Effects of 28-day Rotation of Monensin and Laidlomycin Propionate on Commercial Cattle Performance During the Growing Phase

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Abstract

The rotation of ionophores in feedlot cattle diets has been suggested to enhance performance, but short-term rotations have not consistently shown benefits and are not compliant with feeding instructions for continuous feeding. This study evaluated the influence of multiple 28-day rotations of ionophores on the performance of heifers in a commercial feedlot during the growing phase. Data were collected from 584 crossbred heifers (initial body weight = 639 ± 57 lb) blocked by arrival date. Within each block, heifers arrived in groups that were randomly divided into two pens. Pens within each group (n = 10) were randomly assigned to receive either consistent dietary monensin inclusion at 18.8 g/ton dry matter (DM [MON]) or alternating dietary inclusion of monensin (18.8 g/ton DM) and laidlomycin propionate (7.4 g/ton DM) every 28 days, repeated twice during the 112-day trial (ROT). The basal growing diet contained steam-flaked corn (43.5% DM), mixed hay (25.7% DM), wet distillers grains (18.4% DM), alfalfa hay (6.7% DM), supplement (4.9% DM), and corn oil (0.8% DM). Pen weights were recorded every 28 days, and DM intake (DMI) was calculated from daily feed delivery records. Across days 0–56, ROT heifers tended to have improved feed:gain compared with MON ($P = 0.06$), with no difference in average daily gain (ADG) or DMI ($P > 0.10$). Across days 0–84, feed:gain tended to be improved for ROT ($P = 0.06$) with no differences in ADG or DMI ($P > 0.10$). Over the full 112-day trial, ADG ($P < 0.01$) and feed:gain ($P < 0.01$) were improved for ROT compared to MON with no differences in DMI ($P > 0.10$). These results suggest that two 28-day rotations of monensin and laidlomycin propionate during the growing phase can improve feed efficiency and ADG in limit-fed feedlot heifers compared to consistent monensin feeding.

Introduction

Ionophores are commonly included in feedlot diets to improve feed efficiency by altering ruminal fermentation. Because ionophores differ in their ionic selectivity and effects on ruminal microbes, it has been proposed that management strategies combining these mechanistic distinctions could enhance ruminal fermentation and improve cattle performance. Ionophore rotation in beef cattle diets has been investi-

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gated since the 1980s, with some studies reporting improvements in feed conversion of up to 6% (Morris et al., 1990; Shreck et al., 2016). Ionophore label instructions require "continuous feeding," which the Food and Drug Administration (FDA) defines as a minimum duration of 14 consecutive days. Experimental evidence indicates that the ruminal microbial and fermentation responses to monensin may change approximately 14–42 days after initiation (Crossland et al., 2017; Guan et al., 2006). Short-term rotation studies with daily or weekly rotation intervals have not demonstrated consistent performance benefits (Casey et al., 1994; Morris et al., 1990). Accordingly, a 28-day rotation interval was selected for this study to coincide with this response window and to align with feedyard management schedules. The objective of this study was to investigate the influence of multiple 28-day rotations of dietary monensin (Rumensin 90; Elanco, Indianapolis, IN) to laidlomycin propionate (Cattlyst 50G; Phibro Animal Health Corporation, Teaneck, NJ) during a 112-day growing period on feedlot heifer performance.

Experimental Procedures

The trial was conducted from August 12, 2024, to December 30, 2024, at Clark County Feeders, a commercial feedyard located in Minneola, Kansas. Cattle were received on a rolling basis, resulting in three trial enrollment dates staggered every 14 days. Heifers were housed in drylot pens that allotted 21.5 ± 8.3 in./head of bunk space. Each pen was equipped with an automatic water tank.

A total of 584 commercial beef heifers were enrolled with an average initial body weight (BW) of 639 ± 57 lb. Heifers arrived at the feedyard in three arrival date blocks staggered 14 days apart. Within each block, heifers arrived in groups that were randomly divided into two pens, resulting in an average of 59 ± 15 animals per pen (n = 10). Dietary treatment was randomly assigned to pens within group within block. Following processing, all heifers were acclimated to the facility on a standard commercial starter ration containing decoquinate (Deccox; Phibro Animal Health Corporation) for 28 days with no ionophore included in the ration. After the 28-day acclimation period, cattle were started on one of two dietary treatments: 1) MON: basal diet (57.2 Mcal/cwt net energy for gain (NEg) and 14.3% crude protein) containing 18.8 g/ton dry matter (DM) monensin for 112 days, or 2) ROT: basal diet (57.2 Mcal/cwt NEg and 14.3% crude protein) with the ionophore source alternated every 28 days between 18.8 g/ton DM monensin and 7.4 g/ton DM laidlomycin propionate. The rotation of dietary ionophore inclusion for ROT occurred twice, resulting in two complete 28-day feeding periods for each ionophore and a total feeding period of 112 days (Table 1).

Throughout the trial, cattle were limit-fed to achieve a targeted average daily gain (ADG) of approximately 3.0 lb per animal per day with feed delivered twice daily (morning and afternoon). The basal growing diet was 72.2% DM and formulated on a DM basis to contain 43.5% steam-flaked corn, 25.7% mixed hay, 18.4% wet distillers grains, 6.7% alfalfa hay, 4.9% pelleted protein blend, and 0.8% corn oil (Table 2). Diet composition was consistent across treatments except for the ionophore source. Ionophores were added to the ration using a micro machine. Diets were manufactured on-site and delivered to each pen using commercial-grade horizontal rotary feed mixer trucks.

On day 0 and day 112, pen weights were recorded using a platform pen scale prior to morning feeding to obtain shrunk weights. Interim pen weights were collected at 28-day intervals using the facility's platform pen scale and were adjusted to 96% of the recorded value to approximate shrunk weights and account for gut fill. Dry matter intake (DMI) was determined from daily feed delivery records maintained by the AMS management platform (Turnkey Computer Systems, Loveland, CO).

Data were analyzed as a randomized block design with pen as the experimental unit. Performance models included the fixed effect of treatment with a random effect of placement block. The feed-to-gain ratio was analyzed as gain-to-feed ratio and converted. Prespecified pen-level covariates (bunk space, headcount) were screened as fixed effects and were not retained ($P > 0.10$). Statistical significance was declared at $P \leq 0.05$, with tendencies at $0.05 < P \leq 0.10$. Analyses were performed in R (version 4.4.1; R Core Team, 2024) using lme4, car, and emmeans.

Results and Discussion

Over the entire 112-day growing period, rotating monensin and laidlomycin propionate every 28 days improved ADG ($P < 0.01$) and feed efficiency (feed:gain) ($P < 0.01$) compared with consistent monensin feeding, while DMI remained unaffected ($P > 0.10$) (Table 3). The results demonstrate that alternating ionophores at 28-day intervals can enhance animal performance by 8.7% in commercial feedlot settings, which is consistent with earlier reports of rotational benefits.

The performance response to rotation appeared to improve as the trial progressed. As expected, across days 0-28, when no ionophore differences between treatments were introduced, no treatment differences were observed for ADG, DMI, or feed:gain (Table 3), thereby demonstrating effective allocation of cattle groups to pens within each block. Across days 0-56, when MON cattle had been exposed to 56 days of dietary monensin and ROT cattle had been exposed to 28 days of dietary monensin followed by 28 days of dietary laidlomycin propionate, ROT had a tendency for improved feed:gain compared to MON ($P = 0.06$). The ADG was numerically greater for ROT (3.76 versus 3.44 lb/day; $P = 0.16$), and DMI did not differ between treatments ($P > 0.10$) (Table 3). Across days 0-84, after ROT cattle had received 56 total days of monensin inclusion diet with an interim 28-day rotation of laidlomycin propionate inclusion diet, feed:gain again tended to be greater for ROT ($P = 0.06$), while ADG and DMI did not differ ($P > 0.10$) (Table 3). The tendency for improved feed:gain for ROT heifers was driven by similar DMI between treatments and a numeric improvement in ADG for ROT.

These interim responses indicate that during the early phase (days 0-56), responses were minimal, but differences became more apparent following repeated cycles of ionophore alternation. Possible explanations include enhanced responses in less efficient cattle later in the growing phase and/or shifts in rumen microbial populations due to repeated exposure to alternating ionophores. Importantly, intake did not differ between treatments, indicating that improvements in gain and efficiency are reflective of differences in nutrient utilization rather than changes in consumption. It should also be considered that the interim weights collected were not true shrunk measures but were instead adjusted using a 4% shrink, and additional variability may be present due to the weight collection methods.

Overall, these findings provide novel evidence that ionophore rotation using laidlomycin propionate in the growing phase can be a practical tool for improving cattle performance under commercial conditions. Because the FDA defines continuous feeding as 14 days or longer, the 28-day intervals used in this study represent a label-compliant approach to alternating monensin and laidlomycin propionate in commercial feedyard rations. Additional research is warranted to better understand the biological basis for these responses and to evaluate the consistency of benefits across production phases.

Implications

Rotating monensin and laidlomycin propionate every 28 days during the growing phase improved gain of limit-fed beef heifers by 8.7% compared with consistent monensin feeding, indicating a label-compliant strategy with potential performance value for feedlot producers.

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Table 1. Ionophore included in ration by day for treatment groups

Days on feed	MON[1]	ROT
1-28	Monensin	Monensin
29-56	Monensin	Laidlomycin propionate
57-84	Monensin	Monensin
85-112	Monensin	Laidlomycin propionate

[1] MON = Monensin treatment; ROT = Rotational ionophore treatment.

Table 2. Ingredient and nutrient composition of ration (dry matter basis)

	% of dry matter (DM)	
Ingredient	MON[4]	ROT
Steam-flaked corn	43.5	43.5
Ground mixed hay[1]	25.7	25.7
Wet distillers grains	18.4	18.4
Alfalfa hay	6.7	6.7
Pelleted protein blend	4.9	4.9
Corn oil	0.8	0.8
Monensin[2], g/ton DM	18.8	18.8[a]
Laidlomycin propionate[3], g/ton DM	---	7.4[b]

[1] Blend of sorghum hay and wheat straw.
[2] Monensin in form of Rumensin 90 (Elanco Animal Health, Greenfield, IN).
[3] Laidlomycin propionate in form of Cattlyst 50G (Phibro Animal Health Corp, Teaneck, NJ).
[4] MON = Monensin treatment; ROT = Rotational ionophore treatment.
[a] Day 1-28, 57-84.
[b] Day 29-56, 85-112.

Table 3. Cumulative cattle performance across multiple 28-day periods of study of monensin (MON) versus rotational ionophore treatment (ROT) heifers

Days on feed	Item[1]	MON	ROT	SEM[2]	*P*-value
1-28[a]	ADG, lb/day	3.53	3.63	0.26	0.71
	DMI, lb/day	18.50	18.70	0.70	0.84
	Feed:gain	5.26	5.10	0.24	0.61
1-56[b]	ADG, lb/day	3.44	3.76	0.17	0.16
	DMI, lb/day	20.40	20.60	0.68	0.64
	Feed:gain	5.88	5.32	0.22	0.06
1-84[c]	ADG, lb/day	3.27	3.39	0.09	0.20
	DMI, lb/day	21.80	21.90	0.68	0.95
	Feed:gain	6.54	6.21	0.12	0.06
1-112[d]	ADG, lb/day	3.12	3.39	0.09	<0.01
	DMI, lb/day	23.00	23.10	0.72	0.78
	Feed:gain	7.14	6.58	0.14	<0.01

[1] ADG = average daily gain, DMI = dry matter intake.
[2] Standard error of the mean.
[a] From day 1-28, MON and ROT both received monensin for 28 days.
[b] From day 1-56, MON received monensin for 56 days; ROT received monensin for 28 days followed by laidlomycin propionate for 28 days.
[c] From day 1-84, MON received monensin for 84 days; ROT received 56 total days of monensin with an interim 28 days laidlomycin propionate.
[d] From day 1-112, MON received monensin for 112 days; received monensin for a total of 56 days and laidlomycin propionate for a total of 56 days alternating ionophore inclusion every 28 days.