

Posters

Effect of injectable castration administered at feedlot entry on gain performance, behavior, testosterone production, and serum haptoglobin concentration in beef bulls

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Introduction

The USDA estimates 15 million castration procedures are performed on bull calves in the United States annually. These are performed to reduce aggressiveness and sexual activity, facilitate handling, prevent unwanted breeding, and improve the meat quality of steers. Currently, no commercially available injectable sterilization methods exist for beef cattle in the US. The objective of the current study was to evaluate the effect of a zinc solution as an injectable castration method when administered to beef bull calves at feedlot entry on performance, behavior, testosterone production, and serum haptoglobin concentration.

Materials and Methods

One-hundred and eighty crossbred bulls (BW = 743 ± 24 lb) were blocked by initial bodyweight (6 blocks) and assigned randomly to 1 of 3 treatments on d 0: 1) INJ (injection of 1 mL zinc solution containing 100 mg zinc/mL in each testis; Calviex, Cowboy Animal Health, LLC, Plano, TX), 2) BAN (band castrated; California Bander, Inosol Co. LLC, El Centro, CA), 3) BUL (left intact) in a randomized complete block design (3 pens/block and 10 cattle/pen).

A random subset of 54 animals (n = 3/pen) were fitted with accelerometers (IceRobotics, Edinburgh, UK) from d 0 for 28 d to record behavioral data. The subset also had testis width and scrotal circumference determined, and were bled via jugular venipuncture to assess serum haptoglobin and testosterone concentrations on d 0, 1, 3, 5, 7, 14, 28, 56, 84, 112, 140, and 168. Testosterone concentrations were analyzed using a 125I radioimmunoassay kit (MP Biomedicals, Solon, OH) and serum haptoglobin concentration was analyzed using an ELISA kit (Immunology Consultants Laboratory, Portland, OR).

Data were analyzed in a randomized complete block design using the mixed procedure of SAS (SAS Inst. Inc., Cary, NC) with treatment as the lone fixed effect and block as the random effect. Pen was the experimental unit for all dependent variables. Serum testosterone and haptoglobin concentrations, testicular thicknesses, and scrotum circumference were analyzed using repeated measures analyses.

Significance was considered for a *P*-value of less than or equal to 0.05.

Results

Body weights on d 0, 14, 28, 56, and 84 did not differ ($P \geq 0.16$). Final BW was greater in INJ and BUL compared to BAN ($P < 0.0001$). Average daily gain was greater in BUL compared to either INJ or BAN from d 0 to 14 ($P = 0.002$). Overall DMI was similar between treatments regardless of castration method ($P = 0.46$). The overall G:F was greater in INJ and BUL compared to BAN ($P = 0.03$).

There were no differences in standing or lying time ($P \geq 0.85$) or lying bouts ($P = 0.35$); however, step count was greater ($P = 0.04$) in BUL and INJ compared to BAN. There was a treatment × day interaction for serum testosterone concentration ($P < 0.0001$), and final serum testosterone concentration on d 168 was similar ($P = 0.14$) between INJ and BUL, but after d 14, was non-detectable in BAN. Scrotal circumference ($P = 0.08$) and testis width ($P = 0.07$) on d 168 tended to be greater in BUL compared to INJ. Serum haptoglobin concentration was greater in INJ compared to BUL and BAN on d 1, 3, 5, and 7 ($P < 0.01$).

Histopathological tissue results (n = 13; INJ = 7; BUL = 6) indicated that INJ testes tissue was degenerative and not viable while BUL testes tissue was normal. Testis derived from INJ treated cattle all showed degenerative changes in the testis with loss of sperm producing spermatogonia and an absence of definable sperm formation and maturation. Individual testis were heavier in BUL vs. INJ, as was the total testes weight ($P \leq 0.0009$).

Significance

The injection of a zinc solution appeared to cause sterilization but did not cause complete cessation of testicular function as evidenced by testosterone concentration more similar to BUL than BAN. The INJ treatment resulted in increased BW and G:F compared to BAN; however, the acute phase response was markedly greater for INJ directly after injection.