The effect of a preparturient fenbendazole treatment on lactation yield in dairy cows

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Studies carried out on nine farms in north-west England indicated that fenbendazole treatment of adult winter calving dairy cows in the dry period caused an overall increase of 173 kg in their subsequent lactation yield. There was some evidence to suggest that a correlation existed between pasture *Ostertagia ostertagi* larval burdens and subsequent serum pepsinogen and milk yield responses post treatment. Marked interherd and regional differences existed in the milk yield response to anthelmintic treatment and possible reasons for such results are discussed.

IT is now well established that ostertagiasis may arise sporadically as a clinical entity in adult cattle (Armour 1974, Cawley and Lewis 1975, Selman and others 1976). In addition, the presence of relatively low numbers of *Ostertagia ostertagi* and other nematode species in adult dairy cattle has been suggested as being of considerable economic importance (Grisi and Todd 1978).

Surveys among dairy cattle in the USA have demonstrated a high incidence of parasitism in such animals, with distinct seasonal fluctuations in their worm burdens of various nematodes (Randall and Gibbs 1977). The highest proportion of immature larval stages were observed in cattle during the autumn and winter (Randall and Gibbs 1977, Grisi and Todd 1978), corresponding with the known epidemiology of *O ostertagi* infection of cattle in the UK.

Experimental nematode infections of adult dairy cattle have depressed milk production, the effects being most significant when cattle were challenged in the first 90 days of lactation (Bliss and Todd 1977). Studies in the USA and Belgium have shown advantages to be gained from thiabendazole treatment of dairy cows at calving (Bliss and Todd 1973, 1974, 1976, Todd and others 1972, Pouplard 1978).

As fenbendazole has an action against both adult and immature stages of *O ostertagi* and other nematode species affecting the bovine (Duncan and others 1976, 1978), an experiment was conducted to determine whether treatment of dairy cows in the dry period would result in significant increases in their subsequent lactation yields.

Materials and methods

Farms/animals

Nine farms located in the NW of England were selected for the investigation in autumn 1977. These farms possessed dairy herds which were winter calving and predominantly of the Friesian breed. All the farms used or intended to use milk recording schemes either of their own design or provided by the Milk Marketing Board.

Procedures

The farms were visited in late November 1977 when all the cows had been housed. The dry cows in each herd were randomly allocated to two groups. One group was treated with 7·5 mg per kg fenbendazole while the other group was kept as an untreated control.

At the time of treatment, blood and faecal samples were taken from a minimum of 20 per cent of the treated and control animals. Herbage samples were also obtained from the pastures on which the animals had last grazed. Six weeks later, repeat blood samples were taken from the animals initially bled.

Farms were revisited in January 1978 when any cows which had become dry in the intervening period were again divided into treated and control groups and sampled in a similar manner.

Parasitological examinations

Faecal egg counts.—Egg counts were carried out using a modified McMaster technique. In addition, all faecal samples were cultured at 24°C for 10 to 14 days, larvae harvested and identified.

Pasture larval counts.—Larval counts were performed on herbage samples, results being expressed in numbers of larvae per kg of dried grass.

Serum pepsinogen analysis.—Serum was separated by centrifugation and pepsinogen levels assayed using the technique described by Anderson and others (1965).

Assessment of milk yields

Cows were considered to have completed a lactation if they milked for 270 days or more in the absence of obvious clinical disease such as acute mastitis. When cows lactated for more than 305 days, their official 305 day yield was taken as being their final yield. Lactations between 270 and 305 days were taken as actual yields and not corrected to 305 days.

Any cows which failed to reach a lactation length of 270 days were discarded from the study, the reason for their short lactation having been established. Milk yields of cows in their lactation subsequent to treatment were compared with those in their previous lactation in order to assess the effects of anthelmintic treatment. Ninety day yields were also recorded from heifers on one farm where there were sufficient numbers for comparative purposes.

Results

No evidence of drug toxicity was noted in any of the treated animals. The presence of an *O ostertagi* challenge was confirmed on all the farms by the identification of larvae in faecal cultures or herbage samples. Table 1 summarises the nematode challenge status of all the farms. The highest faecal egg counts were recorded in herd C8A, comprised totally of heifers.

Results of serum pepsinogen levels in cows pre and post fenbendazole treatment are summarised in Fig 1. When compared to levels in the control cows, marked reductions in serum pepsinogen levels occurred following treatment of cows on farms L4, C5, C7, C8A and C9. These findings correlate well with the observed pasture larval burdens as these were the only farms where the presence of *O ostertagi* larvae was demonstrated on the herbage.

The number of animals starting and completing the study on each farm are given in Table 2. Sixty-six animals were lost from both the treated and control groups because of a

TABLE 1: Assessment of parasitic challenge in herds studied

Farm	Faecal egg count mean (range) epg	Larval culture	Pasture larval count (1 pkg dried grass)
L1	<5	25% ostertagia/75% cooperia	Nil
L2	10 (0–50)	20% ostertagia/50% cooperia/30% trichostrongylus	Nil
L3	<5	15% ostertagia/75% cooperia/10% trichostrongylus	19 (100% cooperia)
L4	<5	Nil	225 (73% ostertagia/ 27% cooperia)
C5	<5	Nil	913 (57% ostertagia/ 43% cooperia)
C6	<5	10% ostertagia/85% cooperia/5% trichostrongylus	Nil
C7	<5	30% ostertagia/ 70% cooperia	101 (30% ostertagia/ 70% cooperia)
C8A	30 (0–150)	40% ostertagia/40% cooperia/20% trichostrongylus	760 (46% ostertagia/ 48% cooperia/6% trichostrongylus
C8B	<5	Nil	212 (50% ostertagia/ 4% cooperia/10% trichostrongylus
C9	6 (0–50)	50% ostertagia/40% cooperia/10% trichostrongylus	462 (39% ostertagia/ 53% cooperia/8% trichostrongylus

variety of causes. This represented a total loss of 33 per cent of the original animals. Of these, 9 per cent were discarded because their lactation length in previous or subsequent lactations was less than 270 days, 8 per cent were sold (no reason given), in 6 per cent the records were insufficient for purposes of analysis, 3 per cent had clinical mastitis, 2 per cent were casualty slaughtered, 2 per cent were culled because of infertility, 1 per cent either died, aborted or became lame and one animal reacted to a brucellosis test.

Mean lactation yields of the treated and control animals for which records were complete are summarised in Table 2. The response due to anthelmintic treatment has been calculated from a comparison of the yields of control and treated cattle in the lactation previous and subsequent to treatment.

In herds where data was available on cows in their previous lactation, anthelmintic treatment of cows pre calving was found to result in increased milk yields in six out of eight herds, the mean increase for all farms being 173 kg per cow. In these herds the yield of 89 treated cows in their subsequent lactation increased by a mean of 814 kg whereas the increase in 85 control cows was 641 kg.

On farm C8A the herd consisted solely of heifers and treatment resulted in an extra 529 kg of milk per animal.

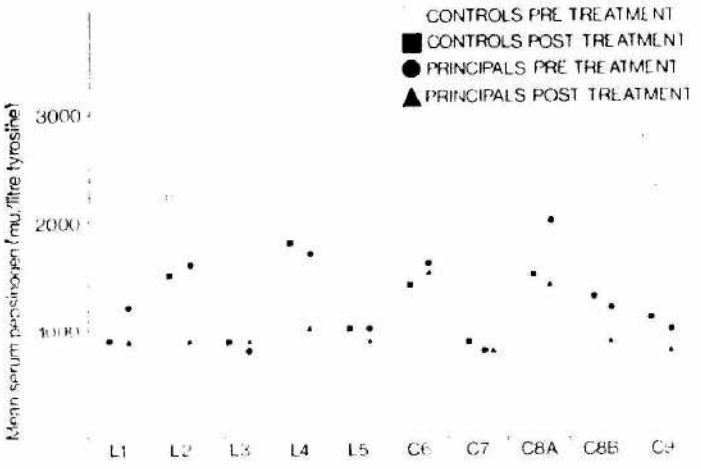

FIG 1: Serum pepsinogen levels in cows pre and post fenbendazole treatment

Of this amount, 286 kg arose during the first 90 days of lactation, the mean 90 day yield of controls and principals being 1516 kg and 1802 kg respectively.

On farm C9, where no records of the previous lactation existed, treated cows yielded 115 kg per cow more milk than their untreated companions.

In nine herds, the mean number of previous lactations of the treated and control animals was not significantly different. On one of the farms where anthelmintic treatment did not benefit the lactation yield (C6), the mean parity of the treated animals was 5·1 whereas that of the controls was 2·3. This difference may be associated with the apparent lack of response in this herd.

The mean lactation lengths of control cows in their previous and current lactations were 296 and 300 days, whereas those of treated animals were 294 and 298 days respectively.

A correlation appeared to exist between *O ostertagi* challenge and milk yield response to anthelmintic treatment, as on all farms, where an appreciable *O ostertagi* pasture larval burden (more than 100 L_3 per kg) was evident, treatment resulted in increased lactation yields.

Discussion

The faecal egg counts recorded from animals in this study were similar to those previously reported as occurring in adult dairy cows. In studies on anthelmintic treatment of dairy cows in the USA, such cattle were generally found to have mean faecal egg counts of one to 10 eggs per gram (Bliss and Todd 1974, 1976, Grisi and Todd 1978).

However, faecal egg counts have distinct limitations as a measure of nematode populations in cattle (Michel 1968, Brunsdon 1971). Smeal and others (1977) found that egg

TABLE 2: Numbers and lactation yields of treated and control cows

Farm	Previous lactation				Current lactation				Mean increase (kg) attributable to anthelmintic treatment
	Controls No	Controls Lactation yield (kg)	Treated No	Treated Lactation yield (kg)	Controls No	Controls Lactation yield (kg)	Treated No	Treated Lactation yield (kg)	
L1	9	5300	9	5005	5	5377	5	5468	+386
L2	13	5669	13	4640	9	6615	7	6052	−466
L3	9	5161	11	5244	6	6188	7	6433	+162
L4	14	3516	11	3675	8	3918	8	4459	+382
C5	20	7000	20	6878	17	7959	18	8186	+349
C6	18	5080	21	5332	9	6007	14	6080	−179
C7	23	6549	24	6069	14	7580	10	6789	−311
C8A	11	—	12	—	10	4040	9	4569	+529†
C8B	34	5370	34	5183	17	5126	20	5067	+128
C9	45	—	49	—	35	6969	40	7084	+115‡
Total (mean)	196	(5456)	204	(5253)	130	(6096)*	138	(6067)*	(+173)*

*Excluding herds C8A and C9 where no records of previous lactation existed
‡No records of previous lactations existed
†Herd consisted of heifers only

counts grossly underestimated the size of worm populations, especially those of *O ostertagi* and *Trichostrongylus axei*, present in 18- to 20-month-old cattle. In Belgium, Pouplard (1978) reported on a large number of adult dairy cattle that carried burdens of tens of thousands of worms which were mostly immature or at least not egg laying. This observation confirmed the findings of Selman and others (1976) in a study of adult beef cows clinically affected with type II ostertagiasis.

As the size of the helminth burden in adult cattle cannot be expected to correlate with the faecal egg count, other indirect assessments of the nematode challenge were also used in this study. When significant reductions in serum pepsinogen levels were observed in treated cows, such responses could be correlated with the size of the *O ostertagi* larval burden on the pastures last grazed. Most of the published data on serum pepsinogen levels relate to studies in young cattle, in which levels in excess of 3000 mu per litre are thought to be indicative of *O ostertagi*-induced abomasal damage (Anderson and others 1965, Armour 1974). That such conclusions also apply to adult cattle was suggested by Selman and others (1976) who found clinically affected beef cows to have serum pepsinogen levels of 3913 mu per litre and greater.

Where *O ostertagi* larvae were identified on the pasture last grazed, serum pepsinogen levels in treated cows always declined significantly as compared to control animals. Overall, however, serum pepsinogen levels were somewhat difficult to interpret because of spontaneous reductions occurring in control cattle, these being especially noticeable in three of the Lancashire herds (L1, L2 and L3). However, it appears from the work of Chiejina and Clegg (1978) that serum pepsinogen analyses and pasture larval burdens are better indicators of nematode challenge than faecal egg counts. Michel (1970) also found a significant correlation between plasma pepsinogen levels and post mortem worm counts in calves.

The problems associated with the indirect assessment of nematode burdens makes it difficult to establish categorically that increased milk yields following thiabendazole treatment of dairy cows around calving (Bliss and Todd 1974, 1976) are actually due to an anthelmintic action. In this study, the greatest benefits, an extra 529 kg of milk, were found in heifers (farm C8A) which had grazed on pasture heavily contaminated with *O ostertagi* larvae. In addition, these animals had the highest egg counts and showed a significant reduction in serum pepsinogen levels post treatment. These findings suggest that the mode of action of fenbendazole in increasing these heifers' milk yields is due to the compound's anthelmintic properties.

On the other farms where an appreciable pasture *O ostertagi*, larval burden existed (more than 100 L_3 per kg), milk yields were also increased by fenbendazole treatment (farms L4, C5, C8B and C9). However, an examination of those farms where *O ostertagi* pasture larval burdens were low indicates the response to anthelmintic treatment to be inconsistent. On two farms (C6 and C7), no benefit was obtained whereas on the remaining three (L1, L2 and L3) a considerable positive response was evident. It should be emphasised, however, that an apparent absence of larvae on the pasture last grazed does not rule out the possibility of previous challenge having existed. The latter three farms were located in north Lancashire whereas C6 and C7 were in Cheshire, suggesting perhaps that it is dangerous to extrapolate results obtained from one region in the UK to another, far less from countries such as the USA or Belgium.

On the Cheshire farms, good correlation existed between *O ostertagi* pasture larval burdens, serum pepsinogen response and milk yield increments, no such correlation existing in the Lancashire herds. Part of the explanation for this anomaly may be related to differences in the state of the herbage when sampled in the two regions. Grass was still plentiful in Cheshire at the time when this study was initiated (late autumn 1977), whereas in north Lancashire pastures were practically bare.

Overall, the results of this study are in accord with those reported in the USA (Bliss and Todd 1974). However, the mean increase in milk yield occurring in the treated cows in this study varied between regions. On the four north Lancashire farms the mean increase was 349 kg whereas in the six Cheshire herds it was only 105 kg. Thus distinct regional differences as well as inter herd differences can be expected in the response to anthelmintic treatment in dairy cattle. The enhanced responses noted in north Lancashire are interesting as it is in this county and Cumbria where ostertagiasis has been reported as being a problem in adult beef cattle (Cawly and Lewis 1975).

The necessity for carrying out trials of this type on very large numbers of animals at different geographical locations is well emphasised by the results of this preliminary study. Over a third of the animals at the start of the study had to be discarded for various reasons such as short lactations, culling or mastitis. It has also emphasised the confusion over official lactation yields. In this study, only the yields of those cows which had lactated for 305 days or more were corrected to 305 day yields, and only those cows which had actually lactated 270 days or more were considered. Lactations between 270 and 305 days were not corrected to 305 days, a procedure adopted by Bliss and Todd (1973, 1974, 1976). It was considered inappropriate to artificially increase the milk yield of a cow to 305 days when it had not actually achieved that yield. There were generally good reasons for a cow not lactating to 305 days, the most frequent and important being that its yield did not justify the time taken to milk it. Correcting such animals' yields to 305 days must perforce give rise to artificially inflated and anomalous results.

The results suggest that anthelmintic treatment of dairy cows is probably justifiable economically, the mean increase in lactation yield being about 173 kg or 35 to 40 gallons. At current prices, an average net return of £15 to £18 per cow could thus be obtained from fenbendazole treatment of winter calving dairy cattle in the dry period. However, variations may occur in the response to treatment of herds in the same and perhaps, more importantly, in different geographical regions. Hopefully, the potential benefits reported here and from studies using other anthelmintics will be finally confirmed by the results of work to be carried out in the UK by the Ministry of Agriculture, involving various anthelmintics and some 15,000 animals (Michel 1979, personal communication).

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