Paper presented at The First Arctic Ungulate Conference,
Nuuk, Greenland, 3-8 September, 1991.

Expanded abstract

Protostrongylid lungworm infection in muskoxen, Coppermine, N.W.T., Canada.

A. Gunn[1] and **G. Wobeser**[2]

[1] Department of Renewable Resources, Government of the Northwest Territories, Coppermine, N.W.T., Canada X0E 0E0.

[2] Department of Veterinary Pathology, Western College of Veterinary Medicine, University of Saskatchevan, Saskatoon, Saskatchevan, Canada S7N 0W0.

Rangifer, 13 (1): 45—47

Introduction

The population of muskoxen (*Ovibos moschatus*) near Coppermine, N.W.T. has remained stable in the 1980s after apparently increasing during the 1970s. The current quota of 50 muskoxen from this small population (about 1,800 animals) is fully utilized by Coppermine hunters. We recently discovered that the muskoxen are infected with an unidentified protostrongyloid lungworm which we suspect may play a role in the ecology of this small (c. 2,000) muskox population.

Practical treatment of wildlife diseases requires avoidance of stress and expense of handling individual animals but has to ensure that the individuals receive suitable doses. The Ballistivet Implant System uses Biobullets which are bioabsorbable hydroxypropyl cellulose bullets packed with doses of vaccina or treatment drug in a freeze-dried state (Wildlife Specialities Inc., Whitebear Lake, Mn.) and fired by a pressurized air delivery system. We tested Biobullets packed with the anthelmintic Ivermectin which was successfully used to treat protostrongylid lungworm in bighorn sheep (Schwantje 1988).

We report here on the prevalence of this unusual lungworm in muskoxen and on the design of our pilot project to test the feasibility of a remote delivery treatment system under arctic field conditions.

Methods

Lungworm prevalence

In 1989 and 1990, we collected faecal samples from muskoxen on their summer ranges and from hunter-killed animals during the winter to determine the prevalence and rate of shedding of larvae at different times of year. Lungs from hunter-killed muskoxen were examined macroscopically to count the numbers of encapsulated nodules.

Treatment experiment

Our experiment to treat the lungworm in free-ranging muskoxen has three research hypotheses: (1) The proportion of calves in the treatment and control group will significantly differ after 6 months. (2) The mean diameters of the lung nodules will be significantly different between muskox cows in the treatment and con-

trol group. (3) The mean numbers of larvae in faecal samples will be significantly different between muskox cows in the treatment and control group.

The experimental design is the randomised selection and assignment of adult cow muskoxen to either a control or treated group. The treatment is the anthelmintic Ivermectin which was successfully used to treat protostrongylid lungworm in bighorn sheep (Schwantje 1988). The delivery system uses Biobullets (bioabsorbable hydroxypropyl cellulose bullets packed with freeze-dried drug) fired by a pressurized air delivery system. The cows were immobilized in March 1991 and ear-tagged to identify treated or control cows and determine whether they were infected with lungworm. Cows in the treatment group received 50 mg Ivermectin by Biobullet fired from 6–8 m into the rump.

Results

Prevalence and pathology

Preliminary investigations indicate that the infection is common and widespread, with 80 of 88 faecal samples (91 %) collected randomly throughout the area in July-August 1990 containing larvae. Three of five faecal samples collected from calves in August 1990 contained larvae, indicating that animals have become infected in their first summer. The 20 cows sampled in March 1991 had 5.64 ± 5.96 (S.D.) larvae/g of fecal pellet. Most (92 % of 48 adults) muskox lungs examined between November 1989 and 1990 had grossly visible lesions.

The muskox host's strong local reaction to the nematodes is a nodule formed by a thick layer of fibrous connective tissue surrounding a mass of coiled adult worms and amorphous debris. The adult worms were surrounded with masses of larval worms many of which appeared dead and necrotic. The nodules are formed next to bronchioles which the larvae can successfully enter as they were also identified within the bronchiole. The lungworms appear to cause only local inflammation and the greatest effect on the lung is through displacement and compression of the surrounding lung tissue.

The infections can be severe in individual muskoxen: one adult bull having 258 pea to grape-sized nodules in its lungs. The effects are unknown but could include impaired breathing and pneumonia and apparent increased vulnerability to grizzly-bear predation. In summer 1989, three of 10 radio-collared cows were killed by grizzly bears. One cow was sufficiently intact to autopsy and her lungs had over 50 protostrongylid nodules. A fourth radio-collared cow died of pneumonia in October 1989 an her lungs contained 70 protostrongylid nodules.

Treatment experiment

The requirements of the study design were met by the immobilisation, marking and treatment of 30 muskox cows between 3 and 14 March 1991. A further 12 cows were immobilised and marked but not treated as part of the control group which also includes the 18 previously radio-collared cows.

Discussion

The identity of this parasite has not been established, but it appears to be a species that has never been described previously in muskoxen. The larvae found in the faeces on muskoxen have a distinct «dorsal spine» that is characteristic of certain genera (*Muellerius, Parelaphostrongylus* and *Elaphostrongylus*). The location of the adults in cysts within the lung is similar to that of *Muellerius* sp. but both the adult parasites and the larvae are larger than those of the only described species in this genus. The life-cycle, host range, geographic distribution in muskoxen, and effect of this parasite on muskoxen are all unknown.

Our findings of the high proportion of animals infected suggested that the lungworm could be a factor in the demography of this small muskox population. Theoretical models of host-prey dynamics predict that parasites with a high prevalence and moderate levels of infection have the most effect on the host population dynamics (May 1983). Hence, we are taking the first steps toward developing treatment of lungworm parasitism in free-ranging muskoxen.

The treatment of wildlife diseases will likely be the most effective in small populations where a significant proportion can be economically treated to improve survival and reproduction. Our treatment experiment was designed to test a remote delivery system that avoids stress and expense of handling individual animals and ensures that the individuals receive suitable doses.

References

May, R. M. 1983. Parasitic infections as regulators of animals populations. – *American Scientist* 71: 36–45.

Schwantje, H. 1988. Causes of Bighorn sheep mortality and dieoffs – a literature review. – *Wildlife Working Reports WR-35,* Ministry of Environment, Government of British Columbia, Victoria B. C., 54 pp.

Manuscript accepted 2 September, 1992.