Ticks and tick-borne diseases: emerging problems?

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Topics

• Ticks on dogs in Ontario and the pathogens they transmit?
• Should dogs be routinely screened for tick-borne pathogens?
• How should you manage a healthy dog that tests positive for a tick-borne pathogen?

Ticks on dogs in North America

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lone Star Tick</td>
<td>Amblyomma americanum</td>
</tr>
<tr>
<td>Gulf Coast Tick</td>
<td>Amblyomma maculatum</td>
</tr>
<tr>
<td>Rocky Mountain Wood Tick</td>
<td>Dermacentor andersoni</td>
</tr>
<tr>
<td>American Dog Tick</td>
<td>Dermacentor variabilis</td>
</tr>
<tr>
<td>Western Black-legged Tick</td>
<td>Ixodes pacificus</td>
</tr>
<tr>
<td>Deer Tick</td>
<td>Ixodes scapularis</td>
</tr>
<tr>
<td>Brown Dog Tick</td>
<td>Rhipicephalus sanguineus</td>
</tr>
</tbody>
</table>

= most likely in Ontario
Ticks on Ontario dogs

*Dermacentor variabilis*  *Ixodes scapularis*

Ticks in Ontario?

Distribution of *Dermacentor* species in USA

© USA
Greene, 2006
**Dermacentor variabilis**

“American dog tick”

Transmits (rarely/never in Canada):
(a) *Rickettsia rickettsii*  
   (Rocky mountain spotted fever - RMSF)
(b) *Francisella tularensis*
(c) *Cytauxzoon felis* (only southeast USA)
   • causes tick paralysis (rare)

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**Dermacentor andersoni**

“Rocky Mountain wood tick”

Transmits (rarely in Canada):
(a) *Rickettsia rickettsii*
(b) *Francisella tularensis*
   • causes tick paralysis (rare)

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**Distribution of Dermacentor species in USA**

[Map showing distribution of Dermacentor species in USA]
Ixodes scapularis – “deer (black-legged) tick”
Ixodes pacificus – “western black-legged tick”

- transmit *Borrelia burgdorferi* (Lyme disease) (4DxPlus)
- transmit *Anaplasma phagocytophilum* (granulocytic anaplasmosis) (4DxPlus)
- cause tick paralysis (rare)

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**Distribution of *Ixodes* species in North America**

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**Reported Cases of Lyme Disease—United States, 2014**

One dot is placed randomly within the county of residence for each confirmed case. Though Lyme disease cases have been reported in nearly every state, most are reported based on the county of residence, not necessarily the county of infection.
Why is the risk of Lyme disease increasing in Ontario?
**Amblyomma americanum**  
"Lone star tick"

- Currently rare in Canada – the next endemic tick?
- Transmits *Ehrlichia ewingii*  
  (canine granulocytic ehrlichiosis) (4DxPlus)
- Transmits *Cyttauxzoon felis* (primary vector)

**Amblyomma maculatum**  
"Gulf coast tick"

- Very rare in Canada
- Gulf of Mexico & as far north as Kansas and Oklahoma
- Transmits *Hepatozoon americanum* to dogs
  - Dog infected by ingestion of tick

**Rhipicephalus sanguineus**  
"Brown dog tick"

- Prefers warm, humid, climate (rare in Canada)
- Only tick that can establish in homes/kennels/veterinary hospitals
**Rhipicephalus sanguineus**

**Transmits:**
(a) *Babesia canis*  
(canine babesiosis/piroplasmosis)

(b) *Ehrlichia canis*  
(canine monocytic ehrlichiosis) (4DxPlus)

(c) *Anaplasma platys*  
(thrombocytic anaplasmosis) (4DxPlus)

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**Screening of dogs for tick-borne pathogens?**

- heartworm antigen
- antibody to *Ehrlichia ewingii*
- antibody to *Borrelia burgdorferi*
- antibody to *Anaplasma platys*
- antibody to *Anaplasma phagocytophilum*

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**SNAP® 4Dx® Plus Test (Idexx)**

- heartworm antigen
- antibody to *Ehrlichia ewingii*
- antibody to *Borrelia burgdorferi*
- antibody to *Anaplasma platys*
- antibody to *Anaplasma phagocytophilum*
Testing of dogs with 4Dx® Test

In 2007, 68,571 dogs in Ontario were tested:
In 2008, 56,943 dogs in Ontario were tested:
In 2013/14, 77,143 dogs in Ontario were tested:

<table>
<thead>
<tr>
<th>Proportion of dogs positive for:</th>
<th>2007</th>
<th>2008</th>
<th>2013/2014</th>
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</thead>
<tbody>
<tr>
<td>(a) B. burgdorferi =</td>
<td>0.58%</td>
<td>0.47%</td>
<td>5.1% (eastern ON)</td>
</tr>
<tr>
<td>(b) A. phagocytophilum =</td>
<td>0.09%</td>
<td>0.09%</td>
<td></td>
</tr>
</tbody>
</table>

SNAP® 4Dx® Plus Test (Idexx)
- Detects antibody to C₆ surface antigen on B. burgdorferi.
- Use of Lyme vaccines does not interfere with this response.

Lyme Quant C₆® Test (Idexx)
- Quantifies antibody to C₆ surface antigen.
- Useful for monitoring response to treatment (determine titer on day of treatment and 6 months later).
- Correlation between titer and risk of disease currently unclear.

Ixodes scapularis and Borrelia burgdorferi

Important facts:
- Ticks need to be attached for a minimum of ≥36 hours before transmission occurs.
- Overall proportion of Ontario/Canada ticks infected with B. burgdorferi = 18.4% (2013).
- Seroconversion occurs 3-5 weeks following infection.
- Dogs become clinical 2-5 months following infection.
- ~95% infected dogs never become clinical.
Will the dog get Lyme disease?

Options if fully engorged *Ixodes scapularis*

1. Evaluate dog for clinical signs consistent with Lyme disease for next 6 months (option most consistent with ACVIM consensus statement)
2. Carry out *B. burgdorferi* serology today and 2 months later - evidence of seroconversion?
3. Submit tick for PCR evaluation of *B. burgdorferi*

If a dog genuinely tests positive for *B. burgdorferi*, how should it be managed?

“Most seropositive dogs will never become ill with Lyme disease and do not need to be treated.”

(ACVIM Consensus Statement 2006)
Typical clinical signs in dogs

*Borrelia burgdorferi* (Lyme disease):
- disease incubation = 2-5 months:
  - fever, anorexia, polyarthritis
  - shifting leg lameness, joint swelling
  - lymphadenomegaly

*Borrelia burgdorferi* (Lyme disease): *Ixodes scapularis*

Clinical Lyme disease

If a healthy dog tests positive for *Borrelia burgdorferi*, how should it be managed?

- Monitor for clinical signs and proteinuria for 6 months -

<table>
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<th>Pathogen</th>
<th>Test</th>
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<tr>
<td><em>Borrelia burgdorferi</em></td>
<td>Urine protein (dipstick)</td>
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</table>

(as long as clean urine sediment, i.e. no blood/inflammation)

If clinical signs consistent with Lyme disease, or urine protein, treat with:
(a) doxycycline at 10 mg/kg, PO, q24 hours for minimum of 1 month
(b) amoxicillin at 20 mg/kg, PO, q8 hours for 30 days
If a dog tests positive for other tick-borne pathogens, how should it be managed?

- If clinical signs consistent with pathogen, TREAT -

Typical clinical signs in dogs

*Borrelia burgdorferi* (Lyme disease):
- *disease incubation* = 2-5 months:
  - fever, anorexia, polyarthritis
  - shifting leg lameness, joint swelling
  - lymphadenomegaly

*Anaplasma phagocytophilum* (granulocytic anaplasmosis):
- *disease incubation* = 1-2 weeks:
  - fever, anorexia, lethargy
  - lameness, stiffness, joint swelling
  - lymphadenomegaly, splenomegaly, hepatomegaly

*Ehrlichia canis* (monocytic ehrlichiosis):
- *seroconversion* = 7-28 days
- *disease incubation* = 8-20 days:
  - fever, anorexia, weight loss
  - polyarthritis
  - lymphadenomegaly, splenomegaly
  - CNS signs, dermal petechiae/ecchymoses
  - cardiac arrhythmias, anterior uveitis
**Ehrlichia canis: mucosal petechiae**

**Ehrlichia canis: scleral bleeding**

**Typical clinical signs in dogs**

*Ehrlichia canis* (monocytic ehrlichiosis):
- disease incubation = 8-20 days:
  - fever, anorexia, weight loss
  - polyarthrits
  - lymphadenomegaly, splenomegaly
  - CNS signs, dermal petechiae/ecchymoses
  - cardiac arrhythmias, anterior uveitis

*Anaplasma platys* (thrombocytic anaplasmosis):
- disease incubation = 8-15 days?
  - mild fever, uveitis
  - petechiae, ecchymoses
Typical clinical signs in dogs

*Ehrlichia ewingii* (granulocytic ehrlichiosis):
- disease incubation = 18-28 days:
  - fever, anorexia
  - stiffness, joint swelling
  - CNS signs

If a healthy dog tests positive for other tick-borne pathogens, how should it be managed?

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<td>CBC – thrombocytopenia</td>
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Retest 2-3 weeks later?

If clinical signs consistent with pathogen, or CBC abnormality, treat with doxycycline for 1 month