PERFORMANCE OF DAIRY HEIFERS FED HIGH FORAGE DIETS SUPPLEMENTED WITH BAMBERMYCINS, LASALOCID, OR MONENSIN

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Summary

One hundred and twenty Holstein heifers weighing approximately 450 lb at the beginning of the study were used to evaluate the impact of bambermycins (Gainpro®), monensin (Rumensin®), and lasalocid (Bovatec®) on performance when included in high forage diets fed ad libitum. Heifers were housed in 24 pens (5 hf/pen) containing a super hutch. Pens were blocked (3 pens/block) from heaviest to lightest and randomly assigned within blocks to bambermycins, lasalocid, or monensin treatment. Bambermycins, lasalocid, and monensin were mixed with fine ground corn and fed as topdressing to deliver 20.25, 150, and 150 mg/hd daily, respectively. Diets were formulated (NRC 2001) to support body weight gains of less than 2 lb/hd daily using a mix of chopped alfalfa hay and corn silage (lighter weight heifers) or chopped alfalfa hay, chopped prairie hay, and corn silage (heavier weight heifers) supplemented with a mineral/vitamin premix. All heifers were fed a common total mixed ration, differing only in topdressing. Diets were fed once daily for ad libitum intake. The study continued until the average bodyweight exceeded 800 lbs. (140 days on study) at which time they were inseminated and first service conception rate determined.

Heifers fed monensin consumed less dry matter (DMI) ($P<0.05$) than those fed bambermycins and lasalocid during the periods d 29 to 56, 57 to 84, and 113 to 140 but DMI was similar across treatments during the 140-day study. No differences were observed for ADG over the 140-d study but heifers fed bambermycins and monensin tended ($P=0.06$) to gain faster during days 85 to 112 than heifers fed lasalocid. Feed efficiency (gain/feed) varied, but heifers consuming diets containing bambermycins and monensin were more efficient ($P<0.05$) during days 85 to 112 and tended to be more efficient ($P=0.051$) during the 140-day study than heifers consuming lasalocid. Bodyweight, condition score, and hip height were similarly influenced by dietary treatments. First service conception rates were 60, 47 and 55% for heifers fed bambermycins, lasalocid, and monensin, respectively.

(Key Words: Inophores, Growth, Heifers.)

Introduction

Replacement dairy heifers represent the future herd and ultimately the success of the producer. Lactational performance of dairy cows is a function of genetics and management. The management part of the equation begins when the heifer is born and continues until it leaves the herd. Recently, interest has been refocused on the impact of heifer rearing programs on lactational performance because producers are breeding heifers to calve at an earlier (less than 24 months) age in order to reduce rearing cost. Calving heifers at less than 24 months of age and weighing 1300 lbs. at calving may require a growth rate of greater than 1.8 lbs daily. Earlier work at Michigan State University indicated that rapid growth (greater than 1.8 lb daily) between 3 and 9 months of age has a negative effect on first

lactation performance. However, this concept has been questioned because the genetic potential for growth is perceived to be different in today's heifer compared to heifers 35 years ago. Heifer growth rate is influenced by the rate of accumulation of lean body tissue (protein) and fat deposition. One of the current concepts related to heifer growth is that growth rates greater than 1.8 lb daily do not have a negative impact on mammary development if growth is primarily due to an increase in lean body tissue between 3 and 9 months of age. Thus, diets formulated to support rapid growth but limit depositions of body fat are receiving increased attention.

A second issue of interest to producers is cost of gain. Target feeding programs have been developed such that targeted growth rates are achieved with minimal feed consumption and minimal feed cost. Target feeding programs assume that the nutritional requirements of growing dairy heifers can be met with a limit fed diet if it contains the correct nutrient mix and density. Target feeding programs are generally less expensive (cost per lb of gain) than ad libitum feeding programs that contain a high percentage of forage. However, many producers that grow their own forage continue to develop replacement dairy heifers on high forage diets.

Ionophores (monensin and lasalocid) are extensively used as diet supplements for dairy heifers. Monensin, in particular, has been shown to improve rate of gain and feed efficiency in heifers offered limit-fed diets. Recently, bambermycin has been approved as a feed additive for dairy heifers. Feed additives that enhance performance, reduce cost of gain, and promote the deposition of lean body tissue are important components of dairy heifer nutritional programs. The major decision for the producer is which additive to use.

Several studies at this station have evaluated the relative impact of monensin and lasalocid on heifer performance when included in a limit-fed target-feeding program. We are unaware of studies that directly compare these ionophores with bambermycin. The purpose of this study was to evaluate the relative impact of bambermycin and ionophores on the performance of dairy heifers when included in high forage diets.

Procedures

One hundred and twenty Holstein heifers were transported from Cimarron Dairy, Cimarron, Kansas (5 hr trip) 21 days prior to initiation of the study. All heifers received a Micotil ® injection (10 mg/kg bodyweight) immediately prior to transport and on day 5 after arrival at the Kansas State University study site. The heifers also received Safe Guard® dewormer (5mg fenbendazole/kg bodyweight) 5 days after arrival. A common total mixed ration (TMR) consisting of chopped alfalfa hay, corn silage, and concentrate was fed during the 21 day site acclimation period. The heifers were weighed on two consecutive days prior to assignment to treatment and ranked from highest to lowest bodyweight. Heifers were blocked (3 heifers/block) starting with the heaviest and proceeding to the lightest, then heifers within blocks were randomly assigned to pens until 5 heifers were assigned to each of 24 pens. Pens were blocked (3 pens/block) from heaviest to lightest and randomly assigned within blocks to bambermycins, lasalocid, or monensin treatment. Bambermycins, lasalocid, and monensin were mixed with fine ground corn and fed as topdressing to deliver 20.25, 150, and 150 mg/hd daily, respectively.

Diets were formulated (NRC 2001) to support bodyweight gains of less than 2 lb/hd daily using a mix of chopped alfalfa hay and corn silage (lighter weight heifers) or a mix of chopped alfalfa hay, chopped prairie hay, and corn silage (heavier weight heifers) supplemented with a mineral/vitamin premix. All heifers were fed a common TMR, differing only

in treatment topdressing. Diets were fed once daily for ad libitum intake. Orts were measured daily and the amount fed adjusted to insure 10 percent refusals. Feed ingredients were sampled weekly and composited by 28-day period for compositional analysis. Heifers were weighed on two consecutive days at the beginning of the study and at the end of each 28-day period. Body condition was scored and hip height measured at the beginning of the study and at the end of each 28-day period. Pen was used as the experimental unit in data analysis. All heifers were inseminated at the end of the study using a time-breeding protocol and first service conception rate determined.

Results and Discussion

The average chemical composition of feed ingredients used in the study is shown in Table 1. Diet composition (Table 2) is shown for weight groups ranging from 450 to 750 lbs in 50 lb increments. The response of heifers to treatments are shown in Tables 3 and 4. Heifers fed monensin consumed less DM ($P<0.05$) than those fed bambermycins and lasalocid during the periods 29 to 56 days, 57 to 84 days, and 113 to 140 days but DMI was similar across treatments during the 140-day study. No differences were observed for ADG over the 140-day study but heifers fed bambermycins and monensin tended ($P=0.06$) to gain faster during the 85 to 112 day period than heifers fed lasalocid. Feed efficiency (gain/feed) was variable across the 28-day periods, but heifers consuming diets containing bambermycins and monensin were more efficient ($P<0.05$) during the 85 to ll2 day period and tended to be more efficient ($P=0.051$) during the 140-day study than heifers consuming the diet containing lasalocid. Bodyweight, condition score, and hip height (Table 4) were similarly influenced by dietary treatments. The first service conception rates (Table 4) were 60, 47, and 55% for heifers fed bambermycins, lasalocid, and monensin, respectively.

The results of this study are interesting because earlier studies at this station found that heifers limit fed diets containing monensin out performed heifers limit fed diets containing lasalocid. The limit fed diets contained primarily chopped alfalfa hay and corn silage with no prairie hay and were formulated to be deficient in energy and surplus in protein similar to diets in the present study. Apparently, lasalocid is better suited for use with ad libitum feeding programs than it is with limit-fed targeted-gain programs. However, the difference in feed efficiency between treatments approached significance ($P=0.051$) with heifers fed bambermycins and monensin being the most efficient and should be considered when selecting the appropriate supplement to include in diets for dairy replacement heifers.

Table 1. Feed Ingredient Analysis

	Ingredient				
Component	Alfalfa Hay	Prairie Hay	Corn Silage	Concentrate*	Topdressing
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% DM	90.60	92.75	35.56	89.00	88.53
% Crude protein	21.26	6.03	10.21	44.90	8.74
NEG, Mcal/lb	0.30	0.25	0.44	0.66	0.68
ADF	33.29	41.62	26.97	7.00	3.87
NDF	43.41	64.35	44.77	8.80	9.20
NFC	27.77	22.85	37.63	N/A	76.40
Ca	1.50	0.78	0.29	2.04	1.50
P	0.30	0.09	0.30	1.39	1.01

*Contains 46.5% corn grain, 48.35% of 48% SBM, 1.25% molasses, 1.55% TM salt, 0.6% dicalcium phosphate, 0.3% vitamin A, D, E premix, and 1.45% vitamin E. It was only used during the first 28 days of this study.

Table 2. Diet Composition, % of Dry Matter

	Live Body Weight, lb							
Ingredient	450*	500*	500	550	600	650	700	750
Alfalfa hay	67.00	63.52	54.57	39.64	39.95	36.30	38.17	34.23
Prairie hay	0.00	0.00	0.00	14.16	16.65	24.2	14.68	19.97
Corn silage	3.00	10.89	34.10	35.39	33.30	30.25	38.17	37.07
Corn grain	13.20	11.98	10.00	9.34	8.79	7.99	7.75	7.53
SBM, solv. 48% CP	15.00	11.80	0.00	0.00	0.00	0.00	0.00	0.00
Molasses	0.30	0.27	0.00	0.00	0.00	0.00	0.00	0.00
Dicalcium phosphate	0.23	0.36	0.33	0.41	0.33	0.35	0.35	0.34
Salt	0.50	0.45	0.55	0.63	0.54	0.54	0.53	0.51
Vitamin A, D, E	0.30	0.28	0.07	0.07	0.06	0.06	0.06	0.06
Vitamin E	0.47	0.45	0.38	0.36	0.38	0.31	0.29	0.29

*Offered only during the first 28 days of study.

Table 3. Performance Response of Heifers to Treatments

Item	Bambermycin	Lasalocid	Monensin	SEM	*P*-value
Pens	8	8	8		
No. heifers	40	40	40		
Daily intake (DM), lb					
01-28 days	14.62	14.68	14.84	0.1853	0.8051
29-56 days	16.18[ab]	16.69[a]	15.81[b]	0.1601	0.0177
57-84 days	16.49[ab]	16.98[a]	5.96[b]	0.1517	0.0398
85-112 days	17.72	17.88	16.93	0.1636	0.0659
113-140 days	19.22[a]	18.87[a]	18.25[b]	0.1420	0.0492
1-140 days	16.84	17.02	16.36	0.1462	0.1014
Average daily gain (ADG), lb					
01-28 days	2.05	2.05	2.18	0.0439	0.2681
29-56 days	2.01	2.12	2.05	0.0279	0.3467
57-84 days	2.05	2.03	2.03	0.0255	0.9268
85-112 days	2.34	2.05	2.18	0.0380	0.0633
113-140 days	1.94	1.87	1.90	0.0341	0.6280
1-140 days	2.07	2.03	2.07	0.0177	0.4587
Efficiency (gain/feed)					
01-28 days	0.1401	0.1390	0.1467	0.0053	0.5309
29-56 days	0.1237	0.1268	0.1297	0.0034	0.3674
57-84 days	0.1243	0.1193	0.1278	0.0035	0.1988
85-112 days	0.1314[a]	0.1148[b]	0.1291[a]	0.0039	0.0197
113-140 days	0.1017	0.1000	0.1037	0.0045	0.6340
1-140 days	0.1234	0.1191	0.1265	0.0021	0.0515
First service conception rate, %					
	60.00	47.00	55.00		0.53

[a,b]Means not bearing common superscripts differ ($P<0.05$).

Table 4. Body Weight, Hip Height, and Body Condition Score

	Treatment				
Item	Bambermycin	Lasalocid	Monensin	SEM	*P*-value
Body weight, lb					
day 0	542.75	541.45	545.90	4.7376	0.3926
day 28	600.36	598.70	607.06	5.3074	0.1516
day 56	656.31	657.99	664.40	5.5050	0.2104
day 84	713.70	714.67	721.46	5.3719	0.2668
day 112	779.13	773.59	782.61	5.8993	0.2542
day 140	833.69	824.78	835.48	5.4601	0.3371
Change/period	48.50	47.22	48.28	0.4139	0.4587
Hip height, in					
day 0	45.65	45.60	45.63	0.7174	0.9863
day 28	46.37	46.55	46.75	0.6052	0.2920
day 56	47.20	47.28	47.45	0.5908	0.6038
day 84	48.70	48.60	48.67	0.5256	0.9097
day 112	49.30	49.40	49.30	0.5575	0.9223
day 140	50.30	50.37	50.25	0.5442	0.9122
Change/period	0.77	0.79	0.77	0.1172	0.9006
Body condition score (BCS)					
day 0	3.29	3.35	3.36	0.0290	0.1301
day 28	3.26	3.26	3.30	0.0362	0.4608
day 56	3.24	3.21	3.29	0.0267	0.0542
day 84	3.16	3.15	3.16	0.0134	0.7528
day 112	3.22	3.22	3.23	0.0149	0.9067
day 140	3.16	3.17	3.19	0.0287	0.7817
Change/period	-0.02	-0.03	-0.03	0.0083	0.6963