Gastrointestinal helminth prevalence, and intensity of infection, in dairy cattle from Avalon Peninsula, Newfoundland

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ABSTRACT. A study was conducted in 1985 to determine gastrointestinal helminth prevalence, and intensity of infection, in dairy cattle on farms and pastures on the Avalon Peninsula, Newfoundland, using a fecal egg count technique.

It was found that 55% of adult dairy cattle on ten farms in the St. John's area were positive for helminth eggs. The mean egg count for the area was 1.2 eggs per gram of feces. The majority of the eggs (60%) were from a group containing the genera Ostertagia-Trichostrongylus-Cooperia, with 30% from Haemonchus-Oesophagostomum, 5% Bunostomum, and 5% trematodes. Trichuris eggs were noted in only one sample.

Bovine fecal samples from community pastures showed a 39% prevalence with 50% of the eggs being from the Ostertagia-Trichostrongylus-Cooperia group, 22% Haemonchus-Oesophagostomum, 16% Bunostomum, and 2% for each of Nematodirus, Trichuris and trematodes.

KEY WORDS: Newfoundland, dairy cattle, nematodes, flukes, feces, prevalence, eggs per gram.

Production losses can occur in domestic livestock harbouring subclinical levels of parasites (12). In dairy cattle losses include decreased milk yield (3) and milk fat production (7). Subclinical parasitism can be controlled by anthelmintic treatment; alone, this strategy provides only a short-term relief (11). Despite the fact that anthelmintic administration at parturition results in an increased milk production (20) many farmers still do not include deworming programs in their herd health programs. In a survey in southwestern Ontario, 26 out of 28 farms reported no use of anthelmintics and only one farm submitted fecal samples for laboratory examination routinely (16). There are no reports of studies of helminths of Newfoundland dairy cattle. This study was initiated in 1985 to determine the prevalence of, and intensity of infection with, gastrointestinal helminths in two groups of cattle, (1, lactating; 2, pastured for the summer) using a fecal egg counting technique.

MATERIALS AND METHODS

Sampling provided data on the gastrointestinal helminths in two different groups of cattle, namely

1) those on ten dairy farms in the St. John's area; and
2) those cattle (heifers and dry cows) grazing for the summer on four nearby community pastures (Fig. 1).
Farms 1, 2, 3, 4, 7 and 9 were located on the sides of hills in rolling terrain and were well-drained. Farm 5 had a similar topography but the pastures contained wet spots. Flat, wet pastures were a feature of farm 6, while farms 8 and 10 had rolling to flat pastures with wet areas, and considerable marshland on the latter farm.

Fecal samples were obtained from the dairy cattle on a regular monthly basis with samples being taken during the morning milking from each of ten different animals in each herd. When an animal evacuated a sample was taken from the top of the freshly dropped feces, placed in a styrofoam cup and taken back to the laboratory for processing that day using a formalin-ether sedimentation technique (6). Eggs detected in the sediment were placed in one of six groups based on shape, size and cell numbers present (4, 5) and the number of eggs per gram of feces (epg) calculated. The groups were:

- a) Ostertagia-Trichostrongylus-Cooperia;
- b) Haemonchus-Oesophagostomum;
- c) Bunostomum;
- d) Nematodirus;
- e) Trichuris;
- f) flukes (including Paramphistomum, Fasciola and Dicrocoelium).

The second part of this project was carried out in the summer of 1985 on four community pastures on the Avalon Peninsula (Fig. 1). Pastures in Brigus and Gaskiers were each visited twice, once on June 28 and again on August 8, while Shoe Cove was visited on June 25, July 30 and August 27, and Aquaforte on July 4, July 25 and September 3. The number of

![Fig. 1: Locations of sample sites: 1-10 correspond to farms discussed in the text, 11-14 to community pastures (11= Aquaforte, 12=Gaskiers, 13= Brigus, 14= Shoe Cove)](image-url)
samples taken at each visit depended upon the accessibility and number of animals grazing, with up to 50 samples/site/visit being taken. The samples were placed in Para-Pak formalin kits and returned to St. John's, where they were analysed as above (6). Loss of fluid and variations in the amount of feces per vial precluded any accurate assessment of epg of feces. However, trends were evident.

RESULTS AND DISCUSSION

(i) Prevalence

The mean prevalence of parasites was 55% (655 of 1200 samples positive; Fig. 2), with statistically significant differences being noted in the prevalence of parasitism between herds (prevalence range 33-67%; $X^2 = 55.9$, df=9, $p < 0.001$). The overall mean is similar to those determined for cattle in Ontario (58%, (16)) and Quebec (50%, (8)), but much lower than for cattle in Maine (96%, (22)), or the rest of the United States (> 80%, (9)). A wide variety of environmental factors, both geographic and climatic, might account for these differences (14). A statistically significant difference was noted in the monthly prevalence of parasitism ($X^2 = 31.0$, df=11, $p < 0.005$), although this pattern was not evident in all herds, e.g. one herd showed a consistently high monthly prevalence ($X^2 = 10.1$, df=11, $p < 0.80$). Prevalence generally rose from 59% in January-February to a peak in April-May (71%) representing the spring or parturient rise. This is followed by a decline and then a small rise in August-September (60%) before a drop-off to a low of 39% in December-January.

Fig. 2. Prevalence of gastrointestinal helminths in dairy cattle from ten farms in the region of St. John's, Newfoundland, as determined by fecal egg counts.

*Meridian Diagnostics, Inc., 3471 River Hills Drive, Cincinnati, Ohio 45244.*
Prevalence of helminths increased in the community pasture cattle as the summer progressed, with an overall prevalence of 39% (162 of 420 samples positive). The greatest change was seen on the Aquaforte pasture where the prevalence rose from 20% (4 July) to 80% (25 July) and then declined to 50% (3 September). The number of epg also changed during this time i.e., < 1-5 to > 5 epg. The pasture at Gaskiers showed a similar pattern while that at Brigus showed a slight decrease in both prevalence and epg. This latter result may be due to the proportions of adult/heifer feces collected on the different sampling dates. The majority of cattle on these pastures were "family" cows to be used as a source of milk or beef. The Shoe Cove pasture is used and operated by dairy farmers with the majority of the cattle pastured there being either replacement heifers or dry cows. Prevalence was low (mean: 30%) on this pasture.

(ii) Egg counts

The majority of fecal samples contained less than 5 epg (mean 1.2 epg; 545 samples, 0 epg: 634, 0.1-5.0 epg), with 21 having more than this (13, 5.1-10.0 epg; 5, 10.1-15.0 epg; 2, 15.1-20.0 epg). Our data are in agreement with the suggestion that a count of 10 epg or less can be considered normal for adult cattle (9). Fig. 3 details the monthly intensity of infection. It should be noted that one heavily infected animal in a given herd may result in a false impression of herd infection if a mean is used e.g. in one herd the February-March raw mean was 5.6 epg. However, if the egg count of one animal (>10 epg) was omitted from the data set the mean epg dropped to 1.2 which is the same as that for all ten herds. Significantly lower egg counts were recorded during this study than in Maine (May-June, 14.2 epg (22) or Quebec (July, 230 epg, (8)). North Dakota cattle were also found to have much higher egg counts (1), while dairy cattle in North Carolina (1.6 epg), Pennsylvania (2.6 epg), and Ver-

Fig. 3. Mean number of eggs per gram of feces/month. Striped bar represents raw data; solid bar is modified data where counts that inflated the monthly mean were removed (10 samples, 1.5% of positives)
Differences such as those noted may be explained by the influence that rainfall and yearly temperature have on rate of infection (14). Newfoundland has a climate that tends to being cold and wet, or hot and dry. These conditions are not conducive to larval development or survival. As with the dairy cattle the majority of fecal samples from community positive cattle contained less than 5 epg (258 samples, 0 epg; 150, 0.1-5.0 epg; 9, 5.1-10.0 epg; 1, 10.1-15.0 epg; 2, 15.1-20.0 epg).

(iii) Parasites and farm management practices

Despite the light infections significant differences were noted in infections between farms ($X^2$ = 699, df = 99, $P < 0.01$), probably as a result of farm location and/or management practices. Farm practices were similar in five cases that showed similar epg counts. On the other five farms a single obvious variable was noted that may have resulted in a lower (4 farms) or higher (1 farm) epg count. Two farms administered anthelmintics at calving and had a significantly lower number of epg than another nearby farm with similar management practices ($P < 0.01$). The farm with the heaviest infections was the one that pastured its cattle earliest, in late May, with the majority of farmers in the sample area pasturing their cattle 3-4 weeks later. The 3-4 week time interval may be critical in acquisition of larvae, and subsequently adult worms. Overwintering larvae die if they fail to find a host within a short time of temperature increases that are normally associated with spring (19). The early group of cattle may have grazed on more heavily contaminated pastures than later releases. Indeed on a farm where the cattle were not pastured until early July the epg approximated that of the two farms where the cattle were treated with anthelmintics.

Manure provides larvae and eggs with an ideal location to overwinter (11). Management of manure is important in control of parasitic infections. In Newfoundland manure is generally stockpiled over winter and then spread in spring. On one farm manure was spread year-round, resulting in a 2.5-5.0 cm layer all over the field that was subject to cold and wetness from all sides. In winter the manure would be spread on frozen, snow-covered ground subjecting it to complete rapid freezing. This layer would provide little protection for larvae and eggs and result in few infective forms, as reflected in the egg counts for the farm (as low as those on the treated farms).

A third method of manure management, which appeared to enhance contamination, was utilized on a farm that had one of the highest egg counts. Manure was placed in small piles (about 1.8 m diameter x 0.75-1.25 m high) throughout the pastures. Larvae overwintered in these piles and then migrated onto the nearby grass in spring resulting in heavy contamination.

The majority of trematode eggs were noted in cows from farm 10 that had considerable patches of marshland associated with the pasture, and which would provide an ideal habitat for the snail intermediate host.

The community pastures exhibited different management practices that could have influenced the worm burdens. The pasture at Aquaforte was used for both cattle and sheep. Cross-transmission of gastrointestinal parasites between cattle and sheep is a common occurrence for genera such as Cooperia and Trichuris but not for Nematodirus or Ostertagia (18). The majority of the Trichuris occurred in animals from the Aquaforte pasture, infection probably resulting from cross-transmission. The practice of mixing sheep and cattle on the same pasture may lead to an increase in the worm burden of the cattle, especially with the spring...
rise phenomenon that is associated with sheep. Pasture rotation was practiced at Shoe Cove probably resulting in the low prevalence (27-32%) and egg counts noted there.

(iv) Egg types

The most prevalent egg group was Ostertagia-Trichostrongylus-Cooperia (OTC: 60% of positive animals), and was most common in February-May. Haemonchus-Oesophagostomum (HO) had a prevalence of 30% with peaks in April-May and August-September. Bunostomum and flukes (Fasciola, Dicrocoelium, Paramphistomum) occurred in lesser numbers (5% and 5% prevalence respectively). The former was found in May-January, while the latter were commonest in January-May. Only one animal was infected with Trichuris. Data from the present study are similar to those recorded in Ontario (16).

Among cattle on the community pastures the most commonly occurring eggs were those of the OTC group (56%) followed by HO (22%), Bunostomum (16%) and Nematodirus, Trichuris, and trematodes (2% each respectively). The presence of Nematodirus on the pastures used by heifers is in agreement with the reports of other workers (Maritime (17); Ontario (16); Quebec (8)).

A comparison of the dairy cattle on farms with the community pasture stock shows that gastrointestinal helminths were present at subclinical levels in both groups but the prevalence was highest in the former group. Pastured animals had fewer strongyloid egg groups (OTC, HO) and trematodes, but more were infected with Bunostomum, Nematodirus, and Trichuris.

SUMMARY

The majority of positive cattle feces (97%) contained in the range of 0.1 to 5.0 epg. Only 2% of positive infections were in the range 5.1 to 10.0, to give a combined total of 99% of the infected cows with counts under 10 epg. This is in agreement with the observation that the average epg in United States dairy cattle was less than 10 (9). Approximately 1% of the positive animals recorded an epg over 10. Several workers (2, 3, 20) suggest that cattle with over 5.0 epg should be treated with anthelmintics, and serious consideration should be given to treating animals with less than 5 epg. Local large animal veterinary practitioners suggest treatment if the epg goes over 12, but testing of cattle is not routine in the St. John's area (Provincial Veterinary Services, personal communication). This study shows that 56% of all animals are infected with parasites, yet routine testing and anthelmintic administration is not carried out on individual farms. The only time farm animals are checked is when parasitism is suspected or on request of a farmer.

Reduced milk production results from artificially induced subclinical infections with helminths in cattle (2, 3). Individual daily milk production records showed losses of 2.7 lbs/day (= 1.23 kg/day) (3) and 2.16 kg/day (2). Naturally infected cattle treated with an anthelmintic at parturition showed a increase in milk production in the range of 500 to 750 lbs (226-339 kg) per lactation, based on a 305-day lactation (20). This has resulted in much discussion on the necessity of deworming adult dairy cattle, as they generally have low fecal egg counts (< 10 epg), despite a high prevalence (> 80%) and are open to constant reinfection on the pasture (9). Further, adult cattle seem to exhibit an age resistance without ever having been exposed to helminths (10), while previous exposure may result in the development of a strong immunity towards reinfection (13). Thus, while many people do not consider the treatment of adult cattle necessary, others (e.g., 21) feel that a fecal egg count as low as 2 epg can have a great effect on milk production.
The effect of parasitism on animal production can be ameliorated by using proper management practices and anthelmintic treatment (11). In the present situation it is suggested that late pasturing and proper manure management might reduce the level of parasitism to a point where anthelmintic treatment was unnecessary. Otherwise the cattle should be dosed with anthelmintics until such time as more data have been collected on the effects of sub-clinical levels of parasitism on milk yield.

ACKNOWLEDGEMENTS

We are indebted to the farmers who co-operated in this study, and we thank Memorial University (Biology Department) for making funds and facilities available to perform this work. We also thank the Natural Sciences and Engineering Research Council for a grant (NRCC-A3500) to WT that helped fund the study, and the Government of Newfoundland and Labrador for supplying the Para-Pak formalin kits.

HARDING R. M. és THRELFALL W.: Gyomor- béléférgek prevalenciája és a fertőzöttség intenzitása az Avalon-félsziget (Új-Fundland) tejelő marha állományában

A szerzők az Avalon-félsziget farmer gazdaságából és legeltetett marhaállományából származó tejelő marhák fekáltájából Para-Pak formalin készlet alkalmazásával (Meridian Diagnostics) peteszámlálási módszerrel vizsgálták a gyomor-béléférgek prevalenciáját és a fertőzöttség intenzitását.

A St. John környékét farmokon az adult marhák 55%-a volt pozitív (1,2 epg). A peték 60%-a az Ostertagia – Trichostrongylus – Cooperia, 30%-a a Haemonchus – Oesophagostomum, 5%-a a Bunostomum típusú fonálférgek, illetve 5%-a métely pete volt. Trichuris petét mindössze egy esetben észlelték.

A legeltetett állományok prevalenciája 39%. A fertőzött egyedek 50%-ban Ostertagia – Trichostrongylus – Cooperia csoportba tartozó, 22%-a Haemonchus – Oesophagostomum, 16%-a Bunostomum és 2%-a a Nematodirus, Trichuris fonálférgek, vagy mételyek petéje volt.

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Received: 10 June, 1989

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