Managing Zoonotic Diseases in Goats
The risk to you and your family

Dr. Paula Menzies
Presented at Grey-Bruce Farmers Week, 2009
What is a zoonotic disease?

• A disease agent is transmitted from animals that causes disease in humans.
Who can tell me the name of a zoonotic disease that has been in the news in the last couple of years?
What about some old diseases that we have managed to “eradicate”?

Bovine tuberculosis, still present in some parts of North America

Bovine brucellosis, still present in bison in N. Alberta and in the United States
What are the common zoonotic diseases of goats?

- Infectious abortion agents
- Some pathogens from neonatal kid diarrhea (scours)
- Some skin diseases
- Infectious agents in raw milk
How Do Humans Contract These Diseases?

- Varies with type of disease
- Contact with birth fluids, diarrhea, handling sick animals
- Drinking raw milk

- This talk will focus on zoonoses associated with abortion and raw milk
Presentation of Abortion in Goat Herds

• Abortion rates in an unaffected herd
  – < 2%

• Abortion storm
  – 15 to 70% pregnancies affected
  – Often clustered in time

• Endemic infection
  – 5 to 7%
  – Mistaken as “normal”
Presentation of Abortion

- Usually ~ 2 weeks prior to first expected kidding date
  - Live but premature
  - Dead premature – fresh to autolyzed
  - Macerated (RLB’s)
  - Mummified
Presentation of Abortion

• Common as well:
  – Resorption of pregnancy
    • Present as open
    • May see abnormal uterine discharge
  – Term losses
    • Stillborn or weak with high neonatal mortality rate
Zoonotic Risk

- Handling of aborted tissues and females
- Wear mask & gloves
- Protection when assisting births
  - Pregnant women
  - Very young and very old
  - Immuno-compromised
- Management of protective clothing
- Raw milk concerns
When Assisting Kidding

- Wear dedicated barn clothes
  - Don’t wear in the house
  - Includes barn hat, coat and boots
- Wear disposable gloves
- Wash hands and arms with disinfectant soap after done
**NOTICE**

Before Entering this Facility
If you have been at another animal facility you must:

** Wash your hands  
** Disinfect your footwear, or  
** Wear disposable plastic boots

PLEASE DO NOT
ANNOY, TORMENT, PESTER, PLAGUE, MOLEST, WORRY, BADGER, HARRY, HARASS, HECKLE, PERSECUTE, IRK, BULLY, VEX, DISQUIET, GRAVE, BESET, BOTHER, TEASE, NETTLE, TANTALIZE, OR RUFFLE THE ANIMALS

SAN DIEGO ZOO
SAN DIEGO WILDLIFE PARK

ANIMAL HANDLING SAFETY TIPS
After Petting Animals, Wash Your Hands!

ALWAYS
Use SOAP and WATER
Rub hands together for 20 seconds.
WASH backs of hands, lower forearms, wrists, between fingers, and under fingernails.
Dry hands with a clean paper towel.

Scrapie Flock Certification Program California
This is to certify that the Flock owned by UC Davis Goat Facility Department of Animal Science Vacaville, CA 95688 is enrolled in the Scrapie Flock Certification Program Enrolled date: July 11, 2007

Certifying Agent
Ann Ford
Director of Animal Science

Certifying Authority
Kathy Kehlman
State Coordinator

DO NOT CROSS
THE YELLOW LINE UNLESS YOU HAVE SANITIZED YOUR FOOTWEAR

Sanitize your footwear before entering all areas.
What About Children?

- If abortion in herd, do not allow young children to handle newborn kids
  - Disease agents may be on hair coat
  - Fingers in mouths
- Keep newborn babies out of the barn
- Make sure children helping with chores follow same rules as adults
  - Clothing
  - Washing hands and arms
If you have abortion in your herd

• Contact herd vet
• Save fetuses AND PLACENTA!
  – As many as possible
  – Do not freeze
  – Clean
• Submit to AHL
Managing the Aborting Herd

- Move at risk pregnant does to clean area
- Consider aborted females as a zoonotic risk
- Cull direct to slaughter
Most Common Causes of Abortion in Goats in Ontario

• Most big outbreaks due to these:
  – *Chlamydophila abortus*
  – *Toxoplasma gondii*
  – *Coxiella burnetii* (Q Fever)
  – Iodine deficiency abortion

• Less common but zoonotic
  – Listeriosis
  – Salmonellosis
Chlamydophila abortus

- Old name *Chlamydia psittaci* – ovine abortion strain
- Enzootic abortion of ewes (EAE)
- Same strain affects both sheep and goats
Chlamydophila abortus

- How does it present?
  - Fresh abortions
  - Severe placentitis
  - Stillbirths
  - Weak kids
  - Increase # of open females
  - Bloody tails
Chlamydomphila abortus

• Sources of infection
  – Aborted fetuses & uterine discharge
  – Carrier does post-abortion
    • Vaginal secretions at estrus
  – Bucks?
    • prepuce & semen temporarily infected
How does *C. abortus* cause abortion

- Infected through mucous membranes
  - As kids or as adults
  - Usually from abortions
- Hides out until a pregnancy occurs
  - Then attacks placenta and fetus
- Takes 2 to 3 months after infection to cause abortion
C. abortus

- If infected late in pregnancy
  - Will abort next gestation
- If infected as kids
  - Will abort at first gestation
- No natural immunity until abort
- Recovered animals do not abort again but may be carriers
Typical herd history

- Introduce with infected replacements
- First year a few replacements abort
- Infect rest of herd
- Next year – abortion storm up to 75% abort
- Following year mostly first kidding does abort
C abortus vaccination

- One licensed vaccine in Canada for control of chlamydia abortion (sheep – Colorado serum)
- Vaccinate 60 days prior to breeding and booster 30 days prior to breeding
  - Withdrawal for slaughter is 60 days
- Revaccinate annually
- Veterinary prescription only
Other Chlamydial Vaccines

- Are many different chlamydial bacteria
- Most common is *Chlamydophila felis*
  - Causes eye infections in cats
  - Used to be called *Chlamydia psittaci*
  - Not related to sheep/goat infection strain
- Are cat vaccines against this disease but they do not work against *C. abortus*
  - Most contain other live viruses that might not be safe to give goats.
C. abortus - Zoonotic

- Not too common but important!
- Pregnant women assisting birth
- Mucous membrane contact with placental fluids
- Severe illness
C. abortus case

- Austria
- 32 year old woman, 4th pregnancy
- 16 weeks gestation
- Developed septicaemia after extensive contact with abortive materials from her goat herd
- Presented 3 days of high fever and started on amoxicillin but deteriorated in 12 hrs.
- Lost fetus and progressed to generalized organ failure until changed treatment
- Fully recovered following appropriate treatment

C. abortus case

- Male sheep producer (Alberta)
- Assisting a dystocia
- Applied mouth-to-nose resuscitation to weak lamb
- Developed severe debilitating fever
- Hospitalized for 10 days with confirmed C. abortus infection
Toxoplasma gondii

Naïve cats become infected by eating infected rodents, birds, aborted material.

Cats pass oocysts for ~ 5 to 14 days. Sporulated oocysts infective for up to 18 mo.

Naïve does mount an immune response. If pregnant – infects placenta & fetuses.

Contaminated feed & pasture with feces.

Mummies / abortions / stillbirths / weak & small kids.
Diagnosis of toxoplasmosis

- Typical lesions on placenta & presence of mummies are very suggestive
Control of toxoplasmosis

• **Cats**
  - Remove cats
    • Problems with rodent control
  - Spay cats
    • Kittens are highest risk
    • Use litter box in barn
  - Feral cats on pasture still a problem

• **Feed protection from feces**
  - Grain in containers
  - Don’t feed top bales to pregnant ewes
  - Purchased feed may contaminated
Control of toxoplasmosis

- Rodent Control
  - Vertical transmission in mice
  - Mouse population past to offspring without reinfection from cats
Control of Toxoplasmosis

- Infected goats may abort more than once
Control of toxoplasmosis

- Prevention of acute parasitaemia of pregnant doe
  - Monensin @ 15 mg/head/day
    - Rumensin
  - Decoquinate @ 2 mg/kg bw/day
    - Deccox
    - Lasalocid?
- Can’t predict exposure
  - Throughout gestation
- No evidence that will treat existing infection
Immunity prior to pregnancy

- Expose youngstock to kittens
  - Works poorly because can’t predict exposure

- New Zealand / European vaccine not available in North America
Toxoplasmosis as a Zoonosis

- **Congenital toxoplasmosis**
  - Pregnant females
  - New infection

- **Signs:**
  - Premature birth or underweight fetus
  - Damage to brain and eyes
  - Milder damage not apparent until older
Toxoplasmosis as a Zoonosis

• Infection Post-Natal
  – Healthy humans
    • usually mild illness with fever and lymphadenopathy
    • Remain infected for life
  – If impaired immune system
    • Encephalitis
    • Retinal damage
    • Altered mental state
How Do Humans Get Infected?

- Consumption of live tachyzooites from uncooked meat
  - E.g. infected kid meat
- Consumption of sporulated oocysts from food / objects contaminated with cat feces
  - Fresh vegetables
  - Unwashed hands after handling kitty litter
Zoonotic Risk from Goats

• Risk is from perpetuation of infection cycle in barn
  – Contamination with kitten feces
  – Consumption of poorly cooked meat
  – Milk
  • During initial infection, the parasite can be isolated from the milk of some goats
  • Evidence that consumption of unpasteurized goat’s milk and unripened cheeses can infect humans
Q Fever / Coxiellosis

- **Causative agent** *Coxiella burnetii*
  - Very common in Ontario
- **Goats**
  - Abortion storm – up to 80% can abort
  - Less in following years
- **Sheep**
  - Abortion – storms less common
  - May not present as high incidence of abortion
Coxiellosis

- Severe placentitis
- Abortions – fresh
  - Failure to dilate cervix
  - Ruptured uterus
- Stillbirth
- Weak kids
  - May present as higher than expected stillbirth, neonatal mortality problem
Epidemiology of *C. burnetii*

- Disease most commonly associated with
  - Sheep and goats
  - Cats
  - Cattle

- But all animals can be infected
  - Wildlife
  - Ticks, insects, birds, etc.
Epidemiology of *C. burnetii*

- Animal becomes infected and
- Aborts
  - Sero-converts
  - Sheds organisms
  - Recovers
  - Clears infection or persistently infected (?)
- No apparent disease
  - May sero-convert
  - Sheds organisms
  - Clears infection or persistently infected (?)
Epidemiology of *C. burnetii*

- **Sources of organisms:**
  - Fetal fluids & vaginal secretion
    - Abortion or normal birth
  - Cloud of organisms around birthing animal
    - inhaled
  - Milk
    - Present in unpasteurized milk and cheese
  - Feces
- **Very resistant to drying, heat etc**
  - Contaminated dust in barn
Shedding of the organism

<table>
<thead>
<tr>
<th>Ruminant Species</th>
<th>Duration of Shedding</th>
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<tbody>
<tr>
<td></td>
<td>Vaginal mucus</td>
</tr>
<tr>
<td>Cow</td>
<td>ND</td>
</tr>
<tr>
<td>Goat</td>
<td>14 days</td>
</tr>
<tr>
<td>Sheep</td>
<td>71 days</td>
</tr>
</tbody>
</table>

Epidemiology of *C. burnetii*

- Organism highly infective
  - 1 organism can infect a human when inhaled
- Major human outbreaks most often associated with
  - Parturient small ruminants
  - Down-wind of parturient small ruminants
  - Dusty conditions + ruminants
The lifecycle of *C. burnetii*

- **Within the animal**
  - Hides out inside host cells
  - Large Cell Variant
  - Highly immunogenic and virulent
  - Can convert to small cell variants and spores that can survive in the environment

- **In the environment**
  - Can infect not only mammals but insects, amoeba and birds
  - Ticks may be reservoir
Control of *Coxiella burnetii*

- **Stop abortion with long acting tetracycline**
  - Won’t clear shedding
  - Risk of residues in milk
- **Serological testing and remove**
  - Contaminated premises
  - Not all infected animals are sero-positive
- **Biosecurity of replacements**
  - Tests are imperfect
  - Carried by all species of animals
Control of Coxiellosis

- Reduce contamination of environment
  - Burn / bury placentas, fetuses, bedding
  - Disinfect kidding area
- Reduce risk of bringing into home
  - Specified protective clothing, gloves, mask, boots
  - Disinfectant hand wash
- Biosecurity
Control of *Coxiella burnetii*

- How can you be sure that the herd is not infected?
  - Individual animal test not very predictive
  - Serology of entire breeding flock
  - PCR of placentas, vaginal secretions
Control of *Coxiella burnetii*

- **Vaccination**
  - CEVA – EU Pharmaceutical Company
  - Killed Phase 1 vaccine
  - Challenge trials in goats
    - Prevents abortion and shedding

- **Canada: Can import on Emergency Biological Release**
  - Vaccinate unexposed replacement stock prior to breeding
  - Annual vaccination
Q fever in Humans

- Group “B” Bioterrorist organism
- Incubation 2-3 weeks after exposure
- 60% of people infected seroconvert but are asymptomatic
- Acute Q Fever:
  - Flu-like: mild to severe of 1 to 2 weeks duration
- More severe:
  - Hepatitis and / or
  - Atypical pneumonia
Q Fever in Humans

- **Severe Q Fever**
  - High undulating fevers (T up to 40°C)
  - Severe headaches, malaise, myalgia, nausea, vomiting, rashes
  - 30 to 50% of these develop atypical pneumonia
  - Low case fatality rate of 1-2%
  - Very responsive to correct antimicrobial
    - doxycycline
Chronic Q fever in Humans

- < 5% of cases become chronic
- Valvular endocarditis
  - High case fatality rate (30-60%)
  - Poorly responsive to antibiotics
- Chronic fatigue syndrome
- Repeated abortions
- Human vaccine
  - Australian abattoir workers
  - U.S. Army
Case Study

- Newfoundland 1999
  - Collapse of cod fishery lead to investigation of alternative agricultural enterprises
  - Dairy goat cooperative
  - 8 farms within a 170 sq km area
- Purchased goats from 3 sources
  - Ontario (2 farms)
  - N.E. USA (1 farm)
  - Housed together prior to kidding
Human cases reported in those working with goats: Chills, sweats, nausea, myalgia, fatigue, diarrhea. 74 contacts with significant antibody titres (phase II). More in surrounding community.
Risks of Q Fever

- From Newfoundland outbreak
  - Contact with placenta
  - Smoking
  - Consumption of pasteurized milk products
- Other risks
  - Contact with aborted queens (cats)
  - Consumption of unpasteurized milk products
  - Visiting a farm at kidding / lambing time
  - Living down-wind of parturient / aborting small ruminants
  - Dusty environment with history of housing SR’s
Other Zoonotic Causes of Abortion

- Listeria monocytogenes
- Salmonellosis
Listeria monocytogenes spp

- **L. monocytogenes**
  - causes neurological disease & abortion in ruminants
- **L.m. ivanovii**
  - causes abortion
- Ubiquitous but prefers pH > 5.0
- **Source**
  - Dead mice
  - Soil
  - Decomposing hay
  - Spoiled silage
Listeriosis

- Incubation 10 to 21 days
- Sheep & goats more susceptible than cattle
- Metritis with abortion
  - Does are very ill
- Rare compared to neurological form
Listeriosis

• Control
  – Remove source of infection
  – LA oxytet in face of an outbreak
  – Don’t feed hay on ground
  – Silage good quality and low acidity
Listeriosis as a zoonosis

- **Shed in milk**
  - Unpasteurized milk and unripened cheeses are most important source of organism
- **Grows in refrigerated foods**
  - Within fridge contamination
- **Septicaemia in elderly, young, immunocompromised**
- **Severe illness in healthy people too**
Salmonellosis

- Many strains implicated in small ruminant abortion usually in conjunction with metritis & septicaemia, e.g.
  - *S typhimurium*
  - *S diarizona*
  - *S brandenburg* (very significant problem in southern NZ)

- Spread by
  - Carrier does,
  - Contaminated feed,
  - Rodents & birds (seagulls, crows)
Zoonoses Associated with Raw Milk

• Many abortion diseases also shed in milk
  – Q Fever
  – Toxoplasma
  – Salmonella
  – Listeria

• Killed by pasteurization
Listeriosis

- Will grow in refrigerated milk and cheese
- Intermittent shedding in healthy does
  - Can’t predict which milk is contaminated
- Bacteria is commonly found in soil, spoiled silage, manure so can contaminate milk easily
Listeriosis in Humans

- Mild disease can cause diarrhea
- Severe disease
  - Encephalitis
  - Abortion in women
  - Death
- Quebec 2002, raw milk (heat-treated) soft and semi-hard cheeses associated with severe outbreak in humans
Quebec 2002

- 17 cases confirmed, including 3 newborns – mostly gastroenteritis
- 5 developed encephalitis
- 3 pregnant women, 1 gave birth prematurely and 2 aborted at 33 weeks
Other Bacteria

• Salmonella and E. coli O157 can be shed intermittently into normal appearing milk

• *Staphylococcus aureus* is a common cause of mastitis and will grow in warm milk
  – Toxin secreted that causes severe food poisoning
**Campylobacter jejuni**

- This is one of the most common causes of food poisoning in humans
  - Gastroenteritis in children
- Chickens but also sheep and goats shed in manure
So What About the Old Diseases

- Tuberculosis
  - See occasional cases in cattle and wild deer in Ontario and Manitoba
  - It's very rare but outbreaks in the US in dairy cattle remind us that we still need to be vigilant
Conclusion

• Scary topic but...
• Being forewarned means that you can take precautions to protect you and your family from these diseases that may be in your goat herd
• If you have more questions, contact your herd vet or local health unit
Questions?