BEEF CATTLE RESEARCH UPDATE

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August 2018

Another Method of Castration: Zinc Injection

Castration of beef cattle is routinely performed in the U.S. to mitigate aggressive and sexual behavior and improve meat quality. It is well documented that castration of feeder calves on arrival or shortly after arrival at a feedlot decreases daily gains and increases morbidity.[1, 2] This is clearly illustrated in Kansas State University research from 2011 that evaluated the effects of castration on calves that were castrated post-arrival relative to those castrated before.[3] In that study, data on 3,380 male calves (2,197 bulls and 1,183 steers) used in 11 receiving trials from March 2006 to October 2008 was analyzed. This analysis showed that surgical castration of calves after arrival reduced daily gains by 9.6% (0.35 lb/day) as compared to steers over a 44-day receiving period.

Surgical removal of testes or application of a restrictive elastic band are the two primary methods of castration currently employed in older bulls upon feedlot arrival, but there is no consensus regarding best method. A 2011 USDA survey of large feedlots with a capacity of 8,000 or more head estimated that of bulls placed on feed, 52.3% are castrated surgically, while 41.1% are banded, and 6.6% are not castrated.[4] Currently, injectable castration techniques are not used in beef cattle, but they may offer performance or welfare benefit compared to physical castration. An injectable product consisting of zinc acetate (Calviex, Cowboy Animal Health, Plano, TX) has been approved by the FDA for proof-of-concept investigation in beef bulls.

Recent joint research between the University of Arkansas and West Texas A&M University (WTAMU) evaluated zinc injection as a castration method.[5] In this study, 207 crossbred beef bulls averaging 655 lb were obtained from regional auctions. After a 42 day backgrounding period near Fayetteville, AR; 180 bulls were shipped 496 miles to a research facility in Canyon, TX. Feedlot processing occurred the following morning (initial weight of 743 lb) and the bulls were either band castrated (BAND), injected with 100 mg of a zinc solution in each testis, or left as intact bulls (BULL). The cattle were allocated to 18 pens (10 head/pen and 6 pens /treatment) and fed a standard feedlot diet. A subset of 54 animals (3 head per pen) was selected randomly for repeated blood sampling every 28 days until slaughter (fed an average of 176 days). Serum testosterone concentration was determined in these samples. In addition, scrotal circumference and right-testicle thickness were measured every 28 days in this subset of cattle. During the slaughter process, testes from INJ and BUL were collected to assess final testes weight and for histopathological evaluation.

These researchers reported that final body weight was greater ($P < 0.01$) for INJ and BULL compared to BAND (1482, 1513, and 1347 lb, respectively). In addition, overall average daily gain and gain efficiency (gain/feed ratio) were greater ($P \leq 0.03$) in INJ and BULL than BAND.

Serum testosterone concentrations on day 168 were similar ($P = 0.14$) between INJ and BULL whereas after day 14, serum testosterone was non-detectable in BAND cattle.

Scrotal circumference (P = 0.08) and testis width (P = 0.07) on day 168 tended to be greater for BULL than INJ. After slaughter, histopathological evaluation indicated that INJ testes were degenerative and reproductively nonviable whereas BULL testes were normal. These data indicate that zinc injection resulted in sterilization but did not cause complete cessation of testicular function evidenced by testosterone concentrations more similar to BULL than BAND. These authors concluded that "zinc injection resulted in outcomes more similar to BULL than BAND, implying minimal efficacy of INJ as a castration method in older bulls arriving to the feedlot".

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[3] Massey, C., K. C. Dhuyvetter, R. V. Llewelyn, and D. A. Blasi. 2011. Castration and morbidity and their effects on performance, carcass quality, and price differentials for bulls and steers. Prof. Anim. Sci. 27:19-28.

[4] USDA-APHIS. 2011. Page 40 in Feedlot 2011 Part I: Management Practices on U.S. Feedlots with a Capacity of 1,000 or More Head. USDA–APHIS–Veterinary Services, Fort Collins, CO. Available: https://www.aphis.usda.gov/animal_health/nahms/feedlot/downloads/feedlot2011/Feed11_dr_PartI.pdf.

[5] Ball, J. J., E. B. Kegley, T. E. Lawrence, S. L. Roberts, J. G. Powell, and J. T. Richeson. 2018. Zinc injection as a novel castration method in beef bulls: effects on performance, behavior, and testosterone and haptoglobin concentration. J. Anim. Sci. 96: 890-901.