

HORMONAL INTERACTION BETWEEN THE TESTES AND COMBS IN COCKERELS

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Growth of the comb in chickens obtained under the influence of injections of pituitary extract was inhibited by injection of cyproterone acetate. Despite the blocking of comb growth, the response of the testes to injection of pituitary extract was not significantly changed. Exclusion of the secondary component of the gonadotropic reaction (stimulation of comb growth) was thus not significantly reflected in the primary effect of the gonadotropins, stimulation of testicular growth. Consequently, the gonadotropic reaction in cockerels failed to reveal any inhibitory effect of the comb on the growing testis.

On the basis of plus-minus interaction, Zavadovskii [2] postulated the existence of interaction between the gonads and the secondary sexual characteristics dependent on them. The nature of the interaction between the gonads and comb in cockerels is that the testes stimulate growth of the comb, but the comb inhibits the function and growth of the testes. Support for this concept was given by experiments in which the comb was removed surgically from a cockerel; soon after the operation, an increase was found in the weight of the testes [3, 4]. However, this effect was not observed always. In some cases the weight of the testes in the cockerel did not increase after removal of the comb, but decreased or remained unchanged [6]. An increase in weight of the testes occurred only if the body weight also increased after removal of the comb [8].

Hypertrophy of the gonads observed in cockerels after removal of the comb cannot therefore be ascribed entirely to blocking of the direct inhibitory effect of the comb on the testis, as Zavadovskii considered.

In the present writers' experiments [1] on infantile cockerels, removal of the combs did not change the response of the testes after administration of gonadotropins was discontinued. Additional stimulation of comb growth by means of testosterone propionate likewise was not reflected in the rate of restoration of the normal weight of the testes. These experiments indicate that a secondary component of the gonadotropic response such as stimulation of comb growth has no inhibitory effect on the primary effect of the gonadotropins, stimulation of testicular growth.

Many investigations have shown that cyproterone acetate (1,2- α -methylene-6-chloropregna-4,6-dien-17 α -ol-3,20-dione acetate) is a compound which can depress a number of biological processes controlled by androgen [5, 9, 10], with which it enters into competitive relationships at the level of the androgen receptors in target organs. This compound has also been shown to weaken the response of the cockerel's comb to preparations of male sex hormone [7, 11]. It might be expected that cyproterone acetate would depress the comb response not only to exogenous, but also to endogenous androgen.

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TABLE 1. Effect of Cyproterone Acetate on Response of Gonads and Comb in Cockerels to Injection of Pituitary Extract

Nature of procedure	No. of cock- erels	Mean body wt. (in g)	Mean wt. of comb	Mean wt. of testes	Mean wt. of thyroid	Mean wt. of adrenal
			in mg/100 g body weight			
No treatment	12	40	23,1±2,1	22,4±2,1	7,9±0,3	38,8±1,91
Injection of pituitary extract	18	41	210,9±32,9	82,1±9,6	52,2±2,8	37,5±2,15
Injection of pituitary ex- tract+ cyproterone acetate	9	43	30,2±5,3	76,3±9,4	49,4±5,76	32,8±2,1

Note. The difference between the weights of the combs of the cockerels in groups 1 and 3 were not statistically significant.

In view of its possibility it was decided to study the effect of blocking comb growth by means of an antiandrogen on the testicular response in cockerels to injection of gonadotropins, after first determining the dose of the compound causing blocking of the adrogenic response of the comb.

EXPERIMENTAL METHOD

Two experiments were carried out on 5-day Russian White chickens. In the first experiment, conducted on chickens of both sexes, the effect of cyproterone acetate* on the comb response to daily injections of testosterone propionate for 8 days was investigated. In the other main experiment the action of the antiandrogen on the response of the comb and gonad of the cockerels to daily injection of alkaline extract of the anterior lobe of bovine pituitary gland was studied. Testosterone propionate was injected intramuscularly once a day in a dose of 100 µg. Cyproterone acetate was injected subcutaneously as an alcohol-oil emulsion twice a day in a dose of 2 mg per cockerel. The alkaline pituitary extract was injected in a daily dose equivalent to 15 mg of an acetone powder of anterior lobes of bovine pituitary glands. All preparations were injected into different parts of the body. On the 9th day of administration of the preparations the cockerels were killed. The combs, testes, and thyroid and adrenal glands were weighed.

The structure of the principal experiment is shown in Table 1.

EXPERIMENTAL RESULTS

The experiments showed that cyproterone acetate blocked the response of the cockerel's combs to androgen almost completely. For instance, the mean relative weight of the combs of the cockerels receiving androgen together with the solvent of the cyproterone was 206.4 ± 12.5 mg. The combs of the cockerels receiving androgen together with cyproterone, however, weighed only 26.8 ± 3.4 mg, i.e., about the same as the weight of the combs in untreated cockerels (21.9 ± 1.9 mg). Cyproterone acetate also suppressed the comb response of the cockerels to injection of pituitary extract (Table 1).

Despite the blocking of comb growth, the response of the testes to injections of pituitary extract was not significantly changed. The antiandrogen had virtually no effect on the weight of the adrenal and thyroid glands (the very small decrease in weight of these organs was not statistically significant).

The results of the experiments with chemical blocking of comb growth, like those of previous experiments with removal of the combs, did not reveal any inhibitory effect of the growing combs on the testicular response: no increase in the response of the gonads to injection of gonadotropic extract was discovered under these conditions, indeed, there was actually a slight increase in the degree of hypertrophy of the tests. This model thus failed to reveal any direct inhibitory action of the comb on the testes in cockerels.

However, it must be remembered that in the experiments described in this paper the cockerels were infantile and growth of the comb and gonads was stimulated artificially. These factors could be reflected in the character of the interaction between these organs.

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