Prevalence and strain identification of *Coxiella burnetii* on dairy goat farms and in associated wildlife

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Coxiella burnetii

- Obligate, intracellular, gram-negative bacterium
- Category B agent of bioterrorism
- Zoonotic “Q-fever”
Goats
- Disease = abortion, stillbirth, weak kids
- Infection without disease = shedding of bacteria in milk, feces, birth fluids

People
- Disease = mild (~20%) to severe (~20%)
- Pneumonia, hepatitis, chronic fatigue
- Endocarditis (chronic Q-fever) (~ 1-2%)
- Infection without disease = no symptoms (~ 60%)
Coxiella burnetii in Ontario - goats

- **Goats**
  - 63% dairy goat farms positive

- **Humans**
  - 65% humans positive
  - Working with dairy goats a risk factor for positivity

Coxiella burnetii in Ontario - wildlife

Are wildlife involved in the transmission of *Coxiella burnetii* on these infected dairy goat farms?
**Hypothesis:** Wildlife are a reservoir of *Coxiella burnetii*.

**Prediction 1:**
Prevalence of *C. burnetii* will be the same from wildlife on the farm as from wildlife in nearby natural areas.

**Prediction 2:**
The same strain type(s) of *C. burnetii* will be detected from dairy goats and wildlife in nearby natural areas.
Methods

- 16 dairy goat farms + 14 nearby natural areas
  - 30 goats, other resident farm animals
  - Maximum 35 wildlife individuals/species/site
    - Small mammals: mice, voles, chipmunks, squirrels
    - Medium mammals: raccoons, skunks, opossums

- Genital and fecal samples collected from all animals (milk from goats)
Methods

- Real-time PCR for *C. burnetii* detection
- Multispacer Sequence Typing (MST) for *C. burnetii* strain identification
Results
Results – Goats Seropositive Farms
Unfortunately, no control farms 😞
Results - Goats

The graph shows the percentage of positive samples from different farm sites, with a notable increase at the Vaccinated Farm site.
Prevalence of *C. burnetii* infection among wildlife will be the same on and off farms.
Results – Prevalence in Wildlife

Fisher’s Exact Test

- Goat (n=453)
- On-farm wildlife (n=68)
- Natural-area wildlife (n=286)

Fisher’s Exact Test
p > 0.3
Results – Prevalence in Wildlife Species – all locations

Same letter = not different

% Positive

(n=167)
(n=57)
(n=30)
(n=86)
(n=14)

Deer mouse
Eastern chipmunk
House mouse
Raccoon
Red squirrel
Results – Prevalence in Wildlife Species by Location

Fisher's Exact Test: p=0.03
Results – Farm Animals

- Cat: (n=18)
- Chicken: (n=6)
- Cow: (n=13)
- Dog: (n=5)
- Horse: (n=2)
- Pig: (n=4)
Conclusions

- Wildlife infected on farms AND natural areas with equal prevalence
  - Evidence for Prediction 1
- MST strain type results still pending
Significance

Results will provide a better understanding of the transmission dynamics of *C. burnetii*

Evidence for recommendations of better biosecurity to keep farm and wildlife animals healthy and preserve human health
Biology’s not always easy

- Video on the project
  - https://www.youtube.com/watch?v=TU0XMTCG-cls
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