Caseous Lymphadenitis (CL)

- "Cheesy gland"
- *Corynebacterium pseudotuberculosis*
- Sheep, goats, horses (different biotype)
- Through skin or mucous membranes
- 2-6 months before clinical signs

CL: Clinical Signs

- **External form**: Abscesses in superficial lymph nodes (LN)
- **Internal form**: Internal LN, lungs and organs.
- Chronic weight loss
- Coughing, nasal d/c

CL: Spread

- Ruptured abscesses contaminate environment
- Persists in the soil for several months
- Contamination of feeders, equipment, milking stands, etc.
- Curious herd mates
**CL: Diagnosis**

- Herd with history of CL: presence of firm, swelling in location of lymph node = CL
- Bacterial culture of lesion
- Serology (antibody) testing for internal form?
  - few weeks to produce antibody response
  - colostral antibodies if <6 m old
- Necropsy +/- culture of abscess

**CL: Treatment**

- Drain or surgically remove (don’t allow to rupture in pen)
- Pus must be collected, burned
- Isolated the animal until completely healed (~ a month)
- Injection of abscess with antibiotics may decrease spread to other LN
- May still have internal abscess
- Zoonotic - can spread to humans

**CL: Control**

- Prevent entry: Examine and test new additions
- Vaccination
- Cull, or split herd
- Remove environmental hazards:
  - barbed-wire, nails, jagged edges
- Disinfect instruments
- Control ectoparasites: lice
- Monitor for reoccurrence

**Caprine Arthritis Encephalitis (CAE)**

- Caused by a lentivirus (like OPP virus in sheep)
- Infection is lifelong
- Mostly shed in colostrum and milk
- Direct/close contact transmission
- Blood contaminated equipment

Photos courtesy of Dr. Mary Smith
**CAE: 4 Main clinical forms**

<table>
<thead>
<tr>
<th>Subclinical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Arthritis in mature goats</td>
</tr>
<tr>
<td>2. Progressive neurologic disease (mostly in 2–6 month-old kids)</td>
</tr>
<tr>
<td>3. Respiratory (interstitial pneumonia)</td>
</tr>
<tr>
<td>4. Interstitial mastitis</td>
</tr>
</tbody>
</table>

**CAE: Arthritic**

Photos courtesy of Dr. Mary Smith

**CAE: Neurologic**

Photos courtesy of Dr. Mary Smith

**CAE: Respiratory**

Photos courtesy of Dr. Mary Smith
CAE: Mastitis

CAE: Diagnosis

- Antibody test: (lentivirus cELISA)
- Avoid periparturient period (possible false negatives)
- Colostral antibodies (possible false positives)
- Can take months to produce antibodies (possible false negatives)
- Useful interpretation

- PCR?
- Radiographs of joints
- Necropsy findings with histology
- Combination of herd history, clinical signs and tests

CAE: Treatment

- No known treatments for any forms
- Supportive care, pain relief

CAE: Control

**Strategies:**

- **Attempt to raise CAE-free kids**
  - remove from dams immediately
  - raised separately from infected herd
  - feed heat-treated colostrum (1 hour 133°F), or pasteurized milk or milk replacer.
**CAE: Control**

- Periodic serologic testing (est. prevalence)
  - all goats >6 months old
  - twice yearly
- Culling or separation
  - cull positives or two herd approach
  - milk negative goats first
  - test new additions, and quarantine, then re-test (6 months?)
  - use individual needles, etc.
  - include sheep on premises in testing/control program

**Ovine Progressive Pneumonia (OPP)**

- Lentivirus (similar to CAE)
- Lifelong infection
- Less likely to spread through colostrum and milk
- Direct/Close contact transmission
- Latent for months or years, most sheep never show symptoms

**OPP: 4 Main clinical forms**

1. Respiratory (sheep lag behind flock, breath harder) *
2. Interstitial mastitis “hard bag” - rare
3. Arthritis - rare
4. Neurologic - rare
OPP Diagnosis: Similar to CAE

- Serology: Lentivirus cELISA
- PCR
- Necropsy findings with histology
- Combination of herd history, clinical signs and diagnostic tests

OPP Treatment/Control

Treatment: supportive care

Control:
- Ideally remove lambs at birth and rear isolated from flock.
- If infection is suspected, screen all animals >1 year.
- Isolate lambs from adults after weaning and test them 4 months later, then 1-2/year. (Minnesota Project)

Unlike CAE, not readily spread through milk and colostrum

What to do if your sheep/goat aborts:

- Personal Protection Equipment: Wear gloves and rubber boots
- Gastro intestinal fluid & placenta: Collect fetuses and placenta; refrigerate
- Isolate: Put the doe/lamb in isolation if possible
- Temperature: Take the doe's temperature
- Call: Call your veterinarian
Abortion of Sheep and Goats

- Sheep and goats have a high incidence of abortion compared with other farm animals
- 5% is common
- <5% good
- <2% excellent
- "Abortion storm" >20%

Involving your veterinarian

Veterinarian may ask questions about your herd:
- Open or closed herd?
- Recent travel to shows?
- Other species on premises?
- Vaccines given?
- Stage of gestation at time of abortion?
- Number / % of abortions
- Health status of dams
- Diet-any changes

Sample collections for diagnostic testing

- Examine the doe that aborted, fetus, and placenta
- Collect blood from doe/ewe- antibody testing
- Collect fluid and tissue samples from fetus
- Collect placenta

Viral/Protozoal Causes of Abortion

**Viral:**
- Cache Valley Fever virus- Bunyavirus *Z
- Border Disease- Pestivirus

**Protozoa:**
- Toxoplasma gondii * Z

( * = most common causes; Z = zoonotic)
**Bacterial Causes of Abortion**

- *Chlamydiophila abortus* (Enzootic abortion of Ewes) *
- Campylobacter fetus (Vibrio) and *C. jejuni* *
- *Coxella burnetii* (Q fever) *
- Listeria monocytogenes *
- Other bacteria (*E. coli*, *Salmonella*, *Brucella*, *Legiospira*)

(*=most common causes; *=vasoconstrictors)

**Cache Valley Fever Virus**

- Spread by mosquitoes and no-seeums
- Bite naive pregnant doe/ewe in the fall
- Deformed fetus born January – March
- Uptick in CFV abortions in the northeast
- Virus can invade the placenta, then fetal brain, spinal cord, and skeletal muscles

<table>
<thead>
<tr>
<th>Days</th>
<th>Gestation Infected</th>
<th>Fetal signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-33d</td>
<td>Embryonic death and mummification</td>
<td></td>
</tr>
<tr>
<td>30-37d</td>
<td>Deformities in brain, spinal cord and muscle (orthogenital)</td>
<td></td>
</tr>
</tbody>
</table>
Cache Valley Fever Diagnosis

- Antibody titer on fetal fluid
  - Heart blood
  - Fluid in thorax
  - Fluid in abdomen
- Antibody titer from doe
  - Negative: rules it out
  - Positive: could be exposure
- Virus is cleared before abortion

The good news

- Immune for years to life
- Ideal to breed outside mosquito season
- Climate change

Pestivirus: Border Disease

- Infected animal sheds virus directly
- Reproductive issues in sheep
- Fertility
- Abortions/ stillborn/premature lambs
- Hairy Shakers (persistently infected lambs)
  - Exposed <60-85 days gestation
  - Hair: like fleece
  - Rhythmic tremors

Protozoa: Toxoplasma gondii

“Cats are EVERYWHERE”

- Cat is the definitive host
- Ingests infected intermediate host
- Shed millions of oocysts in feces for 7-12 days
- Goats > Sheep
- Pregnant does/ewes ingests oocysts in pasture, feed, water
- EED/Mummies, Mid-Late Abortion
**Toxoplasma Diagnosis**

- HISTOPATH of placenta (calcified cotyledons) and fetal brain
- Antibody titer from fetus and doe

Sheep, Goat and Cervid Medicine, 3rd edition, page 194

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**The good news**

- After the abortion, she will have protective antibodies
- Don’t kill the barn cat! Only shed when first infected.
- Keep cat population stable

**Chlamydophila abortus**  
(Enzootic abortion of ewes)

- Gram negative, intracellular bacteria
- Lives in GI tract
- Shed in feces
- Travels blood stream to placenta
- Fetus dies, is aborted last 2 months gestation
- Placenta looks thickened and necrotic
- Transmission to other animals can occur by licking or sniffing vaginal discharge

Can also cause arthritis and pinkeye  
Zoonotic- pregnant women can abort!
**Chlamyphila abortus** diagnosis

- PCR or FA testing on placenta
- Histopath of placenta and fetus

**The good news**

- Vaccine available
- Antibiotic to control an abortion storm:
  - Tetracycline (injection/feed)
- Only yearlings abort

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**Coxiella burnetii: “Q fever”**

- Bacteria
- All animals (domestic and wildlife) can shed it
- Can float 2 miles
- Select Agent with CDC
- Reportable disease with USDA
- Shed mainly during kidding/lambing

**Coxiella burnetii “Q fever” Diagnosis**

- 3rd trimester abortions
- Stillborn or premature
- Affects Placenta- WE NEED PLACENTA!
- Histopath and PCR of placenta
- Need BOTH for causation
- May be there and not cause abortion
**Coxiella burnetii “Q fever” Zoonosis**

**Transmission:**
- Contact during animal birthing
- Ingestion of unpasteurized dairy
- Inhalation 1-10 organisms

**Symptoms:**
- May be asymptomatic
- Flu like symptoms, pneumonia
- Endocarditis, hepatitis, severe disease in immune-compromised individuals

Stays in environment

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**Campylobacter fetus** (Vibrio) and C. jejuni

- 1 bacteria, 2 different strains.
- Late gestation abortion, still births, weak offspring
- More common in sheep
- Shed in feces of sheep, dogs, birds
- Spreads when animals ingest feces or infected placenta/fetus (guard dog)
- Zoonotic: diarrhea in people
- Affects placenta and fetal liver – test these 2 tissues

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**The good news**

- Vaccines available
- Antibiotic options to control an abortion storm:
  - Tetracycline (withhold time)
  - Sulfamethazine and Tylosin
- Once in the herd, only the yearlings abort
**Listeria monocytogenes**

- Gram positive bacteria
- Found in soil, feces, silage (pH>5.5)
- Likes “refrigeration temperatures”
- Causes neurologic disease (circling disease), septicemia and abortion in goats
- Don’t see both at the same time

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**Listeria monocytogenes**

- Diagnose by culture or PCR from placenta and fetal lung
- If feeding silage, check pH
- Try to clean up environment to decrease consumption of listeria

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**Other Causes of Abortion:**

- Brucella
- Leptospira
- Neospora
- Herpes
- Nutritional deficiencies
- Toxins

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**Thank you!**