Impact of broad-spectrum anthelmintic treatment in the summer on the weight gain of reindeer calves

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Antiparasitic treatment has become a standard procedure in the Finnish reindeer husbandry to improve animal condition and survival during the critical winter months, thus providing the hinds with a better possibility to give rise to healthy offspring. The first antiparasitics used to reindeer were aimed exclusively against warbles, *Hypoderma (=Oedemagena) tarandi* larvae, and throat bots, *Cephenemyia trompe* larvae (Nordkvist *et al.*, 1983). Later, the introduction of macrocyclic lactones, as ivermectin, broadened the treatment spectrum to cover nematodes (Nordkvist *et al.*, 1983) and the pentastomid "sinus worm" *Linguatula arctica* (Haugerud *et al.*, 1993).

Experimental treatment with organophosphates, having efficacy against arthropod parasites only, either did not cause a significant weight gain (Nieminen *et al.*, 1980) or caused a small increase (Persen *et al* , 1982). Ivermectin appears to have been more beneficial, treatment of reindeer calves in the autumn or early winter has been demonstrated to decrease weight loss during winter or increase weight gain during the following season (Nordkvist *et al.*, 1984; Heggstad *et al.*, 1986). It is not easy to assess if the weight gain achieved with ivermectin is more due to the effect against arthropods or nematodes. However, circumstantial evidence indicates that gastrointestinal nematodes may be production-limiting factors (Oksanen *et al.*, 1992; Arneberg *et al* , 1993), although clinical parasitic gastroenteritis is virtually unknown in reindeer.

Regarding helminths other than nematodes, very little is known upon the influence of *Moniezia benedeni* tapeworms on the health of reindeer calves although they are common parasites (Bye, 1985; own unpubl.). The *Moniezia* spp. of lambs are usually considered rather harmless (Elliott, 1984) but many Russian scientists have associated them with disturbances in intestinal flora and enterotoxaemia (e.g. Radionov *et al.*, 1985). Rumen flukes (*Paramphistomum* sp.) are at least occasionally prevalent in reindeer (own unpubl.). The adult stage is commonly considered practically harmless, but the larval migration in the intestinal mucosa is regarded as more detrimental in domestic ruminants (Singh *et al.*, 1984).

Reindeer calves are known to pick up infective parasite larvae from the pasture early in their life; by midsummer a high proportion of calves can already have patent gastrointestinal parasite infections (Oksanen *et al.*, 1990).

Recent trends in anthelmintic treatment to domestic ruminants include sustained release and pulse release boluses inserted into the forestomachs of grazing animals. The former type of bolus is designed to release the anthelmintic agent at a constant rate during a fixed period, e.g. three months, while the latter is made to release a certain amount of anthelmintic at predetermined intervals, e.g. three weeks. Although both types of device have been reported to work effectively (Jacobs *et al.*, 1987), the latter principle may be considered better in terms of preventing emerging anthelmintic resistance. The short-lasting but high anthelmintic concentration in the tissues perhaps does not favour emerging anthelmintic resistance to the same extent as a more continuous low concentration.

As no intraruminal anthelmintic device suitable for use in reindeer calves existed, we decided to simulate the effect of a hypothetical pulse-release bolus with a broad-spectrum anthelmintic. Luxabendazole (methyl 5-(4-fluorophenylsulfonyloxy)-benzimidazole-2-carbamate) is a benzimidazole group compound with reported efficacy against various nematodes, cestodes (*M. benedeni, M. expansa*) and also liver flukes, relatives of rumen flukes (Corba *et al.*, 1987; Kassai *et al.*, 1988). Luxabendazole cannot be expected to have any efficacy against oestrid fly larvae or other arthropod parasites.

The experiment was performed at the Kaamanen Experimental Reindeer Herd (69°09' N 27°00' E) in 1990. The allocation of the reindeer calves to the groups was performed by the personnel of the herd. The experimental (n=15) and control calves (n=16) were corralled together with their dams in an enclosure of approximately 10 hectares. The experiment was initiated 14 June, which is 1 to 2 weeks prior to the common onset of ear-marking, the only practical possibility of the insertion of the anthelmintic bolus. The animals were later gathered twice at three-week intervals, 5 July and 26 July, for the treatment of the experimental group. The treatment consisted of oral dosing of luxabendazole (experimental mixture supplied by Hoechst Fennica) at 10 mg/kg b/w. The control group calves were also gathered, but not treated. After the third treatment, 26 July, the calves and their dams were released to the main flock of the experimental herd in a fenced area of about 10 km^2. The flock was again gathered 11 December, when all the surviving calves were weighed.

Mortality was unusually high (the calves missing in December were considered dead) and did not differ significantly between the groups; 3 of 15 (20 %) in the treated compared with 5 of 16 (31 %) in the untreated group. As none of the missing calves were found, the actual causes of death could not be determined. All the suspected deaths took place after the release of the animals to the large enclosure. The missing calves were on average smaller than the others. They had an average birth weight of 5.3 (S.D. 0.8) kg and weight at the trial start 11.2 (3.2) kg. The corresponding weights for the surviving calves were 5.8 (0.9) and 14.8 (2.9) kg, respectively.

Due to the heterogeneity of the groups, covariance analysis was performed to compare the mean December weight adjusted for sex, birth weight and weight at the start of the experiment. The statistical calculations were done by the Statistix 4.1 statistical software package (Anon., 1994). The December weights adjusted for covariates differed significantly between the groups (P = 0.037), animals of the treated group being somewhat heavier (Table 1).

In this trial, the parasite infection pressure was possibly exceptionally high due to crowding in the small corral before the release of the animals after the third treatment 26 July. After the release to the large enclosure, the infection pressure obviously turned more normal. The high infection pressure might have enhanced the effect of parasitism. Normally, calves of the Kaamanen herd harbour commonly both *Moniezia benedeni* and gastrointestinal nematodes (*Ostertagia* spp., *Nematodirus* sp., *Capillaria* sp.) (own unpubl.).

The results indicate that broad-spectrum helminth control may increase summer growth of reindeer calves at least when heavily parasitized. The significant weight gain caused by the treatment was, however, relatively small. On natural reindeer pastures with seasonal migration the parasite infection pressure is possibly considerably lower than in

Table 1. Sex ratios, mean birth weights, weights at the beginning of the trial, weights at the end of the trial, and weighrs at the end of the trial adjusted for covariates for rhe groups of reindeer calves treared wirh luxabendazole, or untreated. Ninety-five % confidence intervals.

Group	Sex ratio (females:males)	Birthweight, kg	Startweight, kg	End weight, kg	Adjusted end weight, kg
untreated	5:6	6.03	14.5	50.1	49.9
- 95 % C.I.		5.61; 6.45	12.6; 16.3	47.4; 52.8	48.6; 51.3
luxabendazole	4:8	5.60	15.1	52.4	52.6
- 95 % C.I.		4.95; 6.25	13.2; 17.0	48.9; 55.9	51.2; 53.9

this trial. Treatment timing and use of different anthelmintics with different spectra as well as the possible economic benefits deserve future studies (see introduction in Haugerud *et al.*, 1993).

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