Colorado’s Tickled Pink Campaign

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[Images of ticks]
Instituting a Statewide Passive Surveillance Program for Ticks

- Colorado’s medically important ticks
- Tick-borne diseases in the state
- The strategy and goals of the surveillance
- Limitations of the surveillance
- Findings
- Additional considerations
Medically important ticks of Colorado

- *Dermacentor* species
  - *D. andersoni*
  - *D. variabilis*
- Brown dog tick (*Rhipicephalus sanguineus*)
- *Ornithodoros* species
Tick vectors

ROCKY MOUNTAIN WOOD TICK
*Dermacentor andersoni*

Colorado tick fever
Tularemia
Rocky Mountain spotted fever (can also cause tick paralysis)
Rocky Mountain Wood Tick
(Dermacentor andersoni)
Life cycle of a 3-host tick may take 1-2 years depending on whether or not the tick can find a suitable host between life stages.

1. Female tick lays eggs on ground.
2. Six-legged larva feeds on a small mammal, then drops off to the ground and molts.
3. Eight-legged nymph feeds on a small mammal, then drops off to the ground and molts.
4. Eight-legged adults feed and mate on a larger mammal, including livestock and pets, then drop off to the ground. Males die soon thereafter and females begin to develop eggs.

Life cycle of a 3-host hard tick: Scott Charlesworth
Purdue University, Medical Entomology Extension
Tick vectors

AMERICAN DOG TICK
Dermacentor variabilis

Tularemia
Rocky Mountain spotted fever
Female

Eggs

Larva
  Feeds on small mammals

Nymph
  Feeds on small and medium sized mammals

Male

Feeds on large and medium sized mammals and humans
Tick vectors

BROWN DOG TICK
*Rhipicephalus sanguineus*

Rocky Mountain spotted fever
Life cycle of a three-host tick

- Engorged female: Each female deposits ~5,000 eggs.
- Egg mass
- Eight-legged nymphs molt from larvae over 9 – 47 days.
- Larvae feed on Dog 1 for 3 – 10 days.
- Nymphs feed on Dog 2 for 3 – 11 days, then drop and molt into adults over 5 – 15 days.
- Adults feed on Dog 3; adult females feed 5 – 21 days before dropping off dog.
Tick-borne diseases of Colorado

Virus
- Colorado tick fever virus

Bacteria
- Tularemia
- Spotted fever (RMSF and others)
- Tick-borne relapsing fever
Ecology of Colorado Tick Fever Virus

Colorado tick fever (CTF) virus is spread by Rocky Mountain wood ticks (*Dermacentor andersoni*). Rocky mountain wood ticks are found in the western United States and Canada at 4,000–10,000 feet above sea level. Here are the steps in how the virus is spread:

1. Small rodents such as squirrels, chipmunks, and mice are infected with CTF virus through tick bites. These animals usually do not become ill but they can pass the virus to other ticks that feed on them.

2. CTF virus is also passed from one stage of the tick life cycle to the next – from larvae to nymph to adult.

3. People are infected with CTF virus through the bite of infected ticks. People who work or play outdoors are most likely to be exposed to ticks.

4. Other animals such as elk, marmots, and deer also can be infected with CTF virus through tick bites. However, these animals probably do not play an important role in passing the virus to other ticks.
Rocky Mountain & other spotted fevers

A group of acute febrile illnesses caused by bacteria in the family Rickettsiaceae.

• Rash appears 2 to 5 days following illness onset.
• Most severe of Colorado’s tick-borne diseases.

Transmitted via tick bite. Very rare in Colorado.
Tick paralysis

- Results from inoculation of a toxin from tick salivary glands during a blood meal
- Ascending paralysis occurs, with symptom onset within 2-7 days
Passive surveillance

- Colorado has no public health historical records of tick species in the state from sampling activities
- Some research studies document the presence of some tick species
- Extremely limited resources for surveillance
Passive surveillance

• Take advantage of opportunities to sample
• Piggy-back on other activities
  – hunter killed deer or moose
  – sample road kill
• Recruit interested parties - provide a service in exchange for samples
Colorado Tick Surveillance

- **Strategy**
  - Request vets send in ticks collected from dogs
  - Ticks biting dogs are the same species and life stage as are anticipated to bite people
We’d be tickled pink if you sent us your ticks...

The Colorado Department of Public Health and Environment would like to better understand the presence and distribution of ticks in Colorado.

If you are a veterinarian practicing in Colorado, please visit the website below for directions on how to submit ticks collected from pets.

We greatly appreciate your help!

www.colorado.gov/pacific/cdphe/tick-borne-diseases

Department of Public Health & Environment
Goals of Surveillance

- Identify species of host-seeking ticks
- Learn about their distribution
- Learn about the seasonality of host-seeking
- Identify risk activities and areas for public health messaging
Colorado Tick Surveillance

– Why not request ticks from humans?
Colorado Tick Surveillance

– Why not test the ticks for disease agents?
Limitations of opportunistic sampling
1. Not systematic
2. Cannot infer anything about the population
3. Presence data only
4. Life stage specific
5. Missing data regarding seasonality
Preliminary Findings

- Identified >500 ticks
- We received submissions from 27 of 64 Colorado counties (42%)
- The vast majority of ticks were adults
- Only 48 (8.8%) were immatures (nymphs)
  - 44 of those were spinose ear ticks
  - two were BDT, one was an *Ixodes* species,
    and one was an American dog tick
Preliminary Findings

Four *Dermacentor* species were identified

- *Dermacentor hunteri*
- American dog tick
- Winter tick (*Dermacentor albipictus*)
- Rocky Mountain wood tick

*Sally Bellacqua: www.nps.gov/colm/learn/nature/desert-bighorn.htm*
Collections reported from 18 counties

• Most were eastern plains
• Two were urban areas (Denver metro)
• One western slope
Preliminary Findings

- Winter tick: *Dermacentor albipictus*
Rocky Mountain Wood Tick

Samples from 21 counties
- Mostly mountain counties
- Elevation
- Issues with submitters obtaining correct information about samples
Brown dog tick

Collected from 14 counties

– Front Range, southwest and south central Colorado
– Some rural, some urban and suburban
Preliminary Findings

*Ixodes* sp.
(likely *spinipalpus*)
Preliminary Findings

*Haemaphysalis* sp. (likely *leporipalustris*)
Preliminary Findings

*Otobius megnini* - spinose ear tick
Out of State Ticks

- Lone star tick
- American dog tick
- *Ixodes* spp.

Of greatest concern: the Lone Star tick
Out of State Ticks

Lone star tick
• Ehrlichiosis
• Heartland virus
• STARI
• Tularemia
Climate change & tick distribution expansions

- Models depend on their underlying assumptions
- Must account for the life history traits of the organisms whose distributions are being forecast
- Are very complex
- Are often tested against the historical record
- Issues with resolution
Lone Star tick distribution

Lone Star tick populations
• 2015 article
• Nothing west

LST Forecast Distribution
Climate change

Darkest areas are where all 5 models agree

Summary

• Finish identifying submitted ticks
  – Continuing to receive samples
• Outreach to vets in areas from which no submissions have been sent?
• Possible active surveillance?
• Implications of BDT and ADT widespread in the state - increased RMSF incidence?
Questions?