Treatment of North Dakota Beef Cows and Calves with Ivermectin: Some Economic Considerations

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Introduction

Profits in the beef cow and calf enterprise are directly related to weaning weight of calves. Since deworming beef cows has been documented to increase the weaning weight of their calves[1,2,3] a field study was conducted to further define the economic impact of treatment with ivermectin.

Three cow/calf operations in North Dakota cooperated to evaluate the economics of treating adult cows and of exploring the impact of an early calf treatment. The economic impact was assessed by evaluating the investment in ivermectin treatment with the return based upon the predicted improvement in the weaning weight of the calf crop. This study was conducted over a two-year period (1986–1988) and involved two calf crops per herd.

Materials and Methods

Herds

Three herds located in North Dakota (east, central and western regions) were elected upon the advice of local practitioners because herd health and record keeping practices were used. Herd A included both commercial and registered Simmental cows. Herd B was a registered Charolais herd. Herd C included Hereford, Simmental, and Hereford/Simmental commercial cows.

Anthelmintics had not been routinely given to these cows previously but calves had been treated at weaning. Standard vaccinations and veterinary care were part of the health management in each herd. Cows and calves were individually identified with ear tags. Each calf's birthdate was recorded. Calf weaning weight was adjusted to 205 days of age.

Each cow herd was initially divided into two similar groups in the fall of the first year. This division was done by each owner based upon criteria they had established, such as breeding practices, genetics, and other factors. Treatment of cows was randomly assigned to the two groups by a coin toss. Analysis of distribution suggested that age, parity and breed were similar in each group. The two cow groups were then further subdivided into two groups, making a total of four groups, at the time of treatment of the calves. Calves were randomly assigned to the treatment group by a coin toss. Each of the four groups of cows which were formed were maintained for the second year of the study.

Treatment

Each group was treated as follows: Group 1: Both cow and calf were treated with ivermectin (IVOMEC®) at 200 mcg/kg,SC. Cows were allocated and treated each fall (October or November) when pregnancy tested; calves were treated in late June the following year, approximately 5–6 weeks after turn out from winter housing onto pasture. Group 2: Only cows were treated with ivermectin. Group 3: Only calves were treated with ivermectin. Group 4: Neither cows nor calves were treated with ivermectin. Cows in Groups 3 and 4 received a pour-on insecticide (WARBEX®, 13.2% famphur, American Cyanamid Co.) to control lice and grubs each year at pregnancy testing.

Animals in Groups 1 and 2 were kept on different pastures from those in Group 3 and 4 during the grazing season (May through October). Forages were similar in each pasture at each ranch and the same pastures were

used for each group during the subsequent year of the study. During late fall and winter (November through April) all cows were kept together on drylots.

Fecal samples (freshly voided stools) were collected from a random number of calves in each group (at least 15%) at the time treatments were given. Samples were examined for nematode ova by the Wisconsin fecal flotation technique and reported as eggs per gram of feces (EPG).

Statistical Analysis

Calf weaning weights and adjusted weaning weights

TABLE 1. Number of calves weaned in beef herds used to evaluate antiparasitic treatments over a 2-year period in North Dakota.

HERD	Group 1 (IVM* cows & calves) 1987	1988	Group 2 (IVM cows only) 1987	1988	Group 3 (IVM calves only) 1987	1988	Group 4 (No IVM treatment) 1987	1988	TOTAL 1987 & 1988
A	34	49	51	49	59	53	61	59	415
B	51	49	47	50	39	38	35	35	344
C	28	25	22	26	26	22	26	19	194
TOTAL	113	123	120	125	124	113	122	113	953

*IVM = ivermectin injection, 200 mcg/kg,SC.

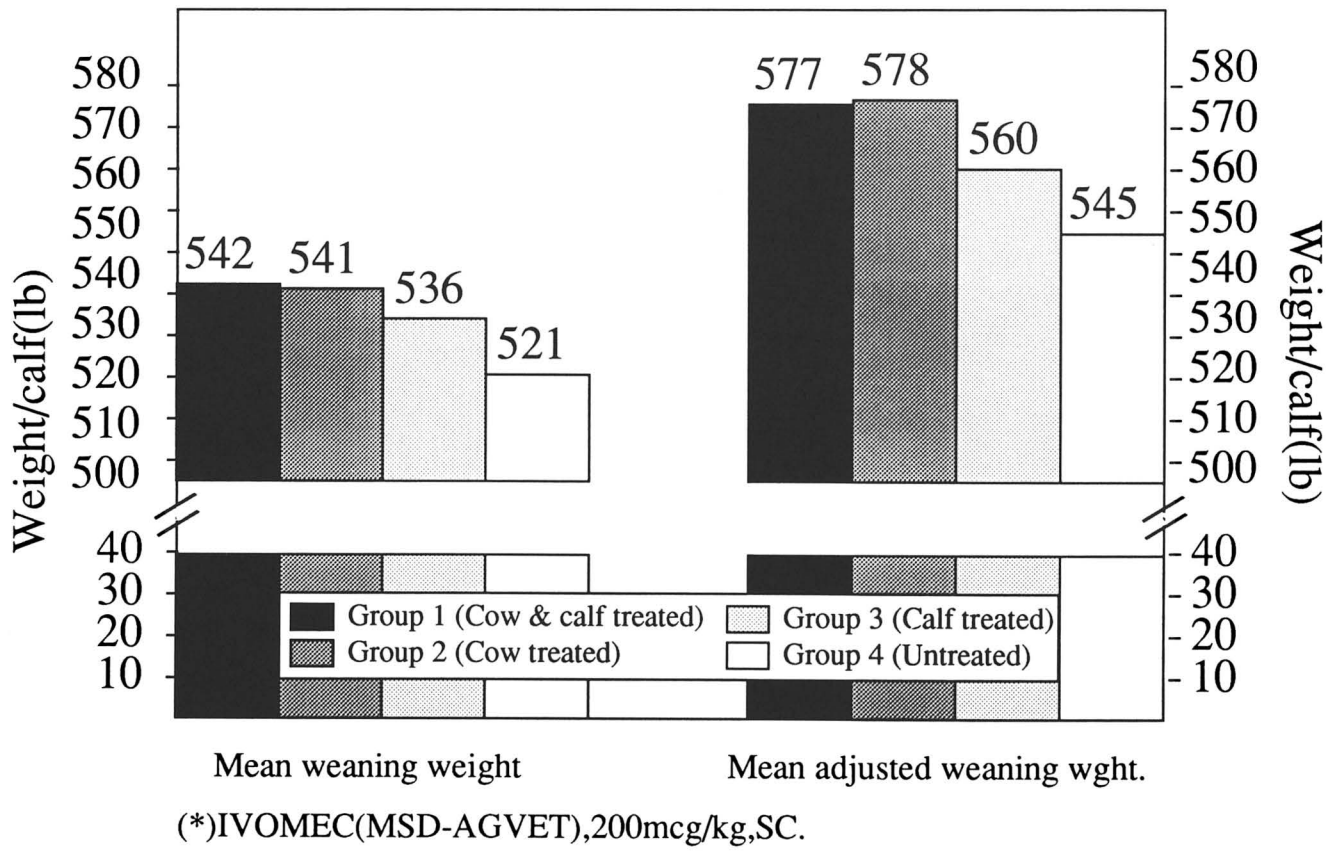

FIGURE 1. Mean weaning weights (lb) of North Dakota beef calves in three herds used to evaluate antiparasitic treatments(*) over a two-year period.

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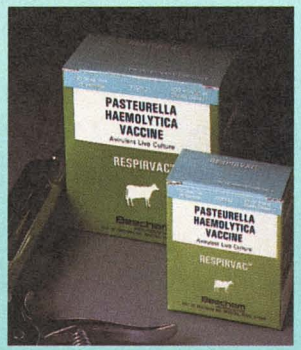

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[2] Data on file at Beecham Laboratories
[3] *Calf News*, March, 1988.

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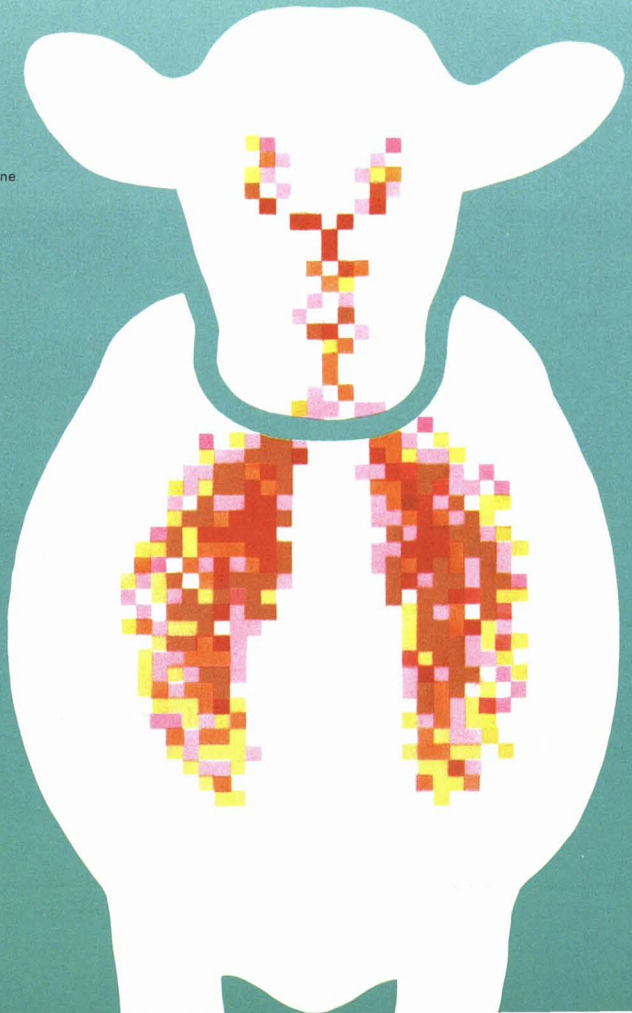

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were tested for significance by an analysis of variance (ANOVA). Data were analyzed as a 3 (herd) × 2 (year) × 4 (treatment) factorial with all possible 2-way interactions allowed. The error term was the 3-way interaction. The General Linear Models procedure was used and the Statistical Analysis System (SAS) was employed in all computations.[5] Differences were considered statistically significant if the two-sided P value was ≤ 0.05.

Economic Analysis

The market value of each calf was calculated each year. Official USDA's mean market prices for October 1987 and October 1988 at Fargo, ND were entered into a regression equation which statistically related market weight to market price during a given sale period. The following equations were used:

1987 steer price = 113.8236 - (6.11849 × cwt) + (0.152522 × cwt^2),

1987 heifer price = 95.80894 - (3.5741 × cwt) + (0.064137 × cwt^2),

1988 steer price = 124.131 - (6.930113 × cwt) + (0.192145 × cwt^2),

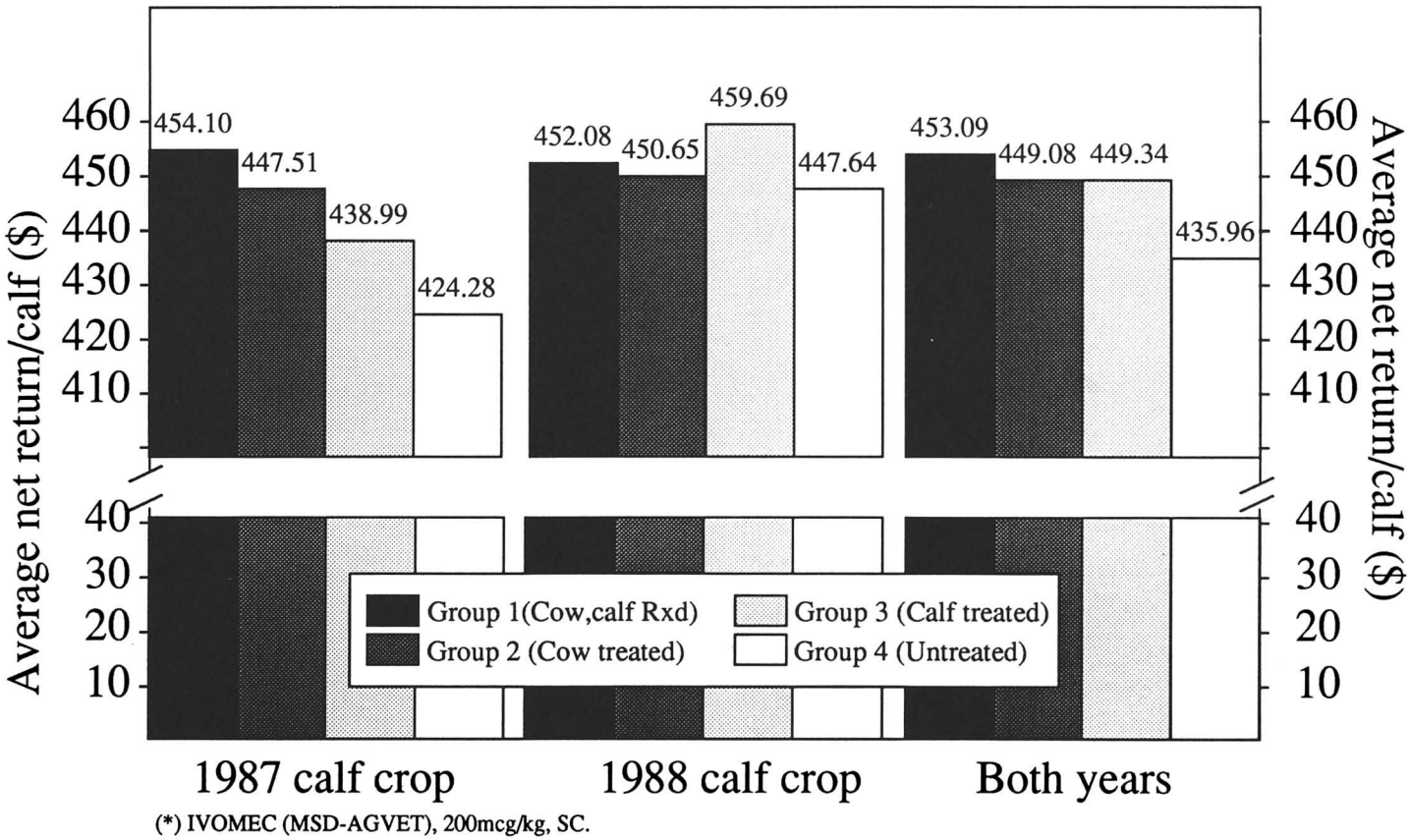
1988 heifer price = 103.8633 - (3.25844 × cwt) + (0.19401 × cwt^2).

The market value of each calf was adjusted for materials (ivermectin or pour-on insecticide) and labor costs associated with treatment of the cow and/or calf. The cost of treatment (materials plus cost) was $6.35 in Group 1, $5.30 in Group 2, $1.78 in Group 3 and $0.73 in Group 4. The net market value per calf was the difference between market price minus treatment cost.

Results

A total of 953 calves were weaned over the 2-year period; 479 in 1987 and 474 in 1988 (Table 1). The mean weaning weight of calves was 542 lb for Group 1; 541 lb for Group 2; 536 lb for Group 3 and 521 lb for Group 4 (Fig. 1). A difference of 21 lb and 20 lb respectively was observed in the weight of calves in Groups 1 and 2 compared to controls (Group 4). This difference was significant (P=0.005). The mean of 205-day adjusted weaning weights of calves was 577 lb for Group 1; 578 lb for Group 2; 560 lb for Group 3 and 545 lb for Group 4 (Fig. 1). Calves from treated cows (Group 1 and 2) were at least 32 lb heavier than controls (Group 4) when weaning weights were adjusted to 205 days of age. This advantage was significant (P=0.0003).

There was a 15 lb advantage in weaning weight and adjusted weight when calves in Group 3 were compared to



(*) IVOMEC (MSD-AGVET), 200mcg/kg, SC.

FIGURE 2. Average net return (market value minus cost of treatment) per calf ($) in three North Dakota beef herds used to evaluate antiparasitic treaments (*) over a two-year period.

controls (Group 4); this difference was not significant (P=0.17).

Following adjustment for treatment cost, the average market value per calf in 1987 was $454.10 in Group 1, $447.51 in Group 2, $438.99 in Group 3 and $424.28 in Group 4. Calves weaned in 1988 had an average market value of $452.08 in Group 1; $450.65 in Group 2; $459.69 in Group 3 and $447.64 in Group 4. When the results from both years were combined. The average net market value per group was as follows: $453.09 for Group 1; $449.08 for Group 2; $449.34 for Group 3 and $435.96 for Group 4 (Fig. 2).

Examination of fecal samples collected from calves each year during the last week in June revealed nematode ova in 58 out of the 165 samples. Regardless of year, herd, or treatment group, approximately one third of samples had nematode ova. The greatest number of parasite eggs found in any sample was 84 EPG. The mean and ranges of nematode ova detected are summarized in Table 2.

Discussion

Previous reports[3,6,7] indicating that treatment of beef cows with ivermectin results in heavier calves at weaning were confirmed by this study. A statistically significant (P=0.005) advantage of at least 20 lb in weaning weight of calves from treated cows over controls was documented. When weaning weights were adjusted at 205 days of age the advantage over the control was at least 32 lb. The specific mechanism(s) responsible for this added weight was not determined, but it could be attributed to increased milk production by dams and subsequent consumption by calves. Increased milk production has been reported in both dairy[8,9] and beef[10,11] cows following anthelmintic treatment.

This study indicated there was an economic advantage of ivermectin treatment of beef cows compared to untreated controls. The economic implications of parasitism may not be easily assessed;[12] nevertheless, under the conditions of this study, the progeny from treated cows returned an average of $13.12 to $17.13 more than calves from untreated cows over the 2-year period. This added return was realized after costs of material and labor were subtracted from the market value of each calf at weaning (Fig. 2). The greatest return resulted when the cow and her calf were treated (Group 1); the net advantage over controls was $17.13 per calf. Treatment of only the cow netted an average of $13.12 per calf over controls.

Results of fecal examinations indicated low to moderate nematode egg counts in calves at treatment time (Table 2) . The epidemiology of cattle nematodes in North Dakota has not been determined, but an attempt was made to determine the effect of treatment of calves with ivermectin in late June. Time selection for treatment of calves was based on assumptions of the epidemiology of cattle nematodes under range conditions, as reported elsewhere.[2,13,14] Our study showed no additional benefit in weaning weight or economic return by treatment of the calf in late June if the cow was treated during the previous fall. When only the calf was treated, there was a 15 lb improvement in weaning weight over controls. The magnitude of this advantage was not significant (P=0.17); however, the economic analysis documented a $13.38 net return over controls by treating only the calf (Fig. 2). The economic analysis took into consideration the differences

TABLE 2. Mean nematode eggs per gram of feces in fecal samples collected during late June 1987 and late June 1988 from beef calves in three North Dakota cow/calf herds.

		Group 1(*)		Group 2		Group 3		Group 4	
Herd	Year	Mean	Range	Mean	Range	Mean	Range	Mean	Range
A	1987	18.7	2-34	22.1	2-36	15.5	2-29	34.5	29-40
	1988	17.0	3-31	27.0	27	28.5	27-30	23.6	2-42
B	1987	45.5	36-55	12.0	4-20	16.5	2-31	27.7	10-47
	1988	38	38	18.5	2-35	23.3	5-34	23.5	20-27
C	1987	49.5	36-61	11.0	1-21	31.0	31	49.7	2-84
	1988	10.0	3-17	19.5	19-20	17.6	12-22	12.5	5-20

(*) Group 1: Cows and calves treated with ivermectin
Group 2: Cows treated with ivermectin
Group 3: Calves treated with ivermectin
Group 4: Untreated controls, neither cows nor calves treated.

in cost of treatment between groups; thus it became apparent that treating only the cow (Group 2) netted as much as treating just the calf (Group 3). Although calves in Group 2 were heavier at weaning than those in Group 3, it cost more to treat animals in Group 2 than in Group 3 ($5.30 vs $1.78 per calf, per year).

This study documented a positive correlation between weaning weight of North Dakota beef calves and treatment of their dams with ivermectin the previous fall. It also suggested that an improvement in weaning weight may be anticipated when only calves are treated with ivermectin. Under the conditions of this study, an economic benefit was derived from the biologic advantage (increased weaning weight); this economic benefit will vary depending on calf prices and costs of treatment.

The epidemiology of cattle nematodes in North Dakota and Northern Great Plains states needs clarification. Efforts to determine optimal time(s) to deworm beef calves in the region appear warranted.

Summary

A two-year field study was carried out in North Dakota to determine if there was an economic benefit from treating cows and/or their calves with ivermectin (IVOMEC®, MSD-AGVET, Rahway, NJ, USA) at 200 mcg/kg,SC. Three herds were used; each herd was divided into four similar groups: (1) Cows and their calves treated with ivermectin (cows in the fall and calves in late June). (2) Only cows treated each fall. (3) Only calves treated in late June. (4) Neither cows nor their calves treated. Fecal samples from 15% of calves were collected at treatment time and examined for nematode ova. A total of 953 calves were weaned over the 2-year period. Calves were individually weighed at weaning and the actual market value (based on local market conditions) of each calf was calculated. Calves in Group 1 (cows and calves treated) and 2 (cows treated) averaged at least 20 lb more than calves in Group 4 (controls) at weaning; this difference was significant (P=0.005). Calves from cows treated with ivermectin (Groups 1 and 2) returned a significant (P=0.049) economic benefit over controls.

Acknowledgements

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