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Effect of nursing-calf implant timing on growth performance and carcass characteristics

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Objective

The objective of this study was to compare pre- and postweaning growth performance, carcass characteristics, and meat quality attributes of calves that did not receive an implant or were implanted early or late in the nursing period.

Study Description

Crossbred steer calves (n = 135) were stratified by birth date, birth weight, and assigned randomly to treatments: Control (CON; no pre-weaning implant); EARLY (36 mg zeranol – administered at an average of 58 ± 13 days of age); and LATE (36 mg zeranol, – administered at an average 121 ± 13 days of age). After weaning, steers were blocked by initial feedyard body weight (BW) to 15 pens (5 pens/treatment, 9 head/pen). All steers were implanted on day 21 after arrival at the feedyard, and again on day 108 of finishing. Steer BW and ultrasound ribeye area (uREA), ribfat thickness (uRFT), and percent intramuscular fat (uIMF) were collected when implants were administered, at weaning, and on harvest day. Standard carcass measures were collected and a 1.5-inch strip loin section was removed from both sides of each carcass and portioned into 1-inch steaks that were aged for 3 or 14 days for analysis of cook loss and objective tenderness.

Take home points

Steer BW, ADG, and gain:feed did not differ among treatments ($P > 0.05$). Steers that were implanted EARLY had a greater ($P < 0.05$) cumulative DMI than CON but were not different from LATE. Ultrasound REA and uRFT (averaged across all collection days) did not differ ($P > 0.05$), however, steers on the CON treatment had a greater ($P \leq 0.05$) percent uIMF than EARLY implanted steers, while steers receiving the LATE implant were intermediate and not different from the other treatments. Carcass traits and meat quality measures did not differ ($P > 0.05$) among treatments. The proportion of steers in each USDA Yield and Quality Grade was similar ($P > 0.05$) among treatments, and no differences were detected for total carcass value or price per hundredweight ($P > 0.05$). In conclusion, administering a nursing implant, regardless of timing, did not influence live performance, carcass characteristics or meat quality of steers fed in this study.

Keywords: beef, implant, meat quality, nursing calf, pre-weaning

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Abstract

The objective of this study was to compare pre- and postweaning growth performance, carcass characteristics, and meat quality attributes of calves that did not receive an implant or were implanted early or late in the nursing period. Crossbred steer calves ($n = 135$) were assigned to treatments: Control (CON; no pre-weaning implant); EARLY (36 mg zeranol – administered at an average of 58 ± 13 days of age); and LATE (36 mg zeranol, – administered at an average 121 ± 13 days of age). After weaning, steers were blocked by initial feedyard body weight (BW) to 15 pens (5 pens/treatment, 9 head/pen). All steers were implanted on day 21 after arrival at the feedyard, and again on day 108 of finishing. Steer BW and ultrasound ribeye area (uREA), ribfat thickness (uRFT), and percent intramuscular fat (uIMF) were collected when implants were administered, at weaning, and on harvest day. Carcass measures were collected and a 1.5-inch strip loin section was removed from both sides of each carcass and portioned into 1-inch steaks that were aged for 3 or 14 days for analysis of cook loss and objective tenderness. Steer BW, ADG, and gain:feed did not differ among treatments ($P > 0.05$). Steers that were implanted EARLY had a greater ($P < 0.05$) cumulative DMI than CON but were not different from LATE. Ultrasound REA and uRFT (averaged across all collection days) did not differ ($P > 0.05$), however, steers on the CON treatment had a greater ($P \leq 0.05$) percent uIMF than EARLY implanted steers, while steers receiving the LATE implant were intermediate and not different from the other treatments. Carcass traits and meat quality measures did not differ ($P > 0.05$) among treatments. The proportion of steers in each USDA Yield and Quality Grade was similar ($P > 0.05$) among treatments, and no differences were detected for total carcass value or price per hundredweight ($P > 0.05$). In conclusion, administering a nursing implant, regardless of timing, did not influence live performance, carcass characteristics or meat quality of steers fed in this study.

Introduction

Anabolic implants are one of several growth-enhancing technologies available to beef producers. Implants work in conjunction with circulating hormones to increase protein deposition, enhancing both the rate and efficiency of muscle growth (Dayton and White, 2014). In general, implants are utilized primarily in the postweaning phases of production, which may not maximize profitability or lean beef production for the entire beef system. Duckett and Andrae (2001) suggested implanting nursing and/or stocker cattle has minimal negative effects on response to additional postweaning implants. Thus, successive, lifetime implants should result in additive gains. In the cow-calf sector implants are available for nursing calves and research has demonstrated implants effectively increase ADG of calves during the suckling phase by 5 to 6 percent compared to non-implanted calves (Duckett and Andrae, 2001). However, some research indicates repetitive use of implants may have negative impacts on beef carcass quality and tenderness (Platter et al., 2003; Scheffler et al., 2003). While previous research has demonstrated the type of implant and timing of administration can influence growth response and carcass characteristics during the stocker and feedlot phase (Paisley et al.,

1999; Roeber et al., 2000; Duckett and Pratt, 2014), efforts focused on the timing of administering implants to nursing calves and the subsequent effects on feedyard performance and carcass quality are limited. Cow-calf producers in the Northern Plains generally administer implants to nursing calves during occasions that coincide with other cattle working events, such as branding, when the calves are ~60 days of age. However, with advances in growth genetics and variability of grazing resources, delaying the administration of pre-weaning implants to coincide with pre-weaning vaccinations, when calves are ~120 days of age, was investigated.

Experimental Procedures

One hundred thirty-five Angus × Simmental crossbred male calves located at the SDSU Antelope Range and Livestock Research Station were utilized for this study. Individual calves were stratified by birth date and birth weight, and assigned randomly to 1 of 3 treatments: Control (CON; no pre-weaning implant); EARLY (36 mg zeranol; Ralgro, Merck Animal Health, at branding – administered at an average of 58 ± 13 days of age); and LATE (36 mg zeranol, in mid-August – administered at an average of 121 ± 13 days of age). At study initiation on June 9, 2014 all steers were branded, individually weighed without shrink, and administered UltraBac 7 (Zoetis, Inc.). Steers were also ultrasounded for ribeye area (uREA), ribfat thickness (uRFT), and percent intramuscular fat (uIMF) at study initiation. While in the chute for these procedures, the EARLY treatment was implanted. On August 11 all steers were weighed without shrink, ultrasounded, administered Vista[®] 5 (Merck Animal Health), Vision[®] 7 Somnus with spur (Merck Animal Health), One Shot[®] (Zoetis Inc.). While in the chute for these procedures the LATE treatment steers were implanted.

All steers were weaned on October 27, 2014. At weaning all steers were weighed, re-vaccinated with Vista[®] 5 SQ and Vision[®] 7 Somnus with Spur, administered Dectomax[®] Pour-On (Zoetis, Inc.), ultrasounded then shipped to the University of Nebraska-Lincoln Panhandle Research and Extension Center in Scottsbluff, NE. Steers were blocked by initial feedyard BW into one of 15 pens (5 pens/treatment, 9 hd/pen). Steers were stepped up to a final finishing ration that contained a mixture of alfalfa, wet distillers grains with solubles, dry rolled corn, and a supplement containing urea, minerals, vitamins, Rumensin (360 mg), and Tylan (90 mg). All steers were ultrasounded and implanted with Revalor[®]-IS (Merck Animal Health) on November 17, and ultrasounded and implanted with Revalor[®]-200 (Merck Animal Health) on February 12. Steers received 300 mg ractopamine hydrochloride/steer/day (Optaflexx 45 Elanco Animal Health) for 35 d prior to harvest. Steers were harvested in two groups (May 6 or May 27) when they were estimated to have an average of 0.6 inches of backfat. On the day of harvest steers were ultrasounded, weighed and shipped to Cargill Meat Solutions in Ft. Morgan, CO. Carcass measures were collected and a 1.5-inch strip loin section was removed from both sides of each carcass and cut into 1-inch steaks that were aged for 3 or 14 days for analysis of Warner-Bratzler shear force (WBSF).

Results and Discussion

There were no interactions ($P > 0.05$) between treatment and period for most response variables (except incremental changes in uREA and uRFT). Therefore, main effects for cattle performance by treatment and period are reported. Body weight, ADG and gain:feed of steers did not differ among treatments for the duration of the project ($P > 0.05$). Further, lack of a

treatment by period interaction ($P = 0.423$) for BW indicated that pre-weaning implants did not influence growth, even during the periods that pre-weaning implants were active. Although this lack of response was unexpected, other researchers have reported variable responses to pre-weaning implants (Duckett and Andrae, 2001, Mader et al., 1985; Simms et al., 1988; Pritchard et al., 2015). Steers that were implanted EARLY had a greater ($P < 0.05$) cumulative DMI than CON but were not different from LATE. It is understood that without adequate nutrition the response to implantation will be limited (Kuhl, 1997). However, the 0.9 lb difference in DMI between EARLY and CON is difficult to explain as ADG and G:F were not different ($P > 0.05$). As expected, there was a period effect for BW and ADG ($P < 0.001$) as steers grew over the duration of the study. The ADG were appropriate for nursing (2.38 ± 0.02 lb), backgrounding (1.32 ± 0.06 lb), receiving (3.95 ± 0.06 lb), and finishing (3.70 ± 0.06 lb) periods. However, no cumulative ADG difference was detected.

When uREA and uRFT were averaged across all periods (i.e. treatment main effect), no differences ($P > 0.05$) were detected as a result of treatment. CON steers had a greater ($P < 0.05$) percent uIMF than EARLY implanted steers, while LATE steers were intermediate and not different from the other treatments. As expected, the main effect for period indicated that uREA, uRFT and uIMF all increased ($P < 0.001$) as the steers grew. Timing of nursing implant administration interacted with period for gain in uREA and uRFT ($P < 0.05$). The incremental gain in uREA was enhanced ($P < 0.05$) during the period that the EARLY nursing implant was active (June to August) but was not enhanced by the LATE implant when it was active (August to November; Figure 1). Additionally, incremental gain in uREA by the EARLY implanted group was depressed ($P < 0.05$) after the implant was no longer active (August to November). Gain in uRFT was depressed ($P < 0.05$) in EARLY implanted steers compared to the CON steers when the implant was active (June to August; Figure 2). Similarly, gain in uRFT was depressed ($P < 0.05$) in LATE implanted steers relative to EARLY implanted steers when the LATE implant was active (August to November; Figure 2). Responses to the early implant in uREA and uRFT gain appear to be offset during late summer, resulting in no differences in uREA and uRFT at weaning. Postweaning responses were not influenced by suckling implants because no differences in uREA or uRFT gain were detected from November to harvest.

Hot carcass weight, REA, FT, USDA Yield Grade, marbling score, and overall maturity, did not differ among treatments ($P > 0.05$). The proportion of steers in each USDA Yield and Quality Grade was similar ($P > 0.05$) among treatments, and no differences were detected for total carcass value or price per hundredweight ($P > 0.05$). There was no interaction ($P = 0.88$) between treatment and steak aging period though, tenderness of all steaks improved ($P \leq 0.05$) with aging. Overall, Warner-Bratzler shear force and percent cook loss were not influenced by treatment ($P > 0.05$). Therefore, it is probable that the implant strategies employed in this study were not aggressive enough to influence mechanisms regulating tenderness.

Implications

Timing of nursing implant did not influence overall live performance, carcass characteristics or meat quality of steers in this study. Additionally, pre-weaning implantation did not influence performance during the suckling phase, suggesting no differential advantage for the cow-calf producer. There were no repercussions of nursing implants on Quality Grade, but nursing

implants did not provide advantages in terms of feedyard performance or carcass quality regardless of when they were administered. Thus, it may not be efficacious for producers to administer nursing implants to calves under production conditions similar to this study.

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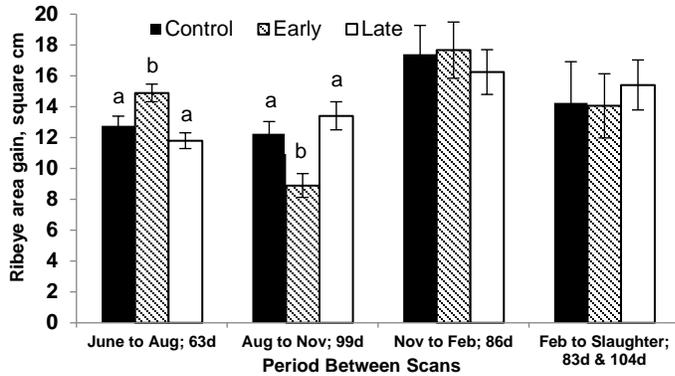


Figure 1. Ribeye area gain (cm²) of steers administered: CON (no pre-weaning implant); EARLY (36 mg zeranol; Ralgro, Merck Animal Health, at branding – administered at an average of 58 d of age); or LATE (36 mg zeranol, in mid-August – administered at an average 121 d of age). Gain was calculated as final measurement of each period minus initial measurement of the period. Means within a time period without a common letter differ ($P < 0.05$).

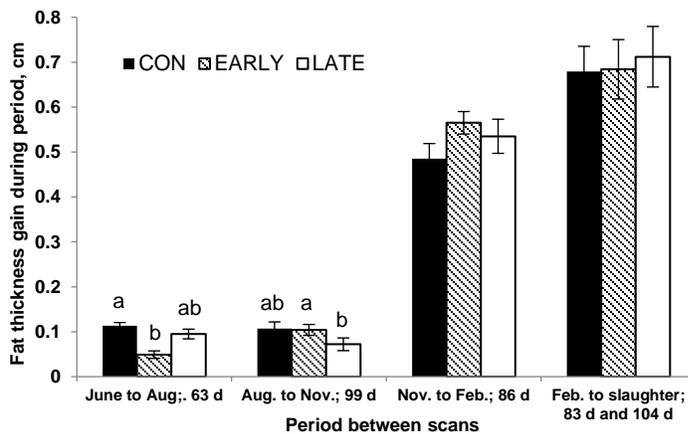


Figure 2. Rib fat thickness gain (cm) of steers administered: CON (no pre-weaning implant); EARLY (36 mg zeranol; Ralgro, Merck Animal Health, at branding – administered at an average of 58 d of age); or LATE (36 mg zeranol, in mid-August – administered at an average 121 d of age). Gain was calculated as final measurement of each period minus initial measurement of the period. Means within a time period without a common letter differ ($P < 0.05$).