EXTENSION
BEEF CATTLE RESEARCH UPDATE
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Effects of Administration of a Growth Promoting Implant during the Suckling Phase or at Weaning on Growth, Reproduction, and Ovarian Development in Replacement Heifers

Growth-promoting implants have been utilized in beef production systems to increase body weight gains and feed efficiency. A 1997 review of research trials that evaluated the effectiveness of implanting nursing beef calves showed that implanting steer calves with zeranol (Ralgro, Intervet/Merck Animal Health; 23 trials reviewed) or estradiol-progesterone implants (13 trials reviewed) increased average daily gains (ADG) by approximately 0.1 lb/day from the time of implant insertion to weaning.[1] In this review, the gain response in heifers was slightly greater (0.12 to 0.14 lb/day). However, concerns about reproductive performance have limited the use of growth implants in heifer calves that are potential herd placements. Research in the 1997 review showed that heifers implanted at birth had nearly a 40% reduction in later pregnancy rates. However, the average loss in percentage pregnant due to one implant at calf working time (1 to 3 months of age) was quite small. In 13 trials where heifers were implanted with Ralgro, the percent pregnant was reduced by only 0.8%. In 9 trials where heifers were implanted with estradiol-progesterone implants, the percent pregnant was reduced by 3.2%. Heifers implanted multiple times had greater reductions in fertility. These results illustrate the timing of implanting and the number of implants given can impact fertility.

Other reviews have also generally concluded that one implant given at or after the heifer is two months of age has little or no impact on future female reproductive performance.[2,3] Research from New Mexico State University (2018)[4] concluded that "utilization of growth-promoting implants in beef heifers during the suckling phase (implanted once at about 3 months of age) can increase efficiency through increased weaning weights without causing detrimental effects on reproductive performance of heifers that will potentially be retained as replacement animals. "Furthermore, the additional weight at weaning is advantageous for producers making replacement heifer selection decisions at weaning, providing additional marketing options and potential profit advantages for heifers not retained as replacements". Since management of beef females during the first year of life can impact fertility and reproductive longevity, New Mexico state University research (2022) investigated the effects of growth promoting implants on growth performance, reproductive efficiency, and the ovarian development.[5]

In this study, 233 spring-born Angus × Hereford crossbred heifers over a 3-year period were randomly assigned to one of three treatments: 1) nonimplanted controls, 2) implanted at approximately 2 months of age (average calf age = 58 days) with Synovex-C (100 mg progesterone + 10 mg estradiol; Zoetis Animal Health, Florham Park, NJ), or 3) implanted at approximately 7 months of age (average calf age = 210 days) with Synovex-C. Research was conducted at the New Mexico State University Corona Range and Livestock Research Center located 8 miles east of Corona, NM. Dams and suckling heifers were managed similarly from calving through weaning, with all dams located at the Corona Range and Livestock Research Center and supplemented to maintain similar body condition and calf performance. Following weaning, heifers were managed together grazing native rangeland. Heifers had ad libitum access to water and a loose salt-mineral mix. In addition, the heifers were supplemented with 20% cubes over the post-weaning development period to provide a minimum gain of 0.20 lb/day with supplementation rates adjusted based on forage availability and historic forage quality as needed.

Estrus was synchronized utilizing the Select Synch + CIDR synchronization protocol with heifers receiving a controlled internal drug release device (CIDR, Eazi-Breed, Zoetis Animal Health) insert for 7 days after which the CIDR was removed and heifers were administered a single intramuscular injection of prostaglandin F2α. At the time of PGF2α administration, an estrus detection aid was

applied to the tail head. Estrus detection was performed for 5 days following PGF2α administration and heifers were artificially inseminated (AI) approximately 12 h after observed standing estrus. Approximately 10 days after the last day of AI, heifers were exposed to bulls for approximately 60 days. First service conception and overall pregnancy rates were determined 30 days after the last day of AI and at a minimum of 30 days after bull removal.

The effect of growth implants on heifer growth performance over the post-weaning development period are presented in Table 1. Heifers implanted at 2 months of age were 33 lb heavier (P = 0.001) at weaning compared to controls and heifers implanted at weaning (516 vs. 483 lb). Synovex-C has an active payout period of 100 to 140 days and is designed to increase growth performance and body weight (BW) in suckling calves under 401 lb. Thus, increased weight at weaning was expected in heifers implanted at branding. Yearling BW (average calf age = 332 days) was 31 lb greater (P = 0.001) in heifers implanted at branding comparted to controls and heifers implanted at weaning (505 vs. 474 lb). This BW advantage was maintained through the beginning of the breeding season, with an increased BW of 25 lb (P = 0.009) in heifers implanted at branding. Average daily gain (ADG) was similar among treatments from weaning to yearling and weaning to the start of the breeding season (P ≥ 0.61); however, heifers implanted at weaning had increased (P = 0.05) ADG from yearling to the start of the breeding season compared to heifers implanted at branding (0.79 vs. 068 lb/day).

Table 1. Effect of growth-promoting implants administered at either branding or weaning on heifer body weight, average daily gain, and reproductive performance.

	Treatment[1]			
Item	Controls	Branding	Weaning	P-value
# Heifers	79	82	72	
Body Weight				
Weaning, lb	483[a]	516[b]	483[a]	<0.01
Yearling[2], lb	474[a]	505[b]	474[a]	<0.01
Breeding, lb	531[a]	556[b]	531[a]	<0.01
ADG, lb/day				
Weaning to Yearling	-0.02	-0.04	-0.02	0.93
Yearling to Breeding	0.73[ab]	0.68[a]	0.79[b]	0.05
Total[3]	0.29	0.24	0.29	0.61

[a,b]Means within a row without a common superscript differ (P < 0.05).
[1]Controls = no growth-promoting implant, Branding = received a single Synovex-C implant at 2 months of age, Weaning = received a single Synovex-C implant at 7 months of age.
[2]Yearling body weight was collected in mid-February of each year. Heifers were an average of 332 days of age.
[3]Heifer average daily gain from weaning to the start of the breeding season.
Adapted from Rosasco et al., 2022.

Heifer puberty attainment, response to synchronization of estrus, first service conception rates, and overall pregnancy rates are shown in Table 2. The percentage of heifers attaining puberty by approximately a year of age was similar (P = 0.22) regardless of implant treatment. There was no difference (P = 0.58) in the proportion of heifers attaining puberty before the start of the breeding season among treatments.

Response to synchronization of estrus was increased (P = 0.03) in heifers implanted at weaning (71%) compared to controls (48%), with heifers implanted at branding similar to all other treatments (58%). First service conception rates tended to be increased (P = 0.09) in control heifers compared to heifers implanted at weaning, with heifers implanted at branding similar to the other treatments. Final pregnancy rates were similar (P = 0.54) among treatments.

Table 2. Effect of growth-promoting implants administered at either branding or weaning on puberty attainment, estrus response, first service conception rates, and overall pregnancy rates.

	Treatment[1]			
Item	Controls	Branding	Weaning	P-value
Puberty, %				
Yearling[2]	58	46	44	0.22
Prebreeding	70	73	65	0.58
Estrus response, %	48[a]	58[ab]	71[b]	0.03
First service conception rate, %	77	63	52	0.09
Overall pregnancy rate, %	88	81	85	0.54

[a,b]Means within a row without a common superscript differ (P < 0.05).

[1]Controls = no growth-promoting implant, Branding = received a single Synovex-C implant at 2 months of age, Weaning = received a single Synovex-C implant at 7 months of age.

[2]Yearling body weight was collected in mid-February of each year. Heifers were an average of 332 days of age.

Adapted from Rosasco et al., 2022.

In years 2 and 3 of the study, a subset of heifers (year 2: 16 heifers; year 3: 14 heifers) were submitted for ultrasonographic evaluation of reproductive tract development using an ultrasonic machine. No differences were observed between treatments for reproductive tract score (P = 0.80). Reproductive tract score is an indicator of reproductive tract maturity as well as an estimate of pubertal status, taking into consideration ovarian size, structures present on the ovary, and uterine horn diameter, assigning heifers a score ranging from 1 to 5. A reproductive tract score of 1 is indicative of an immature, underdeveloped reproductive tract and the heifer is prepubertal, whereas a reproductive tract score of 5 is indicative of a mature reproductive tract and the heifer is considered pubertal. The average reproductive tract score of all treatments was greater than 4.29, suggesting that heifers in all treatments were at a similar stage of reproductive tract maturity and development, as well as puberty attainment.

These data show that the utilization of a growth promoting implant (Synovex-C) during the suckling phase (2 months of age) in beef heifers resulted in an increase in BW at weaning without negatively affecting reproductive development or overall pregnancy rates. The additional body weight at weaning may provide a profit advantage for heifers not retained as replacements. The administration of a Synovex-C implant at weaning did not influence overall pregnancy rates; however, implanting heifers at weaning did not increase growth performance and tended to decrease first service conception rates.

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