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PROGRESS REPORT

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Ionophores for programmed-fed growing heifers

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One major goal of feedlot managers is reducing amount of feed required to produce a unit of weight gain. With programmed feeding, feed intake is limited to attain a prescribed daily weight gain throughout a feeding period. Such a feeding program, which is based on net energy requirements for maintenance and weight gain above maintenance for cattle of known weight and sex (NRC, 1984), consuming a fixed quantity of feed, has improved feed efficiency in some cases (Zinn, 1987; Hicks et al., 1990).

Several studies have evaluated effects of ionophores fed singly, continuously or alternately on performance of growing/finishing cattle. Previous results indicated that feed efficiency was improved ($P < .05$) for steers fed monensin plus tylosin and lasalocid alternated daily in a 90% concentrate diet compared with continuous monensin plus tylosin or lasalocid (Morris et al., 1990). Because little is known regarding efficacy of various ionophores with limit or programmed feeding, we conducted an experiment with beef heifers that were fed an 85% concentrate diet at restricted intake.

Three hundred twelve crossbred heifers [avg body weight (BW) = 562 lb] were used in a randomized block design. Heifers were weighed on two consecutive days at the beginning of the trial and blocked into light, medium and heavy weight groups. They were then allotted randomly to one of four treatments (six pens of 13 heifers/pen for each treatment) consisting of: C - control (no ionophore); M/T - monensin fed continuously at 200 mg/head plus tylosin fed continuously at 75 mg/head; L/OTC - lasalocid fed continuously at 200 mg/head plus oxytetracycline at 75 mg/head; R - daily rotation of M/T and L/OTC. All heifers were fed an 85% concentrate diet with an estimated 1.83 mcg/kg NEm and 1.14 Mcal/kg NEg (as-fed basis). Level of feed intake (based on average BW of heifers in a pen) was programmed to produce a daily of gain of 1.4 lb/day. The trial consisted of three 28-day periods with heifers weighed individually at the end of each 28-day interval. New feed allowances were calculated for each period based on 28-day pen BW. Heifers were weighed on two consecutive days at the end of the trial. Six heifers died during the trial from causes apparently unrelated to treatment. Dry matter (DM), ash, crude protein acid detergent fiber and acid detergent lignin were determined on feed samples ground in a Wiley mill (2-mm screen; Table 1).

Results (Table 2) indicated that during the first 28-d period heifers receiving L/OTC gained less ($P < .01$) than those fed M/T or R diets, with control heifers having intermediate gains. Feed-to-gain ratio was greater ($P < .01$) for heifers fed control and L/OTC compared with heifers fed M/T; heifers fed R had an intermediate feed efficiency.

In the second 28-day period, heifers on all three ionophore treatments had slightly greater ($P < .01$) DM intake than did controls; these differences in feed intake were a result of differences in BW among pens on various treatments, and the resultant effect that BW differences had on programmed feed intake. Heifers receiving M/T or L/OTC had improved ($P < .05$) daily gains compared with control heifers during the second 28 days, but no differences were detected in feed efficiency among treatments during this period.

Daily gain was improved ($P < .05$) among heifers receiving any of the three ionophore treatments compared with control heifers during the third 28-day period. Feed efficiency also was improved ($P < .01$) for M/T heifers compared with controls during this period. Over the 84-day trial, feed intake did not differ among treatments, but daily gain was greater ($P < .01$) among heifers fed M/T and R compared with heifers fed the control diet. Feed efficiency for the 84-d period did not differ statistically among treatments, but averaged 6% better for ionophore-treated heifers than for controls.

Observed weight gain-to-predicted weight gain ratio for days 0 to 84 indicated that heifers in all four treatment groups used feed energy more efficiently than predicted by net energy equations, with heifers receiving the R or M/T treatment having 43 and 59%, respectively, greater ($P < .01$) weight gain than predicted. Control and L/OTC heifers had 24 and 31%, respectively, greater observed than predicted weight gains for the 84-day period. Hence, in our experiment, the net energy system (NRC, 1984) underestimated daily gain by heifers that were programmed fed a high concentrate diet. Use of ionophores either fed continuously or in a daily rotation program, improved daily gain and feed efficiency, suggesting that these feed additives should be included in diets used in limit- and programmed-feeding applications.

Table 1. Chemical composition of programmed-fed heifer diets.

Item	Treatment			
	Control	Monensin + tylosin	Lasalocid + oxytetracycline	Daily rotation
	%			
Dry matter	79.2	79.3	81.9	80.6
Ash	6.3	6.5	6.1	6.3
Crude protein	12.9	13.7	13.2	13.4
Acid detergent fiber	11.1	11.9	12.2	12.1
Acid detergent lignin	4.3	4.1	4.4	4.2

References

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Table 2. Effects of ionophore treatments on feed intake, daily gain, feed-to-gain ratio and observed gain as percentage of predicted gain in programmed-fed beef heifers.

Item	Treatment				SE ^a
	Control	Monensin + tylosin	Lasalocid + oxytetracycline	Rotation	
Initial BW, lb	551.7	559.4	565.5	573.9	
Final BW, lb	695.6	733.7	721.5	739.2	
DM intake, lb/head daily					
First 28 days	11.7	11.4	11.9	11.9	.24
Second 28 days	11.5 ^d	12.3 ^e	12.6 ^e	12.8 ^e	.17
Third 28 days	12.8	12.5	12.8	12.6	.18
Overall	12.1	12.0	12.5	12.4	.15
ADG, lb					
First 28 days	2.1 ^{de}	2.4 ^e	1.9 ^d	2.3 ^e	.09
Second 28 days	2.0 ^b	2.2 ^c	2.2 ^c	2.1 ^{bc}	.06
Third 28 days	1.2 ^b	1.6 ^c	1.5 ^c	1.5 ^c	.08
Overall	1.8 ^d	2.1 ^c	1.9 ^{de}	2.0 ^e	.05
Feed:gain					
First 28 days	5.6 ^e	4.9 ^d	6.4 ^e	5.2 ^{de}	.28
Second 28 days	5.7	6.0	5.7	6.6	.40
Third 28 days	10.8 ^c	8.1 ^d	8.8 ^{de}	8.4 ^{de}	.53
Overall	6.8	6.0	6.7	6.4	.23
Observed ADG as a percentage of a predicted ADG					
0 to 84 days	124.3 ^d	159.4 ^e	130.7 ^{de}	143.1 ^e	4.8

^aSE is standard error of the mean, n = six pens.

^{bc}Means in the same row with different superscripts differ (P<.05).

^{de}Means in the same row with different superscripts differ (P<.01).



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