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### Summary

*Bulls were fed 1 mg/head/day of MGA from 5.5 to 6.5 months ; 6.5 to 9; or fed a control diet. Body weight, scrotal circumference, combined testis weight, testis composition, and testosterone concentration were measured. Feeding MGA prior to puberty increased scrotal circumference and decreased testosterone concentration at 12 months compared to controls. Thus, feeding MGA prior to puberty can alter testis characteristics in bulls.*

### Introduction

Implants containing 17Beta-estradiol administered prior to puberty impaired testis size. In addition, GnRH immunization has been used to immunocastrate bulls at several stages of testis development and resulted in reduced testis size through arrest of spermatogenesis. More recently, a study involving bulls treated with different doses of MGA at or after 9 months of age attempted to reduce aggressive male behavior but showed no effects on behavior or testis characteristics. Previous data (*Tepfer et al., 2006 Nebraska Beef Report,* pp. 16-17) demonstrated that body weight and testosterone were altered by feeding MGA prior to 9 months. In the current study, we used greater numbers of bulls with similar treatment groups to determine if there were effects of feeding MGA during the pre- and peri-pubertal period. The current trial investigated a treatment that would be easy for producers to administer, would have dramatic effects on testis function, and allow for manipulation of testis size in bulls to meet the individual goals of the producer. In the case of seed-stock producers, administration of MGA during the pre-pubertal period may optimize or increase spermatogenic capacity of the bulls allowing for increased sperm cells per ejaculate.

### Procedure

Eighty cross-bred bull calves (420 ± 11 lb; 5 months ) were fed MGA either pre- (PRE) or peri-pubertally (PERI) and a control (CON) group. Calves were allowed to graze a bromegrass pasture and supplemented with soybean hulls (60%, DM basis) and corn (40%, DM basis). The PRE treatment group was fed MGA (1mg/head/day) for 70 days, while the PERI treatment group was fed MGA (1mg/head/day) for 88 days. Treatment protocols are described in Figure 1. At each time point until bulls were castrated, right testis weight was collected as well as combined testis weight (from both testis), scrotal circumference was measured, and blood samples were collected to be later analyzed for testosterone concentration.

### Results

*Scrotal Circumference*

Bulls in the PRE group had increased scrotal circumference at 12 months (36.2 ± 0.8 cm; Figure 2; $P = 0.03$) when compared to CON (34.1 ± 1.0 cm) and their scrotal circumference tended ($P = 0.06$) to be greater than PERI (34.1 ± 0.8 cm). No other effects of either treatment on scrotal circumference at any other collection period were observed.

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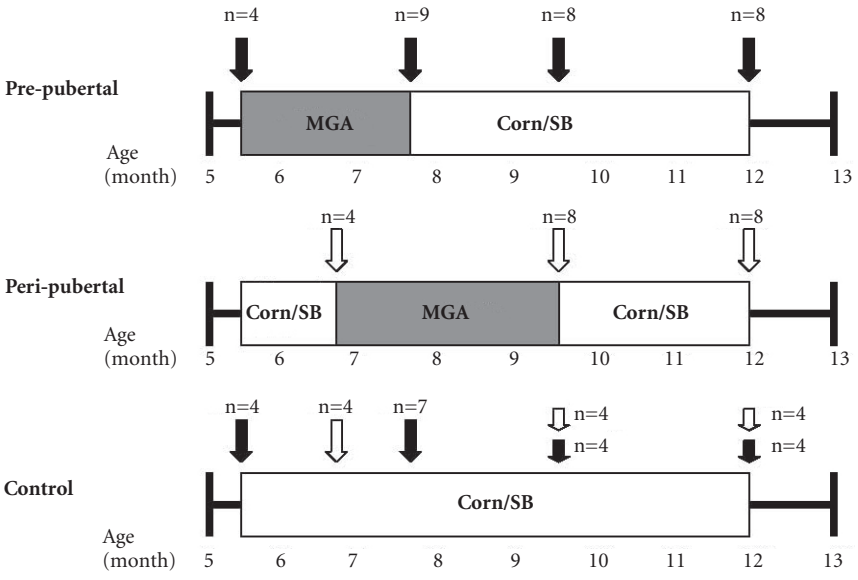


**Figure 1. Schematic of treatment groups and when MGA was administered to bulls, blood samples were collected, and bulls were castrated. Black arrows represent when PRE and CON bull blood samples, SC, and BW were taken. Numbers above the arrows represent the number of bulls from PRE and CON that were castrated. Open arrows represent when PERI and CON bull blood samples, SC, and BW were collected. Numbers above open arrows represent the number of bulls that were castrated at that collection.**

*Testis Weight*

Bulls in the PRE group had greater right testis weight (RTW; 484.9 ± 19.5 g; Figure 3; $P = <0.001$) at 12 months of age when compared to PERI (365.8 ± 19.8 g) and were not different from CON ($P = 0.17$; 457.1 ± 23.0 g). Similarly at 12 months, bulls in the PRE group tended to have heavier combined testis weight (CTW; 821.7 ± 33.9 g; Figure 4) when compared to the CON ($P = 0.08$; 751.5 ± 39.9 g) and PERI ($P = 0.06$; 683.8 ± 34.3 g). Bulls in the PERI group had lighter RTW ($P = 0.01$; 365.8 ± 19.8 g) compared to CON (457.1 ± 23.0 g) at 12 months of age.

*Testosterone*

Feeding MGA pre- and peri-pubertally, affected all testosterone concentration measurements and treatment groups except for the 5.5 month measurement, which showed no difference between groups. The bulls in the PERI group (2.48 ± 0.47ng/ml; Figure 5) resulted in an increased ($P = 0.003$) concentration of testosterone at 6.75 months compared to the CON (0.06 ± 0.40 ng/ml) and increased ($P = 0.02$) testosterone concentration compared the PRE (1.06 ± 0.40 ng/ml). The bulls in the PRE group (1.56 ± 0.41 ng/ml) tended to have an increased ($P = 0.08$) testosterone concentration at 7.5 months when compared to PERI (0.40 ± 0.51 ng/ml). The PERI bulls (2.61 ± 0.51 ng/ml) also showed a decrease ($P = <0.001$) in testosterone compared to the CON (6.50 ± 0.84 ng/ml) and the PRE (6.19 ± 0.51 ng/ml) groups at 9 months. At 12 months of age, bulls in the PRE group (7.14 ± 0.73 ng/ml) tended to have lower testosterone concentrations ($P = 0.07$) compared to the CON (8.98 ± 0.84 ng/ml) and had lower concentrations of testosterone ($P = 0.04$) than the PERI group (9.22 ± 0.73 ng/ml).

*Body Weight*

Feeding MGA increased BW in the PRE group (1115 ± 26.08 lb; Figure 6; $P = 0.05$) compared to the CON (1,040 ± 27.23 lb) and tended to be heavier ($P = 0.08$) then the PERI group (1,043

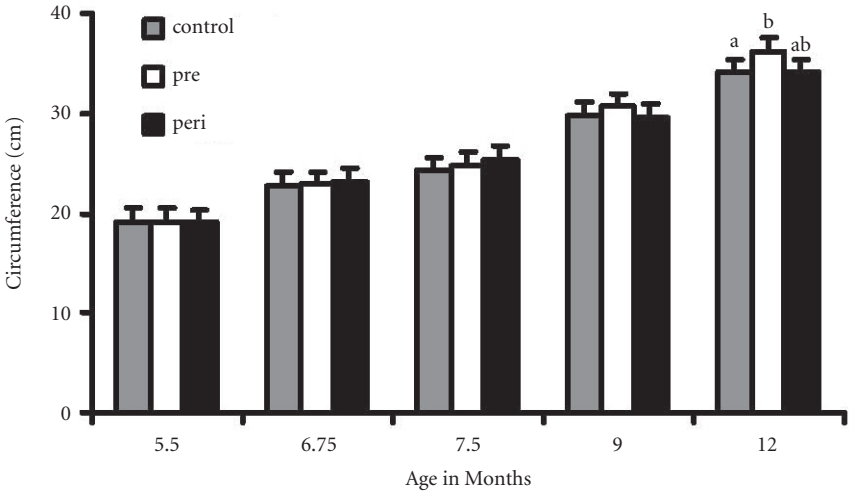


**Figure 2. Effect of feeding MGA on scrotal circumference (SC) during the pre- and peri-pubertal period in bulls.**
**[ab]Means within time point without a common superscript differ ($P \leq 0.05$).**

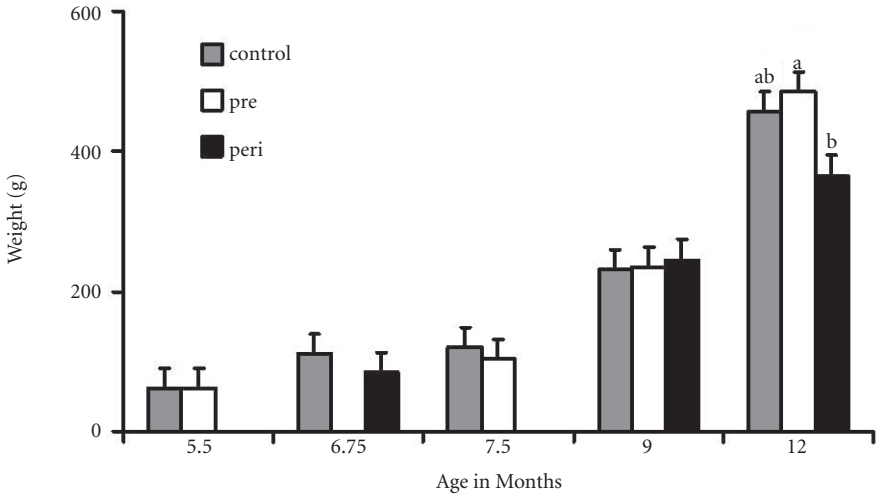


**Figure 3. Effect of feeding MGA on right testis weight (RTW) during the pre- and peri-pubertal period in bulls.**
**[ab]Means within time point without a common superscript differ ($P \leq 0.05$).**

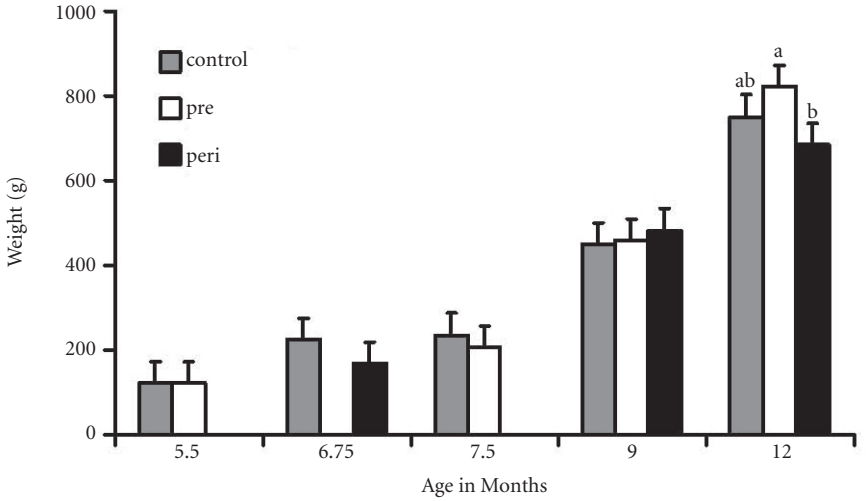


**Figure 4. Effect of feeding MGA on combined testis weight (CTW) during the pre- and peri-pubertal period in bulls.**
**[ab]Means within time point without a common superscript differ ($P \leq 0.05$).**

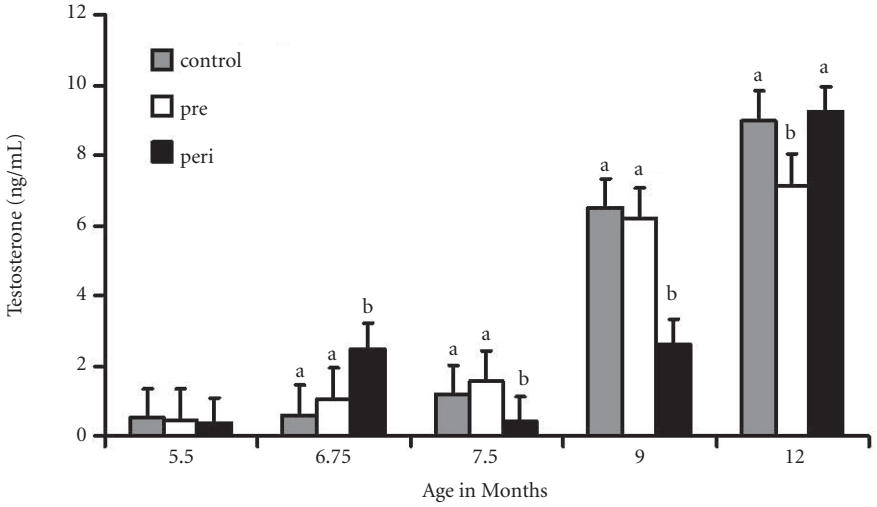


**Figure 5. Effect of feeding MGA on testostesrone (T) concentration during the pre- and peri-pubertal period in bulls.**
**[ab]means within time point without a common superscript differ ($P \leq 0.05$).**

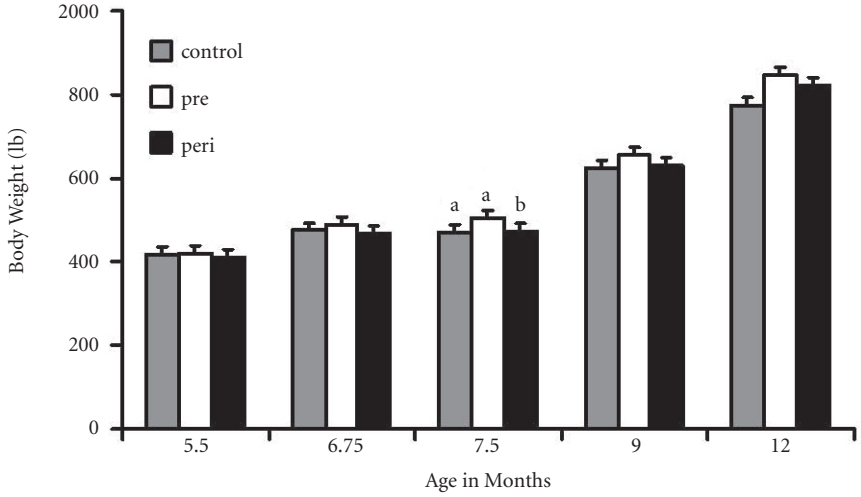


**Figure 6. Effect of feeding MGA on body weight (BW) during the pre- and peri-pubertal period in bulls.**
**[ab]means within time point without a common superscript differ ($P \leq 0.05$).**

± 32.61 lb) at 7 months of age. At 12 months of age, the bulls of the PRE group (1,872 ± 46.14 lb) tended to have an increased ($P = 0.06$) body-weight in comparison to the CON (1,750 ± 53.46 lb).

*Testis Composition: Interstitium vs. Seminiferous Tubule Area*

Differences between treatment groups at any of the measurements for either interstitium or seminiferous tubule area were not apparent. Seminiferous tubules contain developing sperm and if this area was larger we might speculate an increase in number or capacity of spermatogenesis. Cells within the interstitium produce androgens such as testosterone. Thus, an increase in the area of these cells might suggest a greater capacity in the testis to produce testosterone. Since we did see a difference in scrotal circumference and testis weight, this suggests that overall size of the testis was larger in PRE vs. CON treatments with no changes in composition of the internal testis compartments.

In this experiment, pre-pubertal MGA feeding increased scrotal circumference, testis weight and decreased testosterone at 12 months compared to the control and the peri-pubertal treatments. Thus feeding MGA during different stages of pre- and peri-pubertal development can alter testosterone development and may increase spermatogenic capacity of the testis. Since no seminal characteristics were evaluated further research needs to be conducted to determine if sperm characteristics (volume, motility, etc) were also enhanced.

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