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Introduction

Antibiotic supplementation for feedlot cattle is a common practice as a means of decreasing disease problems, improving feedlot performance and reducing the incidence of abscessed livers in cattle fed high-concentrate diets. Use of monensin in rations for feedlot cattle has rather consistently improved feed utilization. The use of monensin in combination with an antibiotic has not been extensively studied.

While the effects of monensin on energy metabolism are well documented, the effects on protein utilization are less certain. The changes in rumen fermentation which result from the use of monensin suggest that it might spare protein. Monensin tends to lower feed consumption 10 to 15% without appreciably altering rate of gain. This may indicate an improvement in protein utilization about equal to that for energy unless rations have generally been oversupplemented in protein. Questions about the protein needs of cattle fed monensin remain. Are the protein levels normally fed adequate or is a higher percentage of protein in the ration needed because of reduced feed intake? When protein supplements are fed at a constant daily rate, should the amount remain the same or can it be reduced when monensin is fed?

In this experiment we examined the response of finishing cattle to an antibiotic, tylosin, measured by feedlot performance and the incidence of abscessed livers and how tylosin might affect the response to monensin. Two protein levels were fed to determine the effects of these compounds alone and in combination on the need for protein supplementation in high-concentrate rations of corn grain and corn silage.

Procedure

The cattle used in this experiment were previously used in a growing experiment designed to investigate the effects of monensin when used with different sources of supplemental protein in high corn silage rations. The growing trial was immediately followed by an interim period of 26 days. All animals were fed identically during this period. They received 10 lb. per head per day of a corn-grain supplement mixture which contained added minerals and vitamin A but no high protein ingredients. In addition, they were fed 10 lb. of alfalfa-brome hay for the first 11 days of the interim period and 40 lb. per head per day of corn silage thereafter.

Following the interim period, the 192 Hereford steers, with an average initial shrunk weight (16 to 18 hr. without feed and water) of 862 lb., were allotted at random within weight groups to 24 pens of 8 head each without regard to previous treatment. The steers were confined to outside, concrete paved pens with water available from automatic waterers. All animals were implanted with Synovex-S at the beginning of the trial. The high-concentrate rations were introduced over a period of about 8 days. The rations were offered at a level of 10 lb. per head the first day and increased 1.88 lb. each day until the steers were on full feed. The cattle were fed once daily.

The eight experimental rations were fed as complete mixes consisting of 66.5% corn grain, 8.5% supplement and 25% corn silage on an as-fed basis. On a dry basis these percentages were 77.9, 11.7 and 10.4. Corn grain contained 87.7% dry matter and 10.7% protein, dry basis. Silage contained 34.9% dry matter and 9.6% protein, dry basis. Two types of rations were fed. One included no supplemental protein; the other contained a soybean meal supplement. Each ration treatment then included a control, monensin, tylosin or monensin-tylosin. Each of the eight treatments was fed to three pens. The protein level was about 10.4% for the unsupplemented rations and about 12.7% for the rations containing soybean meal, both on a dry basis. Ingredient composition of the supplements is shown in table 1.

Supplements were formulated so the rations would supply about the same levels of calcium, phosphorus and potassium. Salt, trace minerals, vitamin A and vitamin E were added to all rations. Tylosin was included in the appropriate rations to supply approximately 75 mg per head per day. Monensin was added to designated rations to supply 10 grams per ton of air-dry feed (11 ppm) for the first 3 weeks and 30 grams per ton (33 ppm) thereafter. Tylosin or monensin premixes, when added, replaced an equal weight of corn grain.

Results

During the course of the experiment, nine steers died or were removed because of illness. These losses occurred in six of the eight treatment groups and did not appear to be related to treatments. Weight gain data are presented for steers completing the experiment. Feed data were adjusted when losses occurred. Data for feedlot performance are shown in table 2.

Feed Consumption

Protein supplementation or the addition of tylosin resulted in essentially no difference in feed intake. The use of monensin reduced ($P<.10$) feed consumption an average of 9.8% compared to rations without monensin. This reduction was similar for the rations with and without soybean meal but slightly less when monensin was fed with tylosin. No reduction in intake occurred during the first 3 weeks when monensin was added at the rate of 10 grams per ton of air-dry ration (11 ppm). Feed consumption was consistently reduced by monensin addition throughout the rest of the experiment when the level was 30 grams per ton (33 ppm).

Average Daily Gain

Groups receiving monensin had higher daily gains during the first 3 weeks. During the same period, groups fed soybean meal without tylosin had lower gains than corn-fed groups. Based on past research, such a reduction in gain due to protein supplementation would not be anticipated. These differences were statistically nonsignificant and were not maintained. At the end of the trial, treatment had only small effects on rate of gain. The small advantage for soybean meal was most evident when rations contained monensin. The slight advantage for tylosin appeared rather consistent in all comparisons. Therefore, the highest average daily gain was obtained when feeding the soybean meal ration with added monensin and tylosin (7.5% more than for corn control).

Feed Efficiency

Soybean meal and tylosin additions resulted in only small and nonsignificant improvements in feed conversion, corresponding to their effects on weight gain. There was an improvement ($P<.01$) in the feed efficiency from monensin amounting to 10.3%. This effect was more pronounced with the soybean meal supplement (13.5%) than for the corn supplement (7.1%).

Carcass Data and Liver Abscesses

Carcass data and incidence of liver abscesses are shown in table 3. Carcass data collected revealed no differences which could be attributed to dietary treatments. Carcass grades averaged between high Good and low Choice. Incidence of abscessed livers was low for the steers fed these rations which provided low levels of roughage from corn silage. Tylosin appeared to have no appreciable effect under the low incidence encountered. Abscesses occurred in 7 of 92 steers not receiving tylosin and 5 of 91 fed rations containing tylosin.

Summary

Results of the experiment indicated no apparent benefit for soybean meal supplementation of a high-concentrate ration composed of corn grain and corn silage containing 10.4% protein for steers weighing 862 lb. except perhaps when feeding monensin. The level of protein in the unsupplemented rations was the same as that recommended by the National Research Council for steers of this weight and for the rate of gain observed. Monensin did result in a reduction ($P<.01$) in feed intake (9.8%) and an improved ($P<.01$) feed efficiency (10.3%). The improvement in feed efficiency was greater with the soybean meal supplement (13.5%) than with the corn supplement (7.1%). These results seem to differ from an experiment with a high corn silage ration (A.S. Series 76-20), where there appeared to be a slight protein sparing effect from monensin. Perhaps the reduction in feed intake becomes more important with high-concentrate rations if protein level is borderline.

Tylosin gave small but nonsignificant improvements in weight gains. Incidence of abscessed livers was low and tylosin had no appreciable effect under these conditions.

Treatments involved had no apparent influence on carcass characteristics measured.

Table 1. Ingredient Composition of Supplements (Air-Dry)

Ingredient	Corn supplement	SBOM supplement
	%	%
Corn	75.66	12.13
SBOM	--	67.63
Limestone	12.67	12.71
Potassium chloride	4.32	1.74
Calcium-phosphorus supplement (18-21% Ca, 18.5% P)	1.65	0.11
Trace mineral salt	5.68	5.68
Trace mineral premix	0.02	--
Vitamin A	11,400 IU/lb. suppl. DM	
Vitamin E	155 IU/lb. suppl. DM	
Added to appropriate supplements:		
Monensin		
10 g/ton air-dry ration (11 ppm), first 21 days	63 mg/lb. suppl. DM	
30 g/ton (33 ppm), after 21 days	189 mg/lb. suppl. DM	
Tylosin	39 mg/lb. suppl. DM	

Table 2. Protein Levels with Monensin and Tylosin for Finishing Cattle
(June 24 to October 8, 1976--106 days)
Feedlot Performance

	Control		Monensin		Tylosin		Monensin-Tylosin	
	Corn	SBOM	Corn	SBOM	Corn	SBOM	Corn	SBOM
No. animals	23	24	22	23	22	24	23	22
Init. shrunk wt., lb.	864	864	853	863	869	864	859	863
Final shrunk wt., lb.	1174	1176	1150	1187	1185	1187	1179	1197
Avg. daily gain to date, lb.								
22 days	2.31	1.96	2.76	2.49	2.17	2.31	2.92	2.98
50 days	3.18	2.94	2.78	3.16	2.68	3.27	3.10	3.30
78 days	2.75	3.08	2.71	2.99	3.01	3.11	2.95	3.03
106 days (filled)	2.91	2.84	2.78	3.00	2.89	2.92	2.96	3.03
106 days (shrunk)	2.92	2.95	2.79	3.06	2.99	3.04	3.01	3.15
Avg. daily ration to date, lb.								
22 days, as fed	19.89	19.57	20.34	19.89	20.22	19.89	20.32	20.39
50 days	23.62	23.50	21.97	21.83	23.87	23.49	22.27	22.15
78 days	24.45	24.83	21.88	22.25	24.58	25.01	22.97	22.80
106 days	25.45	26.18	23.01	22.97	25.97	25.99	23.74	23.76
106 days, dry basis	19.01	19.56	17.19	17.16	19.40	19.41	17.73	17.75
Feed/100 lb. gain to date, lb.								
22 days, as fed	861	998	737	799	932	861	696	684
50 days	743	799	790	691	891	718	718	671
78 days	889	806	807	744	817	804	779	752
106 days (filled)	875	922	828	766	899	890	802	784
106 days (shrunk)	872	887	825	751	869	855	789	754
106 days (shrunk), dry basis	651	663	616	561	649	639	589	563

Table 3. Protein Levels with Monensin and Tylosin for Finishing Cattle
(June 24 to October 8, 1976--106 days)
Carcass Data

	Control		Monensin		Tylosin		Monensin-Tylosin	
	Corn	SBOM	Corn	SBOM	Corn	SBOM	Corn	SBOM
No. animals	23	24	22	23	22	24	23	22
Init. shrunk wt., lb.	864	864	853	863	869	864	859	863
Final shrunk wt., lb.	1174	1176	1150	1187	1185	1187	1179	1197
Hot carcass wt., lb.	734	735	722	744	743	746	730	752
Dressing percent	62.47	62.47	63.02	62.29	62.69	62.85	61.94	62.80
Marbling[a]	4.8	4.8	5.1	4.6	4.7	4.8	4.6	4.9
Carcass grade[b]	18.3	18.3	18.7	18.1	18.3	18.5	18.2	18.6
Percent kidney fat	2.9	2.9	2.7	2.8	3.0	2.9	2.7	2.9
Fat thickness, in.	0.69	0.68	0.63	0.66	0.71	0.74	0.65	0.66
Rib eye area, sq. in.	11.77	11.71	11.68	11.99	12.04	12.17	11.78	12.24
Yield grade	3.7	3.8	3.6	3.6	3.8	3.8	3.6	3.6
No. animals with liver abscesses	1	2	2	2	2	0	3	0

[a] Slight = 4; small = 5.
[b] 18 = high Good; 19 = low Choice.