STUDIES ON THE INCIDENCE OF *DICTYOCAULUS FILARIA* IN SHEEP OF RIMOUSKI REGION

L. Ayalew, J. L. Fréchette, R. Malo and C. Beauregard*

THE SHEEP LUNGWORM *Dictyocaulus filaria* is of a world-wide distribution and may be the cause of a severe parasitic bronchitis resulting in loss of weight and deaths of animals (3, 5, 17). Walley (16) and Thomas *et al* (15) have all concluded that *D. filaria* in sheep in Great Britain may assume economic significance as a contributory cause of unthriftiness and deaths. In fact, in Europe *D. filaria* is one of the most economically important parasitic diseases of sheep (1, 6, 8, 9). A review of the literature of diseases caused by the lungworms of sheep is presented by Poynter and Selway (10).

The published information of the infections of sheep with *Dictyocaulus* in Canada is rather limited, however. Swales (13, 14) has reviewed the early reports on the occcurrence of *D. filaria* in sheep. Subsequently, O'Donoghue (7) reported that this lungworm was the contributory cause of an outbreak of severe coughing and emaciation followed by deaths in a flock of sheep in Alberta. While D. *filaria* might thus be responsible for parasitic bronchitis and emaciation of sheep in various parts of Canada (2, 7), it would appear that there is virtually no published information on the incidence of these infections.

In the Province of Quebec, some 48% of the sheep population is in the Rimouski region, and the farmers and field veterinarians contend that manifestations of severe clinical parasitic bronchitis in sheep are seen in greater frequency than is believed. Therefore as part of an epidemiological study of *D. filaria* infections of sheep of that region, observations were made on the incidence of these infections. The principal aim of the present investigation was to determine the seasonal incidence of *D. filaria* in adult sheep and lambs under field conditions.

*Département de Pathologie et Microbiologie, École de Médecine Véterinaire, Université de Montréal, St.-Hyacinthe (Ayalew and Fréchette); Laboratoire de Pathologie Animale, Ministère de l'Agriculture du Québec, St.-Hyacinthe, Québec (Malo) Rimouski, Québec (Beauregard).

Present address of L. Ayalew: Department of Veterinary Microbiology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0.

MATERIALS AND METHODS

One hundred and ten sheep (adults and yearlings) were purchased from ten different farms in the Rimouski region. The animals had grazed the previous season (June–November, 1970) and were brought together onto three properties, typical of the region, for winter stabling indoors. The ewes were bred in October–November and had lambed by the following spring, 1971. Following lambing the ewes and their lambs were turned out on permanent pastures. Animals were necropsied at various times over the year, namely, during the winter (December, 1970), spring (April, May, June, 1971), summer (July, August, 1971) and fall (October, November, 1971). Forty-six adults and 33 yearlings were necropsied in total.

At necropsy the lungs and trachea were removed intact and the respiratory passages washed twice with one litre of warm physiological saline. Washings were stored in 5% formalin until microscopic examination for parasites was completed. In the results individual animals were recorded as positive if any developmental stage of *D. filaria* was present in the lung content, and the data were entered by month or by season regardless of the year of necropsy.

RESULTS

It was found that various individual animals were infected with the adult or larval forms, or both, of *Dictyocaulus filaria*. The seasonal incidence of *D. filaria* infections is presented in Table I. Out of a total of 79 adult sheep and lambs examined over the year, 48.8% were positive for this lungworm, but the incidence was somewhat higher in the lambs. The infections were present in all seasons, the highest total incidence (80% positive) occurring in early winter and the lowest (30% positive) in the summer. During the fall the incidence had reached peaks of 66.7% and 83.3% in adult sheep and lambs, respectively. However, whereas there were *Dictyocaulus* infections in all seasons in adult sheep, none was seen in lambs during the spring.

TABLE I

SEASONAL INCIDENCE OF *D. filaria* IN ADULT SHEEP AND LAMBS AT NECROPSY

Season	Adult Sheep		Lambs		Total	
	Number Examined	Percent Positive	Number Examined	Percent Positive	Number Examined	Percent Positive
Winter	5	66.7	3	100.0	8	80.0
Spring	21	47.7	2	0	23	43.5
Summer	14	28.6	16	31.2	30	30.0
Fall	6	66.7	12	83.3	18	77.8

TABLE II

MONTHLY INCIDENCE OF *D. filaria* IN ADULT SHEEP AND LAMBS AT NECROPSY

Month of Necropsy	Adult Sheep		Lambs		Total	
	Number Examined	Percent Positive	Number Examined	Percent Positive	Number Examined	Percent Positive
December	5	66.7	3	100.0	8	80.0
April	9	66.7	—	—	9	66.7
May	3	66.7	—	—	3	66.7
June	9	22.7	2	0	11	18.2
July	7	0	4	0	11	0
August	7	57.0	12	41.7	19	47.4
October	—	—	3	66.7	3	66.7
November	6	66.7	9	88.9	15	80.0

The number of animals necropsied at the various months and the percent positive for *Dictyocaulus* are shown in Table II. It can be seen that during the early grazing months of June and July infections with this lungworm were least frequent in both adult sheep and lambs. As the grazing season advanced, however, greater number of animals were infected. By November and December the incidence of the infections had reached peak level. This high level of incidence appeared to be virtually maintained until April and May in adult sheep. By June the incidence of lungworm infections had subsided and in July no sheep were infected.

It is interesting that, coinciding with the peak incidence of these infections, the *Dictyocaulus* counts, not included in the present results, were highest during the fall. At that time, lambs were in poor condition, which was mainly attributable to parasitic bronchitis. Several lambs had died and in two such lambs, in excess of 400 and of 1500 *Dictyocaulus*, respectively, were recovered at necropsy.

DISCUSSION

The results presented here show that almost one-half of the total number of sheep examined over a year were infected with *D. filaria*. This is a much higher level of incidence than that indicated in a recent report derived from diagnostic records of the Ontario Veterinary College in which out of 1303 ovine necropsied during 1965–1970, only in 4% was *Dictyocaulus* present (12). However, in that report the age of animals necropsied, the month of necropsy and the parasitological methods used were not indicated.

The present data clearly show that the incidence of *D. filaria* in sheep is seasonal which fluctuates from as low as zero in July to as high as over 80% in November. Also, in the overall, the infections were least frequent (30% positive) during the summer but most common (over 75% positive) during the fall. These findings concur with those of Thomas *et al* (15) who showed that in Great Britain adult *D. filaria* incidence in lambs increased from 16.7 to 33% in June to an autumn peak up to 75%. It is interesting that Gupta and Gibbs (4) also found that *D. viviparus* infections in cattle were most frequent during the fall. The high level of incidence of *D. filaria* in sheep during the fall in the present work may well be consistent with Rose's (11) findings which indicate that the accumulation of the infective larvae on pasture is minimum during the hot summer months but that it reaches peak levels during the cooler autumn months.

Comparable to the case of the related lungworm, *D. viviparus*, infections in adult and young cattle in Canada (4) and to that of

D. filaria in sheep in Great Britain (15), the seasonal incidence of *D. filaria* in the present work was almost slightly higher in lambs than in adult sheep. An exception to this was during the spring when the incidence was over 47% in adult sheep but zero in lambs. The complete absence of *Dictyocaulus* in the two lambs necropsied during the spring might well be attributable to the fact that the lambs were still kept with their dams in pens where reinfection with *D. filaria* was apparently nil. Clearly, the infections of adult sheep observed during the spring were referable to infections acquired on pasture during the previous grazing season, and this will be discussed in another paper.

According to the present data, it would appear that infections of sheep with *D. filaria* in the Rimouski region might reach epidemic proportions. The economic significance of these infections cannot, however, be determined by these data. Nevertheless, Walley (16) and Thomas *et al* (15) have concluded that *D. filaria* in sheep in Great Britain may assume economic significance as a contributory cause of unthriftiness and deaths. In fact, O'Donoghue (7) reports that in a flock of 150 ewes in Alberta, 30 animals had died over a year with *D. filaria* infections. He points out that lambs were runty and light in the fall, and the ewes were in extremely poor condition, severely emaciated and dying at the rate of two a week from October to January. Also during the course of the present investigation it was noted that as the grazing season advanced sheep appeared to be in poor condition. A number of animals were apparently suffering from parasitic bronchitis and deaths occurred during the fall. At necropsy of each of two such lambs, in excess of 400 and of 1500 *D. filaria* were recovered, respectively, and approximately one-third of the total number of worms in each animal was made up of adults. Working under field conditions in the Montreal area, Gibbs and Pullin (2) recovered only between six and 48 adult *D. filaria* in sheep that were coughing, emaciated, and in poor condition. *Dictyocaulus* counts of this range were not uncommon in sheep killed in the present work. It is, therefore, conceivable that *D. filaria* infections in sheep of the Rimouski region may contribute to some damage of economic significance.

Summary

The incidence of *Dictyocaulus filaria* in sheep was determined under field conditions. Adult sheep and lambs were killed at different months over a year and worms were recovered from the lungs and identified. It was found that *D. filaria* were present in 48.8% of a total of 79 sheep necropsied. The infections were markedly seasonal, occurring in 30% of all sheep killed in the summer and in a peak of over 77% of the animals killed in the fall or the winter. The monthly incidence of *D. filaria* had varied greatly, however, fluctuating from zero in July to 80% in November. The infections were generally more common in lambs than in adult sheep in all seasons excepting the spring when no *Dictyocaulus* were present in lambs.

Résumé

Cette étude visait à déterminer la fréquence de la dictyocaulose naturelle au sein de la population ovine de la région de Rimouski. À cette fin, on abattit des sujets adultes et des agneaux à différentes périodes de l'année; on procéda ensuite à la recherche et à l'identification de leurs parasites pulmonaires. On décela la présence de *Dictyocaulus filaria* chez 48.8% des 79 moutons abattus. Cette parasitose revêtait un caractère nettement saisonnier: on la retrouva chez 30% des sujets sacrifiés durant l'été et chez au-delà de 77% de ceux qu'on abattit au cours de l'automne et de l'hiver. L'incidence mensuelle de la dictyocaulose varia cependant beaucoup, passant de 0% en juillet à 80% en novembre. La condition affectait généralement plus d'agneaux que d'adultes au cours de toutes les saisons, sauf au printemps où les premiers en étaient exempts.

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