Zoonotic Diseases of Sheep

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What are zoonotic diseases?
- Zoonotic diseases are those infectious diseases that are transmitted from animals to humans
  - contact with contaminated environment and diseased animals
  - by contact with infected tissues
    - abortions
  - consuming contaminated food and water
  - transmitted through insect bites

Routes by which different diseases transmitted from sheep to humans:
- Direct contact by handling sheep
  - Contagious Eczyma (soremouth/orf)
  - Ringworm

- Handling contaminated tissues during lambing
  - Oral
    - Chlamydiosis, Campylobacteriosis, Cryptosporidiosis, Listeriosis, Q fever, Salmonellosis, Toxoplasmosis, Leptospirosis

- Inhalation
  - Q fever, Listeriosis, Chlamydiosis

- Vector-borne – tick bites
  - Q fever

Image source: CDC and Merck Vet Manual
Zoonotic diseases of Sheep

• This talk emphasize zoonotic diseases of reproductive importance
• Some of the important infectious zoonotic agents that cause abortions/stillbirths in sheep
  – Chlamydiosis
  – Campylobacteriosis
  – Listeriosis
  – Q Fever (Coxielliosis)
  – Toxoplasmosis

Zoonotic diseases of Sheep

• Why it is important to know the cause of abortions in your flock?
  – Contain the spread of infectious diseases within your farm
    • Implement/strengthen on-farm biosecurity
  – Reduce the Zoonotic risk
    • Everyone are at risk
      – elderly, young children and pregnant women may show clinical effects of the disease
      • Improve hygienic measures
  – Reduce further production losses
    • Prompt treatment
    • Implementing preventive strategies
      – vaccination

Zoonotic diseases of Sheep

• Ontario abortion investigation study (2009-11)
  – At least 1 infectious agent deemed as a causative agent in 90 of 163 submissions (55%)
    • Toxoplasma gondii – 33%
    • Campylobacter spp. – 22%
    • Chlamydophila abortus – 20%
    • Q fever (Coxiella burnetii) – 12%

Zoonotic diseases of Sheep

- Saskatchewan study (2014)
  - Sheep Abortion Surveillance Program (44 submissions)
  - 50% of the abortions were found to be due to Chlamyphila abortus
    - Chlamyphila is predominant cause of ovine abortion
  - 50% of the farms submitting fetuses had at least one abortion caused by Chlamyphila abortus

- Investigation of abortions in small ruminants of Alberta (2013-15)
  - Chlamyphila abortus – 26/92 (28%)
  - Campylobacter spp. – 7/92 (7.6%)
  - Coxiella burnetii (goats) – 1/40 (2.5%)
  - Listeriosis
  - Toxoplasmosis
  - Others: Leptospirosis, Brucellosis etc.

Zoonotic diseases of Sheep—Chlamydiosis

- Cause: Chlamyphila abortus
- Present in most sheep-raising countries except Australia & New Zealand
- Species affected: Sheep, goats, deer, cattle, llamas etc.
Sheep Zoonoses – Chlamydiosis

• How it is transmitted in animals?
  – Contamination of feed and water, and bedding
    • Organisms shed in placenta, uterine discharges and other abortion products
    – Ingestion, aerosol
  • Venereal contact
    – Not a common route

• What are the symptoms in animals?
  • Females
    • Causes late term abortions (enzootic abortion), stillbirth, weak or low birth weight lambs and birth of premature lambs
  • Males
    • Orchitis, epididymitis (not very common)
    – Decreased fertility or infertility in flock
    – Note: other infections can also cause orchitis, epididymitis in rams
  • Some animals can carry and shed these organisms asymptotically

• How it is transmitted to humans?
  – Direct contact
    • Mucous membranes
      – e.g. touching your eye with contaminated hands
    – Ingestion
      • Contaminated environment
      • Unwashed hands after contact with sheep
  – Aerosol
    • Contaminated dust, splash from infected animal tissues or while assisting lambing
Sheep Zoonoses – Chlamydiosis

• What are the symptoms in humans?
  – Flu-like symptoms
    • fever, body aches, headache, reddened eye and pneumonia
    • Can progress to septicemia
  – Severe cases:
    • Heart and kidney infections can occur
    • Pregnant women may abort
      – 14-36 weeks of pregnancy

Source: Center for Food Safety and Public Health

Sheep Zoonoses – Campylobacteriosis

• Causes: Campylobacter jejuni, Campylobacter coli & Campylobacter fetus
• Distribution: Worldwide
• Survives in moist environments
  – Cold tolerant
  – Weeks to months
• Remains viable in:
  – Feces
  – Milk
  – Water
  – Vaginal discharges

Sheep Zoonoses – Campylobacteriosis

• C. jejuni and C. coli
  – Both can cause diarrhea in animals and humans
  – C. jejuni sporadically causes abortions in sheep
• C. fetus
  – Causes abortions in sheep
  – Opportunistic human pathogen
    • Immunocompromised (septicemia)
Sheep Zoonoses – Campylobacteriosis

- **How it is transmitted in sheep?**
  - C. jejuni, C. coli & C. fetus
    - Fecal-oral
      - Contact with feces, vaginal discharges, aborted feti and their membranes
    - Fomites
      - Contaminated instruments, bedding
        - Bacteria found on:
          - Vaginal discharges, aborted materials (C. jejuni & C. fetus)
          - House flies can serve as mechanical vectors

- **What are the symptoms in animals?**
  - Enteritis (C. jejuni and C. coli)
    - resolves in 3 to 7 days
    - Many species affected
    - Young animals
    - Intermittent diarrhea may persist
    - Diseased or stressed adults
  - Abortions (C. fetus and C. jejuni)
    - Late term abortions
    - Weak lambs
    - Uterine infections
    - Ewes can be persistently infected and shed bacteria in feces

- **What are the symptoms in humans?**
  - Incubation period 1 to 10 days *(Source: CDC)*
    - C. jejuni
      - diarrhea, abdominal pain, and fever within two to five days after exposure
      - diarrhea with or without blood
    - C. fetus
      - Opportunistic human pathogen
      - Immunocompromised persons at risk
Sheep Zoonoses – Campylobacteriosis

• How to diagnose the disease in animals?
  − Contact your veterinarian
  • Symptoms: diarrhea in young lambs and abortions in pregnant animals
  − Post-mortem examination of aborted fetuses
  − Laboratory testing required for confirmation
  • Campylobacter can be isolated from aborted fetuses and fetal membranes
  • Fecal testing in diarrheic animals can be used for diagnosis

Sheep Zoonoses – Q Fever

• Cause: Coxiella burnetii

• Distribution: Worldwide
  − Except New Zealand
  − Between 1998 and 2011, there were 39 human cases in Alberta
  • Contact with farms and/or livestock, predominantly cattle, sheep and goats
  − B.C. Centre for Disease Control reported 6 human cases between 1999 and 2008

• Reservoirs
  − Domestic animals
    • Sheep, cattle, goats, dogs, cats
  − Wild Birds and animals
    • snowshoe hares, moose and white-tailed deer

Sheep Zoonoses – Q Fever

• 2007–2009 human Q fever epidemic in The Netherlands
  − Q fever abortions detected in 30 dairy goat and dairy sheep farms between 2005 and 2009
  − A total of 3523 human cases were notified between 2007 and 2009
  − Proximity to small ruminant farms experiencing abortions was determined as a potential risk to human cases
Sheep Zoonoses – Q Fever

• 1985, Nova Scotia human Q fever cases
  – 33 human positive cases
  – 25 were exposed to pregnant cat
• Symptoms
  • Fever, sweats, chills, fatigue, myalgia, headache, cough and pneumonia
  • Cat tested positive for C. burnetii
  • Pregnant queen


Sheep Zoonoses – Q Fever

• Who are at risk?
  – Livestock producers and farm workers
  – Veterinarians and technicians
• Ontario study:
  – Shannon Meadows, PhD student from U of Guelph
    • Coxiella burnetii seropositivity and associated risk factors in sheep, goats, their farm workers and veterinarians in Ontario
    • highlighted the importance of farm hygiene and biosecurity measures
    • failure to disinfect lambing/kidding pens
    • presence of other sheep/goat farms within 5km
    • dairy goat farms
    • Increasing proportions of seropositive sheep/goats on farm

Sheep Zoonoses – Q Fever

• How the disease transmission occurs?
  – Ingestion
    • Lack of hygienic precautions while handling of infected ewes shedding organisms, conducting necropsies
    • Urine, feces, milk, accidental ingestion of fetal fluids while assisting lambing
  – Aerosol
    • airborne droplets or dust contaminated by dried placental material, birth fluids, or feces of infected animals
      • It was estimated that 10^9 bacteria released per gram of placenta
      • few organisms are infective
  – Fomites
    • contaminated bedding, wool, clothing & tools
  – Arthropods
    • Ticks – vectors from wildlife to sheep
Sheep Zoonoses – Q Fever

• What are the symptoms in Sheep?
  – Reproductive failure
    • Abortions & stillbirths
      – Endometritis
      – Retained placenta
    • Weak newborns
      – Low birth weights
  – Carrier state
    • Organisms may be shed in milk and feces for several days after lambing/kidding

Sheep Zoonoses – Q Fever

• How to diagnose the disease in sheep?
  – Contact your veterinarian for investigation if there are multiple abortions in a short period
    • Postmortem examination and confirmatory laboratory testing
      – Fetal tissues and placenta
      – Serology

Sheep Zoonoses – Listeriosis

• Also called ‘Circling disease’
• Cause: Listeria monocytogenes
• Widespread in the environment in soil, plants, mud and streams
  – relatively resistant to freezing
  – killed by cooking or pasteurization or dry heat
• How do sheep get infected?
  – Feeding poor quality silage & spoiled hay (black spots)
  – pH of greater than 5 (e.g. spoiled silage) favors the growth
  – Eating and/or drinking contaminated feed/water
  – Newborn lambs can be infected through pregnancy
• What are the symptoms in animals?
  – walking in circles, seizures, head pressing, incoordination, recumbency, death and abortion
Sheep Zoonoses – Listeriosis

- **How do humans get infected?**
  - Foodborne Illness: Consuming unpasteurized milk and dairy products, and improperly cooked meat
  - Humans can be infected by direct contact with contaminated fetal tissues/fluids during lambing
    - handling aborted fetuses and placentas of infected ewes and lambs without wearing personal protective equipment (PPE)

Sheep Zoonoses – Listeriosis

- **How to diagnose disease in animals?**
  - Contact your veterinarian
    - Symptoms
      - Postmortem examination and laboratory confirmation through testing
      - Tissues from dead animals, placenta, fetus or uterine discharges after an abortion

Sheep Zoonoses - Prevention

- **How to prevent & control these diseases in animals?**
  - Good husbandry
    - Purchasing replacement animals from known sources free from disease and good health records
    - Separate newly acquired or sick animals from healthy sheep on the farm
      - removing ewes that have aborted to a separate pen away from pregnant animals
    - Removing and properly disposing of aborted feti, placenta and contaminated bedding materials from the pens as soon as possible
Sheep Zoonoses - Prevention

• How to prevent & control these diseases in animals?
  – Good husbandry
    • Preventing household pets from scavenging aborted
      materials and spreading them around
    • Restricting stray cats, wild birds/animals accessing
      pens
  – If tick infestation is a problem on the farm, implement
    measures to control tick infestation
    – Q fever can spread through tick bites!

• How to prevent & control these diseases in humans?
  – Practice good personal hygiene
    • Use personal protective equipment (PPE)
    • Wash hands after contact with animals on the farm
  – Alberta Agriculture does not recommend consumption of
    raw milk and uncooked meats
    • Q fever, Campylobacteriosis and Listeriosis can spread through
      milk
    • Pasteurization of milk and milk products
    • Thorough cooking of meats
  – Young children, immunodeficient individuals and pregnant
    women should limit contact with sheep
    • Pregnant women should not work with pregnant sheep when abortions
      occurring on the farm
  – Contact your physician immediately if you are exposed to
    an animal carrying these diseases

• Good husbandry (continued..)
  • Feeding good quality hay & silage
    – Avoid feeding spoiled or moldy silage
  • Vaccinating the flock if the disease has been confirmed in
    the flock
    – For Campylobacteriosis, Chlamydiosis and Q Fever
  • Prompt cleaning and disinfection of pens, tools, contaminated
    clothing, boots etc.
    – 10% Bleach solution, Quaternary ammonium compounds
  • Practice Biosecurity to Keep Flocks Healthy
    – All actions to prevent disease entry, to contain disease spread once on farm, and to reduce
      the risk of animal infection and illness
    – Good husbandry, care & handling of sheep
    – For additional information on biosecurity please refer to
      National Biosecurity standards & Biosecurity online Manual
Sheep Zoonoses: Take home message

- Never ignore an abortion - Consider investigation if multiple abortions occur in a short period - Consult your Veterinarian
  - Preserve freshly aborted fetus and placenta
  - Double bag and refrigerate or freeze the samples for investigation
- Chlamyphila, Campylobacter, Coxiella and Listeria were identified in some of abortion cases in Alberta
- ‘Zoonotic alert’ – Use of PPE while handling sick animals, aborted ewes, aborted fetuses placenta
- Observe strict on farm biosecurity, cleaning and disinfection procedures and personal hygiene measures on the farm to reduce spread of contagious diseases
- Consult your physician for any exposure to these zoonotic agents from confirmed cases on the farm

Thank you