TESTICULAR DEVELOPMENT AND ENDOCRINE FUNCTION IN BOARS FED ALTRENOGEST[1]

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Summary

Crossbred male pigs were used to evaluate the influence of a synthetic progestogen on reproductive development. Concentrations of luteinizing hormone (LH) and testosterone in blood serum were reduced while boars were being fed altrenogest (15 to 21 wk of age). At 25 wk of age (4 wk after withdrawal from altrenogest), weights of the testes and accessory reproductive glands and testicular content of sperm were reduced in boars that had been fed altrenogest. However, testicular weight and content of sperm had returned to control values following 12 wk after withdrawal from altrenogest. In addition, concentration of LH and testosterone in blood serum were similar for control boars and boars previously fed altrenogest. We conclude that suppression of normal reproductive development of growing boars by altrenogest merely delays the onset of sexual maturation but does not permanently affect testicular function.

Introduction

Although the hormonal mechanisms underlying reproductive development in growing boars are generally understood, factors contributing to the tremendous variation observed in young boars for testicular size, production of sperm, and libido remain unclear. Perhaps some factors (e.g., severe heat stress, disease, confinement) associated with the environment in which young boars are reared affect their reproductive function as adults.

An approach we have used to study the hormonal control of reproductive development in young boars is treatment with the synthetic progestogen, altrenogest. We have demonstrated that altrenogest suppressed testicular function of growing boars. We now describe a study in which we evaluated the degree to which reproductive functions returned in boars whose testes had been severely reduced during growth by feeding altrenogest.

Procedures

At 12 wk of age, littermate male pigs (two intact boars and one barrow) were selected from 18 litters (n=54). Treatment groups included: 1) control, intact boars, 2) intact boars fed altrenogest (20 mg/day) for 6 wk from 15 to 21 wk of

[1]The authors appreciate the generous donation of altrenogest by Roussel-UCLAF, Paris, France.

age, and 3) barrows castrated at 2 wk of age. During the withdrawal period (21 to 33 wk of age) when no altrenogest was fed, altrenogest-treated boars were fed the same diet as control boars and barrows.

Blood was collected at biweekly intervals from 13 to 33 wk of age. The blood serum was obtained, frozen, and later evaluated for concentration of LH and testosterone. We measured LH, since this hormone controls testosterone output from the boar testis.

At 25 wk of age, a sample of pigs from each treatment (12/treatment) was sacrificed. The testes, epididymides (control and altrenogest-treated boars), and accessory reproductive glands (prostate, bulbourethral glands, and seminal vesicles) were collected, trimmed, and weighed. Later, content of sperm in the testes and epididymides was determined.

The remaining control boars and altrenogest-treated boars were castrated at 33 wk of age to evaluate longer-term effects of altrenogest on testicular function. At castration, the testes and epididymides were saved, weighed, and the content of sperm in these tissues was determined.

Results and Discussion

In general, weights of reproductive accessory glands for boars fed altrenogest were intermediate between weights of those for control boars and barrows (Table 1). Similarly, when evaluated at 25 wk of age, weights of the testes and epididymides and total content of sperm in these tissues were reduced for boars fed altrenogest (Table 2). However, 12 wk after removal of altrenogest, when boars were 33 wk of age, weight and total sperm content of the testes and epididymides had returned to control values (Table 2).

Table 1. Accessory Reproductive Gland Weights at 25 Weeks of Age after 6 Weeks of Altrenogest Feeding (20 mg/d) from 15 to 21 Weeks of Age.

Item	Control Boars	Altrenogest Boars	Barrows	SE
Number	12	12	12	
Paired seminal vesicle, lb	.432[a]	.144[b]	.008[c]	.038
Body of prostate, lb	.018[a]	.011[b]	.003[c]	.002
Paired bulbourethral, lb	.290[a]	.204[b]	.009[c]	.024

[a,b,c]Means with different superscripts are different.

Table 2. Testicular and Epididymal Weights and Sperm Content at 25 and 33 Weeks of Age after 6 Weeks of Altrenogest Feeding (20 mg/d) from 15 to 21 Weeks of Age[a].

Item	25 Weeks			33 Weeks		
	Control Boars	Altrenogest Boars	SE	Control Boars	Altrenogest Boars	SE
No. boars	12	12		5	6	
Paired testes, lb	1.30[b]	0.87	0.07	1.53	1.63	0.13
Total testicular sperm x 10^9	7.2[b]	3.6	.8	15.4	15.4	2.7
Paired epididymides, lb	0.24[b]	0.17	0.1	0.32	0.32	0.03
Total epididymal sperm x 10^9	79.1[b]	30.0	8.6	96.8	98.6	22.3

[a]Comparisons were made within age group (25 or 33 wk) only.

[b]Different from altrenogest-treated boars ($P<.05$).

The data depicted in Fig. 1 and 2 provide some evidence underlying the dramatic effects observed on the accessory glands, testes, and epididymides of boars fed altrenogest. During the period of altrenogest feeding (15 to 21 wk of age), concentration of LH in the blood serum of boars receiving the drug was reduced compared with controls (Fig. 1). Since LH controls the release of testosterone from the testes of boars, it is not surprising that testosterone was also reduced during this period (Fig. 2). Note, however, that both LH and testosterone returned to control values after removal of altrenogest.

Taken together, our data suggest that feeding altrenogest to growing boars reduced testicular function. This likely resulted from a suppression of LH secretion from the anterior pituitary. However, these effects were only temporary and did not permanently reduce reproductive function. These data provide us with valuable information relative to the ability of pubertal boars to recover quickly from drastic reductions in testicular function. Perhaps the response we observed is typical of other normally occurring situations and several other questions can be raised. For example, would heat stress produce a similar inhibition of testicular development of young boars and would it be as completely reversible? Our results provide a new approach for studying the effects of environmental stresses on future reproduction of boars.

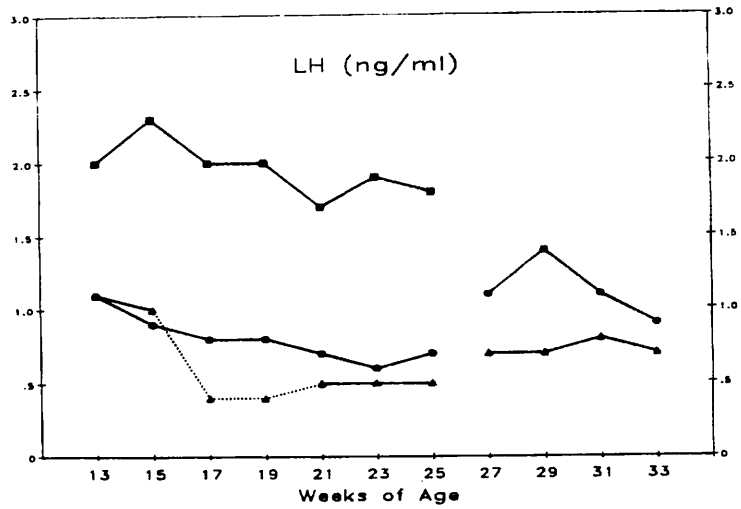

Figure 1. Concentrations of luteinizing hormone (LH) in serum of barrows (n=18, □), control boars (n=17, O), and altrenogest (20 mg/d)-treated boars (n=18, Δ) from 13 to 25 wk of age. Broken line indicates a 6-wk period of altrenogest treatment. Standard errors are ± 0.08. Concentrations of LH in serum of five control boars (O) and six boars previously fed altrenogest (Δ) also are shown from 27 to 33 wk of age. Standard errors are ± 0.21.

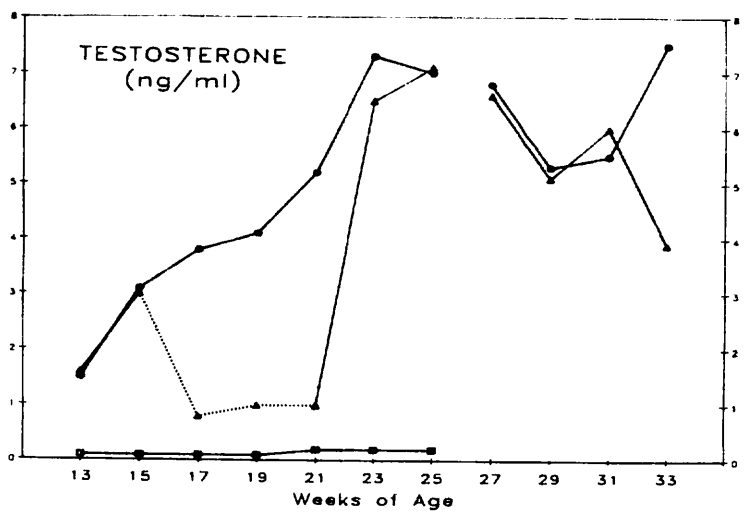

Figure 2. Concentrations of testosterone in serum of barrows (n=18, □), control boars (n=17, O), and altrenogest (20 mg/d)-treated boars (n=18, Δ) from 13 to 25 wk of age. Broken line indicates a 6-wk period of altrenogest treatment. Standard errors are ± 0.33. Concentrations of testosterone in serum of five control boars (O) and six boars previously fed altrenogest (Δ) also are shown from 27 to 33 wk of age. Standard errors are ± 0.99.