



Top 15 Small Ruminant Dz, part 2: CAE, Pregnancy toxemia, Urolithiasis, Copper tox, Polled intersex

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You need more than *shear* luck to pass the boards.



Get "sheep shape" with Zuku's small ruminant review!

6. [Caprine arthritis encephalitis \(CAE\)](#)

o **Classic case:**

- Adults: progressive polysynovitis/arthritis
 - Swollen joints (esp. carpus)
 - Lameness
 - Weight loss, poor hair coat
 - Indurative mastitis ("hard udder"), agalactia
 - Dyspnea due to interstitial pneumonia
- Kids 2-4 mos old: encephalomyelitis
 - Weakness, ataxia
 - Placing deficits in pelvic limbs
 - Hypertonia, hyper-reflexia
 - May progress to para- or tetraparesis or paralysis

o **Dx:**

- Etiology: Enveloped, single-stranded RNA lentivirus (family Retroviridae), very similar to ovine progressive pneumonia virus and Maedi-Visna
- Serology for herd control programs:
 - Agar gel immunodiffusion (AGID) - more specific
 - ELISA - more sensitive
- Definitive: biopsy or necropsy shows characteristic lymphoproliferation with degenerative mononuclear cell infiltration
- Virus isolation or PCR

o **Tx:** None

- Supportive care:
 - Deep bedding, good quality feed
 - NSAIDs, regular foot trimming
- Prevent:
 - Isolate kids at birth & feed heat-treated colostrum, pasteurized milk
 - Serology of herd biannually
 - Separate seropositive & seronegative animals
 - Eventually cull seropositive animals

o **Pearls:**

- Widespread in dairy goats, 65% prevalence in US herds
 - Only 20% of infected goats ever show clinical signs



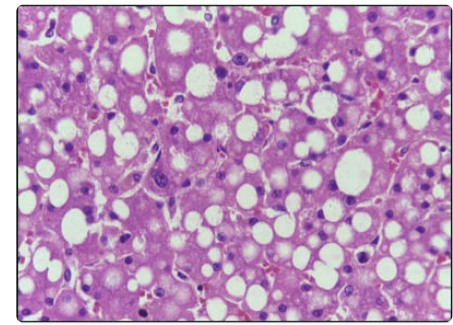
Bottle-feeding heat-treated colostrum can help prevent CAE



- Clinical signs develop much later
- Horizontal transmission within herd possible

7. Pregnancy toxemia

- **Classic case:**
 - Late-gestation pregnancy (last 1-3 wks)
 - Dam is over- or under-conditioned
 - Likely multiple fetuses
 - Partial anorexia, depression
 - Bruxism
 - Aimless pacing, muscle tremors, opisthotonus
 - Blindness, ataxia, recumbency, coma, death
- **Dx:**
 - Ketosis: increased serum beta-hydroxybutyric acid (BHB), increased urine ketones
 - +/- Hypoglycemia, hypocalcemia
 - +/- Increased nonesterified fatty acids
 - Necropsy: hepatic lipidosis, adrenal enlargement
 - Increased BHB in aqueous humor, CSF
- **Tx:**
 - Mild cases: Enteral/oral therapy
 - Propylene glycol
 - +/- Calcium, potassium
 - +/- Induce parturition with steroids
 - Severe cases:
 - Maybe euthanasia
 - Check fetal viability via ultrasound
 - If alive and within 3 days of due date, perform C-section
 - If dead, induce parturition with steroids
 - IV therapy: dextrose, insulin, calcium, flunixin meglumine
 - +/- Oral potassium
 - Prevention:
 - Assess body condition score (BCS) at breeding and mid-gestation pregnancy check
 - Takes 6 wks to raise BCS by 1 point
 - Improve feeding management:
 - Adequate space
 - Sort animals by BCS
 - Ration formulation
 - Forage analysis
 - Feed grain in final 6 wks
 - Do NOT enter last 6 wks pregnancy with BCS less than 2.5
 - Herd screening of ~20% of flock
 - Serum BHB levels should be 1.7 mmol/L high risk)
 - Ionophores MAY help late-gestation ewes improve feed efficiency
 - e.g, Monensin
 - Do not use in goats
 - **Pearls:**
 - Pregnancy toxemia develops when there is inadequate nutrition in late gestation in the face of increased metabolizable energy requirements
 - Mobilized fat stores + increased liver gluconeogenesis passes glucose to fetus
 - Can overwhelm liver leading to hepatic lipidosis & ketosis
 - Prognosis is good if ambulatory with mild clinical signs
 - Prognosis is guarded to poor if recumbent or comatose



Hepatic lipidosis seen in pregnancy toxemia - note fat vacuoles within hepatocytes [H&E stain 40X]

8. Urolithiasis

- **Classic case:**
 - Partial urethral obstruction:
 - Dribbling urine
 - Hematuria, stranguria

- Complete urethral obstruction:
 - Tenesmus, tail swishing
 - Colic, weight-shifting
 - +/- Bloat, rectal prolapse, inappetence, depression
- Urethral/bladder rupture
 - Abdominal swelling
 - Preputial swelling
 - Necrosis of ventral abdominal skin with "pseudourethral" development
- **Dx:**
 - Usually obvious based on history/clinical signs, exam
 - May see urolith in urethral process
 - Abdominal ultrasound/palpation: enlarged urinary bladder unless ruptured
 - Abdominal radiographs: calcium carbonate and calcium oxalate calculi are radiopaque (but struvite are radiolucent)
 - Ruptured bladder:
 - Abdominal ballottement of fluid wave
 - Ultrasound: large volume of hypoechoic fluid in abdomen
 - Abdominocentesis: creatinine of abdominal fluid is 2X that of peripheral blood
 - Bloodwork: low sodium/chloride, high phosphate, metabolic alkalosis



Amputated urethral process and uroliths removed

- **Tx:**
 - If obstructed, not ruptured:
 - Preferred Rx = tube cystotomy
 - Calculi are expelled spontaneously over time
 - If early/mild/partial:
 - Try antispasmodics/tranquilizers to relax sigmoid flexure of penis
 - If blockage at urethral process: amputate
 - Perineal urethrostomy to bypass urolith
 - Common long-term complication: stricture
 - If ruptured urethra or bladder:
 - Drain uroperitoneum slowly via teat cannula or trocar
 - IV normal saline: correct electrolyte abnormalities, dehydration, acid-base imbalance
 - Perineal urethrostomy as salvage procedure
 - Cannot usually repair bladder; may heal on its own
 - Usually cull within 3-4 mos
 - Prevention:
 - Struvite:
 - Increase chloride excretion by adding sodium chloride to ration (increases water intake to dilute urine and increases chloride excretion)
 - Decrease urine pH: ammonium chloride in ration
 - Feed calcium:phosphorus ratio of 2:1
 - Calcium stones: decrease calcium in feed
- **Pearls:**
 - Common problem, esp. in males because of long urethra with sigmoid flexure
 - High-grain diets with a ~1:1 calcium:phosphorus ratio or diets high in magnesium predispose
 - Most often at sigmoid flexure and urethral process
 - Urethroliths are most common type of urolith to cause problems
 - Type that forms is based on diet
 - Struvite (magnesium-ammonium-phosphate) stones: due to lots of grain with low calcium:phosphorus ratio
 - Silica stones: associated with grazing on silica-rich soil
 - Calcium stones: due to high-calcium diets

9. [Copper toxicity in sheep](#)

- **Classic case:**
 - Acute:
 - GI pain, diarrhea, anorexia, dehydration, shock
 - Chronic (*more common!*): no signs until ACUTE hemolytic crisis
 - Depression, lethargy, weakness, recumbency
 - Rumen stasis, anorexia, thirst, dyspnea

- Photosensitization
- If animal survives, renal failure
- **Dx:**
 - Acute: at necropsy
 - Blue-green ingesta
 - "Gun metal"-colored kidneys, enlarged spleen
 - Increased fecal or liver copper concentrations
 - Chronic:
 - Increased blood and liver copper concentrations
 - Also measure molybdenum levels
- **Tx:**
 - Rarely successful; prognosis poor
 - If acute:
 - GI sedative and Rx for shock may help
 - Penicillamine: enhances copper excretion
 - Vitamin C: antioxidant for erythrocyte damage
 - Ammonium tetrathiomolybdate: decreases liver copper absorption and increases liver copper excretion (has 10-day withdrawal)
 - Molybdenum: top-dress pastures, supplement feed
 - Zinc acetate, sodium thiosulfate: feed supplements that both help decrease copper absorption
- **Pearls:**
 - Worldwide problem
 - Sheep uniquely sensitive
 - Excessive copper ingestion for long periods leads to copper build-up in liver then STRESS causes sudden release and acute hemolytic crisis
 - Stress = transportation, handling, pregnancy, lactation, deteriorating plane of nutrition, weather conditions, strenuous exercise
 - Sheep have increased liver enzymes for weeks before acute crisis
 - Factors that affect copper metabolism:
 - Low molybdenum in diet leads to excess copper retention
 - Low sulfur, zinc, calcium in diet
 - Subterranean clover leads to excess copper retention
 - Plants such as *Heliotropium europaeum* or *Senecio* spp. contain hepatotoxic alkaloids which lead to liver disease, leading to release of copper into blood stream and hemolysis
 - Always check feed labels and use correct feed for sheep!



Photosensitization is seen in copper toxicity

10. Polled intersex syndrome (PIS)

- **Classic case:**
 - Most common in western European breeds: e.g., Toggenburg, Saanen, and Alpine
 - Usually look male (male phenotype), but are genetically female (female genotype), with testes (or ovotestes) and dysfunctional penis
 - Enlarged clitoris in a doe-like animal or decreased anogenital distance in a more masculine-appearing animal is typical
 - Polled homozygotic males have decreased fertility
 - Should not breed polled bucks!
- **Dx:** Thorough exam
- **Tx:** Cull, do NOT breed
- **Pearls:**
 - Polledness is an autosomal dominant trait in males and females
 - Intersexism is a recessive trait seen only in polled females
 - Intersex goats are:
 - Homozygous for polled trait
 - Genetically female with male traits (e.g., developed testes)
 - Most are NOT true hemaphrodites (e.g. those that have true testes and ovarian structures)
 - PIS is very rare in cattle and sheep
 - Freemartinism occurs in 20% of opposite-sex sheep twins (arteriovenous anastomoses between their placentas lead to masculinization of the female twin)



A horned (NOT polled) goat

- **Classic case:**
 - Males: especially castrated males!
 - Mild: preputial swelling
 - Severe: preputial swelling plus straining to urinate
 - Scabs and ulcers around preputial orifice
 - Urine accumulation in prepuce
 - Fatal if urinary blockage due to chronic scarring
 - Females:
 - Swelling, redness of vulva and clitoris
 - Scabs and ulcers of vulva, vestibule, and caudal vagina with yellow exudate
- **Dx:**
 - Etiology: *Corynebacterium renale* - a gram+, diphtheroid bacterium that hydrolyzes urea
 - Clinical signs
 - Culture
- **Tx:**
 - Isolate animal
 - Feed low-protein diet
 - Clip and clean around prepuce
 - Make sure urethra is patent
 - Watch for urination
 - Pass catheter past scarring
 - Antibiotics: penicillin or cephalosporin
- **Pearls:**
 - High-protein diet leads to increased urea in urine causing increased ammonia produced by *C. renale* which causes penile/urethral irritation
 - Predisposing factors:
 - Dirt caked in hair around prepuce
 - Preputial hairs too short or long - alters urine flow away from urethral orifice
 - Seasonal incidence associated with high-protein feed intake



Culture of *C. renale*

Images courtesy of [AnRo0002](#) (black-faced lambs), Sarah Reuss, VMD, DACVIM (uroliths), [Andrei Niemimäki](#) (bottle feeding black Finnsheep), [Calicut Medical College](#) (hepatic lipidosis), [Lucien Mahin](#) (photosensitization), [Fir0002](#) (horned goat), [CDC](#) (bacteria), and [Manhattan Research Inc](#) (sheep nose)

Ruminants

