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Impact of Castration Time and Method on Carcass and Palatability Traits in Steers

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Summary

Angus and Angus x Limousin steers from one ranch were used to evaluate the effect of castration time and method on production and carcass traits. At 2 mo of age, calves were randomly assigned to one of two treatments (TRT); surgical castration at 2 mo age (SC) or castrated at 9 mo age (828 lb) by banding (BAND). Calves assigned to SC received a Synovex-C implant at castration. All calves were weaned at 5 mo of age with no difference in weaning weight. Calves were blocked into heavy and light groups with a 45 Mcal NEG/lb diet fed for 91 d (heavy group) and 119 d (light group). A Magnum implant was administered to SC only, 29 d post weaning to steers. No differences were observed between treatments for BW, DMI, ADG, or F/G during backgrounding. At the time of banding, BW was 828 lb for both treatments, SC and BAND. During the 29 d post-banding period, BAND caused reduced ($P < 0.05$) ADG by 46% with a 47.8% change in F/G (15.7 vs 8.2) while DMI was unaffected. At the start of the finishing phase (30 d post-banding) a Revalor-S was administered to all steers. From this point until harvest, cumulative performance (117 d) did not differ between treatment for ADG, DMI, or F/G; however, an advantage in body weight was maintained at harvest for SC vs BAND (1297 vs 1272 lb; $P < 0.05$). Banded bulls tended to have less 12th rib fat and had lower Yield Grade. Quality Grade and Warner Bratzler Shear Force were not affected by treatment. These results indicate that similar performance can be achieved during the suckling and background phases between steers and bulls when an appropriate implant strategy is used on the steer calves. Banding as a method of castration reduced gain 29 d post-banding, resulting in surgically castrated calves at 2 mo of age maintaining a weight advantage throughout the finishing period.

Introduction

To increase calf weights and pounds of calf produced per cow, many producers have decided to let Mother Nature assist them in the endeavor. By choosing to castrate calves post-weaning, producers hope to improve weaning weights. This decision has come about due to convenience, the natural growth promotion allowed by intact males, and the gaining popularity of the bloodless castration method of banding. Although not well documented, banding is perceived to impose less stress on bulls, even at heavier weights. Early research studied the difference between intact males vs. steers with conflicting results in regard to tenderness. Research has focused on the difference between bulls and steers but has not quantified the differences in carcass palatability traits relative to current commercial practices. It was the objective of this trial to quantify differences in performance and feed efficiency of banded bulls.

Materials and Methods

Steers from one ranch (n = 160) were randomly assigned to one of two treatments: Treatment 1 - calfhood castrated by knife method (CALF CAST), and Treatment 2 - banded with a calicrate bander at 800 lb. (BANDED). Random treatment allocation took place at 2 mo of age when calves received their calfhood vaccinations and were branded. Calves assigned to the calfhood castration treatment received a Synovex-C at this time. At approximately 5 mo of age calves were early-weaned due to drought and hauled 450 miles to the South Dakota State University Nutrition Unit where they were weighed and vaccinated w/Resvac 4, Sommubac, Ultrabac 7 and de-wormed with Dectomax. Calves were blocked by weight (Heavy and Light) and randomly

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assigned to pen within treatment group. Time line for events is illustrated in Table 1.

Calves were fed a backgrounding diet consisting, on a dry matter basis, of oatlage, 37.3%; cracked corn, 34.9%; grass hay, 19.8%; and supplement, 8.0% with a NE_m and NE_g content of 77.2 Mcal/cwt and 45.7 Mcal/lcwt, respectively. Calves were fed to gain approximately 2.5 lb per day and were fed for 91 and 119 d before banding for the heavy and light groups, respectively. Banding date was selected based on when the intact males reached 800 lb within each group. The castrated calves at branding treatment received a Magnum implant 29 d after weaning at 596 lb. Non-castrated males were castrated by Calicrate band method at a targeted weight of 800 lb. To quantify sexual maturity, blood was sampled from bulls at banding time to measure serum testosterone concentrations. Scrotal circumference was also measured at this time. Performance measurements were taken 29 d post banding. The cattle were weighed to quantify performance after banding. A Revalor-S implant was administered to both treatments at 29 d post-banding. Weight and performance parameters were determined for 28-d periods throughout the finishing phase.

Cattle in each block were harvested when the average of the block reached 0.40 in. of backfat at the 12^{th} rib. Cattle were hauled 125 miles to a commercial packing plant where steer identification was maintained and carcass data was obtained by University personnel. Marbling score was assigned by an official USDA Grader. Twelfth-rib samples were taken from 40 steers within each treatment for tenderness evaluation. Steaks were transported to the SDSU Meat Lab where excess fat and bone was removed from the Longissimus muscle. Steaks were aged for 7 d before being frozen at -20^{o}C. Tenderness was quantified by Warner Bratzler Shear Force as outlined by Bruns et al. (2000).

All performance variables were evaluated using General linear model procedures of SAS (SAS Inst. Inc., Cary, NC) in a statistical model that included treatment with pen as the experimental unit. Analysis of carcass data was conducted in a similar fashion except that the individual steer was considered as the experimental unit.

Results and Discussion

Calves were weaned 5 weeks earlier than normal due to drought conditions at the ranch. No differences in performance were observed between implanted steer calves and intact males at weaning or throughout the backgrounding phase (Table 2). Post weaning performance (91- d heavy group and 119-d light group) was not different between treatments for DMI, ADG, or F/G. Steers castrated at 2 mo of age and receiving an implant at branding and at 596 lb, during backgrounding phase, did perform similar to intact males.

Post banding performance was determined 29 d after banding as is reported in Tables 2 and 3. Steers castrated at 2 mo of age were heavier (896 vs. 863 lb; $P < 0.01$) and had improved ADG (2.4 vs. 1.3 lbs; $P < 0.01$). Dry matter intake was higher ($P < 0.05$) for the steers castrated at 2 mo of age versus banded bulls (18.8 vs. 18.2 lb). Likewise, feed efficiency was improved for the steers that were castrated at 2 mo of age (8.2 vs 15.7). Cost of gain during the 29 d post banding was improved for the steers castrated at 2 mo of age. Health was observed daily. Four steers from the BANDED treatment were pulled due to secondary infections. One steer was eliminated from the trial due to the band breaking. Sexual maturity between the light and heavy groups were similar, with no differences ($P > 0.05$) found for circulating testosterone (Heavy 5.2 ng/ml vs. Light 7.13 ng/ml) or scrotal circumference (Heavy 31.4 cm vs. Light 31.2). Bulls can reach puberty between scrotal circumference of 27 and 29 cm, however variation exists between individuals.

Finishing performance is reported in Table 4. The banded treatment tended to result in a greater ADG during the first 28-d period of the finish phase (57 d post-banding) with no differences in DMI or F/G. The difference in performance could be attributed to compensatory growth taking place in the banded steers. We would speculate that the loss of circulating levels of testosterone immediately after banding may have contributed to the poorer performance reported 29 d post-banding. Replacement of circulating levels of hormone was replenished 29 d post-banding with an implant resulting in improved performance. Even though BANDED steers had improved ADG the first 28 d post-implant, calves castrated at 2 mo of age did maintain a greater weight

advantage throughout the subsequent four weigh periods (28, 56, 80, and 117 d) due to the 50% increase in ADG for the 29-d post-banding period.

Carcass data are presented in Table 5. Calfhood castrated steers had greater endweights with greater carcass weight than BANDED (791 vs. 774 lb). No difference was observed for Longissimus muscle area (12.7 vs. 12.9 in^2). However, ribfat and kidney, pelvic, heart fat tended to be less in BANDED bulls than calves castrated at 2 mo of age. The BANDED treatment tended to have a lower YG (3.0 vs. 2.7) with similar marbling scores. Tenderness as measured by Warner Bratzler Shear Force was not different (7.1 vs. 6.6 lb). This population represented tender carcasses with 82.4% below 7.7 lb shear force.

Implications

These results would indicate that similar performance can be achieved during the suckling and backgrounding phases between steers and bulls when an implant strategy is used on the calves castrated at branding time. Banding as a method of castration at 800 lb had an adverse effect on 29-d post banding performance, dry matter intake, and feed efficiency. No notable differences were observed in carcass traits or tenderness.

Producers practicing delayed banding in their operations need to be aware of reduced performance 29 d post banding. Careful consideration should be given to management strategies such as diet and time of implant shortly after banding.

Literature Cited

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Tables

Table 1. Project Timeline

	Heavy Group	Light Group
Calf ID[a]	5/13/02	5/13/02
Weaning	9/18/02	9/18/02
Backgrounding, days	91	119
Banding	12/19/02	1/16/03
Banding Period, days	29	29
Start Finishing Phase	1/17/03	2/14/03
End Wt./Slaughter Date	5/14/03	6/11/03
Finishing Period, days	117	117

[a] Calf ID. Calves were designated to treatment at this time.

Table 2. Backgrounding[a]

	Heavy Group, 91 d		Light Group 119 d	
	CALF CAST	BANDED	CALF CAST	BANDED
Initial BW, lb[b]	526	526	461	451
Final BW, lb	840	844	815	811
DMI, lb/d	16.7	16.1	15.2	15.1
ADG, lbd	3.4	3.4	3.0	3.0
F/G[c]	4.8	4.6	5.1	5.0

[a] No group x treatment interaction was found. These group data were pooled and tested for treatment effect.
[b] Initial body weight was also used for weaning weight data.
[c] Treatment effect (CALFCAST vs. BANDED at 800 lb; $P < 0.05$).

Table 3. Yearling cattle performance at banding[a]

	CALF CAST	BANDED	SEM
n	81	83	
Banding BW, lb	827	827	4.4
29-d Post band BW, lb	896[c]	863[d]	6.2
29-d ADG, lb/d	2.4[c]	1.3[d]	0.09
29-d DMI, lb/d	18.8[e]	18.2[f]	0.20
29-d F/G	8.2[c]	15.7[d]	1.0
Pulls, head (% of population)	0 (0%)	5 (6%)	

[a] No group x treatment interaction was found. This group data were pooled and tested for treatment effect.
[c,d] Means with different superscripts differ ($P < 0.01$).
[e,f] Means with different superscripts differ ($P < 0.05$).

Table 4. Finishing phase cattle performance

	CALF CAST	BANDED	SEM	*P*-Value
Period 1; d 1-28				
BW, lb	986	962	3.9	0.0004
ADG, lb/d	3.2	3.6	0.13	0.07
DMI, lb/d	18.5	18.5	0.07	NS
F/G	6.0	5.4	0.28	NS
Period 2; d 28-56				
BW, lb	1115	1095	5.1	0.013
ADG, lb/d	4.6	4.7	0.10	NS
DMI, lb/d	22.7	22.4	0.24	NS
F/G	5.4	4.8	0.10	NS
Period 3; Heavy Group d 56-84, Light Group d 56-89				
BW, lb	1211	1185	5.4	0.0035
ADG, lb/d	3.1	3.0	0.14	NS
DMI, lb/d	23.5	23.1	0.25	NS
F/G	7.7	7.9	0.36	NS
Cumulative; d 1-117				
BW, lb	1297	1272	4.7	0.0013
ADG, lb/d	3.4	3.5	0.05	NS
DMI, lb/d	22.2	21.9	0.18	NS
F/G	6.5	6.3	0.11	NS

Table 5. Carcass data

	CALF CAST	BANDED	SEM
Harvest BW, lb	1298	1273	8.6
Dressing %	63.4	63.2	0.18
HCW, lb	791	774	5.5
Ribfat, in	0.44	0.41	0.012
KPH, %	2.0	1.8	0.05
LMA, in^2	12.7	12.9	13.5
Yield Grade	3.0	2.7	0.05
Marbling Score*	563	557	9.3
WBS, lb$^+$	7.1	6.6	0.18

*Marbling Score; 500 = Small^o.
$^+$ Warner Bratzler Shearforce; Tender less than 7.7 lb; Tough greater than 11.0 lb.