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THE EFFECTS OF TWO ZERANOL PREWEANING IMPLANTS ON THE SUBSEQUENT REPRODUCTIVE PERFORMANCE OF BEEF HEIFERS

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ABSTRACT

Eighty-seven spring born heifer calves in three trials were assigned to receive either 0 or 2 Zeranol implants during the suckling period to study the effect of Zeranol on subsequent reproductive performance. In trial 1 heifers were stratified by weight and age at 73 ±6 d to either a control group or a treatment group which received one 36 mg Zeranol implant followed by a second implant at 157 d of age. In trial 2 every other heifer born served either as a control or received one 36 mg Zeranol implant on day one followed by a second implant at 90 ±8 d. In trial 3 heifers were assigned by weight and age to either a control group or a treatment group which received one 36 mg implant at 35 ±9 d and a second implant at 120 d of age. No differences ($P > .05$) in percent of the heifers exhibiting estrus following synchronization or in percent conception rate during the breeding season were observed in trials 1 and 3. In trial 2 fewer ($P < .05$) implanted heifers than control heifers conceived during the breeding season comparing 64.2% vs. 91.6%. In trial 2 implanted heifers had larger ($P < .05$) pelvic areas than non-implanted heifers. Implanted heifers in all three trials had higher ($P < .05$) average daily gains (ADG) and adjusted weaning weights than non-implanted heifers. This study suggests that (1) implanting heifer calves twice preweaning will improve gain performance and increase weaning weights, (2) if the first implant occurs on or after 35 d of age yearling reproductive performance will not be affected, (3) implanting at birth reduces yearling conception rates.

INTRODUCTION

Zeranol, known commercially as Ralgro, is a widely used anabolic agent that has been shown to increase weight gain and improve feed conversion in steers and heifers. The affects of Zeranol on the performance of finishing cattle is well documented: Borger et al., 1973; Baker and Ganyou, 1983; and Vanderwert et al., 1983. Zeranol has also been approved for implanting young calves prior to weaning. Zeranol, when implanted preweaning, has been demonstrated to have a beneficial effect on the weight per day of age and on the weaning weight values of nursing calves (Walker, 1981). Considerable data has also been generated demonstrating that steer and heifer calves implanted with Zeranol preweaning also respond positively (have an increased average daily gain and improved feed efficiency) to Zeranol when it is reimplanted post weaning (Ralgro News, 1983). Little data is available, however, regarding the efficacy of preweaning Zeranol implantation of heifer calves on their subsequent reproductive performance. What data is available is somewhat contradictory.

Muncy, et al. (1980) found that implanting heifer calves with Zeranol will suppress pubertal development. Ott, et al. (1982) found that implanting yearling heifers prior to the breeding season did not affect pregnancy rate but did result in conception occurring later in the breeding season.

Cow-calf producers make their initial replacement heifer selection at weaning. Currently, most producers do not implant their heifer calves prior to weaning because little is known about what affect Zeranol has on future reproductive performance. Consequently, the producer is not receiving the greatest preweaning performance possible from those heifer calves that are not kept as replacements.

OBJECTIVE

The objective of this study was to examine the effects of implanting suckling heifer calves with Zeranol on subsequent reproductive performance. Criteria measured were (1) rate of gain and feed efficiency to weaning; (2) physiological abnormalities at weaning and one year of age; (3) fertility at a synchronized estrus; (4) ease of calving of first calf; (5) milk production of first lactation and (6) conception rate during the breeding season following the birth of the first calf.

MATERIALS AND METHODS

During the calving seasons of 1982, 1983 and 1984 Chianina crossbred heifer calves were assigned to receive either 0 or 2 Zeranol implants preweaning to study the effect of Zeranol on subsequent reproductive performance (table 1). In trial 1, 25 heifers were stratified by weight and age at 73 days of age into either a treatment group or a control group. In the treatment group 13 heifers received one Zeranol implant (3-12 mg pellets) at 73 d ±6 d and another implant 82 d later at 155 d of age. In trial 2 every other heifer born received one Zeranol implant on day one and again 90 d ±8 d later. Accordingly, this procedure resulted in 14 heifers receiving two Zeranol implants preweaning and 12 heifers serving as controls. A total of 26 heifers were enrolled in trial 2. In trial 3, 36 heifers were stratified by weight and age at 35 d ±9 d into either a treatment group or a control group. In the treatment group 18

heifers received one Zeranol implant at 35 d ±9 d and another implant 85 d later at 120 d of age.

All heifers in each trial were creep fed on Pinpointer computer feeders which allowed for individual feed consumption to be recorded. All heifers in each trial were fed the same creep feed (table 2). While creep feed was provided from birth, actual consumption was not measured until approximately day 60 postpartum. Weaning weights are a reflection of adjusted 205 day steer equivalent weaning weights calculated according to Carr and Ricketts (1978). Average daily gain values reflect actual ADG as measured from birth to weaning. Following weaning all heifers within each trial were handled as one herd unit and were fed a corn silage based diet according to NRC estimates.

In trials 1, 2, and 3 all heifers were synchronized at 13-14 months of age and then bred at one timed insemination followed by pasture exposure to a bull for 60 days.

During trial 2 heifer calves were phenotypically scored at weaning for condition, conformation and frame size according to the Illinois Beef Performance Testing Procedures. In addition, each heifer was given a phenotypic abnormality score. The abnormality score included a visual examination of udder and vulva development, a generally coarse appearance, and abnormally large tailheads. According to the abnormality score each heifer was assigned a value between one and seven (one = normal, seven = abnormal). All phenotypic scores reflect the mean value of three technicians working independently. When the heifers in trial 2 were approximately one year of age, they were again scored for phenotypic abnormalities and were measured for size of the pelvic canal with a Rice Calipers. Size of the pelvic area was calculated by multiplying height times width. At the same time each heifer's reproductive tract was examined by rectal palpation and scored as either normal size or infantile. Any abnormalities observed were also recorded.

During trial 2 all heifers were rectally palpated 45 days following the end of the 60-day breeding season. All open heifers were culled at this time. Culled heifers were slaughtered within two weeks and their reproductive tracts were analyzed for abnormalities. All bred heifers were allowed to calve. Subsequent calving occurred during February and March of 1986. Ease of calving was measured subjectively according to the following procedure:

1 = no difficulty — no assistance
2 = minor difficulty — some assistance
3 = major difficulty — calf pulled
4 = Caesarian section — very difficult
5 = abnormal presentation

Each calf was weighed at birth and length of the rear cannon bone was measured. All calves were implanted with 3-12 mg pellets of Zeranol at birth. Reimplantation occurred 80 days later. A creep feed was provided to all the calves from birth until weaning.

Subsequent fertility of the first calf heifers (those implanted with Zeranol preweaning and controls) was measured according to conception rates to a timed insemination followed by a 60 day natural breeding season. These conception rates were determined by rectal palpation 45 days following the end of the breeding season.

Administering Zeranol preweaning and its effect on the subsequent milk production of the first calf heifer was determined by two methods. Method one consisted of calculating the adjusted 205 day weaning weight ratio of their calves and comparing the resulting values between implanted and nonimplanted heifers. The second method consisted of milking the heifers on one day of each month from calving through weaning via vacuum machine and then calculating an average 4% fat corrected milk production for each cow.

When each heifer's first calf was weaned, trial 2 was terminated. This occurred on September 9, 1986.

Performance data were analyzed by least squares analysis of variance and reproductive data were analyzed by Chi-square procedures according to procedures outlined by Neter and Wasserman (1978).

RESULTS AND DISCUSSION

The results of trial 1 can be found in table 3. No differences ($P>.05$) in percent of the heifers exhibiting estrus following synchronization or in percent conception rate during the breeding season were observed between the two treatments. Average daily gains were significantly higher for the heifers receiving Zeranol comparing 1.10 kg vs. 1.01 kg. Hence, adjusted 205 d weights were also higher ($P<.05$) for the implanted heifers comparing 226.4 kg to 207.3 kg. While differences ($P<.05$) in ADG and adjusted 205 d weights were observed, no significant differences in average daily feed intake (ADF) or G:F values were found. Trial 1 suggests that two Zeranol implants preweaning improve gain performance without decreasing yearling reproductive performance when the first implant does not occur before 73 d of age.

The results of trial 2 can be seen in tables 4, 5, and 6. ADG preweaning were different ($P <.05$) comparing 1.32 kg vs. 1.05 kg. Likewise adjusted weaning weights were different at the 10% confidence level and approached significance at ($P<.05$). Again ADF and G:F ratios were not different ($P>.05$) between implanted and non-implanted heifers. While no differences ($P >.05$) in estrus exhibition following synchronization were observed, heifers implanted at birth and again at 90 d did tend to trend lower numerically in percent exhibiting estrus comparing 85.7% vs. 91.7%. Significantly fewer implanted heifers conceived during the breeding season comparing 64.2% vs. 91.6%. Following rectal palpation all open heifers were slaughtered and their reproductive tracts were examined. For the most part these open heifers were observed to have small inactive or infantile ovaries (table 6). This trial would suggest that implanting Zeranol at birth may decrease yearling reproductive performance.

At weaning heifers were (1) given a numerical frame score, (2) measured for hip height, (3) given condition scores and (4) given phenotypic abnormality scores. No differences ($P >.05$) in any of these characteristics were noted between the implanted and non-implanted heifers.

Just prior to the breeding season all the heifers in trial 2 were measured for height and width of the pelvic opening with a Rice Calipers. Size of the pelvic opening was then calculated multiplying height times width. Implanted heifers had larger ($P<.10$) pelvic openings than non-implanted heifers but no difference was

observed at the 5 percent level of confidence. In addition, yearling hip heights, weights, condition scores and phenotypic abnormality scores were not different ($P > .05$) between the two groups of heifers. This data suggests that implanting Zeranol at birth improved gain performance to weaning without altering post weaning performance other than fertility as discussed previously.

All those heifers in trial 2 that conceived were allowed to calve. Calving ease scores were obtained as were birth weights and weaning weights of each heifer's first calf. In addition, each heifer was milked once each month during her first lactation by vacuum machine and an average daily 4% fat corrected milk production (4% FCM) was calculated. No differences ($P < .05$) in any of these performance parameters were found, regardless of implant treatment.

The results of trial 3 can be found in table 7. No differences ($P > .05$) in the percent of the heifers exhibiting a synchronized estrus or in percent conception rate during the breeding season were observed between the two groups. ADG were significantly higher for those heifers receiving Zeranol (1.18 vs. 1.04 kg.). Therefore, adjusted 205 d weights were also higher ($P < .05$) for the implanted heifers comparing 286.9 kg to 254.1 kg. As in trial 1 ADF and G:F values were not different ($P > .05$) between the two treatments. Trial 3 suggests that two Zeranol implants preweaning improve gain performance to weaning without decreasing yearling reproductive performance when the first implant occurs as early as 35 d of age.

CONCLUSION

In summary, our study suggests that (1) implanting heifer calves twice with Zeranol preweaning will improve gain performance and increase weaning weights. (2) If the first implant occurs at either 35 d or 73 d no adverse effects on postweaning reproductive performance will be observed. (3) If, however, the first implant occurs at birth the producer should expect to observe reduced yearling conception rates. It should be noted that at the present time implanting heifers with Zeranol which are to be kept for breeding purposes is not approved by the Food and Drug Administration.

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Table 1. Experimental Design

Trial No.	Treatment	No. of Heifers	Implant Times
1	+Ralgro	13	73 ±6 d, 157 ±d
	-Ralgro	12	
2	+Ralgro	14	Od, 90 ±8 d
	-Ralgro	12	
3	+Ralgro	18	35 ±9 d, 120 ±9 d
	-Ralgro	18	

Table 2. Creep Feed Composition

Item	Percent of Diet
Corn cobs (IFN1-02-782)	20.5
Alfalfa hay (IFN1-00-068)	15.5
Oats (IFN4-03-309)	24.0
Corn (IFN4-02-935)	20.0
Soybean meal (IFN5-04-064)	20.0

Table 3. Reproductive and Performance Data of Trial 1

Treatment	Heifers exhibiting estrus %	Conception rate %	ADG[a] kg	205 d wt[b] kg	ADF[c]	G:F[d]
+Ralgro	61.5	92.3	1.10 ±.09*	226.4 ±20.2*	3.27 ±.5	.34 ±.07
-Ralgro	54.6	90.9	1.01 ±.07*	207.3 ±18.4*	3.00 ±.6	.34 ±.05
Significance level	P >.05	P >.05	P <.05	P <.05	P >.05	P >.05

[a]Average daily gain.
[b]Adjusted 205 d steer equivalent weaning weight.
[c]Average daily creep feed intake.
[d]Gain to feed ratio.

Table 4. Reproductive and Performance Data of Trial 2

Treatment	Heifers exhibiting estrus %	Conception rate %	ADG kg	205 d wt kg	ADF kg	G:F	Weaning frame score[b]	Weaning condition score	Weaning abnormality score	Weaning hip height (cm)
+Ralgro	85.7	64.2*	1.32 ±.26*	310.9 +56.3	4.4 ±1.3	.31 ±.09	5.5 ±.9	4.2 ±.6	1.0 ±.1	113.7 ±6.4
-Ralgro	91.7	91.6*	1.09 ±.28*	282.8 ±22.2	4.3 ±.7	.28 ±.06	5.9 ±.8	4.3 ±.5	1.0 ±.1	119.5 ±14.5
Significance	P >.05	P <.05	P <.05	P <.10[a]	P >.05	P >.05	P >.05	P >.05	P >.05	P >.05

[a]Approaches significance at the P <.05 level of confidence.
[b]Scores ranged from 1-7, 1 = small and 7 = large.

Table 5. Yearling and Two Year Old Data of Trial 2

Treatment	Yearling Pelvic area (sq. cm.)	Yearling hip height (cm)	Yearling weight (kg)	Yearling condition score[a]	Yearling abnormality score[b]	Calving ease score first calf	Birthweight first calf (kg)	4% FCM (kg)
+Ralgro	198 ±15.1	125.3 ±5.6	341.9 ±30.3	4.2 ±.6	1.0 ±.3	1.4 ±1.3	41.7 ±5.8	4.4 ±.8
-Ralgro	185.8 ±21.6	127.5 ±5.1	346.7 ±27.1	4.2 ±.6	1.0 ±.3	1.8 ±1.1	42.9 ±4.2	4.7 ±.8
Significance	P <.10	P >.05	P >.05	P >.05	P >.05	P >.05	P >.05	P >.05

[a]Scores ranged 1-7 with 1 = thin and 7 = fat.
[b]Scores ranged 1-7 with 1 = normal and 7 = abnormal.

Table 6. Morphological Analysis of Open Heifers Reproductive Tracts, Trial 2

Treatment	Heifer No.	Comments
+Ralgro	1	Mature tract, infantile, inactive right ovary not cycling, no corpus luteum or corpus albican; small follicles on left ovary.
+Ralgro	2	Normal right ovary; small left ovary with small follicles less than .2 inches in diameter.
+Ralgro	3	Right ovary had two small follicles .3 inches in diameter; left ovary was small with regressing corpus luteum.
+Ralgro	4	Right ovary had cystic follicle; left ovary appeared normal.
+Ralgro	5	Right ovary, normal, 1 follicle .5 inches in diameter and one corpus luteum; left ovary small, inactive.
-Ralgro	1	Right ovary appeared normal with two follicles, one corpus luteum and one corpus albican; left ovary normal size but inactive.

Table 7. Reproductive and Performance Data of Trial 3

Treatment	Heifers exhibiting estrus (%)	Conception rate (%)	ADG	205d wt	ADF	G:F
+Ralgro	94.4	100.0	1.18 ±.14*	286.9 ±12.6*	4.0 ±.9	.30 ±.03
-Ralgro	88.9	88.9	1.04 ±.17*	254.1 ±17.5*	3.9 ±.8	.27 ±.05
Significance	P >.05	P >.05	P <.05	P <.05	P >.05	P >.05