU) or BoSe injection

- Treatment
  - Ammonium molybdate
    - 50-500 mg PO q24hrs for 3 weeks
  - Sodium thiosulfate
    - 300-1000 mg PO q24hrs for 3 weeks
  - D-penicillamine
    - 26 mg/kg PO BID for 6 days
  - OR
  - Ammonium tetrathiomolybdate
    - 1.7 mg/kg IV QOD for 3 tx’s

**Copper...**

- Prognosis
  - Unfavorable once hemolytic crisis

- Prevention/Control
  - Ensure Cu:Mo is 6:1–10:1
  - Sulfur levels > 0.35%
  - Add zinc to diet
  - Feed species-specific rations
  - Test Copper levels in feedstuff in mineral mixes regularly
  - Don’t pasture on old orchards
  - Avoid water w/ algicides, footbath runoff
Herd Treatment

- Copper chelators
  - Sodium molybdate (20 mg/hd/d)
  - Sodium sulfate (6 g/hd/d)
    - Daily Tx, duration: min. 3 weeks, ideally 12 weeks, $$$
- Heavily Copper–contaminated pasture
  - Top-dress with Molybdenum PO₄ @ 113 g/acre
- Expectations?
  - < 5% herd morbidity
  - > 75% mortality for affected animals
  - Losses continue for months after diet change

Cost of Copper chelation therapy?

Example: 100 lb (45.5 kg sheep)

- Ammonium molybdate
  - 300 mg/hd/d = 7.5 mL x $0.22/mL x 21 d = $ 35
- D-Penicillamine
  - 26 - 52 mg/kg/hd/d = 5.3 -11.5 mL x $1.04/mL x 6 d = $ 33 – 72
- Sodium thiosulfate
  - 300 mg –1000 mg/hd/d = 10 mL x $ 0.11/mL x 21 d = $ 7 – 23
- $ 75-130 / head