Infertility in the Sheep and Goat

Non-infectious Infertility in Sheep/goats

• Puberty- breed specific
• Length of breeding season varies by breed
  – Dorset, merino, Finnish-Landrace longer
  – Southdown, Shropshire, Hampshire tighter short-day breeders
  – Breeds originating from tropical climates tend to cycle year round
    • Barbados
  – Pygmy and Tennessee meat goats longer
  – Nubian, Spanish, Kiko, Boer more seasonal

Non-infectious Infertility in Sheep/goats

• Nutritional
  – Animals need at least 7% dietary crude protein
  – Nutritional requirement doubles when in lactation
  – Free choice salt and mineral supplement

Non-infectious Infertility in Sheep/goats

• Heat Stress
  – Depressed signs of estrus
  – Increased number abnormalities on spermiogram
  – High humidity levels make worse
  – Prevention
    • Shave wool off hairy scrotum
    • Well designed barns, misters, cool water

Infertility in the Sheep and Goat

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Non-infectious Infertility in Sheep/goats

- **Plant Toxicity**
  - *Veratrurn californicum* – Skunk cabbage
  - Alkaloid cyclopamine
    - EED if ingested early gestation
    - Cyclops if ingested between d12-14 of gestation
    - arthrogryposis

- **Plant toxicity**
  - Locoweed - *Astragalus* and *Oxytropis*
    - Abortion
    - Arthrogryposis
    - Decreased spermatogenesis in ram
  - Broomweed - *Gutierrezia spp.*
    - Abortion
    - RFM
    - arthrogryposis

- **Plant toxicity**
  - Fescue - *Festuca arundinacea* infected with fungus *Neotyphodium coenophialum*
  - Ergot alkaloids and Ergot
  - Prolonged interval to get all ewes bred
  - Reduced number live births sheep

- **Plant toxicity**
  - Estrogen producing plants
  - Sheep appear to be more sensitive than goats
    - Subterranean clover and alfafas
      - Infertility
      - Hyperestrogenism
      - Vaginal prolapse
    - Subclinical reproductive impairment in sheep
Plants That Affect Reproduction

Non-infectious Infertility in Sheep/goats

- **Psuedopregnancy**
  - Mucometra, hydrometra, “cloudburst”
  - Seen most commonly in dairy goats in fall
  - May occur once in lifetime of doe or multiple times
  - Prolonged luteal phase in goats
    - Anestrus
    - Increased abdominal size
    - Signs of pregnancy
    - Udder development
    - Bloody vaginal discharge

- **Pharmaceuticals**
  - Admin mid to late gestation
    - Abortion and birth defects
    - Chlorpromazine
    - Phenylbutazone
    - Phenothiazine anthelmentics
    - Levamisole
    - Corticosteroids
    - Benzimidazole 1st trimester ass’d fetal abnormalities
      - Netobimin, albendazole, parbendazole, cambendazole

Non-infectious Infertility in Sheep/goats

- **Psuedopregnancy**
  - Diagnosis
    - Ultrasound
      - Fluid in uterus with no fetus or placentomes
      - Examiner must be certain not to confuse hydrometra with an early pregnancy
  - Treatment
    - PGF2α- 10-20mg
    - Cloprostenol- 75-100microg/45kg
Non-infectious Infertility in Sheep/goats

- **Cystic Ovarian Disease**
  - Probably over-diagnosed by owners
  - Short cycles, nymphomania
  - Occas ass’d with does who have been superovulated
  - Doe follicle excess of 12mm
  - Ewe follicle excess of 19mm
  - TX; HCG or GnRH

Non-infectious Infertility in Sheep/goats

- **Non-infectious causes of Abortion**
  - Stress
    - Goats CL dependent throughout gestation
  - Angora does- habitual abortions 4-5 yrs age
  - Nutrition
    - Iodine Deficiency- lambs born with goiter
    - Copper Deficiency- enzootic swayback in lambs
      - Lambs born normal→ progressive hindlimb paresis/paralysis→ death

Infectious Infertility in Sheep & Goats

- **Viral**
  - Bluetongue
  - Border Disease Virus
  - Cache Valley Disease
  - Akabane Virus*

- **Bacterial**
  - *Campylobacter*
  - *Chlamydophila abortus*
  - *Coxiella burnetti*
  - *Brucella melitensis*
  - *Brucella ovis*
  - *Listeria monocytogenes*

- **Protozoal**
  - *Toxoplasma gondii*

Infectious Infertility in Sheep & Goats

- **Bluetongue**
  - Orbivirus
  - Southwestern US and Central America, tropical, subtropical and occas temperate epizootic outbreaks
  - Cattle reservoir – transmitted by *Culicoides*

- **Clinical Signs**
  - Fever, swollen ears, face, tongue
  - +/- abortion
  - Fetal malformations
    - Hydroencephaly and arthrogryposis
Bluetongue

Swollen Face, Tongue, Ears

Ulceration of Coronary Band → Lameness

Ulcerated Mouth & Nose

Infectious Infertility in Sheep & Goats

• Border Disease Virus (BDV)
  – Pestivirus (with BVDV)
  – Hairy Shaker Lamb
  – Oral transmission → infect fetoplacental unit → EED, resorption, mummies, congenital defects, persistently infected animals
    • Hydranencephaly & cerebellar hypoplasia
  – C.S. → weak hairy lambs
  – Dg: Virus isolation buffy coat
  – Prev: test, cull, isolate new arriv.

Border Disease or Hairy Shaker Disease

“Hairy-Shaker Lamb”
- hairy fleece, darker pigmentation & tremors

Cerebellar Hypoplasia

Hydranencephaly

Infectious Infertility in Sheep & Goats

• Cache Valley Disease
  – Southwestern US
  – Mosquitos, Culicoides
  – C.S. → fever, depression → invade placenta → fetus
    • Severity of c.s. depends upon gestational age of infection
    • Stillbirth
    • Congenital defects
      – Arthrogryposis
      – Brachygnathia
      – Predelection for CNS tissue: hydranencephaly, microencephaly
  – Dg: antibodies and abnormalities
  – Prev: isolate from mosquitos
Cache Valley Virus

- Arthrogryposis
- Hypoplasia of Spinal Cord
- Hydranencephaly
- Microencephaly

Infectious Infertility in Sheep & Goats

- Akabane Virus
  - Australia, Africa, Asia
  - *Culicoides* and mosquitoes
  - C.S. - none in dam
    - Arthrogryposis
    - Hydranencephaly
    - Hydrocephalus

Brucellosis

- *Brucella melitensis*
  - goats
  - abortion, weak kids, mastitis
  - low incidence in N. America,
    outbreaks in TX & CO (*JAVMA 2000*)
  - may cause abortion in ewe

Brucellosis

- *Brucella ovis*
  - sheep
  - rarely a cause of abortion in sheep
  - causes epididymitis in rams
  - widespread in western portions on N. America
**Test rams ELISA**
**Brucellosis**

*Human Cases CDC 2010*

- **Diagnosis**
  - Isolation of organism from abomasum, placenta, or vaginal fluid
- **Treatment**
  - None
- **Prevention**
  - Cull rams with epididymitis
  - ELISA testing
  - Vaccination
    - Options exist outside USA

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**Infectious Infertility in Sheep & Goats**

- *Campylobacter* (Vibriosis)
  - *jejuni*: sporadic abortion
  - *fetus fetus*: large outbreaks of abortion
  - *lari*: recognized as cause of abortion in coastal CA
  - **Most significant cause of abortion in sheep in North America, especially in Western USA**
  - Zoonotic
  - Rare in goat

- *Campylobacter* (Vibriosis)
  - **Transmission**
    - Fetal fluids, fetus, placenta
    - Shed from mucosa and intestines of sheep
      - Can have carrier state
  - **Clinical Signs**
    - late term abortions, stillborns
    - Ewes not ill
    - Enzootic abortion rates of 20%
    - Epizootic abortion rate of ~80%
Infectious Infertility in Sheep & Goats

- *Campylobacter spp.*
  - Lesions and Diagnosis
    - Target lesions hepatic necrosis
    - Isolation of organism placenta, abomasum, vaginal fluid

- *Chlamydia abortus*
  - Enzootic Abortion of Ewes
  - Zoonotic
  - Obligate intracellular organism
  - Important cause of abortion in goats and sheep
  - Placentitis → late term abortion

- *Chlamydia abortus*
  - Persistent subclinical infection in females
  - If introduced into naïve flock 25-60% of ewes/does may abort
  - In endemic farms abortions occur in primiparous females

- Prevention/control
  - Outbreak
    - Tetracyclines (300mg/hd/day)
    - Remove pregnant ewes and isolate
    - Some feed tetracycline before and during lambing season
    - Tetracycline resistant clone C jejuni
      - Sulfadiazine (110 mg/kg PO) or
      - Tylosin (30mg/kg)
  - Vaccination-
    - C fetus - C jejuni bacterin
      - Before breeding and booster
    - Annual revacc.
    - Autogenous vaccines
Infectious Infertility in Sheep & Goats

- *Chlamyphila abortus*
  - Lesions and Diagnosis
    - Necrotic placentitis of cotyledonary and intercotyledonary areas
    - Histopathology Zeil Neilson stain
      - Elementary bodies in trophoblasts
    - PCR of vaginal/placental tissues
  - Treatment and prevention
    - Tetracyclines in outbreak
    - prophylactic admin. tetracyclines
    - Vaccination

- *Chlamyphila abortus*
  - Treatment
    - Tetracyclines
      - Given in outbreak
      - prophylactic admin. Tetracyclines
        » 400-500mg/head/day mixed in feed for final 4-6 weeks of gestation
        » Some treat with LA-200 (20mg/kg SC) q10-14 days
  - Prevention
    - Try not to purchase ewes/does from endemic herds into naïve herds

Infectious Infertility in Sheep & Goats

- *Chlamydphila abortus*
  - Prevention
    - Purchase ewes/does EAE free herds
    - Vaccination.
      » Killed vaccines for sheep:
        » May be used in goats but may cause soreness
        » Campylobacter + E coli bacterin + Chlamyphila
        » Give 2 vaccines pre-breeding
    - CEVA has a live vaccine in Europe
    - Enzovax in UK

- *Chlamydphilia pecorum (previously Chlamydia psittaci)*
  - Also produces pneumonia, keratoconjunctivitis, epididymitis, and polyarthritis in sheep & goats.
Infectious Infertility in Sheep & Goats

- *Coxiella burnetii*
  - Obligate intracellular rickettsial
  - Queensland fever (Q fever)
  - Can survive in environment for long periods
  - Zoonotic
  - Trans:
    - Any fluid
    - Placenta, uterine fluids, oral, respiratory, ticks, semen, milk

Q Fever

- Clinical Signs:
  - usually subclinical
  - occasional abortion
  - outbreaks in goats > sheep
  - pregnant ♀ = placentitis
  - → abortion, stillbirth

Q Fever

- *Coxiella burnetii*
- Diagnosis:
  - placental lesions
  - necrotizing placentitis and/or mineralization of both cotyledonary and intercotyledonary regions
  - Fetus no lesions usually
  - PCR of placenta
  - Serology not much help
    - Infections w/o abortion may exist
Infectious Infertility in Sheep & Goats

- *Listeria monocytogenes*
  - Zoonotic
  - Ewes are ill
  - Rotting hay or improperly stored silage
  - Treatment
    • Tetracyclines during outbreak (300mg/hd/day)
  - Prevention
    • Quality forage

- Other Bacterial causes
  - infertility/abortion

  - Leptospira spp.
    - Not a big cause of abortion in sheep/goats
    - Sheep more resistant
  - Mycoplasma and Ureaplasma
    - Sporadic causes of abortion and infertility and granular vulvovaginitis
  - Yersinia spp
    - *pseudotuberculosis* - abortions NE
    - *enterocolitica* - isolated ovine fetus
  - Fusobacterium necrophorum
    - Sporadic abortion sheep
  - E coli
    - Need pure culture
  - Helicobacter bilis
    - Sheep abortions in SD

Infectious Infertility in Sheep & Goats

- *Toxoplasma gondii*
  - Zoonotic
  - raw goat milk, aborted fetuses, placentas
  - encephalitis & blindness in human fetuses and immunocompromised

- Mummies
- Abortion
- Weak kids
- stillborns

Toxoplasmosis

- Fecal Oocyst
- Tachyzoites
- Bradyzoites in Zoitecyst
Toxoplasmosis

Clinical Signs:
- goats > sheep
- 30-90 days = resorption or mummification
- last ½ gestation = abortion
- weak lambs/kids
- females may develop neurologic form if immunosuppressed - rare

Diagnosis:
- intercotyledonary areas of placenta normal, cotyledons have white to yellow small areas of focal necrosis
- culture from fetus, placenta
- serology

Toxoplasmosis

Coxiella
Brucella
Chlamyphila similar lesions BUT more likely intercotyledonary involvement

Intercotyledonary areas = normal
Cotyledons = white to yellow areas of focal necrosis

Toxoplasmosis

• Diagnosis and Prevention
  – Check with lab-
    • Cotyledon, lung, brain, muscles
    • Cooled or frozen (PCR ok for frozen)
• Treatment
  – Decoquinate (2mg/kg/day)
  – Monensin (15-30mg/hd/day)
• Prevention
  – Prevent exposure to oocyst water
  – No cats
  – Disposal aborted fetus/placenta promptly
  – Vaccine in NZ and Europe tachyzoites