PREPUBERAL TESTOSTERONE TREATMENT AND TESTES DEVELOPMENT, SPERMATOGENESIS AND SEXUAL BEHAVIOR OF BOARS

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Story in Brief

Prepuberal boars were used to determine the influence of testosterone on sexual behavior, testicular development and spermatogenesis. Sixty-three boars from 21 purebred Hampshire or Yorkshire litters were used. At three months of age, littermate boars were assigned to weekly treatments: Control (vehicle), LTP (0.5 mg testosterone propionate/kg BW), or HTP (2 mg testosterone propionate/kg BW). Behavior trials were conducted weekly for 4 wk when boars were 6 mo of age. Boars were castrated at 7 mo of age. Weights of testes and epididymides and sperm numbers were quantified. Testosterone treatment did not influence the percentage (70%) of boars that mated between 6 and 7 mo of age. Testicular and cauda epididymal weights were greater for control than for LTP or HTP boars. Yorkshire boars had heavier testes and greater sperm numbers than Hampshire boars.

(Key Words: Boar, Libido, Testis, Testosterone.)

Introduction

Much variation exists in sexual behavior among boars. The male hormone, testosterone, causes libido in boars. Removal of testosterone in boars by castration (Pickett et al., 1967) or immunization (Esbenshade and Johnson, 1987) decreases sexual activity. Male pigs castrated at birth display female sexual behavior in response to post-pubertal injections with estrogens (Ford and Christenson, 1987). Boars castrated at 8 mo of age and treated with estrogen do not exhibit the immobility response. If boars were castrated at birth but given testosterone injections between 3 and 6 mo of age, an intermediate number displayed female sexual behavior after estrogen treatment. Thus sexual defeminization is related to testosterone concentrations in boars during the prepuberal period.

The objective of this research was to determine the influence of

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exogenous testosterone on sexual behavior, testicular development and spermatogenesis.

Materials and Methods

Trios (n=21) of littermate boars were selected from purebred Yorkshire and Hampshire herds during the 2 year experiment. When boars were 3 mo of age, 1 boar from each litter was assigned to each of three treatments. Boars were injected (IM) once per week with vehicle (Control; 60% propylene glycol, 30% ethyl alcohol and 10% benzyl alcohol), .5 mg/kg BW testosterone propionate (LTP) or 2 mg/kg BW testosterone propionate (HTP) for 3 mo.

Libido of boars was evaluated for 15 min/wk for 4 wk commencing when boars were 6 mo old. The month that boars attained 6 mo of age was used to classify boars into seasons. Each season consisted of 3 consecutive months with the Winter season commencing in January of each year. Boars from 4, 4, 6 and 2 litters were evaluated in Winter, Spring, Summer and Fall, respectively. Each boar was moved to an isolated room for a 5 min acclimation period. An estrous gilt was introduced after acclimation and sexual activity was observed by two individuals for 15 min. The number and time of first occurrence were noted for ano-genital sniffs, nose-to-nose contacts, nosings of the gilts flank, improper mounts, proper mounts, erection of penis, intromission and copulation. Successful mating was denoted by completion of copulation.

When boars were 7 mo of age, they were anesthetized and castrated. One of the testes, the caput-corpora epididymis and the cauda epididymis were weighed. The complete caput-corpus and cauda epididymides and 10 g of the testicular parenchyma were each homogenized in 200 ml of a saline-Triton-Merthiolate solution. Sperm numbers were counted in these homogenates with a hemocytometer.

Results and Discussion

Boars were born and reached puberty in all seasons during the two year study. There was an interaction between season tested and testosterone treatment ($P < .02$) on the percentage of boars that completed matings. The effect of treatment was not consistent and probably associated with animal variation (Figure 1). Overall, 70% of the boars completed matings during at least one of the four libido tests and only during the Summer was the average of all treatments (40%) less than that percentage. Our results indicate that puberty may be delayed in boars that are initiating mating during the Summer. This agrees with studies with gilts that suggest that heat stress may delay puberty.

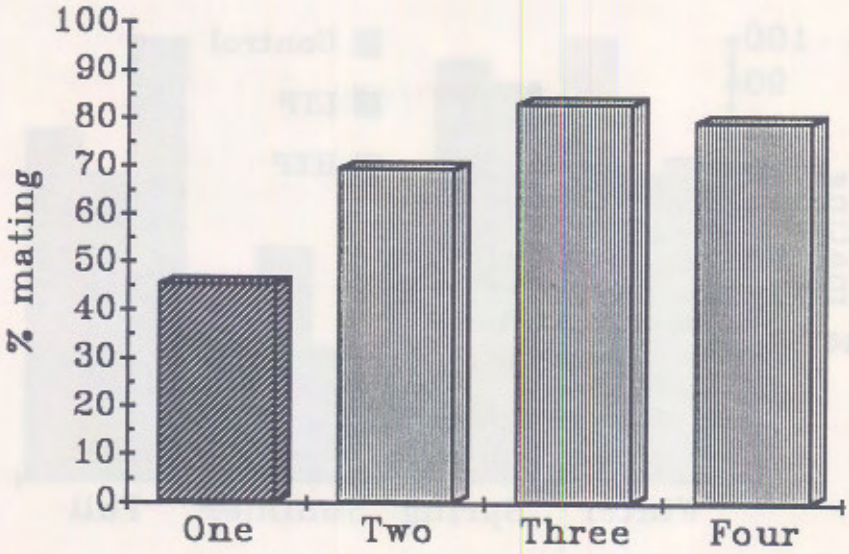

Figure 1. Influence of season and testosterone treatment on the percentage of boars completing successful matings.

Libido of boars (Figure 2) was evaluated during 4 weekly mating tests. The percentage of boars that mated was less ($P<.05$) during the first exposure to gilts compared to the other evaluations. The actual percentages of boars that mated were 45, 70, 83 and 79% for evaluations 1 through 4, respectively. Similarly, Levis (1984) concluded that at least 3 mating tests are necessary to evaluate libido.

Boars weighed an average of 115 ± 4 kg when castrated at 7 mo of age. The influence of testosterone on weights of testes and epididymal sections is presented in Table 1. The objective was to utilize dosages of testosterone that would stimulate libido without adverse effects on testicular function. Control boars had heavier testes, capita-corpora, and caudae epididymides ($P<.02$) compared with boars treated with testosterone. Boars on LTP had heavier testes and caudae epididymides and tended ($P<.13$) to have heavier capita-corpora weights compared to boars receiving HTP.

The number of sperm in the capita-corpora epididymides was influenced by treatment with testosterone. Control boars had greater numbers (27.5 billion) of sperm in the capita-corpora region ($P<.01$) compared with testosterone treated boars. Boars on the low dosage of testosterone propionate had greater ($P<.05$) numbers (20.4 billion) compared with HTP boars (11.4

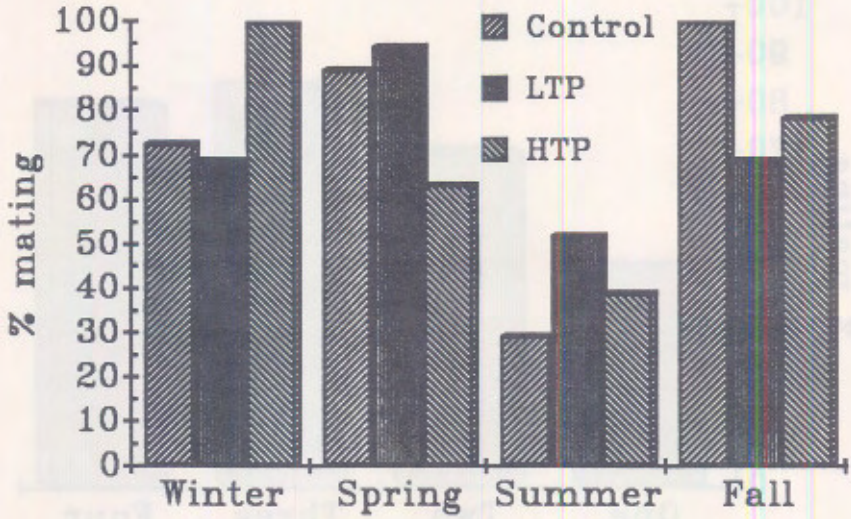

Figure 2. Influence of number of exposures to estrous gilt on mating.

Table 1. Influence of weekly testosterone injections on testicular, capita-corpora (C-C) and caudae (C) weights (g).

Treatment	n	Testes Wt.[ab]	C-C Wt.[ab]	C Wt.[ac]
Control	18	300.9 ± 4.5	34.3 ± .4	30.7 ± .4
LTP	19	248.5 ± 3.9	28.9 ± .4	30.2 ± .4
HTP	19	195.3 ± 3.9	23.3 ± .4	23.2 ± .4

[a]Control differed from testosterone treated ($P < .02$)
[b]LTP differed from HTP ($P < .02$)
[c]LTP differed from HTP ($P < .13$)

billion). Testosterone treatment interacted with season ($P<.02$) to influence sperm numbers in the testes and caudae epididymides (Table 2). This interaction may be related to the limited number of boars during the Fall season. Number of sperm per testis from Control boars (38.9 billion) were similar throughout the seasons. But, number of sperm per testis from LTP boars were greatest in Fall, and HTP boars had the greatest sperm numbers in the testes during Spring. Sperm numbers in the caudae epididymides of Control and LTP boars were greatest in the Fall. Boars receiving the high testosterone treatment had decreased numbers of sperm in the caudae epididymides during Summer and Fall.

Breed of boar influenced weights of tissues and total testicular and epididymidal sperm numbers. The average weight of one testis from Yorkshire boars (273.8 ± 9 g) was greater ($P<.02$) than that for Hampshire boars (222.7 ± 18 g). Similarly the caudae epididymides from Yorkshire boars weighed approximately 6 g more ($P<.01$) than those from Hampshire boars.

Table 2. Influence of season and testosterone treatment on numbers of sperm (x 10^9) in testicular parenchymae and caudae (C) epididymides.

Season	n	Testes	C
Winter			
Control	4	39.3 ± 6.7	57.6 ± 14.6
LTP	4	31.1 ± 6.6	45.6 ± 5.1
HTP	4	20.9 ± 4.1	25.7 ± 5.8
Spring			
Control	4	35.3 ± 6.8	39.3 ± 13.2
LTP	4	24.8 ± 7.7	25.3 ± 5.4
HTP	4	51.4 ± 22.5	26.9 ± 15.6
Summer			
Control	6	39.4 ± 4.4	52.5 ± 6.1
LTP	7	31.2 ± 6.0	47.8 ± 10.1
HTP	7	22.2 ± 4.2	16.7 ± 5.2
Fall			
Control	2	41.6 ± 5.3	92.4 ± 8.7
LTP	2	71.3 ± 17.9	99.8 ± 28.9
HTP	2	10.1 ± 0	7.9 ± .8

Also, Yorkshire boars had greater numbers of sperm in the testes (37 billion; $P < .03$) compared with Hampshire boars (20.7 billion).

In summary, prepuberal treatment of boars with testosterone did not influence sexual behavior. Exogenous testosterone decreased testicular, capita-corpora and cauda weights and sperm numbers. Weekly injections of testosterone propionate before puberty, sufficient to influence testicular weight and function, did not affect sexual behavior of boars at puberty.

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