THE EFFECTS OF IONOPHORE SUPPLEMENTATION ON REPLACEMENT HEIFER DEVELOPMENT

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Story in Brief

Sixty spring-born heifer calves were randomly assigned by weight and breed using a completely randomized design to evaluate the effects of ionophore feeding on replacement heifer development. Heifer weights averaged 461 lb at the initiation of supplementation. Heifers received 5 lb of a 25% protein supplemented to provide 0 (Control), or 200 mg monensin/hd daily (Monensin), beginning November 6, 1992 through April 27, 1993. Heifers were weighed after a 12-hour shrink period every 28 days to evaluate weight changes throughout the developmental period. Blood samples were collected beginning March 3, 1993, and serum was harvested for progesterone assays. Heifers were introduced to two bulls on April 27, 1993 for a 60-day breeding season. Ionophore supplementation did not increase gain during the supplementation period. However, after supplementation was stopped control heifers gained more weight through the breeding season. Total gain favored the control animals due to the difference in weight changes during the breeding season. There was no difference in age and weight at puberty between treatments. However, final pregnancy rates were numerically higher for ionophore supplemented animals. We interpret these data to show the importance of adequate weight gain during the developmental stage. It appears that monensin may not hasten puberty when daily weight gains are less than .54 lb/head from weaning to the beginning of the breeding season.

(Key Words: Replacement Heifers, Ionophore, Puberty, Native Range.)

Introduction

Management of replacement heifers is a key variable for many cow/calf operations. Sufficient gains throughout the developmental period are necessary to achieve adequate reproductive performance. However, attaining adequate gains necessary to provide optimal reproductive performance can be a challenge. Ionophores have been shown to hasten puberty independent of weight gain (Mosely et al., 1982). The incorporation of ionophores in heifer development on range may enhance reproductive success. Current literature is lacking concerning the ability of ionophores to hasten puberty at the low rates of gain, commonly encountered with heifers grazing on dormant winter range.

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The objectives of this trial were to determine the effects of monensin on weight gains and on the onset of puberty by spring-born heifers.

Materials and Methods

This trial was conducted at the Range Cow Research Center 12 miles west of Stillwater, OK. Sixty spring-born Hereford and Hereford x Angus heifers were allotted by breed and weight to one of two treatment groups. All heifers were fed 5 lb/day of a soybean meal-based supplement (Table 1) to provide 0 (Control) or 200 mg/day monensin. Supplementation began November 6, 1992 and ended April 27, 1993. Supplement amounts were prorated for feeding only 5 days each week. Heifers were fed individually in covered stalls and all heifers grazed the same pasture. Prairie hay (CP=4.4%) was provided free choice from January 6, 1993 through March 29, 1993.

All weights were measured after an overnight withdrawal from feed and water. Initial (Nov 5, 1992), ending weights for supplement gain (April 27,

Table 1. Diet compositions and nutrient content of supplements (dry matter basis).

	Treatment [a]	
	Control	Monensin
Ingredients		
Soybean Meal	37.5	37.5
Wheat Middlings	56.2	56.2
Cane Molasses	4.0	4.0
Dical Phosphate	.58	.58
Limestone	1.6	1.6
Vitamin A-30,000	.04	.04
Rumensin (60 gr/lb)	---	.07
Amount Fed, lb/day	5.0	5.0

[a] Nutrient Composition % (calculated)

Crude Protein	28.70
Phosphorus	1.09
Calcium	1.01
Potassium	1.84
NEm, Mcal/cwt	77.96
NEg, Mcal/cwt	49.21

1993) and gain until breeding (June 22, 1993) were calculated as the average of two shrunk weights taken 24 hours apart. Ending weights (Nov. 15, 1993) for summer weight gain were taken once following an overnight shrink.

Heifers were exposed to two bulls for natural service for 60 days beginning April 30. From April 30 through November 2, 1993, heifers were commingled and grazed native range. No supplement was offered during this time; however, heifers had free access to water and a complete mineral mix. On November 2, 1993 all heifers were rectally palpated for pregnancy diagnosis.

Weekly blood samples were taken beginning March 3, 1993 for progesterone analysis. Puberty was defined as two consecutive weekly progesterone concentrations greater than 1 mg/ml. Pubertal weight was calculated by regression analysis using weights taken before and after puberty.

Statistical analysis was performed using general linear model of SAS (1982). The model included treatment and breed. Weight at puberty was attained by regression analysis. Pregnancy data were analyzed by performing one-sided *t*-tests with alpha = .05.

Results and Discussion

Heifer body weights and ages did not differ between treatments at the initiation of the trial (Control: 458 lb, 281 days; Monensin: 462 lb, 284 days). Weight gain averaged across the 171-day supplementation did not differ (Table 2), although intermittent weight gain differed. During period two, control heifers gained more than monensin fed heifers. Heifer gain during this period was poor because of extremely cold and wet conditions. Other studies have reported that monensin enhances animal performance more at higher rates of gain. During the first period (Nov. 6 to Dec. 4) the rate of gain was about .7 lb/day and not affected by monensin. During the second period (Dec. 5 to Jan. 4) gains were only .25 lb/day and monensin reduced gains significantly (.24 vs -.05 lb/day). Monensin may reduce intake of low quality forages, so when temperatures were very cold and rain fell almost everyday, monensin feeding probably reduced energy intake. During the third and fourth periods (Jan. 5 to Mar 5) animals had free access to prairie hay so gains were about 1 lb/day. During these periods, monensin-fed heifers gained .14 and .28 ($P<.05$) lb/day more. On March 29, 1993 hay supplementation was stopped and heifers on both treatments lost weight. We interpret this period effect to reflect the importance of available forage for adequate weight gain.

After supplementation was stopped, two bulls were introduced for a 60-day breeding season. Control heifers gained 14.4 lb more than heifers fed monensin during the breeding season so that control heifers weighed more than Monensin-fed heifers at the end of the summer grazing season (808 vs 794; $P<.05$). This difference is primarily due to the greater weight gain during the breeding season.

Table 2. The effect of ionopore supplementation on weight gains of developing replacement heifers.

	Treatment	
	Control	Monensin
Item		
Beginning weights (11/6/91)	458[a]	462[a]
Beginning of breeding weights (4/27/92)	531[a]	536[a]
End of breeding weight (6/22/92)	620[a]	610[b]
Ending weight (11/15/92)	808[a]	794[b]
Intermediate weight gains during supplementation, lb/d		
11/6 - 12/4, 28 days	.73[a]	.68[a]
12/5 - 1/4, 31 days	.24[a]	-.05[b]
1/5 - 2/2, 28 days	.96[a]	1.10[a]
2/3 - 3/5, 31 days	1.12[a]	1.40[b]
3/6 - 4/1, 27 days	-.20[a]	-.14a
4/2 - 4/27 26 days	.37[a]	.26[a]
Intermediate weight gain following supplementation, lb/d		
4/27 - 5/25 28 days	1.53[a]	1.24[b]
5/25 - 6/22 28 days	1.68[a]	1.49[b]
Combined gain, lb/days		
Supplement gain, 171 days	.55[a]	.55[a]
Breeding gain, 56 days	1.61[a]	1.35[b]
Summer gain, 115 days	1.64[a]	1.57[a]
Total gain, 342 days	1.02[a]	.96[b]

[a,b] Means in the same row with different superscripts differ (P<.05).

Monensin supplementation did not hasten puberty compared to controls (Table 3) in contrast to other studies (Mosely et al. 1982; Purvis et al. 1993). In those studies, daily gain prior to breeding was greater than 1 lb, compared with only .54 lb in our study. No study has evaluated the rate of gain needed throughout the developmental stage prior to breeding season for monensin to affect puberty. Pregnancy rates, determined by rectal palpation on November 2, 1993, showed a numeric advantage for monensin treatment compared to Control (65% vs. 55%; P=.45). Blood sampling ceased on June 22, 1993, but bulls remained with the heifers until June 29, 1993. Therefore, more ION heifers exhibited behavioral estrus during this time period.

Table 3. The effects of ionophore supplementation on age and weight of puberty in the spring born heifer.

	Treatment	
	Control	Monensin
No. of heifers	30	29
Age, days		
initial	281[a]	284[a]
Puberty		
Age, days	459[a]	461[a]
Weight, lb	589[a]	584[a]
Pregnancy rate %	55[a]	65[a]

[a,b] Means in the same row with different superscripts differ (P<.05).

This study indicates that monensin supplementation of spring-born heifers wintered on native range had no impact the onset of puberty. We believe the monensin response is related to rate of gain. The observation that control heifers gained faster than monensin-fed heifers during the breeding season following the cessation of supplementation cannot be explained currently. Additional animals will be used in a replication of this study to evaluate effects of monensin on reproductive performance.

Literature Cited

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