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PREWEANING PROCESSING-ANTHELMINTIC TREATMENT AND POSTWEANING EFFECTS OF SULFAMETHAZINE BASED MEDICATIONS ON PERFORMANCE TRAITS AND OOCYST SHEDDING IN WEANED CALVES

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Summary

Two trials were conducted to evaluate antibiotic therapies for feeder calves originating in western South Dakota. In Trial 1, processing-anthelmintic treatment 28 days before weaning reduced ranch gains and provided no advantage in feedlot gains when calves were reprocessed. Processing included deworming, grubicide treatment, implanting and vaccination. Sulfamethazine medication caused transient improvements in feedlot performance during the feedlot receiving period in both trials. Supertherapeutic treatment with AS 700 offered no advantage in feedlot performance over therapeutic feeding in these calves. Sulfamethazine exposure suppressed coccidia oocyst shedding and appears to be an effective means of controlling coccidiosis and shipping fever complex for newly received calves.

(Key Words: Calves, Sulfamethazine, Coccidiosis, Shipping Stress, Parasites.)

Introduction

The initial 4 weeks in the feedlot represent a critical period for recently weaned feeder calves. Stresses due to weaning, shipping, parasite burden, vaccination, exposure to pathogens and reduced feed intake increase susceptibility to disease. Respiratory illness and coccidiosis represent the two most common problems when managing these calves. Calf receiving programs that minimize losses to these problems are critical to successful feeding. The efficacy of sulfa based medications such as AS 700[3] for controlling shipping fever has been established. These products may also suppress coccidiosis. Two feeding trials were conducted to determine if sulfamethazine medication would reduce disease and enhance performance of calves infected with coccidiosis.

Materials and Methods

Feeding trials were conducted in the fall of 1988 and 1989. Calves were obtained from the same ranch each year. It was previously established that many of these calves were infected with coccidia.

Trial 1. Crossbred steer and heifer calves (48 head each) were weighed on the ranch and allotted to receive preshipment processing or as controls. The treated calves were vaccinated against IBR, BVD, PI_3, Hemophilus somnus and a 7-way clostridia. Warbex[3], Levamisole[3] and Ralgro[4] implants were also administered at this time. All calves were then comingled for 28 days before weaning.

At weaning, 32 additional steers that had received the vaccination and parasite treatments were added as a second group for inclusion in postshipment treatments. All calves were weighed and half of the calves from each sex, vaccination and group received three Sulmet[3] boluses before being loaded on trucks and shipped 350 miles to the SDSU research feedlot near Brookings.

In the feedyard, calves stood overnight with access to long stemmed grass hay and water. The next morning all calves received the same vaccinations as were used on the ranch. Previously unimplanted calves received a Ralgro implant. Sulmet boluses (3) were again administered to those calves bolused preshipment. Calves were sorted into 8-head pens by vaccination and Sulmet treatment groups. Steer and heifer calves were mixed within pens. The feedlot receiving diet was based on corn silage (Table 1). AS 700 was fed at therapeutic levels to half of the calves and was balanced across previous treatments. AS 700 feeding was continued at a constant dosage for 27 days. Performance data on the ranch were based

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TABLE 1. DIETS FED TO CALVES DURING FEEDLOT PERFORMANCE TEST[a]

Ingredient	R8840-R[bc], %	R8840-2[cd], %
Ground hay	10.00	--
Corn silage	80.54	88.04
Supplement		
Soybean meal, 44%	8.54	10.75
Trace mineralized salt[e]	.40	.40
Limestone	.31	.64
Dicalcium phosphate	.21	.17

[a] Percent dry matter basis.
[b] Fed 1 to 27 days after arrival. In Trial 1, diet was top-dressed with .5 lb/head/day ground corn that did or did not contain 9.08 g AS 700/lb. In Trial 2, medication top-dressed as 6.67% diet, DMB.
[c] Diets contained 1,000 IU per lb supplemental vitamin A.
[d] Diet provides 27 g/T monensin. Fed after initial 27 days.
[e] Contains NaCl >93%, Zn >.35%, Mn >.28%, Fe >.175%, Cu >.035%, I >.007%, Co >.007%.

on individual calf responses. Feedlot performance data were analyzed on a pen mean basis using procedures appropriate for a 2 x 2 x 2 factorial arrangement of treatments.

Trial 2. One hundred thirty-one steer calves were shipped directly from the ranch to the Brookings feedlot without any preshipment treatment. Receiving conditions and diet were the same as for Trial 1. All calves received similar vaccinations, but Ivomec[5] was used for anthelmintic treatment in this trial. Allotment was based upon a weight stratification providing 15 pens of 8 head. Eleven steers were randomly selected to be removed from the experiment to balance pen concentrations.

Premixes were prepared to contain (A) 0, (B) 1.98 or (C) 5.94 g/kg AS 700 (Table 2). These premixes were top-dressed at 6.67% of diet dry matter. If dry matter intake (DMI) during this period was 1.5%, body weight treatment B would provide therapeutic levels of AS 700. If DMI was .5%, body weight treatment C would provide therapeutic levels of AS 700. On day 11, premix C was discontinued and premix B was used in its place. Feeding premixes A and B was discontinued after 27 days. Performance data were analyzed on a pen mean basis by procedures appropriate for a completely random designed experiment.

In both studies, fecal samples were obtained from all steers twice weekly for the initial 4 weeks in the feedlot. Oocyst counts/gram fresh feces were determined and categorized as clean, 0 oocysts/g; low, 1 to 99 oocysts/g; moderate, 100 to 499 oocysts; and heavy, >499 oocysts/g. The frequency of occurrence in each infestation category was compared among treatments by Chi square analysis.

TABLE 2. TOPDRESS MEDICATION FORMULATION[a]

Item	Premix A	Premix B	Premix C
Ground corn	136	133	128
AS 700	0	2.724	8.172
Vegetable oil	1.26	1.36	1.36
AS 700 concentration, g/kg	0	1.98	5.94

[a] Kg, as fed basis.

[5]MSD AgVet, Rahway, NJ 07065.

Results and Discussion

The on ranch processing depressed gains (2.30 vs 2.08 lb/day, P<.05) on the ranch in Trial 1. We have observed this response in previous trials on an inconsistent basis. In previous studies, a Ralgro implant 4 weeks preshipment improved gains. Other processing treatments were not confounded with anabolic implants in those studies.

Calves vaccinated on the ranch actually received this treatment twice. We took this approach since it is typical for a feedyard to vaccinate all incoming cattle regardless of reported medical history. During the period from 28 to 55 days after feedlot arrival, calves vaccinated preshipment had lower average daily gains (2.53 vs 2.29; P<.05) and higher feed conversions (5.57 vs 6.18; P<.05) than controls. After 83 days, this response had diminished. A similar response was noted when gains were calculated for the period of initial ranch processing through 83 days in the feedyard.

Dosing with Sulmet boluses depressed gains (3.24 vs 3.01; P<.05) during the initial 28 days in the feedlot (Table 3). Intake was not affected by bolusing. The reason for the lowered average daily gain (ADG) is unclear. Calves made up this difference by 55 days.

Feeding AS 700 improved ADG (2.98 vs 3.28; P<.05) during the initial 27 days on feed and increased DMI (13.73 vs 14.36; P<.05) during 28 to 55 days on feed. After 83 days on corn silage diets, these responses had disappeared.

Interactions occurred (P<.05) between bolusing and AS 700 for DMI from 28 to 55 days, where cattle receiving one medication treatment consumed more feed than those receiving no medication or those receiving both forms of medication (Table 3). ADG from 56 to 83 days responded similarly. These data suggest that in the absence of acute disease only one avenue of medication should be utilized.

TABLE 3. EFFECTS OF SULMET BOLUS AND AS 700 ON FEEDLOT PERFORMANCE OF FEEDER CALVES, TRIAL 1

Sulmet boluses	No		Yes	
AS 700	No	Yes	No	Yes
1 to 27 days				
ADG[ab]	3.07	3.41	2.88	3.15
DMI[c]	10.59	10.85	9.84	10.69
F/G	3.46	3.19	3.44	3.39
28 to 55 days				
ADG	2.39	2.39	2.43	2.41
DMI[ad]	13.37	14.82	14.09	13.90
F/G	5.62	6.24	5.84	5.81
56 to 83 days				
ADG[d]	4.15	4.60	4.79	4.28
DMI	14.54	16.39	14.88	14.55
F/G	3.52	3.58	3.11	3.41
1 to 83 days				
ADG	2.71	2.91	2.80	2.77
DMI[c]	11.11	12.08	11.18	11.32
F/G	4.10	4.15	4.00	4.10

[a] AS 700 effect (P<.05).
[b] Bolus effect (P<.10).
[c] AS 700 effect (P<.10).
[d] AS 700 x bolus effect (P<.05).

An interaction also existed between processing-anthelmintic and AS 700 treatments for feed conversion from 55 to 83 days and overall (Table 4). Feed conversion was higher when calves received preweaning vaccinations and AS 700 in the receiving period.

In Trial 2, intake was good, resulting in high medication intakes during the initial 10 days in the feedlot (Table 5). Feeding AS 700 increased ($P<.10$) steer weights at 27 days and DMI after the initial 27 days (Table 6). Most of the increase in gain occurred during the initial 13 days in the feedlot. Feed conversion was also improved due to AS 700 feeding over the 13- ($P<.05$) and 27-day ($P<.10$) periods. The high dosage of AS 700 depressed feed intake ($P<.10$) throughout the receiving period. Using this approach to medicating diets does not help and may hinder performance if calves take to feed readily.

In both studies sulfamethazine reduced the frequency of calves shedding moderate and high amounts of oocysts. Sulmet treatment reduced shedding ($P<.05$) at 2, 5, 9 and 12 days after feedlot arrival in Trial 1 (Table 7). AS 700 reduced oocyst shedding on days 5 ($P<.05$), 9 ($P<.10$), 12 ($P<.10$), 23 ($P<.01$) and 26 ($P<.10$). In Trial 2 (Table 8), oocyst shedding was suppressed uniformly throughout the collection period. Supertherapeutic medication enhanced this response over therapeutic medication levels. In both studies monensin was included in diets at 20 g/T after AS 700 was withdrawn and subsequent fecal samples contained minimal incidence of oocyst shedding.

No significant incidence of respiratory illness or acute coccidiosis occurred in either of these trials. AS 700 treatment at therapeutic levels tended to improve calf performance and suppressed oocyst shedding. The higher level of AS 700 feeding was not efficacious for improving performance but may provide greater protection against coccidiosis. Other research has shown advantages to supertherapeutic treatment. Level of feed intake may be an important consideration in selecting medication therapy.

In our receiving studies, calves have been in the marketing channels for less than 48 hours. The importance of a preweaning processing program may differ in groups of cattle exposed to a longer transition time from the ranch to the feedlot or other stresses.

TABLE 4. EFFECTS OF PREWEANING PROCESSING AND POSTWEANING SULMET BOLUS AND AS 700 ON FEEDLOT PERFORMANCE OF FEEDER CALVES, TRIAL 1

Preshipment vaccination	No		Yes	
AS 700	No	Yes	No	Yes
1 to 27 days				
ADG[a]	2.93	3.27	3.03	3.29
DMI[b]	10.29	10.54	10.13	11.00
F/G	3.55	3.23	3.35	3.35
28 to 55 days				
ADG[c]	2.57	2.48	2.25	2.32
DMI	13.76	14.33	13.70	14.39
F/G	5.35	5.79	6.11	6.26
56 to 83 days				
ADG[e]	4.24	4.64	4.71	4.24
DMI	14.59	14.97	14.83	15.97
F/G[e]	3.47	3.23	3.16	3.76
1 to 83 days				
ADG	2.74	2.91	2.77	2.77
DMI[b]	11.15	11.51	11.13	11.89
F/G[e]	4.07	3.96	4.03	4.29

[a] AS 700 effect (P<.05).
[b] AS 700 effect (P<.10).
[c] Vaccination effect (P<.10).
[d] Vaccination effect (P<.05).
[e] AS 700 x vaccination effect (P<.05).

TABLE 5. DAILY DRY MATTER INTAKE AND DRUG CONCENTRATION BY TREATMENT GROUP[a]

	A		B		C	
Day	Dry matter intake	Drug intake[b]	Dry matter intake[b]	Drug intake[b]	Dry matter intake	Drug intake[b]
1	3.78	–	3.78	297	3.78	887
2	4.48	–	4.48	351	3.78	887
3	5.76	–	5.76	451	5.24	1228
4	7.22	–	7.22	565	6.69	1569
5	8.38	–	8.38	657	7.86	1840
6	9.54	–	9.54	748	9.02	2114
7	10.71	–	10.71	948	10.19	2385
8	11.87	–	11.87	930	11.81	2660
9	12.51	–	12.51	980	12.51	2930
10	13.68	–	13.68	1072	13.44	3151

[a] Mean of five pens.
[b] Mg/head of chlortetracycline + sulfamethazine.

TABLE 6. FEEDLOT RECEIVING PERIOD PERFORMANCE OF STEER CALVES, TRIAL 2

Treatment	A	B	C	SEM
Steer weight				
Initial	527	528	529	3.2
Day 10	561	563	557	6.6
Day 13	567	578	579	5.4
Day 27[a]	619	631	629	4.2
Day 34[a]	622	633	630	3.9
Average daily gain				
Days 1-10	3.30	3.54	2.78	.496
Days 1-13[b]	3.03	3.86	3.85	.263
Days 14-27	3.74	3.77	3.53	.306
Days 1-27[b]	3.40	3.82	3.68	.103
Days 1-34[b]	2.78	3.10	2.95	.071
Dry matter intake				
Days 1-13[c]	10.09	10.31	9.81	.163
Days 14-27[a]	13.92	14.81	14.48	.281
Days 1-27[ac]	12.08	12.65	12.23	.160
Days 1-34	13.18	13.70	13.24	.183
Feed/gain				
Days 1-13[b]	3.40	2.67	2.66	.213
Days 14-27	3.81	3.94	4.29	.294
Days 1-27[a]	3.58	3.32	3.33	.103
Days 1-34[b]	4.76	4.43	4.49	.084

[a] A vs BC (P<.10).
[b] A vs BC (P<.05).
[c] B vs C (P<.10).

TABLE 7. CHI-SQUARE ANALYSIS OF OOCYST SHEDDING FREQUENCIES BY SULMET BOLUS AND AS 700 TREATMENTS, TRIAL 1

Sample date	Bolus	AS 700	No No	No Yes	Yes No	Yes Yes	No	Yes	No	Yes
			Number of calves							
Initial	0		3	1	2	1	4	3	5	2
	1-99		6	6	8	10	12	18	14	16
	100-499		5	8	6	7	13	13	11	15
	>499		6	5	8	6	11	14	14	11
Day 0	0		8	8	11	6	16	17	19	14
	1-99		12	10	11	15	22	26	23	25
	100-499		6	9	2	6	15	8	8	15
	>499		3	3	7	4	6	11	10	7
Day 2[bd]	0		11	7	26	22	18	48	37	29
	1-99		10	17	3	10	27	13	13	27
	100-499		4	6	1	0	10	1	5	6
	>499		3	2	1	0	5	1	4	2
Day 5[bdf]	0		6	13	15	24	19	39	21	37
	1-99		12	10	13	7	22	20	25	17
	100-499		8	7	3	1	15	4	11	8
	>499		6	2	0	0	8	0	6	2
Day 9[de]	0		8	14	27	24	22	51	35	38
	1-99		14	11	5	5	25	10	19	16
	100-499		1	4	0	0	5	0	1	4
	>499		8	1	0	0	9	0	8	1
Day 12[ace]	0		17	23	24	26	40	50	41	49
	1-99		9	6	5	3	15	8	14	9
	100-499		5	1	1	0	6	1	6	1
	>499		0	0	0	0	0	0	0	0
Day 17	0		19	24	24	22	43	46	43	46
	1-99		7	4	3	6	11	9	10	10
	100-499		3	4	3	1	7	4	6	5
	>499		1	0	1	0	1	1	2	0
Day 19	0		19	26	21	21	45	42	40	47
	1-99		5	1	2	6	6	8	7	7
	100-499		4	3	5	2	7	7	9	5
	>499		1	0	4	1	1	5	5	1
Day 23[ag]	0		15	24	14	23	39	37	29	47
	1-99		10	3	10	5	13	15	20	8
	100-499		5	1	5	1	6	6	10	2
	>499		1	0	1	0	1	1	2	0

TABLE 7 CONTINUED

Sample date	Bolus	No No	No Yes	Yes No	Yes Yes	No	Yes	No	Yes
	AS 700								
		Number of calves							
Day 26[e]	0	20	27	19	23	47	42	39	50
	1-99	7	4	5	2	11	7	12	6
	100-499	2	0	4	1	2	5	6	1
	>499	1	0	3	2	1	5	4	2
Day 31	0	17	17	14	23	34	37	31	40
	1-99	11	10	13	5	21	18	24	15
	100-499	1	3	3	1	4	4	4	4
	>499	2	2	2	1	4	3	4	3
Day 87	0	25	32	32	29	57	61	57	61
	1-99	1	0	0	1	1	1	1	1
	100-499	0	0	0	0	0	0	0	0
	>499	1	0	0	0	1	0	1	0

[a] Heterogeneity among four treatment array (P<.05).
[b] Heterogeneity among four treatment array (P<.01).
[c] Heterogeneity among bolus treatments (P<.05).
[d] Heterogeneity among bolus treatments (P<.01).
[e] Heterogeneity among AS 700 treatments (P<.10).
[f] Heterogeneity among AS 700 treatments (P<.05).
[g] Heterogeneity among AS 700 treatments (P<.01).

TABLE 8. CHI-SQUARE ANALYSIS OF OOCYST SHEDDING FREQUENCIES BY AS 700 TREATMENT, TRIAL 2

Sample date	Oocyst counts/g feces	AS 700 treatment		
		A	B	C
		Number of animals		
Initial	0	12	17	12
	1-99	8	4	10
	100-499	0	1	1
	>499	0	0	1
Day 0	0	11	6	8
	1-99	17	23	22
	100-499	9	5	6
	>499	2	1	4
Day 3[a]	0	6	7	14
	1-99	20	18	20
	100-499	9	6	6
	>499	5	6	0
Day 6[c]	0	13	13	29
	1-99	21	21	10
	100-499	5	4	1
	>499	1	0	0
Day 10[b]	0	18	24	34
	1-99	17	12	5
	100-499	3	2	0
	>499	1	1	0
Day 13[c]	0	18	24	34
	1-99	19	13	4
	100-499	2	1	0
	>499	0	1	0
Day 17[b]	0	23	19	33
	1-99	15	19	5
	100-499	1	0	1
	>499	0	0	0
Day 19[a]	0	28	25	35
	1-99	10	11	3
	100-499	1	2	0
	>499	0	1	0
Day 24	0	27	29	31
	1-99	5	6	7
	100-499	0	1	0
	>499	0	0	0

TABLE 8 CONTINUED

Sample date	Oocyst counts/g feces	AS 700 treatment		
		A	B	C
		Number of animals		
Day 27[a]	0	26	31	31
	1-99	10	3	3
	100-499	1	0	0
	>499	0	0	0
Day 31[a]	0	27	37	34
	1-99	9	2	6
	100-499	0	0	0
	>499	0	0	0
Day 85	0	33	35	33
	1-99	4	2	7
	100-499	1	0	0
	>499	0	0	0

[a] Heterogeneity among three treatment array ($P<.10$).
[b] Heterogeneity among three treatment array ($P<.05$).
[c] Heterogeneity among three treatment array ($P<.01$).