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Preliminary investigations on the parasite burden and distribution of endoparasite species of muskox (*Ovibos moschatus*) and caribou (*Rangifer tarandus groenlandicus*) in West Greenland

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Abstract: In the autumn 1990 5 muskoxen and 5 caribou from Angujaartorpfiup Nunaa, West Greenland, were parasitologically examined. The findings included gastro-intestinal parasites as *Eimeria spp., Ostertagia circumcincta, Ostertagia trifurcata, Teladorsagia davtiani, Marshallagia marshalli, Nematodirella longissimespiculata, Nematodirus helvetianus* and *Moniezia expansa.* No pulmonic or hepatic parasites were detected. A theoretically possible interaction of parasite species between muskox and caribou is most likely in the case of *Ostertagia spp.* and *N. longissimespiculata.* Preliminary investigations on the contamination of infective larvae (third stage larvae of gastro-intestinal nematodes) showed great differences on herbage from different types of habitats in the research area. A moist dwarf schrub heat on a north facing slope being the most contaminated (1643 L_3/kg of dry herbage).

Key words: Parasites, muskoxen, caribou, West Greenland, cross transmission, larval contamination, management.

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Introduction

In 1962 and 1965 muskoxen (*Ovibos moschatus*) from Rypefjord, East Greenland were transplanted to Angujaartorfiup Nunaa, West Greenland after wintering in Copenhagen Zoo, Denmark. Regarding population parameters including age of sexual maturity, calf production and growth rate, the muskox population of West Greenland range among the most succesful (Olesen, 1990). The Greenland caribou (*Rangifer tarandus groelandicus*) is indigenous in Angujaartorfiup Nunaa and is the only other species of ruminant living in the area.

Alendal & Helle (1983) examined helminth parasites in muskoxen from Norway and Sweden and gave a synopsis of parasite species previously reported from this host. A study on gastrointestinal nematodes of domestic sheep in South Greenland was carried out by Rose (1990), but until now no systematic, parasitological investigation has been done on caribou in West Greenland or on the rapidly expanding population of muskoxen. However report on the occurrence of the tapeworm *Moniezia expansa* and a bladderworm has been given from East Greenland (Alendal & Helle, 1983). *Nema-*

todirella longispiculata was found in some caribou calves by Clausen *et al.* (1980) and both warble fly larvae (*Hypoderma tarandi*) and nasal botfly larvae (*Cephenomyia trompe*) have been reported in caribou from Angujaartorfiup Nunaa (Olesen, 1990).

The aim of this work is to elucidate the burden and composition of different parasite species in West Greenland muskoxen and caribou.

Material and methods

Five muskoxen and five caribou were killed in August 1990 near Lake Ferguson and in Ørkendalen in the eastern part of the Angujaartorfiup Nunaa area. Muskoxen are identified in this paper as *Om* and caribou by *Rt* each with a suffix (1-5). Date and location of killing, sex, age and body weight are summarised in Table 1.

Parasitological examination of lungs and gastrointestinal tracts, digestion of abomasal mucosa, isolation and indentification of nematodes was carried out according to Korsholm (1988). When the small intestine was subdivided, the following exceptions were made: T_I represented the orally 2 m, T_{II} the following 6 m and T_{III} the rest of the small intestine.

According to Henriksen (1971) herbage samples were collected in four different habitats located in Ørkendalen: Moist grassland, meadow, Kobresia steppe and moist dwarf shrub heath on a north facing slope. The content of infective nematode parasite larvae were estimated by a makro-Baermarm technique described by Henriksen (1982).

Carcasses were skinned and hides examined for warble fly larvae scars.

Results

In the faecal samples a low number of coccidia oocysts were found in 3 muskoxen and 3 caribou (Table 2). All oocysts belonged to *Eimeria spp.* In muksoxen at least two different types of *Eimeria spp.* were represented.

Strongyle eggs were found in 4 muskoxen and in 4 caribou. The strongyle EPG (eggs per gramme of faeces) tended to be higher in musk-

Table 1. Identification code (Identification), date of killing, sex (F: female, M: male), age, body weight and location of killing of specimens examined in this study.

Identification	Date (1990)	Sex	Age (Years)	Weight (Kg)	Location
Muskoxen					
Om_1	21-aug	F	1	139	Lake Ferguson
Om_2	22-aug	M	4-5	309	Lake Ferguson
Om_3	25-aug	M	5-6	324	Ørkendalen
Om_4	26-aug	M	3	279	Ørkendalen
Om_5	27-aug	M	5-6	298	Ørkendalen
Caribou					
Rt_1	22-aug	M	4	137	Lake Ferguson
Rt_2	23-aug	M	4	136	Sdr. Strømf. Airb.
Rt_3	25-aug	F	1	51	Ørkendalen
Rt_4	28-aug	M	4	137	Ørkendalen
Rt_5	29-aug	M	3	116	Ørkendalen

Table 2. Faecal oocyst (OPG), Strongyle egg (EPG Strongyle) and cestode egg count (EPG Moniezia) in 5 muskoxen and 5 caribou killed in West Greenland in 1990. X: mean egg or oocyst count per g of faeces, R: Range, P: Prevalence.

	Muskoxen			Caribou		
Parasitic elements	X	R	P	X	R	p
OPG	60	0-200	3/5	15	0-50	3/5
EPG Strongyle	370	0-1300	4/5	65	0-100	4/5
EPG Moniezia	25	0-50	3/5	-	-	0/5

Table 3. Mean counts (X) of gastrointestinal nematodes (adults + larvae) and range (R) in 6 different locations (Loc.) of the gastrointestinal tracts of 5 muskoxen and 5 caribou killed in West Greenland in 1990.

	Muskoxen		Caribou	
Loc.	X	R	X	R
Abomasum	19.739	6.759–28.430	4.732	800–11.150
T_I	359	136–655	3	0–10
T_{II}	1.296	412–3.450	1	0–3
T_{III}	96	0–463	0	–
Caecum	0	–	0	–
Colon	0	–	0	–
Total	21.450	8.267–29.427	4.735	803–11.153

Table 4. Range (R) and mean counts (X) of adult nematodes and nematode larvae in the digested abomasal mucosa of 5 muskoxen and 5 caribou killed in West Greenland in 1990.

	Muskoxen		Caribou	
	X	R	X	R
Adult	521	5–1.525	101	20–210
Larvae	3.948	1.350–13.350	6.810	575–12.525

oxen (mean 370) than in caribou (mean 65) (Table 2). The 5–6 year old muskox bull (Om_5) represented the highest count (1300).

A low number of cestode eggs (*Moniezia spp.*) were detected in muskoxen, but in none of the caribou (Table 2).

Neither fluke eggs nor lungworm larvae were seen in either of the two host species.

In caribou the gastrointestinal nematodes (GI-nematodes) were almost solely located in the abomasum (Table 3). The distribution tended to be alike in muskoxen, as abomasum carried 92 % of the mean GI-nematode burden. In muskoxen small intestine the T_{II} subsample held a higher mean number (1.296) of nematodes than T_I and T_{III} (Table 3). No specimens were found in caecum or colon in any of the two host species (Table 3).

Muskoxen carried more nematodes than caribou (Table 3). In contradiction to findings in the intestinal subsamples the mean number of larvae in the digested caribou abomasal mucosa tended to exceed that of muskoxen (Table 4).

Nematode males of *Ostertagia circumcincta* (Stadelmann, 1844) Ransom, 1907; *Ostertagia trifurcata* Ransom, 1907; *Teladorsagia davtiani* Andreeva et Satubaldin, 1954 and *Marshallagia marshalli* (Ransom, 1907) Orloff, 1933 were recorded in all of both host species. Specimens of the circumcincta-complex (*O. circumcincta* and its polymorfs *O. trifurcata/T. davtiani*) were most abundant in muskoxen (87,6 %) and *M. marshalli* was most numerous in caribou (51,0 %) (Table 5). *Nematodirus helvetianus* May, 1920 and *Nematodirella longissimespiculata* (Romanovitsch, 1915) Skrjabin et Schikhobalova, 1952 and a not yet identified species of *Nematodirus* were found in substantial numbers in muskoxen small intestine (Table 5).

The few GI-nematode males found in T_I and T_{II} from caribou belonged to species with abomasum as the predelection site (Table 5).

The cestode *Moniezia expansa* (Rudolphi, 1905) Blanchard, 1891 was isolated from T_{II} or T_{III} in all five muskoxen. In contrast no cestodes were seen in caribou. Between 96 and 225 scars caused by warble fly larvae (*Hypoderma tarandi*) were found in all 5 caribou.

Intensivly grazing was observed in all 4 habitats where herbage samples were collected. Although infective GI-nematode larvae were found in all 4 samples some differences in contamination apparently existed. The less sun exposed and most moist habitat, a moist dwarf shrub heath on a north facing slope, seemed to be the most contaminated (1643 L_3/kg of dry herbage) of the habitats. Larvae of *Ostertagia spp.* were dominant in all habitats.

Table 5. Prevalence (P) of gastrointestinal nematode males and their procentual dominance (D) in abomasum and small intestine of 5 muskoxen and 5 caribou killed in West Greenland in 1990.

	Muskoxen		Caribou	
Species	P	D	P	D
Abomasum:				
Ostertagia circumcincta	5/5	79,6	5/5	37,8
Ostertagia trifurcata/ Teladorsagia davtiani	5/5	18,6	5/5	9,2
Marshallagia marshalli	5/5	12,0	5/5	51,0
Terratologic specimens	1/5	0,4	1/5	2,0
Small intestine:				
Nematodirus helvetianus	5/5	58,2	0	-
Nematodirus spp.	5/5	22,4	0	-
Nematodirella longissimespiculata	3/5	16,4	0	-
Circumcincta complex	3/5	3,0	2/5	100
Terratologic specimens	1/5	-	1/5	-

Discussion

More than 20 species of nematodes have been recorded in muskoxen, but the spectrum was expected to be more limited in free living populations (Alendal & Helle, 1983). We detected only 6 or 7 nematode species and 1 cestode species in this host. All helminths were located in the gastrointestinal tract (Table 5). The spectrum was even more limited in caribou, carrying only 4 nematode species, - solely belonging to species with predilection site in the abomasum (Table 3 and 5).

Although caribou and muskoxen select different herbage in the summer period (Olesen, 1991), differences in nematode infection level might also be a result of differences in hosts resistance or immunity rather than in larval uptake. The findings of high numbers of nematode larvae in the abomasal mucosa of caribou indicate a considerable larval uptake. Differences in the distribution of species is also believed to be a result of host resistance or host specificity of the parasites. The abscense of typically intestinal helminths in the small intestine in caribou, especially *Nematodirella longissimespiculata* (syn: *Nematodirella longispicaulata*) were in contrast to the findings of Clausen *et al.* (1980). This may be explained by the small sample size or the absence of calves in the present material.

Sharing the same spectrum of species in the abomasum a cross transmission of parasites between the two hosts is possible. This conclusion is also supposed to be true of *Nematodirella longissimespiculata.*

Although being a pilot study, the larval contamination in herbage from a moist dwarf shrub heath on a north facing slope reached a level equal to Danish cattle paddocks with a stocking rate of 6–12 heads per hectar (Hansen, 1982) or of 11 heads of sheep per 1,3 hectar (Thamsborg, 1987). Concerning *Ostertagia spp.* larvae, the counts were approximately 30 % higher than in herbage from a heavily sheep grazed area at a mouth of a stream in South Greenland (Rose, 1990).

In agreement with the findings in roe deer (*Capreolus capreolus*) (Korsholm, 1988) the GI-nematode burden was less in the caribou and the muskox yearlings (Rt_3 and Om_3) than in elder individuals.

Alendal & Helle (1983) supposed a low resistance to parasite infections in muskoxen. The present study indicated that the nematode burden was higher in muskoxen than in caribou (Table 3 and 5). The fact that West Greenland muskoxen show an excellent performance (Olesen *et al.*, 1991) and at the same time do carry heavy worm burdens should not lead to a conclusion of ignoring parasites as a potential problem in muskox management. The West Greenland muskoxen were transplanted to an area where quality and availability of food resources

were good (Olesen 1990 and 1991), and where the climate is stable with low precipitation. In the beginning they lived under low stress, surrounded by potential muskox habitats. Therefore overcrowding and high social stress were avoided by migration. These favourable circumstances are supposed to surpass the possible negative influence of the parasites.

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