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Demasculinization of Beef Bulls by LH Immunization

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Introduction

Intact bull calves grow more rapidly in the feedlot than do their castrate counterparts but are generally less acceptable to the packer because of excess masculinity and insufficient intramuscular and external fat for postmortem handling and storage. Steers, on the other hand, are less efficient and yield less lean meat than bulls. Therefore, it was envisaged that reducing the masculinity of bulls by a noninvasive, nonsurgical procedure might yield a more suitable market animal.

A nonsurgical approach to castration of bulls would possibly provide advantages to the producer and find favor with animal welfare groups. Immunocastration by active immunization against the hypothalamic hormone, luteinizing hormone releasing hormone (LHRH), has proven successful in a number of species, including sheep and swine. This vaccination procedure is so effective at inducing a castration effect, however, that we have attempted to produce only partial castration by immunizing bull calves against the pituitary hormone, luteinizing hormone (LH). It was hypothesized that immunization against this hormone would decrease testosterone secretion and cause moderate demasculinization of bull calves.

Twenty spring-born bull calves were weaned in September and randomly assigned to one of three treatment groups. These included ten immunized controls, five immunized against purified sheep LH, and five immunized against an LH-human serum globulin conjugate (LH-hSG). Preliminary studies showed the conjugate to be more antigenic than LH alone.

Bull calves weighed approximately 350 lb at the time of primary immunization and gained 750 lb (controls), 586 lbs (LH), and 646 lbs (LH-hSG) during the 293-day trial. These gains manifested themselves in differences for avg daily gain, final wt, carcass wt (Table 1), and ribeye area (Table 2). Scores for the secondary sex characteristics (Table 2), weights of the accessory sex glands, and serum testosterone levels (Table 3) suggest that immunization against LH, and especially LH-hSG, produces a condition of androgen deficiency. From this standpoint, the response to the LH-hSG vaccine was comparable to the castration effect achieved by LHRH immunization in sheep and pigs. Although the LH-hSG calves were sterile and were usually similar to steers, kidney and backfat estimates and USDA quality and yield grades were not different from intact controls. Additional studies are required to evaluate the efficacy of this vaccine to demasculinize beef bulls fattened in the feedlot.

Like LHRH immunocastration, LH immunocastration is a simple, effective way to neuter calves. As an attractive alternative to conventional castration, it avoids the primary shock and secondary consequences of hemorrhage and infection that are associated with surgery in the feedlot. The immunocastrate is also interesting in that it may be possible to reactivate the dormant testes with exogenous gonadotropin.

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Table 1—Growth rates and carcass weights of intact bull calves (controls) and calves immunized against either LH or LH conjugated to human serum globulin (LH-hSG)

Treatment	Initial wt (lb)	Final wt (lb)	Avg daily gain (lb/day)	Carcass wt (lb)
Control	350	1,100	2.49	690
LH	366[a]	952[a]	2.03[a]	600[a]
LH-hSG	357[a]	1,003[a]	2.18[a]	608[a]

[a]P <0.05. Significantly different from intact control group.

Table 2—Carcass characteristics of intact bull calves (controls) and calves immunized against either ovine LH (LH) or LH conjugated to human serum globulin (LH-hSG)

Treatment	Secondary sex characteristics[a]	Backfat thickness (in)	Kidney fat (%)	Ribeye area (in^2)	Quality grade[b]	Yield grade[c]
Control	3.8	.17	2.3	12.7	9.6	2.5
LH	2.8[d]	.14[d]	2.3	11.7	7.8	2.4
LH-hSG	1.6[d]	.16	2.2	11.7[d]	10.4	2.5

[a]Sex characteristics, 1 = steer-like (no masculinity); 9 = very masculine.
[b]Quality grade, 8 = average good; 9 = high good; 10 = low choice.
[c]Yield grade, 1 = high cutability; 5 = low cutability.
[d]P <0.05. Significantly different from intact control group.

Table 3—Reproductive parameters of intact bull calves (controls) and calves immunized against either LH or LH conjugated to human serum globulin (LH-hSG)

Treatment	Serum testosterone (ng/ml)	Testes diameter (cm)	Testes wt (gm)	Seminal vesicle wt (gm)
Control	6.1	7.1	582	69.4
LH	3.5[a]	6.2[a]	471	44.0[a]
LH-hSG	.2[a]	5.2[a]	313[a]	11.4[a]

[a]P <0.05. Significantly different from intact control group.