

IONOPHORES AND ANTIBIOTICS FOR FEEDLOT STEERS

D. R. Gill¹, C. Strasia², F. N. Owens¹ and J. J. Martin³

Story in Brief

One hundred sixty steers (734 pounds initially) were divided into four groups and fed a 95 percent concentrate diet (whole shelled corn, cottonseed hulls and supplement) for 132 days. Dietary treatments were 1) without supplemental ionophore or antibiotic, 2) with Terramycin (75 mg/day), 3) with Terramycin plus lasalocid (30 g/ton) or 4) with Tylan (90 mg/day) plus monensin (30 g/ton). Performance was satisfactory the first 62 days on test, but adverse weather conditions and mud in pens reduced feed intake and gains severely during the second half of the trial. Rate of gain tended to be more rapid with the diet supplemented with Terramycin plus lasalocid, especially during the first 62 days on trial. Feed intakes were slightly depressed with addition of Terramycin alone or Tylan plus monensin. Feed efficiency favored the Terramycin plus lasalocid diet the first 62 days on trial, but for the total trial, feed efficiency for cattle fed tylosin plus monensin was equal to that of steers fed Terramycin plus lasalocid, and both were superior to the diets without an added ionophore. Efficiency of feed use was improved above the negative control by adding lasalocid and oxytetracycline by 6.4, 9.2 and 4.9 percent based on feed/gain on live, carcass or calculated metabolizable energy, respectively.

Carcass weights, fat thicknesses and marbling scores, factors generally associated with heavier carcass weights, tended to be greater with added ionophores. No liver abscesses were noted with added ionophores though without added antibiotics, six steers had abscesses. Since the incidence of liver abscesses is often greater with ionophore feeding, absence of abscesses in this trial suggests that the added antibiotics were controlling liver abscesses. More experimentation on this point is needed.

Introduction

Ionophores typically increase efficiency of feed use by finishing steers by 5 to 12 percent. Yet, steers fed ionophores often exhibit a higher incidence of liver abscesses (Anonymous, 1980; Witt and Owens, 1980). Though minor abscesses may not depress rate of gain (Rust and Owens, 1980; Stanton, 1983), severe abscesses will reduce rate of gain and possibly reduce efficiency of feed use. Rate and efficiency of gain were reduced by 3 percent and 7.1 percent by abscesses in a summary by Farlin (1980). The value of the liver at slaughter usually does not exceed \$3/animal and, thereby, is a small fraction of the total value of the carcass, but Farlin suggested that a total of \$66.50 was lost due to reduced gain, efficiency and liver value due to presence of a liver abscess. In addition, cattle buyers often discriminate against cattle suspected to have a high incidence of abscesses. This encourages cattle feeders to feed antibiotics such as Aureomycin (chlortetracycline) Terramycin (oxytetracycline) or Tylan (tylosin) to reduce the incidence

¹Professor, Animal Science ²Area Specialized Agent ³Chairman,
Division of Agriculture, Panhandle State University

of abscessed livers at slaughter. Food and Drug regulations currently prohibit the simultaneous feeding of feed additives in combination unless they have been proven to be of benefit in combination. Tylosin is cleared for feeding with monensin, but other abscess-preventing antibiotics are not cleared for feeding with ionophores at this time. Terramycin has received less attention as an abscess-preventing antibiotic than tylosin and chlortetracycline. The objective of this experiment was to determine the influence of added ionophores and antibiotics on performance, liver abscess incidence and carcass characteristics of feedlot steers.

Materials and Methods

One hundred sixty steers were processed similar to receiving cattle at Hitch Feedlot, Guymon, OK and trucked to Goodwell for feeding on November 12, 1982. Steers were randomly allotted to 20 pens in two adjacent barns and the four dietary treatments assigned to three pens in one barn and two in the other. Composition of the four diets is presented in Table 1 and assays for drug content of the pelleted supplements are presented in Table 2. Drug assays agreed well with proposed drug concentrations.

Steers were weighed following trucking (shrunk) initially and without withdrawal of feed and water at subsequent times. Rates of gain are all calculated using a 5 percent pencil shrink of full weights. High rainfall and muddy lot conditions prevented weighing of animals at 28 day intervals and markedly depressed feed intake and rate of gain the last half of the trial. Steers were fed twice daily for the 132 day trial. On day 132, steers were weighed and trucked to Booker, TX and slaughtered and liver abscess and carcass data were obtained. Final weight was calculated from carcass weight divided by .62 based on an assumed dressing percentage of 62 percent.

Table 1. Diet composition, dry matter basis^a.

Ingredient	Percentage
Corn, whole shelled	89.00
Cottonseed hulls	5.00
Soybean meal	2.00
Cottonseed meal	1.85
Limestone	.90
Urea	.40
Dicalcium phosphate	.30
Potassium chloride	.25
Salt	.25
Premix ^b	.05

^a To provide 11.59% protein, .44% calcium, .33% phosphorus, and 3.23 mcal ME/kg dry matter

^b Pelleted supplement (6% of the diet) for specific treatments contained .562% Terramycin 10, .331% Bovatec 68, or .35% Rumensin 60 plus .675% Tylan 10. Vitamin A-30 also included at .165% of the supplement. These were formulated to supply ionophores at 30 g/ton of air dry feed and Terramycin at 75 mg/head daily or Tylan at 90 mg/head daily (assuming a daily feed intake of 20 pounds of dry matter/head).

Table 2. Drug assays of feed supplements.

Drug Assayed ^a	Control		Diet					
			Terramycin		Lasalocid Terramycin		Monensin Tylan	
Monensin	0 ^b	<5 ^c	0	NA ^d	0	0	450	450
Tylosin	0	0	0	NA	0	NA	135	NA
Lasalocid	0	0	0	0	450	459	0	17
Terramycin	0	0	112	95	112	99	0	NA ^c

^a Assayed by Elanco, Hoffman-LaRoche and Pfizer, respectively.

^b Theoretical concentration in supplement, g/ton.

^c Measured concentration in supplement, g/ton.

^d Not assayed.

Results and Discussion

Animal performance data are presented in Table 3. Two steers, both Simmental type animals, were removed from the data due to excessive weight losses during the stress period from day 62 to 111. The difference between final live weight and live weight calculated from carcass weight is very large, reflecting the very low dressing percentage (Table 4). This suggests that during recovery from a stress period with low weight gains, dressing percent may be low due to dehydration. It is unlikely that the low dressing percentage is attributable either to lack of carcass fat or to increased volume of the digestive tract since fat thickness over the rib, calculated yield grade and marbling score appeared typical and feed intake was not increased during the final portion of the trial. The reduced performance during the stress period cannot be explained by reduced feed intake alone, since the dietary metabolizable energy values calculated from performance were only about 2.7 compared to a calculated ME value of the diet of 3.2 (Table 1). This suggests that efficiency of conversion of feed energy to carcass energy was reduced during the stress period. Had sufficient time been available to recover from the stress, cattle may have exhibited compensatory weight gains.

Performance during the first half of the trial was satisfactory. Over the first month, gains of cattle fed the lasalocid-terramycin diet were considerably more rapid than steers on the other treatments but this difference disappeared during the remainder of the trial. Feed efficiency was significantly improved over the first half of the feeding trial by addition of these two materials. Feed intake is often reduced with monensin in the diet at the start of a feeding trial while such a reduction is seldom observed when lasalocid is fed. Over the total trial, efficiency of feed use on a live and on a carcass basis and ME of the diet, calculated from feed intake and rate of gain, were increased by lasalocid by 6.4, 9.2 and 4.9 percent, respectively. This indicates that despite the stress, ionophores were improving efficiency of feed use. Terramycin alone decreased feed intake and rate of gain slightly (4 percent and 2 percent) to improve feed efficiency by 2 percent.

Carcass characteristics were changed little by feed additives. No liver abscesses were noted with ionophores added to the diet, and added terramycin tended to decrease the incidence of liver abscesses.

Table 3. Gains and efficiencies of steers fed ionophores and antibiotics.

Ionophore Antibiotic	None None	None Terramycin	Lasalocid Terramycin	Monensin Tylan
Steers, number	39 ^a	39 ^a	40	40
Weights, lb				
Initial	734	733	737	736
28 days	879	879	897	880
62 days	983	980	1010	989
111 days	1059	1042	1076	1065
132 live ^b	1110	1098	1135	1119
132 carc ^b	1001	995	1032	1021
Daily gains, lb				
0-28 days	3.62	3.66	4.10	3.58
29-62 days	2.90	2.83	3.15	3.03
63-111 days	1.48	1.21	1.30	1.49
112-132 days	2.32	2.51	2.66	2.40
0-62 days	3.22	3.20	3.58	3.28
63-132 days	1.73	1.60	1.71	1.76
0-132 live ^b	2.43	2.35	2.59	2.48
0-132 carc ^b	2.03	1.99	2.23	2.16
Daily feed, lb				
0-28 days	21.6	20.9	21.0	20.9
29-62 days	19.9	18.5	19.9	19.1
63-111 days	17.6	17.1	17.7	16.3
112-132 days	17.1	17.0	17.0	16.9
0-62 days	20.7	19.6	20.4	19.9
63-132 days	17.5	17.1	17.5	16.5
0-132 days	19.0	18.3	18.9	18.1
Feed/gain				
0-28 days	5.97 ^c	5.73 ^{cd}	5.15 ^d	5.93 ^{cd}
29-62 days	6.88	6.62	6.50	6.38
63-111 days	6.88	6.62	6.50	6.38
112-132 days	7.46	6.87	6.39	7.27
0-62 days	6.41 ^c	6.14 ^{cd}	5.74 ^d	6.12 ^{cd}
0-132 live ^b	7.81	7.78	7.31	7.38
0-132 carc ^b	9.37	9.23	8.51	8.48
Metabolizable energy, mcal/kg	2.66	2.70	2.79	2.82
ME intake, mcal/day	22.9	22.4	23.9	23.2

^aOne steer removed from analysis due to poor performance.

^bBased on carcass weight divided by .62, an assumed dressing percentage.

^cMeans in a row with different superscripts differ ($P < .05$).

Marbling scores tended to be greater with added ionophores though the heavier carcasses may explain this difference.

Comparative effects of different antibiotics are presented in Table 5. Based on these summaries, chlortetracycline appears to increase gain and feed efficiency and decrease the incidence of liver abscesses in cattle slightly more than oxytetracycline. However, level at which the drugs are used may influence their effects on cattle performance.

Table 4. Carcass measurements for steers fed ionophores and antibiotics.

Ionophore Antibiotic	None	None	Lasalocid	Monensin
	None	Terramycin	Terramycin	Tylan
Carcass weight	621	617	640	633
Dress percent	58.9	59.2	59.3	59.6
Liver abscesses				
Incidence, %	10	5	0	0
Severity ^a	2.2	2.2	0	0
Rib eye area				
Square inches	11.6	11.4	11.8	11.6
Sq. in/cwt	1.88	1.86	1.85	1.84
Fat thickness, inches	.38	.39	.42	.42 ^{cd}
Marbling ^b	13.7 ^{cd}	13.2 ^d	14.5 ^c	14.1 ^{cd}
Yield grade	2.32	2.20	2.28	2.25
Cutability, %	51.0	50.9	50.8	50.7

^aMean Severity, Minor = 1; Severe = 3.

^bGood = 11; Choice = 14.

^cMeans in a row with different superscripts differ (P<.05).

Table 5. Comparison of antibiotic summaries.

Antibiotic	Trials	Antibiotic effect, %				Liver Abscesses	Source
		Gain	Intake	Efficiency			
Chlor	34	+4.3	+5	+3.7		Burroughs	
Chlor	31	+5.6	-1.7	+7.0		Burroughs	
Chlor 350	9	+4.8	+2.2	+2.5	-57%	Gill ^a	
Chlor	4				-76%	Foster & Woods	
Bacitracin	6				+1%	Foster & Woods	
Terramycin	1				-33%	Foster & Woods	
Terramycin	4	+3	-1.5	+3.3	-41%	This summary	

^aDelivered 6/19/1983 at Bovatec conference, San Diego, California.

Literature cited

- Anonymous. 1975 Rumensin Technical Manual, p. Q-6, Elanco Products Co., Indianapolis, IN.
- Burroughs, W., C.E. Summers, W. Woods, and W. Zmolek. 1959 Feed Additives in Beef Rations. Anim. Sci. Leaflet. 805, Iowa State University, Ames.
- Farlin, S.D. 1980. Liver abscesses. Beef 16 (12):44.
- Foster, L. and W. Woods. 1970. Liver losses in finishing cattle. Nebraska Beef Cattle Report EC 70-218.

- Stanton, T.L. 1983. The effect of Rumensin-Tylan or Bovatec on liver abscesses and average daily gain of feedlot cattle. Colorado State University Beef Program Report, Special Series 22:7.
- Rust, S.R., F.N. Owens and D.R. Gill. 1980. Liver abscesses and feedlot performance. Okla. Ag. Expt. Sta. Misc. Publ. 107:148.
- Witt, K.E., F.N. Owens, and D.R. Gill. 1980. Rumensin for feedlot steers--A six trial summary. Okla. Ag. Exp. Sta. MP-107:125.