Zoonotic Diseases in Alaska:
Impact of Warming, Current Knowledge, Plans for the Future

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Zoonotic Diseases in Alaska

Purpose

• Summarize meeting held August 11-12, 2010, University of Alaska, Fairbanks.
• Goals of Meeting: review historical data on zoonoses in Alaska.
• Review climate changes, predictions.
• Review current knowledge of zoonoses in Alaska.
• Develop plan for human/wildlife surveillance and collaboration within Alaska and other Arctic countries.
Zoonotic Diseases in Alaska

Organisms Discussed

• Brucella
• Arboviruses (Snowshoe hare, Jamestown Canyon, WHV)
• Trichinella
• Rabies
• Q-fever
Zoonotic Diseases in Alaska

Organisms Discussed Continued

- Echinococcus
- Francisella tularensis
- Avian influenza
- Giardiasis
- Toxoplasma
- Cryptosporidium
Zoonotic Diseases in Alaska
Data/Research Needs

- Brucella – Serologic/PCR tests for marine brucella
  - baseline seroprevalence in important food species.
  - Marine/freshwater ecology of marine brucella.
  - Cross-reactivity between B. suis/marine brucella.
  - Human co-infection?
Zoonotic Diseases in Alaska
Data/Research Needs

• Toxoplasma
  – Baseline seroprevalence in humans in rural Alaska, and subsistence species.
  – Asexual ecology in rural Alaska.
Zoonotic Diseases in Alaska
Data/research needs

• Trichinella
  – Baseline prevalence in humans, subsistence wildlife.
  – Protocol standardization for sampling, testing.
Zoonotic Diseases in Alaska
Data/research needs

• Francisella tularensis - Not much experience in Alaska; both types A & B exist
  – Movement of beavers and muskrat north with warming trend raises threat of local waterborne outbreaks.
  – Baseline seroprevalence studies in humans, and animals.
Zoonotic Diseases in Alaska
Next Steps

- Establish Alaska Zoonotic Disease Committee.
- Plan collaborative efforts with multiple federal agencies to address data and research needs.
- Establish village-based capacity for hunters to gather specimens to begin zoonotic disease surveillance.
- Create education products for residents, medical providers in rural Alaska.
- Participate in circumpolar planning to create international zoonotic disease research and surveillance.
Zoonoses in Alaska

Brucellosis (Brucella suis)

- First identified in an AN woman from NSB 1959.
- 1960 cohort of 793 AN men, 55 villages; rates 0-20%.
- Animal serosurvey data:
  - Caribou – 0%-9% - highest in NW Alaska
  - Wolves – 0%-25% - highest in NW Alaska
  - Moose – 3%
  - Harbor seals – 46% - SE Alaska, GOA, PWS
- Marine brucella has been found in lung worm parasites of marine mammals.
- Fish and benthic invertebrates may act as hosts for marine brucella.
Zoonoses in Alaska

Q Fever (Coxiella burnetti)

- Worldwide infection.
- Mild disease in most humans.
- 15% of adult resident cohort in Quebec City region, without known risk factors, were seropositive.

Zoonoses in Alaska

Arboviruses

- Jamestown Canyon (JC), Northway (NOR), Snowshoe Hare (SSH), (Bunyaviridae)
- Klamath (KLA), (Rhabdoviridae)
- Wildlife prevalence
  JC–Bison–89%; Dallsheep–51%; snowshoe hare–45%
  SSH–Bison–89%; Dallsheep–41%; Snowshoe hare–65%

Ref: Zarnke RL, J. Wildlife Dis; 1083; 19(3):175-179
# Zoonotic Arbovirus Serology in Alaska Residents

<table>
<thead>
<tr>
<th>Virus</th>
<th>Human Serology</th>
<th>Zarnke</th>
<th>Walters</th>
<th>Stanfield</th>
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<td>Jamestown Canyon</td>
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<td>54%</td>
<td>17.60%</td>
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<td>Snowshoe hare</td>
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<td>42%</td>
<td>6.80%</td>
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<td>Northway</td>
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<td>14%</td>
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<td>Klamath</td>
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<td>5.00%</td>
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<td>3.40%</td>
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</table>


Zoonoses in Alaska

Toxoplasmosis (Toxoplasma gondii)

- Worldwide infection..
- Felids only host for sexual life cycle.
- Many species can be infected, and transmit the infection by cysts in tissues.
- Not a reportable disease in Alaska.
- Represents an under-appreciated risk to developing fetus, immunocompromised and elderly adults.
Zoonoses in Alaska

Prevalence of *Toxoplasma gondii* antibodies in marine mammals in the USA

<table>
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<tr>
<th>Species</th>
<th>Source</th>
<th>No. Tested</th>
<th>% Positive</th>
<th>Test</th>
<th>Titer</th>
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<td>Dubey et al (2003b)</td>
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</table>
Zoonoses in Alaska

Tularemia (Franciscella tularensis)

- Common infection in rodents, rabbits; can use ticks as vector.
- Infected muskrats, beavers can result in water-borne infection.
- Two types; A (more virulent), B (less virulent).
- 30% of pooled Alaska mosquitos are positive for Francisella DNA (Triebenbach AN, et al J. of Med. Entomyology; 2010, 47(4), pp639-648.)
- Transmission of Franciscella by mosquito has been widely cited in Europe.