1-1-2006

Feeding Melengestrol Acetate to Bulls Prior to and at Puberty Alters Body Weight, and Hormone Concentration

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Summary

Melengestrol acetate (MGA), which is commonly used in the beef industry to manipulate ovarian activity of females, was fed to bulls at two times during development, prepubertal (5.5 to 7.5 months) and peri-pubertal (6.5 to 9.5 months), to determine effects on testes size, scrotal circumference, body weight, and/or hormone production. We can conclude that feeding bulls MGA during the prepubertal and peri-pubertal time can alter body weight and testosterone production.

Introduction

Previous studies feeding bulls 0.5 to 2.0 mg/hd/day MGA at 317 days of age for 99 days resulted in no effects on LH or testosterone concentrations or male sexual behavior. However, no experiments have determined the effects of feeding MGA prior to 9 months on testis function in bulls. In the current study MGA was fed at two critical times during development; 1) prepubertal (5.5 to 7.5 months) and; 2) peri-pubertal (6.5 to 9.5 months), to determine the effects on testes size and hormone concentration in bulls. If MGA caused an increase in either testes weight or scrotal circumference this should result in an increase in sperm production. Bulls with increased sperm production would be beneficial to those in the cattle industry raising seedstock or purebred bulls for natural mating or collection of semen for artificial insemination.

In contrast, if MGA caused decreased testis weight or scrotal circumference then this may decrease testosterone production which would be beneficial to producers that castrate bulls later in age. Testosterone has positive effects on increased lean muscle growth. However, testosterone also induces aggressive male behavior, and causes off flavor in carcasses (especially in intact males). Therefore, a reduction in testosterone production may provide the benefits of lean muscle growth while reducing the unfavorable effects associated with behavior and meat flavor.

Procedure

Experiment 1 Prepubertal

Bull calves were given a supplement of 56% soybean hulls, 40 % fine ground corn at 6 lbs/hd/day either containing MGA (1 mg/hd/day, n=12) or without MGA (n=11) while on a roughage diet from 5.5 to 8.5 months. The roughage diet included pasture, containing smooth brome grasses, during the summer months and alfalfa hay fed ad libitum during the winter months. Blood samples, scrotal circumference and body weight were collected at 7.5, 8.75, 9.5, and 11 months. In addition, two bulls were castrated at each collection time to determine individual testis weight and combined testis weight. Blood samples were evaluated for LH and testosterone concentrations (Figure 1). Data were analyzed using SAS with repeated measures and weaning weight as a covariate.

Experiment 2 Peri-pubertal

Bull calves were given a supplement of 56% soybean hulls, 40 % fine ground corn at 6 lbs/hd/day either containing MGA (1 mg/hd/day, n=12) or without MGA (n=10) while on a roughage diet from 6.5 to 9.5 mo. The roughage diet included pasture, containing smooth brome grasses, during the summer months and alfalfa hay fed ad libitum during the winter months. Blood samples, scrotal circumference and body weight were collected at 9.5, 10.5, 11.5, and 12.5 months. In addition, at least two bulls were castrated at each collection time to determine individual testis weight and combined testis weight. Blood samples were evaluated for LH and testosterone concentrations (Figure 2). Data were analyzed using SAS with repeated measures and weaning weight as a covariate.

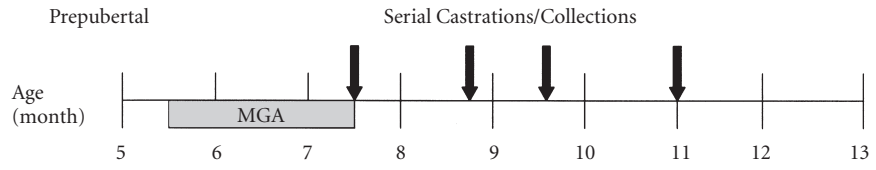

Figure 1.

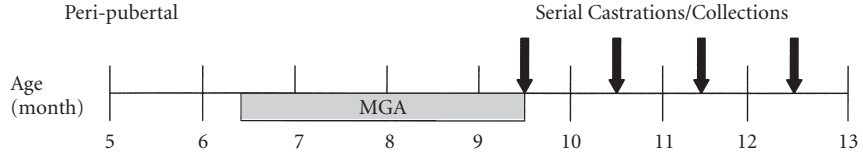

Figure 2.

Table 1. Feeding MGA during the prepubertal period.

	Bull Age							
	7.5 mo		8.75 mo		9.5 mo		11.0 mo	
	C[a]	MGA[b]	C	MGA	C	MGA	C	MGA
TW[c] (g)	102.9	180.7	222.1	206.6	306.3	190.5	416.0	301.6
CTW[d] (g)	207.0	356.9	451.8	422.6	577.9	372.0	826.7	606.2
N[e] =	2	2	2	2	2	2	2	2
SC[f] (cm)	25.1	24.2	30.8	28.4	32.1	30.0	33.0	32.0
BW[g] (lb)	504	513	552	554	606[i]	588[j]	730	755
LH (ng/mL)	0.16	0.11	0.18	0.16	0.19	0.27	0.28	0.26
Testosterone (ng/mL)	3.95	2.31	9.04	6.62	5.70[k]	4.40[l]	10.37	9.66
N[h]=	12	11	10	9	8	7	6	5

[a]C = Control
[b]MGA = Melengestrol acetate
[c]TW = Testis weight
[d]CTW = Combined testis weight
[e]N = Number of bulls castrated at each time for each group
[f]SC = Scrotal circumference
[g]BW = Body weight
[h]N =Number of bulls at each collection that were collected to determine SC, BW, LH and testosterone.
[i,j]Different letters within collection for each measurement are different at $P < 0.05$.
[k,l]Different letters within collection for each measurement are different at $P = 0.1$.

Table 2. Feeding MGA during the peri-pubertal period.

	Bull Age							
	9.5 mo		10.5 mo		11.5 mo		12.5 mo	
	C[a]	MGA[b]	C	MGA	C	MGA	C	MGA
TW[c] (g)	260.57	230.37	156.60	132.47	334.95	388.83	361.80	418.87
CTW[d] (g)	531.43	470.33	292.77	312.43	683.65	789.03	761.90	864.83
N[e]=	3	3	3	3	2	3	2	3
SC[f] (cm)	31.10	30.88	33.24	33.41	34.68	35.48	34.50	36.60
BW[g] (lb)	725.60	719.00	779.00	765.33	863.75[i]	854.33[j]	846.00	885.33
LH (ng/mL)	0.25	0.36	0.16	0.16	0.17	0.24	0.18	0.22
Testosterone (ng/mL)	8.87	5.19	4.39	5.76	7.54	8.68	5.02	13.27
N[h]=	10	12	7	9	4	6	2	3

[a]C = Control
[b]MGA = Melengestrol acetate
[c]TW = Testis weight
[d]CTW = Combined testis weight
[e]N = Number of bulls castrated at each time for each group
[f]SC = Scrotal circumference
[g]BW = Body weight
[h]N =Number of bulls at each collection that were collected to determine SC, BW, LH and testosterone.
[i,j]Different letters within collection for each measurement are different at $P < 0.05$.

Results

Experiment 1 Prepubertal

MGA treated bulls were lighter than control bulls ($P < 0.05$) at collection 3 (9.5 mo; Table 1). There was also a tendency ($P = 0.1$) at collection 3 for testosterone concentration to be lower in the MGA treated than control group (9.5 months; Table 1). Testis weight, combined testes weight, and scrotal circumference were not different between the treatment and control groups. Histological sections from bulls at each castration collection are being evaluated to determine the effects of MGA prior to puberty on testis composition.

Experiment 2 Peri-pubertal

Control bulls were heavier ($P < 0.05$) than MGA treated bulls at collection 3 (11.5 mo; Table 2). Testis weight, combined testis weight, and scrotal circumference were not statistically different between the two groups (Table 2). Further analysis of histology from testes from both experiments will determine if MGA treatments affected populations of cells within the testis or sperm maturation.

From these experiments, we can conclude that feeding MGA during the pre- and peri-pubertal period can alter testosterone production and body weight. Thus, feeding MGA during different stages of bull development may be good method to alter testis function. Further experiments with larger numbers of bulls are being conducted to provide more information on MGA's effect on testis development.

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