Background

• In WA, the burden of tick-borne diseases (TBDs) is much lower than highly endemic areas like the Northeast and Midwest

• Human cases of the following are notifiable to LHJs in WA:
  • Lyme disease
  • anaplasmosis
  • ehrlichiosis
  • babesiosis
  • spotted fever rickettsioses
  • tickborne relapsing fever
  • tularemia

• Under-recognition and under-reporting are suspected
## Tick-borne Diseases of WA (ever)

<table>
<thead>
<tr>
<th>Disease</th>
<th>Agent in WA</th>
<th>Ever identified in locally-exposed humans</th>
<th>Ever identified in ticks in WA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lyme disease</td>
<td><em>Borrelia burgdorferi s.s.</em></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Rocky Mountain Spotted Fever</td>
<td><em>Rickettsia rickettsii</em></td>
<td>YES*</td>
<td>YES^</td>
</tr>
<tr>
<td>Tick-borne relapsing fever</td>
<td><em>Borrelia hermsii</em></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Anaplasmosis</td>
<td><em>Anaplasma phagocytophilum</em></td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Babesiosis</td>
<td><em>Babesia duncani, Babesia divergens</em>-like organism</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Tularemia</td>
<td><em>Francisella tularensis</em></td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>B. miyamotoi infection</td>
<td><em>Borrelia miyamotoi</em></td>
<td>NO</td>
<td>YES</td>
</tr>
</tbody>
</table>

*See following case slides  
^Personal communication only, not confirmed by DOH  
No detections of *Ehrlichia* spp.
Methods

- Human cases of Lyme disease, anaplasmosis, ehrlichiosis, babesiosis, Rocky Mountain spotted fever, tick-borne relapsing fever, and tularemia reported 2010-2016 were reviewed
- Reclassified to most recent CSTE case definitions as of 2017; confirmed and probable included
- Classified as locally acquired, travel-associated, or unknown according to standard definition
Tick-borne diseases 2010-2016, travel-associated

- Lyme
- Anaplasmosis
- Babesiosis
- RMSF
- Relapsing Fever
Tick-borne diseases 2010-2016, autochthonous
Reviewing the Evidence: Anaplasma/Ehrlichia

- To date, no documented locally-exposed human cases of anaplasmosis or ehrlichiosis reported in WA
- Occasional reports of anaplasmosis and ehrlichiosis with out of state travel (e.g. 2011 case with travel to NC, 2013 case with travel to WI)
- *A. phagocytophilum* has been documented in *I. pacificus* ticks collected by drag in WA
- *Ehrlichia* spp. have not been documented in ticks in WA
- The primary vector for ehrlichiosis (*Amblyoma americanum*) is not known to be present in WA
- Reports of canine anaplasmosis in Western WA (PCR+ with no travel documented)*
- Reports of human/animal anaplasmosis cases in nearby states/provinces

*J of Clin Micro 2005, Poitout et al.*
*Vet Clin Pathol 2011, Carrade et al.*
Lyme Disease

- 18 locally-acquired cases were reported 2010-2016
- *B. burgdorferi ss.* is present in WA tick populations, including the known Lyme disease vector *Ixodes pacificus*
- There is a very low-level incidence of in-state acquired Lyme disease cases
  - Potential for false positives/misdiagnosis
- Human cases and positive ticks have been documented in BC, OR, and CA
- Canine serosurvey documented 3.8 cases/1,000 dogs tested by ELISA*

*Vet Clin Pathol 2011, Carrade et al.*
Reviewing the Evidence: Babesiosis

- No locally acquired cases of babesiosis have been reported in WA since 2002
- Four locally acquired cases were reported during 1991-2002, one caused by B. divergens-like organism, and three caused by B. duncani
- No identifications in ticks to-date
- Two blood transfusion recipients in 2014 and 2015; donors had travel
Reviewing the Evidence: Rocky Mountain Spotted Fever

- Cases of RMSF were reported frequently until the 1940s’
- Since mid-1900’s, case reports decreased to 0-4 cases per year
- No locally acquired cases reported since 2011
  - Prior to 2011, no locally acquired cases since 2002 (1 case in Stevens County)
- Three locally-acquired probable cases of RMSF were reported in 2011 (two included in analysis after re-classification)
Case 1

- In 2011, a male resident of Clallam County was diagnosed with RMSF (IgG 1:256) following a camping trip in Chelan County
- This specimen was collected <1 week after symptom onset
- A follow-up serum specimen collected 3 weeks after symptom onset resulted IgG 1:64
- Clinically consistent findings include fever, malaise, HA, myalgia, lymphadenopathy, ulcerated lesion on leg, platelets normal
- No recall of tick bite

- Classified as probable case
- Note: Pacific Coast Tick Fever (R. philipii) presents as a localized lesion/eschar without a petechial rash
Case 2

• In 2011, a female resident of Klickitat County was diagnosed with RMSF following a single elevated IgM (EIA) result = 8.84 (ref >1.10)
• Follow-up serology testing on a specimen collected one month after symptom onset was RRI-IgG negative (<1:32) at CDC
• Clinically consistent findings include fever, myalgia, rash, SOB
• Tick embedded in naval, hunting on property in Klickitat County

• Originally classified as probable, but removed from study due to negative IgG result
Case 3

- In 2011, a male resident of Island County was diagnosed with RMSF following a single elevated IgG result (1:64)
- Clinically consistent findings include fever, myalgia
- The patient had travel to Okanogan County and a known tick bite

- Classified as probable
RMSF Conclusions

• Prevalence of *R. rickettsii* in our tick populations remains uncertain

• Very few cases reported, convincing evidence of infection lacking
  • Potential for false positives/misdiagnosis
  • Look for clinical, lab, and exposure evidence

• Healthcare providers should be aware of the possibility for RMSF to be acquired locally due to potential for severe outcomes
Relapsing Fever

- 31 locally-acquired cases of TBRF were reported 2010-2016
- 1-12 cases are reported in WA residents each year
- First documentation of canine infection was a dog with travel to Chelan County*

*Ticks Tick Borne Dis 2014, Kelly et al.
Tularemia

- 28 cases of locally-acquired tularemia were reported during 2010-2016
- Only a small number of these cases report tick bites
- *F. tularensis* documented in *D. variabilis* ticks in WA
Reviewing the Evidence: B. miyamotoi

- To date, no documented locally-exposed human cases of infection with B. miyamotoi reported
- Documented in Ixodes in WA
- Unknown whether providers ever try to order it
  - Quest offers PCR
  - None of our “general commercial labs” offer serology
  - Serology available at CDC
During 2010-2016, 79 cases of locally-acquired Lyme disease, Rocky Mountain spotted fever, tick-borne relapsing fever, and tularemia were reported

- 41.8% female
- Age range 1-91
- Average age 45.5, median age 49
- Seasonality driven by tularemia and relapsing fever

Tick-borne relapsing fever is the most commonly reported autochthonous tick-borne disease in WA

Lyme disease is the most commonly reported imported tick-borne disease
Conclusions

• Tick-borne diseases are rare but present in WA
• Rarity proves a challenge for surveillance and provider education
  • Difficult to maintain awareness among provider populations
  • Likely miss cases = unknown morbidity
  • High potential for false positive results
• Revising our administrative code to specifically include more TBDs
  • Unknown pathogens?
Acknowledgements

- WA DOH: Liz Dykstra and Mary Chan
- LHJ partners
- CDC ELC funding
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