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Rangiferine Brucellosis in a Muskox, *Ovibos moschatus moschatus* (Zimmermann)

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Rangiferine brucellosis is an enzootic disease of caribou and reindeer (*Rangifer tarandus* (L.)). The causative bacterium, *Brucella suis* biotype 4, has been isolated in Siberia, Alaska and Canada; i.e., it is holarctic in occurrence (Meyer, 1966, Am. J. Vet. Res. 27: 353-358). In addition to the genus *Rangifer*, *Brucella suis* biotype 4 has been isolated from sled dogs, wolves, (*Canis lupus* (L.)), red foxes (*Vulpes vulpes* (L.)) and grizzly bears (*Ursus arctos* (L.)), all of which may feed on infected caribou tissues (Neiland, 1970, J. Wildl. Dis. 6: 136-139; Neiland, 1975, J. Wildl. Dis. 11: 45-53; Gorban, 1977, Microbiol. Epidemiol. Immunobiol. No. 8, 142 pp.), and from humans (Huntley et al., 1963, J. Inf. Dis. 112: 110-116; Brody et al., 1966, J. Inf. Dis. 116: 263-269; Meyer, 1966, op. cit.). The organism has been transmitted experimentally to a number of species of rodents (Miller and Neiland, 1980, J. Wildl. Dis. 16: 457-464) and to domestic dogs (Neiland and Miller, 1981, J. Wildl. Dis. 17: 183-189).

To date there has been no evidence of rangiferine brucellosis in any other species of ungulate. This paper describes infection with *Brucella suis* biotype 4 in a muskox from the central arctic mainland of Canada.

In February 1982 a mature male muskox appeared in the vicinity of an outpost camp, located in the central barren lands of Canada on the north side of Garry Lake on the Back River system, District of Kee-

watin, Northwest Territories (65°55'N lat., 100°47'W long.). The muskox remained more or less stationary for 4 days and was observed to walk with great difficulty. The carpal area of both forelegs was noticeably swollen. When finally approached, the animal was barely able to stand and made no attempt to retreat or to charge. The animal was killed and although a necropsy was not done, it was noted that muscle masses were atrophied and body fat was absent. The skinned, eviscerated carcass together with the hide were transported to Baker Lake, Northwest Territories, about 290 km to the southeast.

The lower front leg bones were attached to the hide when it was received in Baker Lake. One forelimb was collected and kept frozen during shipment to Saskatoon. An extensive thick-walled bursa was present over the anterior aspect of the carpal joint. This had been opened partially during the skinning of the animal, but still contained a small amount of fibrin and turbid fluid. The interior surface was rough and granular. The carpal joint was unaffected. Microscopically, the wall of the bursa was composed of a thick layer of dense connective tissue with irregular foci of macrophages and lymphocytes. The luminal surface was covered by fibrin with small collections of neutrophils.

Two swabs of the bursal contents were cultured. A gram-negative non-motile coccobacillus, which produced pearly grey non-hemolytic colonies, appeared only on blood agar plates incubated under 10%

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CO₂. It was identified as *Brucella suis* biotype 4 by standard procedures (U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Laboratory Procedures for Isolating, Identifying and Typing *Brucella*, Ames, Iowa, 30 pp.; Alton et al., 1975, Laboratory Techniques in Brucellosis, 2nd Ed., World Health Organization, Monogr. Series No. 55, Geneva, Switzerland, 163 pp.). One swab yielded two colonies of *Brucella suis* and one colony each of *Streptococcus* sp. and *Corynebacterium* sp. The second yielded numerous colonies of *Brucella suis* on the first quadrant of a quadrant streaked plate. These colonies were mixed with similar numbers of *Corynebacterium* sp., *Pseudomonas* sp. and *Micrococcus* sp. They were not individually counted. The characteristics of the isolate were identical to those of the biotype reference strain, *Brucella suis* biotype 4, strain 40, except for a slightly greater sensitivity to thionin and basic fuchsin dyes. Identification was confirmed by the FAO/WHO Collaborating Centre for Reference and Research on Brucellosis, Central Veterinary Laboratory, New Haw, Weybridge, England.

Brucellosis in caribou caused by *Brucella suis* biotype 4 is a chronic infection with low morbidity, low mortality, and reproductive failure caused by abortion and infertility. Bursal infection is also reported (Neiland et al., 1968, Bull. Wildl. Dis. Assoc. 4: 27-36; Rausch, 1978, Can. J. Microbiol. 24: 129-135). The poor condition of the muskox in this study suggested that more than one disease process was involved. However, the presence of *Brucella suis* biotype 4, even as an incidental finding, raises questions about its effect on health and reproduction in this

species as well as about its zoonotic implications. To address these concerns, serological surveys of muskoxen are required to determine the prevalence of infection, and clinical trials are needed to define the pathogenesis.

Muskoxen are common in the Garry Lake region. They are harvested by native residents of Baker Lake, raising concerns about the transmission of brucellosis to this population. Barren ground caribou (*R. T. groenlandicus* (L.)), which are seasonally abundant in this area, are known hosts of the disease. Broughton et al. (1970, Can. J. Zool. 48: 1023-1027) found serologic evidence of brucellosis in 6% of the Kaminuriak caribou population. The adjacent Beverly caribou population, with which some interchange has been documented (Parker, 1972, Can. Wildl. Serv. Occ. Paper 15, Ottawa, Ontario, 20 pp.), has a calving area that borders on the Back River immediately to the south of the site where the muskox was collected. Infected membranes and associated tissues are a major source of infection (Gillespie and Timoney, 1981, Hagan's Infectious Diseases of Domestic Animals, 7th Ed., Cornell Univ. Press, Ithaca, New York, 851 pp.), so it is possible that the muskox may have contracted brucellosis on that calving area.

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