BEEF CATTLE RESEARCH UPDATE

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Protein Supplementation of Cattle Consuming Low-Quality Cool- or Warm-Season Forage

Forage types can be grouped into cool season or warm season. It is generally assumed that cool-season grasses have greater nutritional quality than warm-season grasses, which has been attributed to greater nonstructural carbohydrates and protein and less fiber. Research has generally shown that protein supplementation of low-quality forage (< 7% crude protein, CP) increases forage intake. However, most of this research has been with warm-season forages. Data comparing the utilization of low-quality cool-season vs. warm-season forages by ruminants is limited. Oregon State University research used ruminally cannulated steers (556 lb) to determine the influence of supplemental CP (soybean meal providing CP at level of 0.09% of body weight per day) on nutrient intake and digestion of low-quality cool- and warm-season forages.[1] The cool-season forage used was Kentucky bluegrass straw containing 6.3% CP, 66.4% neutral detergent fiber (NDF), and 36.2% acid detergent fiber (ADF) on a dry matter (DM) basis. The warm-season forage used was tallgrass prairie from Oklahoma containing 5.7% CP, 69.8% NDF, and 36.6% ADF (DM basis).

The effects of forage type and protein supplementation on DM intake and digestibility are shown in Table 1. A CP supplementation x forage type interaction ($P < 0.01$) was noted for forage and total DM intake, with supplementation increasing intake of warm-season forage by 47% and intake of cool-season forage by only 7%. Dry matter digestibility responded similarly, with a CP supplementation x forage type interaction ($P = 0.05$). Supplementation increased digestibility by 21% with warm-season forage and by 9% with cool season forage. These researchers concluded that these results indicate that intake and digestibility of low-quality cool- and warm-season forages are not similar and, more importantly, that the physiological response of ruminants to supplemental protein may depend, in part, on the cell wall structure of the basal diet, with intake and digestibility of warm-season forages increasing to a greater extent with supplementation compared with cool-season forages of similar nutritional quality. This data and other published research also suggest that the intake and digestibility of cool-season forages appear to be greater than the intake and digestibility of warm-season forages with comparable nutritional indices (e.g., CP, ADF, NDF).

Table 1. Dry matter (DM) intake and digestibility by steers consuming low-quality cool-season (CS) and warn-season (WS) grass hay with or without soybean meal (CP) supplementation.

	Treatment				P-value		
Item	WS	WS + CP	CS	CS + CP	CP vs. no CP	WS vs. CS	CP x forage type
DM Intake, % of body weight							
Forage	1.56	2.29	2.37	2.53	< 0.01	< 0.01	< 0.01
Soybean meal	0.0	0.17	0.0	0.17	< 0.01	< 0.01	< 0.01
Total	1.56	2.46	2.37	2.70	< 0.01	< 0.01	< 0.01
DM digestibility, %	42.8	51.8	49.7	54.2	< 0.01	< 0.01	0.05

Adapted from Bohnert et al., 2011.

Effect of Castration Technique on Calf Performance

A 2007-08 USDA survey of U.S. beef cow operations found that about 59.2% of operations castrated any bull calves prior to sale.[2] This same survey reported that most operations (74.5%) castrated bull calves at an average age of less than 93 days, but almost one of five operations (18.4%) did not castrate calves until they were over 122 days old. Several methods of castration are available. All methods of castration cause significant acute pain and distress. This pain increases in acuteness and duration as the age, BW, and testicular size of the calf increases. Recent research from the University of Florida evaluated the growth performance, feed and water intake, feed

efficiency, and inflammatory response of weaned male beef calves in response to different methods of castration.[3] In this study, 75 Angus and Brangus male beef calves (average weight = 472 lb and average age = 200 days) were assigned to five treatments: 1) bulls castrated surgically pre-weaning (52 days of age), 2) intact bulls, 3) bulls castrated with a Callicrate Bander 28 days post-weaning (day 0 of study, 4) bulls castrated surgically with a Henderson Castrating Tool on day 0, and 5) bulls castrated surgically utilizing an emasculator on day 0. Performance of the calves was measured over an 84 day feeding period.

During the first 14 days of the study, all castrated calves gained less (0.48 lb/day, $P < 0.05$) than control calves (1.57 lb/day) with intact bulls being intermediate and similar to all other treatments (1.10 lb/day, $P = 0.23$). Average daily gain during the entire experiment (day 0 to 84) was similar ($P = 0.42$) for all treatments, indicating that castrated calves were able to compensate and recover from castration regardless of castration method. Average daily gain by period from day 7 to 70 is presented in Figure 1. From day 7 to 28, calves castrated with a bander gained significantly slower than the other treatment groups. Similarly, banded calves tended to consume less feed during weeks 2 and 4 of the study than the other treatments. Daily feed intake, daily water intake and gain efficiency were similar for all treatments for both day 0 to 14 and day 0 to 84. However, during day 0 to 14, control calves numerically consumed more feed and water and were more efficient than the other treatments. Surgical castration at the start of the study (day 0) caused a short-term inflammatory response in calves, whereas banding caused a delayed inflammatory response.

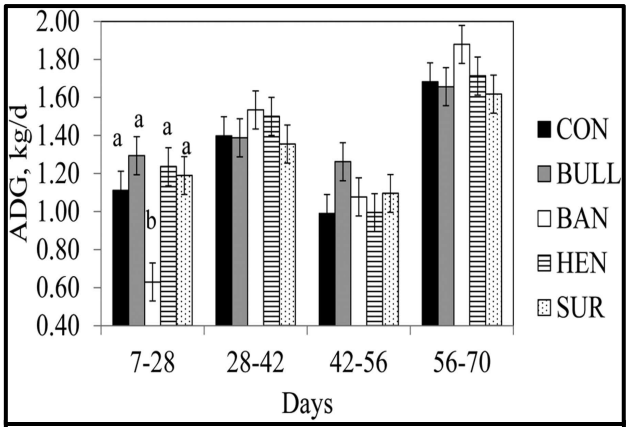

Figure 1. Effect of castration technique on average daily gain (ADG) from day 7 to 70 by period in beef calves. CON = calves castrated pre-trial; BULL = intact male calves; BAN = calves banded on day 0; HEN = calves surgically castrated with Henderson castration tool on day 0; SUR = calves surgically castrated with emasculators on day 0. [a, b] Means with different superscripts differ $P < 0.05$. Source: Warnock et al., 2012.

These researchers concluded that calves castrated before weaning had greater initial growth rates, feed intake, water intake, and gain efficiency than calves castrated after weaning at older ages and heavier body weights. Banding elicited a delayed negative response in daily gain, feed intake, and inflammation. They also noted that the Henderson castrating tool did not appear to be any more or less stressful than other surgical methods of castration. Research has shown that pain due to castration is more acute and last longer as age, weight, and testicular size increase. Thus, Beef Quality Assurance Guidelines recommend that bull calves that are not herd sire prospects be castrated as early in life as possible (preferably, between birth and four months of age).

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[1] Bohnert, D. W., T. DelCurto, A. A. Clark, M. L. Merrill, S. J. Falck and D. L. Harmon. 2011. Protein supplementation of ruminants consuming low-quality cool- or warm-season forage: Differences in intake and digestibility. J. Anim. Sci. 89:3707-3717.

[2] USDA-APHIS. 2008. Pages 37-39 in Beef 2007-08, part I: Reference of beef cow-calf management practices in the United States, 2007–08. USDA–APHIS–VS–CEAH, Fort Collins, CO. Available: http://www.aphis.usda.gov/animal_health/nahms/beefcowcalf/downloads/beef0708/Beef0708_dr_PartI_rev.pdf

[3] Warnock, T. M., T. A. Thrift, M. Irsik, M. J. Hersom, J. V. Yelich, T. D. Maddock, G. C. Lamb and J. D. Arthington. 2012. Effect of castration technique on beef calf performance, feed efficiency, and inflammatory response. J. Anim. Sci. 90:2345-2352.