

## **New Distribution Records of *Echinococcus multilocularis* in the Brown Lemming from Barrow, Alaska, USA**

Authors: Holt, Denver W., Hanns, Cyd, O'Hara, Todd, Burek, Kathy, and Frantz, Rita

Source: Journal of Wildlife Diseases, 41(1) : 257-259

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-41.1.257>

---

BioOne Complete ([complete.BioOne.org](https://complete.BioOne.org)) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at [www.bioone.org/terms-of-use](https://www.bioone.org/terms-of-use).

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

---

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

## New Distribution Records of *Echinococcus multilocularis* in the Brown Lemming from Barrow, Alaska, USA

Denver W. Holt,<sup>1,9</sup> Cyd Hanns,<sup>2,6</sup> Todd O'Hara,<sup>3,7</sup> Kathy Burek,<sup>4</sup> and Rita Frantz<sup>5,8</sup> <sup>1</sup> Owl Research Institute, PO Box 39, Charlo, Montana 59824, USA; <sup>2</sup> North Slope Borough, Veterinary Clinic, Public Health Department, PO Box 925, Barrow, Alaska 99723, USA; <sup>3</sup> North Slope Borough, Department of Wildlife Management, PO Box 69, Barrow, Alaska 99723, USA; <sup>4</sup> Alaska Veterinary Pathology Services, PO Box 773072, Eagle River, Alaska 99577, USA; <sup>5</sup> Barrow High School, Barrow, Alaska 99723, USA; <sup>6</sup> Current address: North Slope Borough, Department of Wildlife Management, PO Box 69, Barrow, Alaska 99723, USA; <sup>7</sup> Current address: Institute of Arctic Biology, University of Alaska, PO Box 757000, Fairbanks, Alaska 99775-7000, USA; <sup>8</sup> Current address: North Slope Borough, Department of Wildlife Management, PO Box 69, Barrow, Alaska 99723, USA; <sup>9</sup> Corresponding author (email: owlmontana@charlo.net)

**ABSTRACT:** We identified *Echinococcus multilocularis* for the first time in brown lemmings (*Lemmus trimucronatus*) from Barrow, Alaska, USA. Of 467 brown lemmings trapped between 1995 and 2000, two males and two females (0.9%; 95% confidence interval=0.9±0.9%) were found to be infected with metacestodes of *E. multilocularis*. No metacestodes were found in 17 collared lemmings (*Dicrostonyx rubricatus*) also trapped at Barrow. In humans, *E. multilocularis* causes alveolar echinococcosis, which is potentially fatal. Knowledge of the distribution of this parasite is important to protect the public health.

**Key words:** Alaska, alveolar echinococcosis, brown lemming, *Echinococcus multilocularis*.

The cestode *Echinococcus multilocularis* is the cause of alveolar echinococcosis, also known as alveolar hydatid disease in humans. It is a potentially fatal disease that primarily affects the liver of its host (Rausch, 1967, 1986, 1995; Rausch et al., 1990a, b). In natural cycles, transmission is governed by predator–prey relationships. In North America, the ecology of *E. multilocularis* has been thoroughly studied in the Arctic, particularly on Saint Lawrence Island, Alaska, USA (Rausch et al., 1990b; Rausch and Fay, 2002). Herein, we report the first identification of *E. multilocularis* in the brown lemming (*Lemmus trimucronatus*) from the tundra near Barrow, Alaska, USA (71°18'N, 156°40'W). Barrow is located on the northern coastal plain and lies about 15 km southwest of Point Barrow, the most northerly point in Alaska (Brown et al., 1980). It is the largest Eskimo village in Alaska, numbering about 4,600 people.

During our study of the breeding ecology of the snowy owl (*Nyctea scandiaca*), lemmings were snap-trapped during June and July 1992–2004. Between 1995 and 2000, 467 brown lemmings and 17 collared lemmings (*Dicrostonyx rubricatus*) were trapped and their internal organs were examined for metacestodes of *E. multilocularis* and other taeniids. Suspicious lesions on internal organs, especially liver and kidney, were noted, and these organs were removed and placed in neutral buffered 10% formalin. They were shipped to the Alaska Veterinary Pathology Services, Eagle River (Alaska, USA) for gross pathology and histopathology. Hepatic lesions observed grossly contained metacestodes of *E. multilocularis*. Brood capsules containing protoscolices and calcareous corpuscles were present. Normal hepatic parenchyma was significantly reduced.

Infection with *E. multilocularis* was found in two male (82 and 108 g) and two female (50 and 60 g) brown lemmings captured in 1997 and 2000, respectively. The four were captured within 4 km of the neighborhoods of Barrow and Browerville. Prevalence over 5 yr was 4 of 467 (0.9%; 95% confidence interval=0.9±0.9%). No metacestodes were found in collared lemmings.

Infection of brown lemmings by *E. multilocularis* has rarely been described in the wild, although they are readily infected experimentally (Rausch, 1995). Despite extensive research on brown lemmings in

Barrow from 1949 to 1974, metacestodes of *E. multilocularis* were not reported (Rausch, 1950; Pitelka, 1973; Rausch and Fay, 1988). Indeed, of 421 brown lemmings examined specifically for helminths from 1949 to 1960, none were infected with metacestodes of *E. multilocularis*, although other metacestodes (*Taenia* spp.) were found in 1953 (Rausch and Fay, 1988). The collared lemming apparently is not a suitable intermediate host in the wild (Rausch, 1995) and also appears to be refractory to experimental infection with *E. multilocularis* (Ohbayashi et al., 1971).

*Echinococcus multilocularis* is a public health concern. The pathway to humans is most commonly through ingestion of eggs from feces of dogs (Rausch et al., 1990b). Humans are believed to be infected at a young age and preclinical periods can be 20–30 yr. The median age at which alveolar echinococcosis was detected during the Saint Lawrence Island study was 53 yr (Rausch et al., 1990b).

Detection of eggs of *E. multilocularis* in canid feces is difficult; however, detection of *E. multilocularis* in the local environment is possible by monitoring small rodent hosts such as the brown lemming. Public health measures could be initiated thereafter. For example, treatment of sled dogs with praziquantel reduced infection rates of *E. multilocularis* by 83% (Rausch et al., 1990b). Thus, responsible animal care and monitoring of small rodents may be important measures to prevent human infection with this parasite.

We thank J. Petersen-Parett, L. Parett, A. Paulson, and M. Seidensticker for helping trap and dissect lemmings. We thank the Ukpéagvik Iñupiat Corporation for permission to work on Iñupiat lands. D.W.H. thanks the North Slope Borough Department of Wildlife Management for support of the research on snowy owls and lemmings. We thank E. Layne for reviewing the final version of the manuscript and helping with terminology. Finally, R. Rausch made significant efforts to help us

present this manuscript. We are very grateful to him.

#### LITERATURE CITED

- BROWN, J., K. R. EVERETT, P. J. WEBER, S. F. MACLEAN, JR., AND D. F. MURRY. 1980. The coastal tundra at Barrow. *In* An Arctic ecosystem, J. Brown, P. C. Miller, L. L. Tieszen, and F. L. Bunnell (eds.). Dowden, Hutchinson and Ross, Stroudsburg, Pennsylvania, pp. 1–29.
- OHBAYASHI, M., R. L. RAUSCH, AND F. H. FAY. 1971. On the ecology and distribution of *Echinococcus* spp. (Cestoda: Taeniidae), and characteristics of their development in the intermediate host. II. Comparative studies on the development of the larval *E. multilocularis* Leuckart, 1863, in the intermediate host. *Japanese Journal of Veterinary Research* 19(Suppl 3): 1–53.
- PITELKA, F. A. 1973. Cyclic pattern of lemming populations near Barrow, Alaska. *In* Proceedings of the 25th celebration of the Naval Arctic Research Laboratory: Alaskan Arctic tundra, M. E. Britton (ed.). Arctic Institute of North America Technical Paper 25. University of Calgary, Alberta, Canada, pp. 199–215.
- RAUSCH, R. L. 1950. Observations on a cyclic decline of lemmings (*Lemmus*) on the Arctic Coast of Alaska during the spring of 1949. *Arctic* 3: 166–177.
- . 1967. On the ecology and distribution of *Echinococcus* spp. (Cestoda: Taeniidae), and characteristics of their development in the intermediate host. *Annales de Parasitologie Humaine et Comparee* 42: 1–63.
- . 1986. Life cycle patterns and geographic distribution of *Echinococcus* species. *In* The biology of *Echinococcus* and hydatid disease, R. C. A. Thompson (ed.). George Allen and Unwin, London, UK, pp. 44–80.
- , AND F. H. FAY. 1988. Postoncofpheral development and cycle of *Taenia polyacantha* Leuckart, 1856 (Cestoda: Taeniidae). *Annales de Parasitologie Humaine et Comparee* 63: 263–277 and 334–348.
- . 2002. Epidemiology of alveolar echinococcosis, with reference to St. Lawrence Island, Bering Sea. *In* Cestode zoonoses: Echinococcosis and cysticercosis—An emergent and global problem, P. Craig and Z. Pawlowski (eds.). IOS Press, Amsterdam, Netherlands, pp. 309–325.
- , F. H. FAY, AND F. S. L. WILLIAMSON. 1990a. The ecology of *Echinococcus multilocularis* (Cestoda: Taeniidae) on Saint Lawrence Island, Alaska: II—Helminth populations in the definitive host. *Annales de Parasitologie Humaine et Comparee* 65: 131–140.
- , J. F. WILSON, AND P. M. SCHANTZ. 1990b. A program to reduce the risk of infection by *Echinococcus multilocularis*: The use of prazi-

quantel to control the cestode in a village in the hyperendemic region of Alaska. *Annals of Tropical Medicine and Parasitology* 84: 239–250.

———. 1995. Life cycle patterns and geographic distribution of *Echinococcus* species. In *Echi-*

*nococcus and hydatid disease*, R. C. A. Thompson and A. L. Lyubert (eds.). CAB International, Oxfordshire, UK, pp. 89–134.

*Received for publication 6 May 2004.*