

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
- Cryptosporidia

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.
- Found in 85% (12 of 15) Dallsheep (Zarnke, J. Wildlife Dis. (19) 4; 1983).
- Responsible for 22% of 110 cases of lower respiratory tract infections in a one year cohort at a hospital in Nova Scotia (Marrie TJ, et al. Can J. Public Health. 76:233-36, 1985).
- 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), (Bunyaveridae)
- Klamath (KLA), (Rhabdoviridae)
- Wildlife prevalence
JC–Bison–89%; Dallsheep–51%; snowshoe hare–45%
SSH–Bison–89%; Dallsheep–41%; Snowshoe hare–65%

ZOONOTIC ARBOVIRUS Serology in Alaska Residents

VIRUS	HUMAN SEROLOGY		
	Zarnke	Walters	Stanfield
Jamestown Canyon	54%	17.60%	20.50%
Snowshoe hare	42%	6.80%	13.60%
Northway	14%	3.10%	3.90%
Klamath	5.00%		3.40%

Walters LL, Tirrell SJ, Shope RE, Seroepidemiology of California and Bunyamwera serogroup (Bunyaviridae) virus infections in native populations in Alaska. *Am J Trop Med Hyg.* 1999 60(5):806-21.

Stansfield SK, Calisher CH, Hunt AR, Winkler WG, Antibodies to arboviruses in an Alaskan population at occupational risk of infection. *Can J Microbiol.* 1988 34(11):1213-6

Zarnke RL, Calisher CH, Kerschner J, Serologic evidence of arbovirus infections in humans and wild animals in Alaska. *J Wildl Dis.* 1983; 19(3):175-9.

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.
- Alaska wildlife (Zarnke, RL, et al, Journal wildlife Dis. 36 (2), 2000, 219-224), Black bear – 43%; wolves – 9%; Dallsheep – 7%; caribou – 6%; moose – 1%.
- 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

Species	Source	No. Tested	% Positive	Test	Titer	Reference
Walrus	Alaska	53	5.6	MAT	1:25	Dubey et al.(2003b)
Sea Lions	Alaska	27	29.6	MAT	1:25	Dubey et al.(2003b)
	California	18	61.1	MAT	1:25	Dubey et al.(2003b)
Harbor Seals	Washington	380	7.6	MAT	1:25	Lambourn et al (2001)
	Alaska	311	16.4	MAT	1:25	Dubey et al (2003b)
Ringed Seals	Alaska	32	15.6	MAT	1:25	Dubey et al (2003b)
Bearded Seals	Alaska	8	50	MAT	1:25	Dubey et al (2003b)
Spotted Seals	Alaska	9	11.1	MAT	1:25	Dubey et al (2003b)

Zoonoses in Alaska

Tularemia (*Francisella tularensis*)

- Common infection in rodents, rabbits; can use ticks as vector.
- Infected muskrats, beavers can result in water-borne infection.
- Seroprevalence among North American trappers and aboriginal groups 6-17% (Levesque B., et al; clinical and diagnostic Lab., Immun., July 1995 pp 496-498.
- 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. Entomology; 2010, 47(4), pp639-648.)
- Transmission of Francisella by mosquito has been widely cited in Europe.
- 1961 Serosurvey of 793 AN men 17.5% seropositive (Philip RN, et al; J of Inf. Dis., (110)3, May-June 1962, ;; 220-230).