**Paramphistomum spp. in Dairy Cattle in Québec**

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**SUMMARY**

Few cases of infection with *Paramphistomum* spp. have been reported from cattle in Canada. During the course of a recent study of bovine fascioliasis both *P. microbothrioides* and *P. liorchis* were found in the rumen of dairy cattle slaughtered in a Quebec abattoir. Eggs in feces were distinguished on the basis of their size. Coprological analysis of 932 samples from 601 cows on 17 selected farms in Portneuf County (Quebec) revealed that 34% of the animals were infected with *P. microbothrioides* and 1% with *P. liorchis*. Based on data from one herd there appears to be significant seasonal variation in egg passage for *P. microbothrioides*. Furthermore, old cows exhibited a higher prevalence of infection.

**Key words**: *Paramphistomum liorchis*, *Paramphistomum microbothrioides*, Quebec, dairy cattle, egg passage, prevalence, abundance, mean intensity, seasonality, epidemiology, fascioliasis.

**RÉSUMÉ**

*Paramphistomum* spp., chez des bovins laitiers du Québec

On a déjà rapporté quelques cas d’infection par *Paramphistomum* spp., chez des bovins du Canada. Au cours d’une étude récente sur la fascioliasis bovine, les auteurs ont trouvé *P. microbothrioides* et *P. liorchis* dans le rumen de bovins laitiers envoyés à un abattoir du Québec. L’identification des œufs dans les fèces s’appuyait sur leurs dimensions. L’examen de 932 échantillons fécaux provenant de 601 vaches, issues de 17 troupeaux du comté de Portneuf, au Québec, révèle que 34% d’entre elles étaient parasitées par *P. microbothrioides* et 1%, par *P. liorchis*. D’après les données recueillies dans un troupeau, une variation saisonnière appréciable existerait, relativement à l’élimination des œufs de *P. microbothrioides* dans le fumier. Par ailleurs, la fascioliasis se révèle plus fréquente chez les vieilles vaches.

**Mots clés**: *Paramphistomum liorchis*, *Paramphistomum microbothrioides*, Québec, bovins laitiers, élimination d’œufs dans le fumier, prédominance, abondance, intensité moyenne, caractère saisonnier.

**INTRODUCTION**

During the course of a study on bovine fascioliasis on suspected endemic farms in Portneuf county, Quebec, from October 1981 to January 1983, eggs resembling those of *Paramphistomum* were frequently found in fecal samples. Necropsy of 130 dairy cows at a slaughterhouse during August 1982 yielded four animals (3%) bearing rumen infections with the adult worms. The parasites were identified as *P. liorchis* (Fischoeder 1901) and *P. microbothrioides* (Price and McIntosh 1944). *Paramphistomum microbothrioides* is a common parasite of cattle in the United States (1). *Paramphistomum liorchis* (originally identified as *P. cervi*) has been reported from moose in Ontario (2,3), from deer in the southern United States and occasionally from cattle (4). Swales (5) documented the presence of *P. cervi* in cattle from British Columbia, Nova Scotia and Ontario and in bison from Alberta.

Both rumen flukes follow a typical digenean life cycle which involves a mammalian definitive host (commonly cattle, sheep, or moose) and a snail intermediate host. In North America the parasites are thought to be confined to snails of the genus *Lymnaea* (4). However, Lankester et al (2) in Ontario, Canada found a natural infection of *P. liorchis* in a planorbid host. The flukes produce operculated eggs which are expelled into the external environment with the feces of the host. In an aquatic milieu with adequate temperatures, the miracidia hatch from the eggs and after a brief free-swimming existence penetrate the snail host. Within the snail, polyembryony gives rise to cercariae several weeks later. These escape from the snail and encyst on aquatic vegetation to become metacercariae. When ingested by the definitive host, metacercariae excyst and develop into juvenile worms which feed on the intestinal mucosa before migrating to the upper rumen where eggs are passed three to four months postinfection. The entire life cycle requires a minimum of six months (6).

The acute disease of paramphistomiasis is caused by massive infection with the juvenile worms in the small intestine which give rise to gastroenteritis (7). The acute disease in cattle has been reported world-wide and may be caused by various species of the genus *Paramphistomum*. It generally occurs in young animals less than two years of age (8). Older animals suffer less, probably due to immunity (7). The diagnosis of acute paramphistomiasis is difficult due to the small size of the worms and the absence of eggs at this stage. The presence of mature param-
phistomes can be detected by the identification of eggs using coprological techniques. The techniques commonly used in the diagnosis of fascioliasis will usually detect paramphistome infections as well (9).

The present study was undertaken to establish the mean intensity (mean number of ova \( \div \) number of positive samples), prevalence (number of positive samples \( \div \) number of samples examined) and abundance (mean intensity \( \times \) prevalence), of paramphistome egg passage in dairy cattle (10), to document any seasonal variations in the abundance of egg passage for \( P. \) microbothrioides, as well as to assess whether there is an association between paramphistomiasis and fascioliasis in a series of Quebec farms.

**Materials and Methods**

A total of 932 individual fecal samples, each weighing approximately 85 g were taken from 601 dairy cows on 17 farms (mean herd size: 42 cows), in Portneuf County, Quebec. The normal sampling period was from the fall of 1981 to the spring of 1982, but was extended to January 1983 on one farm to detect possible seasonal variability in the abundance of egg passage. The age of each cow was recorded when known.

Fecal samples were weighed and stored at 4°C in plastic bags, until they were analysed. The feces were composted in one liter of tapwater and washed through a graded series of five sieves (diameter: 20.5 cm, mesh openings 2000, 1000, 450, 250 and 63 μm) under running water. Eggs and debris retained by the 63 μm sieve were then passed through a 150 μm mesh to further remove large debris. No eggs were trapped in this mesh. The eggs were then collected on a 63 μm mesh, washed into a Petri dish and allowed to settle for 15 minutes. Suspended particles were removed with the supernatant and water was added to the sediment. The Petri dish was scanned under a dissecting microscope (30X) and eggs were counted. Egg counts were converted to eggs per 80 grams of feces (EPG 80). The detection threshold of the technique was approximately two eggs per gram of feces.

Ova of \( P. \) liorchis and \( P. \) microbothrioides were distinguished on the basis of size (135 by 70 μm and 150 by 90 μm respectively), whereas \( P. \) microbothrioides and Fasciola hepatica ova were distinguished on the basis of color, the former being amber and the latter clear (6). This differentiation was confirmed at intervals by incubating ova at 27°C ± 1°C for 12-13 days. Clear ova (\( F. \) hepatica) yielded miracidia with eye spots; amber eggs (\( P. \) microbothrioides) yielded miracidia without eye spots (11).

**Results**

Paramphistomum liorchis was relatively rare. It was found in only seven cows from two farms. One cow passed eggs of \( P. \) liorchis only, three cows had mixed infections of \( P. \) liorchis and \( P. \) microbothrioides, two cows harbored \( F. \) hepatica and \( P. \) liorchis and one cow was infected with all three flukes.

Paramphistomum microbothrioides ova were detected on 14 of the 17 farms and in 34% of the 601 animals sampled. On six farms more than half of the animals passed \( P. \) microbothrioides eggs. The mean intensity of egg passage was relatively low, ranging from 1 to 15 EPG 80; very few samples contained more than 50 EPG 80; the abundance was 2.6 eggs/80 g of feces, ranging from less than 0.1 to 13.55. These data are summarized in Table 1.

The abundance of eggs of \( P. \) microbothrioides in the feces of young cows (two to four years old) was 1.6. The corresponding figure for older cows (5 to 16 years) was 3.7. The difference was significantly different, based on an ANOVA test (\( PR > F = 0.0005; df = 1; F = 12.10; n = 513 \)). The abundance of eggs of \( P. \) microbothrioides passed by dairy cows varied significantly during the course of one year. On one farm, the abundance of eggs passed was higher in January, February and July than in April, June, October and November. (ANOVA test: \( PR < F = 0.0008; df = 6; F = 3.81; n = 180 \) (Figure 1).

Since both \( P. \) microbothrioides and \( F. \) hepatica give rise to patent infections between November and May, this time span was used to assess the degree of association between the two parasites. Of the fecal samples examined during this period 33% yielded \( F. \) hepatica only, whereas 7% yielded only \( P. \) microbothrioides eggs. Both parasites were found in 30% of the samples. This suggests that the two flukes are significantly associated according to the \( X^2 \) test of association (\( X^2 = 7.24, df = 1, n = 433, p > X^2 = 0.01 \)).

**Discussion**

Of the two rumen flukes, \( P. \) liorchis and \( P. \) microbothrioides, the latter is by far the more prevalent when judged by the presence of eggs in the feces of the bovine definitive host. However,

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<td><strong>Abundance and Prevalence of ( P. ) microbothrioides Ova From 17 Selected Quebec Farms</strong></td>
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*Farms endemic for fascioliasis.
the long prepatent period and seasonal changes in the level of eggs passage may make both figures underestimations of the true level of infection with these parasites in this selected dairy cow population. On the other hand, since there is an association between fascioliasis and paramphistomiasis, as shown in this study and since the study populations of dairy cows was selected for the suspected presence of fascioliasis, it is difficult to assess the true county-wide level of paramphistosome infection.

Based on data from one herd there appear to be significant seasonal fluctuations in the abundance of *P. microbothrioides* eggs in the feces of dairy cows. It is unlikely that the increase in the abundance of fecal eggs in July is due to the maturation of an infection acquired in early spring since the prepatent period is between three and four months and the animals have been on pasture for only two months at this point. Furthermore, the prevalence of infection does not increase significantly over this period of time. It is more likely that the observed rise is due to increased egg production by flukes that were acquired during the previous fall. Egg passage subsequently declines to low levels by fall and early winter. The resurgence of egg passage at the end of January may be due to the acquisition of metacercariae during the preceding September, just prior to the return of cattle to their winter quarters. The summer and winter peaks of egg passage are approximately six months apart, just sufficient time for the completion of the life cycle. This midwinter burst of egg passage is not found in moose, the definitive host of *P. liochris*. Instead, egg passage appears to be delayed until the following spring (2). Lankester et al suggest that the delay in maturation of these infections may be due to a nutritional stress which the moose definitive host experiences during winter. Since dairy cattle are not exposed to such severe nutritional stresses, maturation of the flukes may not be delayed and egg passage may occur in winter. It is not clear what proportion, if any, of these eggs contribute to the life cycle of the fluke. However, the present study suggests that old cows can maintain the infection and perhaps serve as an important reservoir of infection for younger animals.

Little is known about the snail intermediate host of *P. microbothrioides*. However, significant association between the presence of *F. hepatica* and *P. microbothrioides* eggs in the present study corroborates the work by Krull (6) and Lang (12) which suggests that *Fossaria modicella* may be an important intermediate host of *F. hepatica* and *P. microbothrioides*. The possible role of this snail in the transmission of *P. microbothrioides* and *P. liochris* warrants further research, particularly since, due to drug restrictions, snail control may be one of the few available means of combating these parasitic infections should this become necessary.

ACKNOWLEDGMENTS

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ABSTRACTS


Radiography was used to follow the progress of the lesion in 53 sheep. It was concluded that foot abscesses could be defined as an infection of the distal interphalangeal joint. The term “foot abscess” was considered preferable to the term “infective bulbar necrosis”. The attack rate of foot abscesses was reported to be higher for rams than for ewes and the condition was less prevalent during summer. Fusobacterium necrophorum and Corynebacterium pyogenes either alone or in combination were isolated from 46 of the sheep. Once infection was established in the distal interphalangeal joint a relatively uniform and thus predictable series of events took place that inevitably resulted in some permanent damage and deformity to the digit. If rupture of the axial collateral ligaments occurred, the joint became unstable and the degree of permanent deformity was greater. Treatment with antibiotics did not greatly affect the progress of the lesion or the outcome, once infection had become established in the joint. Although the prognosis for complete recovery was poor, in most cases the foot healed sufficiently after about two months to allow the animal to walk normally.

SILVER IA, ROSSDALE PD, (Editors), BROWN PN, GOODSHIP AE, LANYON LE, McCULLAGH KG, PERRY GC, WILLIAMS IF. A clinical and experimental study of tendon injury, healing and treatment in the horse. Equine Veterinary Journal 1983; Suppl. 1, 43 pp. (Med. Sch., Univ., Bristol BS8 1TD, UK).

A five-year clinical and experimental investigation resulted in the conclusion that cautery (firing) applied to the skin above limb tendons did not improve tendon healing, and might have a harmful effect. Synthesis of tendon collagen was unaffected or even decreased by cautery in every case but one. Tendons took at least 15 months to heal, and cautery, either failed to accelerate the rate of healing, or retarded it. Skin subjected to cautery became thinner and weaker as a result. The practice of tendon splitting was deprecated. This is a detailed report, which should be consulted by equine specialists.


Rift Valley fever (RVF) has long been important as a domestic animal and human pathogen in sub-Saharan Africa. With the Egyptian epidemic of 1977-78 the virus demonstrated its ability to spread and cause extensive disease in a totally new ecological context, the irrigated region of the Nile valley. Conditions which might prove receptive to epidemic disease exist not only in the Middle East (e.g. Israel, the Tigris-Euphrates basin) but also in areas which could be reached by incubating or viraemic air travellers (e.g. the western hemisphere, Australia, Southeast Asia). Precise predictions of the risk of introduction and spread of disease in these regions are hampered by lack of knowledge of the ecology of the virus and its vectors in Africa. The principal method of effective control of RVF in Africa is vaccination of sheep and cattle, and supply problems would limit the use of vaccines in areas of recent disease extension. While it seems unlikely that RVF will be responsible for epidemic/endemic disease in the USA, increasing air communications augment the risk of return of viraemic travellers to potentially receptive areas in the western hemisphere. If an epidemic should occur in North or South America, the choice of control measures is limited, and the control methods used for diseases such as foot and mouth disease would have little applicability.