COMPARISON OF IONOPHORES FOR FEEDLOT STEERS

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Story in Brief

One hundred eighty-nine yearling steers were fed whole shelled corn diets 1) without additives or with 2) salinomycin (10 g/ton of feed), with lasalocid (30 g/ton of feed) both without (3) and with (4) Terramycin (75 mg/head daily), with 5) monensin (25 g/ton of feed) plus tylosin (90 mg/head daily) added for the complete trial (103 days) or with 6) lasalocid-Terramycin for the first half (56 days) of the trial followed by monensin-tylosin the last half of the 103-day finishing trial. Feed intakes tended to be increased by all ionophores except lasalocid fed alone, with the highest feed intake for steers receiving the salinomycin diet. Gains and efficiency were greatest for the steers fed salinomycin, however steers fed lasalocid-Terramycin during the first half and monensin-tylosin the final half of the trial gained 6.4 percent faster and 8.1 percent more efficiently than the mean of steers fed the two different diets for the total trial. Gain and efficiency improvements for the total trial were: (live basis) 23 percent and 11 percent; 4.5 percent and 4.9 percent; 8.9 percent and 4.9 percent; 7.7 percent and 5.2 percent and 10.1 and 7.0 percent for the 5 supplements, respectively. Carcass weights, fat thickness over the rib, marbling scores and percent of carcass graded choice were greater with treatments that increased feed intakes and rates of gain.

Introduction

Ionophores of several types have been tested for feedlot cattle. Lasalocid and monensin are currently approved by the FDA, though some other compounds like salinomycin appear promising from earlier studies (Owens and Gill, 1982b). Combinations of ionophores with antibiotics appear helpful to reduce the incidence of liver abscesses though such combinations require additional FDA clearances.

A study with lasalocid-Terramycin and monensin-tylosin reported elsewhere in this publication (Gill et al., 1984) and other feeding trial results suggest that the major advantage of lasalocid over monensin is observed early in a feeding trial. Feed intake is depressed to the greatest degree by monensin during the initial weeks of feeding. Steers fed monensin usually gain more rapidly and compensate later in a feeding trial. An alternative explanation which has been offered is that ruminal fermentation may adapt to an ionophore and switching to another ionophore will improve performance. Though other sequences and times could be chosen for switching ionophores, our previous work suggested that lasalocid should be more beneficial early in a feeding study and monensin may be more useful later. This trial was conducted to test the idea of switching ionophores midway in a feeding trial and to further

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evaluate salinomycin.

Materials and Methods

One hundred ninety-two yearling crossbred steers with some brahman breeding were selected from a group of 500 steers which had received routine feedlot vaccinations and ear tags at Hitch Feedlot, Guymon, Oklahoma. Steers were adapted to a starting feedlot diet in a single pen for 30 days prior to trucking 6 miles to Goodwell, Oklahoma on May 21, 1983.

On arrival, steers had a shrunk weight of 759 pounds. They were allocated to 6 treatments in 24 pens in 2 barns, with one replication in the "steer" barn and three replications in the "bull" barn at Panhandle State University. Three steers died during the trial from causes not related to the experimental treatments. Compositions of the adaptation and finishing diets are presented in Table 1. Steers received diet 1 for 2 days, diet 2 for 2 days, diet 3 for 5 days, diet 4 for 7 days, diet 5 for 7 days and diet 6 for the remainder of the trial. Steers were weighed full on days 28, 56, 84 and 103.

Additives being tested in addition to 1) an additive-free diet included 2) salinomycin at 10 g/ton of feed, 3) lasalocid at 30 g/ton of feed, 4) lasalocid plus Terramycin at 75 mg/head daily, 5) monensin at 25 g/ton of feed plus tylosin at 90 mg/head daily and 6) a switch from the lasalocid-Terramycin diet to the monensin-tylosin diet (diet 3 to diet 4) on day 56 of the experiment. Cattle being fed compounds currently approved by the FDA were slaughtered on either day 103 or 110,

Table 1. Diet composition, dry matter basis[a].

Ingredient	Percentage
Corn, whole shelled	88.14
Corn silage	4.00
Soybean meal	3.71
Cottonseed meal	2.00
Limestone	1.00
Urea	.45
Molasses	.38
Salt	.30
Premix[b]	.02

[a] To provide 11.78% protein, .43% calcium, .34% phosphorus, .49% potassium and 3.23 mcal ME/kg dry matter.

[b] Pelleted supplement (7.86% of the diet) for specific treatments contained .213% Salinomycin 30 (theory 128 g/ton, found 117.67 g/ton), .478% Terramycin 10 (theory 96.64 g/ton, found 70 g/ton), .2816% Bovatec 68 (theory 383 g/ton, found 369.5 g/ton), or .2652% Rumensin 60 (theory 318.37 g/ton, found 312.5 g/ton) plus .5739% Tylan 10. Vitamin A-30 also included at .281% of the supplement. These were formulated to supply lasalocid at 30 g or monensin at 25 g/ton ton of air dry feed, 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).

Silage was substituted for whole corn to get the cattle on feed. Diet 1 contained 40% corn silage, Diet 2 30%, diet 3 20%, Diet 4 15%, Diet 5 10%, and the final ration 4% as indicated in the table.

while the FDA test groups were switched to an additive-free diet for 9 days prior to slaughter on day 110. Steers were trucked 70 miles to Booker, Texas for slaughter on day 103 or 110 of the trial and slaughter and carcass data were obtained. Weights are reported on a full basis while gains and feed efficiencies were calculated using a 5 percent pencil shrink. Gains and feed efficiencies for the total trial were calculated from hot carcass weights assuming a dressing percentage of 62. After removal of barn effects, treatment means for performance and carcass data were compared using the statistical analysis package of SAS (Barr and Goodnight, 1976) and Duncan's Multiple Range Test.

Results and Discussion

Performance and carcass data are presented in Tables 2 and 3. Live weight gains during the first half of the feeding period tended to be greater with added ionophores, while during the last half of the trial, only steers receiving salinomycin and monensin gained more rapidly than control steers. Rates of gain generally reflected level of feed intake. Salinomycin feeding increased feed intake by 7.4 percent in this trial, somewhat more than the 2.0, 2.3 and 2.4 percent increases with salinomycin at 10 g/ton in previous trials at OSU (Owens and Gill, 1982;

Table 2. Steer performance with various ionophores and antibiotics.

Ionophore	None	Salinomycin	Lasalocid	Lasalocid	Monensin	Switch*
Antibiotic	None	None	None	Terramycin	Tylosin	
Pens of steers	4	4	4	4	4	4
Steers	32	32	32	32	31	30
Weights						
Initial	754$_{b}$	759	760$_{ab}$	758$_{ab}$	768$_{ab}$	755$_{ab}$
56 days	929$_{b}$	975$_{a}$	953$_{ab}$	962$_{ab}$	956$_{ab}$	958$_{ab}$
103 days	1061$_{b}$	1128$_{a}$	1079$_{b}$	1090$_{ab}$	1096$_{ab}$	1090$_{ab}$
Daily gains, lb						
0-56	2.30$_{b}$	2.99$_{a}$	2.60$_{ab}$	2.78$_{a}$	2.52$_{ab}$	2.78$_{a}$
57-103	2.68$_{ab}$	3.10$_{a}$	2.56$_{b}$	2.58$_{b}$	2.83$_{ab}$	2.66$_{ab}$
0-103	2.47$_{b}$	3.04$_{a}$	2.58$_{b}$	2.69$_{b}$	2.66$_{b}$	2.72$_{b}$
0-slaughter	2.91$_{c}$	3.45$_{a}$	2.96$_{c}$	3.11$_{bc}$	2.92$_{c}$	3.23$_{b}$
Daily feed, lb						
0-56	19.5$_{b}$	21.0$_{a}$	19.2$_{b}$	20.3$_{ab}$	19.8$_{ab}$	19.7$_{ab}$
57-103	18.6$_{b}$	20.6$_{a}$	18.5$_{b}$	19.2$_{ab}$	19.2$_{ab}$	19.2$_{ab}$
0-103	19.1$_{b}$	20.8$_{a}$	18.9$_{b}$	19.8$_{ab}$	19.5$_{ab}$	19.5$_{ab}$
0-slaughter	19.0	20.4	18.8	19.4	19.4	19.2
Feed/gain						
0-56	8.57$_{a}$	7.02$_{b}$	7.46$_{b}$	7.28$_{b}$	7.90$_{ab}$	7.18$_{b}$
57-103	7.02	6.69	7.30	7.51	6.82	7.26
0-103	7.75$_{a}$	6.86$_{b}$	7.37$_{ab}$	7.37$_{ab}$	7.35$_{ab}$	7.21$_{ab}$
0-slaughter	6.55$_{a}$	5.92$_{b}$	6.37$_{a}$	6.25$_{ab}$	6.65$_{a}$	5.93$_{b}$
Metabolizable energy mcal/kg	2.98$_{b}$	3.17$_{a}$	3.04$_{b}$	3.08$_{ab}$	2.97$_{b}$	3.17$_{a}$

*Switched from lasalocid-Terramycin to monensin-tylosin diet on day 56.
$_{abc}$ Means in a row with different superscripts differ ($P<.05$).

Table 3. Slaughter and carcass data of steers fed ionophores and antibiotics.

Ionophore Antibiotic	None None	Salinomycin None	Lasalocid None	Lasalocid Terramycin	Monensin Tylosin	Switch*
Carcass weight	656^{d}	706^{a}	663^{cd}	682^{abc}	665^{bcd}	688^{ab}
Dressing percent	64.8^{ab}	64.5^{ab}	64.5^{ab}	64.7^{ab}	63.7^{b}	65.3^{a}
Liver abscess						
Incidence, %	3.1^{b}	6.2^{b}	18.8^{a}	9.4^{b}	3.6^{b}	0.0^{b}
Severity[d]	2	1.5	1	1	1	0
Rib eye area,	12.3	12.1	12.2	12.3	12.3	12.4
Kidney-heart-pelvic						
fat, %	1.50^{c}	1.74^{a}	1.53^{bc}	1.73^{ab}	1.62^{abc}	1.70^{abc}
Fat over rib						
in.	.36^{b}	.46^{a}	.38^{ab}	.43^{ab}	.42^{ab}	.37^{b}
Marbling score[e]	10.2^{b}	11.6^{a}	10.7^{ab}	10.8^{ab}	11.5^{ab}	11.8^{a}
Cutability, %	51.6^{a}	50.2^{b}	51.3^{a}	50.8^{ab}	51.0^{ab}	51.2^{a}
Percent choice	15.6	31.2	18.8	13.8	28.6	32.1

[a,b,c] Means in a row with different superscripts differ ($P<.05$).
[d] 1 = abscess of small size; 2 = many abscesses or one or moderately large abscess.
[e] 10 = slight minus; 11 = average slight.

Ferrell et al., 1983). Gains with the monensin-tylosin combination were slightly less than with the lasalocid-terramycin diet, especially during the first half of the trial, so that the switch from one ionophore to the other midway in the trial produced greater gains and efficiencies than either ionophore fed throughout the total trial. Whether adjusting ionophore levels or switching to other ionophores would cause similar responses remains to be tested. Improvements in rate of gain adjusted to an equal carcass basis with these additives were: 18.6, 1.7, 6.9, .3 and 11.0 percent for salinomycin, lasalocid, lasalocid plus Terramycin, monensin plus tylosin, and the cattle switched from lasalocid-Terramycin to monensin-tylosin. Efficiency improvements on a carcass weight adjusted basis for these same treatments were: 9.6, 2.7, 4.6, -1.5 and 9.5 percent. Much of this increase in efficiency is due to altered feed intake, since calculated ME values for the diets, which correct for feed intake, are increased less than efficiency of feed use. Changes in ME were: 6.4, 2.0, 3.4, -.3 and 6.4 percent.

Carcass weight differences correspond with differences in rate of gain discussed above. Dressing percentages were all high. The incidence of liver abscesses appeared to be greater when antibiotics were not present. With heavier weight carcasses, kidney-heart-pelvic fat, fat thickness over the rib, marbling score and percentage of choice carcasses tend to increase as might be expected.

Results of this trial confirm that of previous trials that salinomycin appears to be useful as an ionophore for feedlot cattle. The idea of switching feedlot cattle from one ionophore to another during a finishing period merits further research, as it appears to permit growth rate and efficiency to be enhanced further than either ionophore fed throughout the trial. Efficiency early in the trial for this group was about 1.4 percent superior to that of steers fed lasalocid-Terramycin throughout the trial and superior to that of steers fed monensin-tylosin, whereas following the switch, efficiency was

slightly superior to that of steers continued on lasalocid-Terramycin. Further study of switching from one ionophore to another is needed before the practice can be endorsed.

Literature cited

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