

Dissertation



Jackie T. Hrabok

Jackie T. Hrabok (b. 1973) successfully defended her dissertation 'Nematode parasites of reindeer in Fennoscandia: Population dynamics, anthelmintic control and its environmental impact' for the degree of Doctor of philosophy in parasitology at the Swedish university of agricultural sciences, Faculty of veterinary medicine and animal science, Uppsala, Sweden, 13 October 2006.

Opponents were professor Susan Kutz (Faculty of veterinary medicine, University of Calgary, Alberta Canada), docent Margareta Steen (Gävleborg county veterinarian), professor Antti Sukura (University of Helsinki, Department of veterinary medicine), and professor Birgitta Åhman (Swedish university of agricultural sciences, Reindeer husbandry unit). Dr. Peter Waller (National veterinary institute of Sweden, Department of parasitology), professor Arvid Uggla (Swedish university of agricultural sciences, Dean of veterinary medicine), dr. Antti Oksanen (Finnish food safety authority, director of Oulu region) and docent Mauri Nieminen (Finnish game and fisheries research institute, director of Kaamanen reindeer research station) have been supervisors during the PhD thesis.

Jackie T. Hrabok completed an Arctic biology post-graduate student internship (2002) 'The effects of rut on muskoxen: body condition scores, body mass and histology' at the University of Alaska Fairbanks, Institute of arctic biology, Large animal research station U.S.A. She defended her Master's of science in biology (1999) 'Density, depth distribution and richness of adult chironomids (Diptera: Chironomidae) before and after experimental upland and riparian deforestation' and her Honour's bachelor of science in biology (1996) 'The possible importance of wintering yards in the transmission of *Parelaphostrongylus tenuis* to white-tailed deer (*Odocoileus virginianus*) and moose (*Alces alces*)' at Lakehead university, Thunder Bay, Ontario, Canada.

The doctoral studies were performed at the Department of parasitology (SWEPAR) of the National

veterinary institute and the Swedish university of agricultural sciences; Finnish game and fisheries reindeer research station Kaamanen; and the Kutuharju reindeer field station in northern Finland. Research was funded by the Swedish research council of environment, Agricultural sciences and spatial planning (FORMAS); Nordic arctic research program (NARP); the Finnish ministry of agriculture and forestry (MAKERA); and the Nordic council for reindeer husbandry research (NOR). The Finnish reindeer herders' association (Paliskuntain yhdistys) provided reindeer from the Kutuharju experimental herd for this project.

Thesis

Hrabok, J. T. 2006. Nematode parasites of reindeer in Fennoscandia. Population dynamics, anthelmintic control and its environmental impact. Faculty of veterinary medicine and animal science, Swedish university of agricultural sciences (SLU), Uppsala. – *Acta Universitatis Agriculturae Sueciae* Doctoral Thesis No. 89-2006. Uppsala. <http://diss-epsilon.slu.se/archive/00001207/>

Her thesis was based on the following papers:

- Hrabok, J. T., Oksanen, A., Nieminen, M. & Waller, P. J.** 2007. Prevalence of gastrointestinal nematodes in winter-slaughtered reindeer of northern Finland. – *Rangifer* 27 (2): 133-139.
- Yeates, G. W., Hrabok, J. T., Oksanen, A., Nieminen, M. & Waller, P. J.** 2007. Soil nematode populations beneath faeces from reindeer treated with ivermectin. – *Acta Agri. Scand. B - Soil and Plant Science* 57 (2): 126-133.
- Hrabok, J. T., Oksanen, A., Nieminen, M. & Waller, P. J.** 2006. Population dynamics of nematode parasites of reindeer in the sub-Arctic. – *Vet. Par.* 142 (3-4): 301-311.
- Hrabok, J. T., Oksanen, A., Nieminen, M., Rydzik, A., Uggla, A. & Waller, P. J.** 2006. Reindeer as hosts for nematode parasites of sheep and cattle. – *Vet. Par.* 136: 297-306.
- Åsbakk, K., Hrabok, J. T., Oksanen, A., Nieminen, M. & Waller, P. J.** 2006. Prolonged persistence of faecally excreted ivermectin from reindeer in a sub-Arctic environment. – *J. Agric. Food Chem.* 54 (24): 9112 -9118.

Summary: Nematode infections of semi-domestic reindeer were monitored by faecal egg counts of the Kutuharju experimental reindeer herd in northern Finland. The tracer calf technique was also used to estimate the acquisition of nematode infection from pasture. The most abundant parasite in the worm counts of tracer animals and in faecal egg counts of adult female reindeer was *Ostertagia gruehneri*. *Capillaria* sp. eggs were detected in calves and adults, but

Nematodirinae eggs were only recovered from calves. Egg output of *O. gruebneri* was most abundant from late summer to autumn whereas *Capillaria* sp. and the Nematodirinae dominated the winter months. The proportion of inhibited larvae of *O. gruebneri* and Nematodirinae steadily increased from summer to early winter, followed by a decline and a commensurate increase in the number of adult parasites in the second summer.

High prevalence and low intensity also characterized the nematode infections of winter-slaughtered reindeer from other northern herds examined. Our investigations showed that parasite transmission occurs throughout the year in this part of the sub-Arctic.

We demonstrated that reindeer are suitable hosts for important nematode parasites of sheep and goats (*Haemonchus contortus* and *Teladorsagia circumcincta*) and cattle (*Ostertagia ostertagi*), as well as for *Trichostrongylus axei*. However, it is not known if all of these parasite species reach maturity in reindeer. With the trend towards increasing numbers of livestock in the southern grazing regions of reindeer, these findings highlight the increased risks with parasites not normally associated with reindeer.

Approximately 80% of reindeer in Finland are de-wormed with ivermectin once annually in the winter. We analysed soil samples containing faeces from reindeer treated with ivermectin. Ivermectin degraded rapidly during the first spring, but residual levels were detected for more than two summer seasons following treatment. Residues were similar from ungrazed and grazed reindeer pastures, but the levels in faeces from reindeer treated with oral ivermectin were higher than for the subcutaneous formulation. Our results show that ivermectin persists on pasture longer than previously shown. However, the levels found had no detectable negative effects on the soil nematode communities beneath the faeces.

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