

# Infectious Diseases and Vaccination for Hobby, Show, and Pet Goats

## 2024 MVMA Winter Meeting

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Retired Professor Emeritus

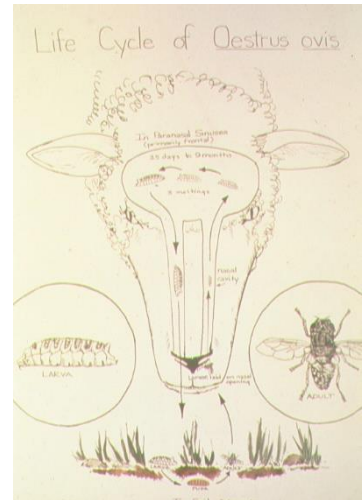
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### Respiratory Diseases

- Irritant and Allergic Rhinitis
  - Signalment
    - Any age, breed, or sex.
    - Irritant rhinitis may affect a larger number of animals or may be sporadic.
    - Allergic rhinitis is generally sporadic cases of just a few animals.
    - Both can be seasonal depending on husbandry and cause.
  - Causes
    - Dust (dirt roads, dry lot, bedding material, etc.)
    - Irritant Gasses (ammonia, others)
    - Seasonal Pollins
    - Fungal Spores
  - Signs
    - Sneezing
    - Stertor
    - Nasal Discharge, generally serous or only slightly mucoid.
    - Pruritis, head shaking, nose rubbing.
    - Conjunctivitis
    - **No Fever or very mild**
    - **CBC No Left Shift, may have stress leukogram**
  - Diagnosis
    - Pertinent Negatives
      - Normal Temperature
      - Normal appetite and attitude
      - Normal CBC
    - Nasal swab to visually assess for dust contamination.
    - Deep laryngeal swab to rule out viral or bacterial causes.
  - Treatment
    - Environmental
    - Anti-Inflammatory
      - NSAIDs
        - Meloxicam 1-2 mg/kg PO q24h
      - Steroids
        - Trial treatment with Dexamethasone (0.1 mg/kg) to evaluate response?
        - Prednisolone – Decreasing dosage over 3-4 weeks.
        - Antibiotics are generally not necessary but are not harmful for individual cases.
- Nasal Bots
  - *Oestrus Ovis*

- Signalment
  - Spring to early Fall
  - 4-H and FFA animals with owners not used to husbandry
  - Often mistaken as pneumonia and have been treated with antibiotics by the owner but no response.
- Signs
  - Nasal discharge
  - Sneezing
  - Stridor or Stertor
  - Decreased nasal airflow (hand, mirror, cotton, cheeks expand on expiration)
  - Normal attitude, appetite, body temperature, and CBC
- Treatment
  - Ivermectin, injectable is more efficacious than oral.



- Common Respiratory Disease
  - Rhinitis and/or Bronchopneumonia
  - Signalment
    - Any age but generally weaning and older.
  - Causes
    - Viral
      - PI-3
      - Adenovirus
      - RSV
      - Coronavirus
      - Herpesvirus
      - Others
      - **No species-specific vaccines available**
    - Bacterial
      - *Pasteurella multocida*
      - *Mannheimia haemolytica*
      - **Species specific vaccines available**
    - Mycoplasma
      - *Mycoplasma ovipneumoniae*
        - [https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/sa\\_a\\_nimal\\_disease\\_information/sheep-goat/movi/mycoplasma-ovipneumoniae](https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/sa_a_nimal_disease_information/sheep-goat/movi/mycoplasma-ovipneumoniae)
      - *Mycoplasma mycoides*
      - *Mycoplasma capricolum*
      - Also associated with arthritis, infertility, and abortions
    - *Chlamydophila psittaci ovis*
  - Signs
    - Lethargy
    - Decreased Appetite

- Nasal Discharge
- Cough
- Fever
  - Less common with mycoplasma when not combined with viral or bacterial causes.
- Increased HR and RR
- Inflammatory leukogram
- Diagnosis
  - Culture or PCR
    - Deep pharyngeal or laryngeal swab
    - Tracheal aspirate
    - Lung tissue
  - Treatment
    - Antibiotic
      - Macrolides (tulathromycin, gamithromycin)
      - Florfenicol
      - Oxytracycline
      - Ceftiofur (*P. multocida* and *M. haemolytica* but not *Mycoplasma spp.*)
      - Penicillin (*P. multocida*)
      - Because many respiratory infections are mixed bacterial and mycoplasma infections, macrolides or oxytetracycline are appropriate first choices.
      - **DO NOT USE**
        - Tilmicosin (Micotil) – cardiotoxic in goats
        - Any fluoroquinolone – Extra label use in goats is prohibited for all indications.
  - Prevention
    - Nutrition
      - Energy and Protein
      - Minerals – Cu, Zn, Se, Mo
      - Vitamins – Vit A, E, D
      - Good to evaluate serum levels of vitamins and minerals when greater than expected morbidity or mortality is observed, or when animals do not respond as expected to antibiotic treatment.
    - Husbandry and Environment
      - Reduce crowding.
      - Ventilation of enclosed housing.
      - Reduce stress.
      - Segregate affected individuals.
    - Vaccination
      - *P. multocida* bacterins
      - *M. haemolytica* bacterins
      - Not considered core vaccines
      - Will not overcome nutritional or stress related deficiencies.
- Lungworm

- All ages of goats are susceptible.
  - Causes
    - *Muellerius capillaris*
      - Most common
      - Least pathogenic
    - *Dictyocaulus filaria*
    - *Protostrongylus rufescens*
      - Rare in U.S.
      - Highly pathogenic
  - Signs
    - Cough
    - Generally mild signs
  - Diagnosis
    - Baermann fecal exam
  - Treatment
    - Fenbendazole, albendazole, oxfendazole, and ivermectin.
    - Recommend repeated dosing at 35-day intervals for 3 treatments.
- Small Ruminant Lentivirus Pneumonia
    - Both OPP and CAEV are genetically similar strains and grouped together as Small Ruminant Lentivirus.
    - The respiratory form of disease is less common in goats than it is in sheep.
    - Chronic progressive pneumonia
    - Diagnosis
      - Serology: ELISA > AGID
      - PCR
    - No effective treatment
    - Control
      - Biosecurity – Test all incoming animals.
        - Part of Small Ruminant Biosecurity Screen.
      - Identify carriers and either cull or segregate.
      - Alternate source of colostrum and milk
        - 20 mL of colostrum or milk is adequate to transfer infection from an infected doe to her kid
        - Feed only from negative does
        - Heat Treated Colostrum
          - 56°C, 135°F for 60 minutes
          - Preheat a thermos bottle with boiling water
          - Slowly heat the colostrum to 56°C (135°F)
          - Pour the heated colostrum into the prewarmed thermos
          - Check the colostrum temperature after 1 hour (should remain at 56°C)
          - Cool and feed
        - Milk
          - Pasteurized at 165°F for 15 seconds
          - Transfer kids to negative dams
          - Feed milk replacer.

- Nasal and Pulmonary Adenocarcinoma
  - Retrovirus, both nasal and pulmonary forms are closely related.
  - Nasal Adenocarcinoma
    - More common in sheep than goats.
    - Decreased nasal airflow.
    - Nasal discharge, stertor, stridor, inspiratory dyspnea, open mouth breathing, inspiratory dyspnea, expansion of cheeks on expiration.
    - Locally invasive
  - Pulmonary Adenocarcinoma
    - Less common than nasal.
    - Sheep > Goats
    - Progressive
    - Crackles on auscultation
    - Frothy exudate in respiratory tract
      - Wheelbarrow test
  - Diagnosis
    - Radiographs
    - Rhinoscopy
  - No treatment, Progressive, Fatal



### Enteric Diseases

- Neonatal Enteritis
  - *Cryptosporidium spp.*
    - 5-10 days
    - Malabsorptive diarrhea
    - Fecal exam – Acid Fast stain,
    - Supportive care
    - Separate from other animals.
  - Enterotoxigenic *E. coli* (K99, F41, same as calves)
    - <10 days of age
    - Outbreaks
    - Secretory diarrhea
    - Treatment
      - Fluid Therapy – oral, IV, SQ
      - Antibiotic? Oral Amoxicillin? Oral Trimethoprim-sulfa?
      - NSAID, single dose
    - Prevention
      - Vaccination of pregnant does with bovine ETEC vaccines may help in outbreak
    - Husbandry
  - Rotavirus
    - Group B Rotavirus
    - 2-14 days of age
    - Malabsorptive diarrhea
    - Supportive care

- Prevention
  - Husbandry
  - Vaccination of pregnant does with bovine rotavirus vaccines may help with control.
  - Separation of affected animals.

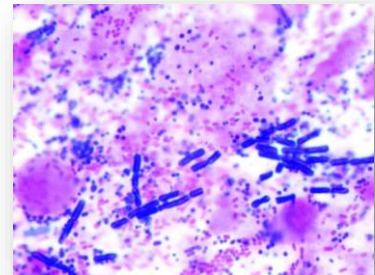
- Clostridial Abomasitis and Enteritis

- *Clostridium perfringens*

<i>Cl. perfringens</i>	Alpha	Beta	Epsilon	Iota	Disease Names
Type A	+				Enterotoxemic Jaundice, Yellow Lamb Disease, Abomasitis, Enteritis
Type B	+	+	+		Lamb Dysentery, Enterotoxemia
Type C	+	+			Hemorrhagic Enterocolitis
Type D	+		+		Enterotoxemia, Pulpy Kidney Disease, Overeating Disease
Type E	+			+	Necrotic Hemorrhagic Enteritis

- Type A – Most commonly observed.

- Signs
  - Abdominal tympany
  - Abomasal ulceration
  - Hemorrhagic enteritis
- Dietary Factors?
  - Carbohydrate and Protein
  - Protein Type
  - Milk Quality – Bacterial Overgrowth
- Diagnosis
  - Fecal Smear
  - Fecal Anaerobic Culture
- Treatment
  - Relieve Abdominal Distension
    - Respiratory Compromise
    - Abomasocentesis, right lower abdomen.
  - Stop Production of Toxins
    - Oral or Systemic Oxytetracycline
    - Single dose
  - Neutralize Toxins
    - Oral C&D Antitoxin
    - Systemic C&D antitoxin is probably not necessary.
      - The toxin is in the lumen of the GI tract.
  - Stop Bacterial Proliferation
    - Oral Penicillin 22,000 IU/kg q24 hours
    - Continue 24 to 48 hours past resolution of tympany and diarrhea.
  - Systemic Support



- IV Fluids
      - NSAIDs
    - Restore Intestinal Flora
      - Transfaunation
  - Vaccination
    - Clostridium Perfringens Type A Toxoid
    - Last made by Elanco but no longer available
  - Types B, C, and D all effectively controlled with C&D vaccines.
  - See Clostridial vaccines list at end of notes.
- *Salmonella spp.*
  - All ages
  - Necrotizing enteritis with septicemia
  - Treatment
    - Supportive care
    - Antibiotics
    - NSAIDs
- Johnes Disease
  - Adult goats
  - Signs
    - Chronic weight loss
    - Hypoproteinemia
    - Feces are most commonly normal but can be softer pellets or diarrhea in advanced stages.
  - Diagnosis
    - Fecal PCR
  - No effective treatment
  - Control
    - Test all incoming animals.
    - Small Ruminant Biosecurity Screen
      - Includes CAEV, Johnes, Caseous Lymphadenitis
      - Washington State University
      - UC Davis
      - Others?

### **Infectious Keratoconjunctivitis**

- Causes
  - Mycoplasma
    - *M. conjunctivae*, *M. capricolum*, others
    - Carriers, often up to 6 months or longer
  - *Chlamydia abortus* and *pecorum* (Chlamydia)
- Blindness
  - Corneal damage is common.
  - Many will partially resolve but can take 1-2 months.
- Diagnosis
  - Ocular/Conjunctival Swab

- PCR
  - IFA Cytology
  - Culture
- Treatment
  - Topical Antibiotic, tetracycline, or triple antibiotic
  - Oxytetracycline
  - Tulathromycin
  - Florfenicol
  - What about Feed Antibiotics?
    - Requires a Veterinary Feed Directive (VFD) and can only be used per label.
    - **No product currently labeled for keratoconjunctivitis in sheep or goats.**
    - Chlortetracycline (Aureomycin) in feed labeled for vibrio in sheep.
  - NSAIDs
  - Isolate affected animals.
  - May require 7-14 days of treatment.
- Prevention
  - Reduce environmental ocular irritation.
  - Chlamydia (*Chlamydomphila*) Abortion Vaccine is not considered to be effective.

### Abortion

- Causes
  - *Coxiella burnetii* (Q Fever)
  - *Chlamydomphila abortus* (Enzootic Ovine Abortion)
  - *Campylobacter spp* (Vibrio)
  - *Brucella spp.*
  - *Leptospirosis*
  - *Listeria spp.*
  - *Toxoplasma gondii*
- Diagnosis
  - Submit samples for diagnostic testing.
    - Fetus (stomach contents, liver, lung)
    - Placenta (required for *Coxiella*)
    - Vaginal discharge
  - Serology
    - Dam - paired samples at time of abortion and 14 days later
    - *Chlamydomphila*
    - *Leptospirosis* may support or rule out suspicion.
- Prevention
  - Environmental
    - Reduce potential sources.
    - Crowding
    - Moisture
  - Test Rams for *Brucella ovis* and cull.
  - Vaccination
    - Chlamydia Abortus Bacterin (Colorado Serum Company)
      - Labeled for sheep



- Initial Vaccination: 60 days prior to breeding and again at 30 days prior to breeding
- Annual Vaccination: 30 days prior to breeding
- Cattle Leptospirosis Vaccines

### Caseous Lymphadenitis

- *Corynebacterium pseudotuberculosis*
- Superficial and Internal abscesses
- Chronic and considered lifelong infections.
- Transmission through contact with purulent exudate, oral and nasal secretions
- Diagnosis
  - Aspirate bacterial culture
  - CL Serology
- Treatment
  - Generally considered infected for life.
  - Superficial Abscesses
    - En bulk surgical removal
    - Needle lavage with local installation of antibiotic
      - Penicillin
      - Tulathromycin
    - Lance and drain increases risk to other animals.
  - Internal Abscesses
    - Generally difficult to surgically remove.
    - Needle lavage if adhered to body wall and visible with ultrasound. Instill antibiotics after lavage.
    - Life threatening cases that impair airway, esophagus, or GI tract
      - IV Sodium Iodide may help reduce the size of the abscess quickly.
      - K Pen IV if episode is immediately life threatening
        - 22,000 IU/kg IV q6-8 hours until stable
        - Once stable can transition to PPG IM
      - PPG 22,000 IU/kg IM q12h for at least 5 days
      - If stable, transition to oral sulfadimethoxine
        - Loading Dose: 50 mg/kg PO once
        - Maintain at 25 mg/kg PO q24h for at least 1 month.
      - Monitor and repeat oral sulfadimethoxine as needed.
- Control
  - Screen all incoming animals.
    - Serologic Test
    - Part of Small Ruminant Biosecurity screening
  - Separate positive animals from negative animals
  - Separate husbandry equipment for positive and negative groups
  - Vaccine is available.
    - Generally not recommended.
    - Will not prevent infection and disease.
    - May slow progression of abscesses and decrease shedding.
    - Only in non-infected animals.
    - **Infected animals may have severe reactions.**

## **Tetanus**

- *Clostridium tetani*
- Causes
  - Castration: Banding > Surgical
  - Tail Docking (sheep): Banding > Surgical or Hot Iron
  - Dehorning
  - Penetrating wounds, especially due to trauma with underlying necrotic tissue
- Incubation: 1 day to several weeks, average 10-14 days.
- Susceptibility: Horse > Sheep > Goat > Cattle > Dog > Cat > Humans
- Prevention
  - Tetanus Antitoxin
    - Prior to castration or dehorning
      - If < 8 weeks of age, colostral antibodies from a vaccinated dam are likely protective.
    - Following trauma, laceration, bite wounds, etc.

## **Rabies**

- Rabies is generally rare in goats as they tend to avoid foxes and skunks.
- Vaccination of goats for rabies should be considered when.
  - The goats have contact with the public, i.e. petting zoos, shows, assistance animals, goat yoga, etc.
  - Housed in a rabies endemic area.
  - Evidence of foxes or skunks in the local area.
- There is no commercial rabies vaccine that is labeled for goats.
  - Use a rabies vaccine that is labeled for sheep and follow the label for sheep.
- Keep records identifying vaccinated animals so that the local public health office can make appropriate decisions if there is an exposure event.

## **Scrapie**

- Transmissible Spongiform Encephalopathy
- National Scrapie Eradication Program
  - Premises ID
  - Scrapie Ear Tags
  - Required for transfer of ownership.
- Genetic Predisposition

## **Goat Vaccination**

- Core Program
  - Breeding Does
    - Pre-Breeding
      - Chlamydia (Chlamydia) Bacterin at least 60 days prior to breeding. Repeat in 30 days.
    - Mid-Gestation
      - Following pregnancy diagnosis
      - Any CD&T vaccine, Covexin 8, or Cavalry 9

- Bucks, Yearlings, and Non-breeding Does
  - CD&T or Covexin 8 annually
- Kid Goats
  - If Dams vaccinated with CD-T, then immunize kids at 1-2 months of age and again in 3-4 weeks
  - If dams NOT vaccinated with CD-T, then immunize kids at 1-3 weeks and twice more at 3-4 week intervals
- Non-Core Vaccines
  - *Pasteurella multocida* +/- *Mannheimia haemolytica* Bacterins
    - Breeding Does: Annually before breeding or mid-gestation
    - Bucks, Yearlings, Non-breeding Does: Once annually
    - Kids: 2-4 months and again 2 to 4 weeks later
  - *Vibrio* (*Campylobacter fetus*) if diagnosed in herd.
    - Shortly before breeding and again in 60 to 90 days
  - Rabies
    - No rabies vaccines are labeled for goats
    - Use any rabies vaccine labeled for sheep
    - 12 weeks of age
    - Annually
  - Ovine Contagious Ecthyma (Orf, Soremouth)
    - Modified live vaccine.
    - Only use in infected herds
    - Vaccinate kid goats at 1 month and again 2-3 months later.
  - Enterotoxigenic *E. coli* scours vaccine (bovine) 4-6 weeks prior to parturition.
  - Caseous Lymphadenitis (*Corynebacterium pseudotuberculosis*)
    - Limited efficacy
    - Initial Vaccination plus booster in 4 weeks
    - Annually
  - Footrot (*Dichelobacter nodosus*)
    - Vaccinate before anticipated problem (i.e. before rainy season) and again in 6 weeks to 6 months.

#### Vaccine References:

1. Tizard IR. Sheep and goat vaccines. *Vaccines for Veterinarians*. 2021:215–224.e1. doi: 10.1016/B978-0-323-68299-2.00026-5. Epub 2020 Jul 10. PMID: PMC7348623. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7348623/>
2. Tizard IR. Porcine vaccines. *Vaccines for Veterinarians*. 2021:225–242.e1. doi: 10.1016/B978-0-323-68299-2.00027-7. Epub 2020 Jul 10. PMID: PMC7348622. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7348622/>

List of common multivalent Clostridial vaccines

Product	CLOSTRIDIAL ANTIGENS								Other Antigens
	Chauvoei	Septicum	Sordellii	Novyi	Haemolyticum	Perf C	Perf D	Tetani	
<b>7-Way Vaccines</b>									
Alpha-7	X	X	X	X		X	X		
Bar-Vac 7	X	X	X	X		X	X		
Caliber 7	X	X	X	X		X	X		
Clostri Shield 7	X	X	X	X		X	X		
Fortress 7	X	X	X	X		X	X		
Ultrabac 7	X	X	X	X		X	X		
UltraChoice 7	X	X	X	X		X	X		
Ultrabac 7/Somubac	X	X	X	X		X	X		Histophilus somni
Vision 7 with Spur	X	X	X	X		X	X		
Vision 7 Somnus with Spur	X	X	X	X		X	X		Histophilus somni
One Shot Ultra 7	X	X	X	X		X	X		M. haemolytica
20/20 Vision 7 with Spur	X	X	X	X		X	X		Moraxella bovis
Alpha-7/MB-1	X	X	X	X		X	X		Moraxella bovis
Piliguard Pinkeye + 7	X	X	X	X		X	X		Moraxella bovis
<b>8-Way Vaccines</b>									
Bar-Vac 8	X	X	X	X	X	X	X		
Fortress 8	X	X	X	X	X	X	X		
Ultrabac 8	X	X	X	X	X	X	X		
UltraChoice 8	X	X	X	X	X	X	X		
Vision 8 with Spur	X	X	X	X	X	X	X		
Vision 8 Somnus with Spur	X	X	X	X	X	X	X		Histophilus somni
One Shot Ultra 8	X	X	X	X	X	X	X		M. haemolytica
Covexin 8	X	X		X	X	X	X	X	
<b>9-Way Vaccines</b>									
Cavalry 9	X	X	X	X	X	X	X	X	