

EFFECT OF THYROXINE AND METHYLTHIOURACIL
ON GONADOTROPIC REACTION AND ABILITY
OF ANDROGEN TO STIMULATE COMB REGENERATION
IN COCKS

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Against the background of thyroxine administration, growth and regeneration of the comb in infantile cocks are intensified by the action of pituitary extract and testosterone propionate. If the thyroid is blocked by methylthiouracil the effects of pituitary extracts and testosterone propionate on the cock's comb are considerably weakened.

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Blocking of thyroid function sharply inhibits the response of the comb of the capon or infantile cock to androgen [4, 5, 7]. Administration of thyroxine stimulates this response [6]. Gonadotropins, activating testicular function in infantile cocks, stimulate androgen secretion and this promotes premature growth of their combs.

The reaction of the testes and comb of cocks to injection of gonadotropins was investigated in birds receiving thyroxine or with blocking of thyroid function. In addition, the effect of testosterone propionate on comb regeneration was studied in relation to the content of thyroid hormone in the body.

EXPERIMENTAL METHOD

The effects of thyroid hormones on the gonadotropic reaction were studied in cocks of the Russian White breed aged 5 days. The cocks were divided into four groups: group 1 was the control; the cocks of group 2 received subcutaneous injections of acetone-treated bovine anterior pituitary extracts twice a day for 10 days in a daily dose equivalent to 15 mg pituitary. The cocks of group 3 received methylthiouracil (MTU) in a daily dose of 8-10 mg per bird for 18 days. The cocks of group 4 received thyroxine for 18 days in a daily dose of 10 μ g (once daily). Starting on the 9th day of MTU or thyroxine administration, the cocks of group 3 and 4 received pituitary extract in addition.

In experiments to investigate regeneration of the comb, this organ was cut off with scissors at its base. On the day after the operation, the cocks in the different series of experiments received pituitary extract (given for 10 days in a daily dose equivalent to 20 mg pituitary substance), testosterone propionate (100-150 μ g for 10 days), androgen combined with thyroxine (10 μ g), or androgen combined with MTU (10 μ g). Administration of thyroxine or MTU continued for 20 days, and began 10 days before administration of the androgen.

EXPERIMENTAL RESULTS

The results given in Table 1 show that pituitary extract caused a marked increase in weight of the thyroids, testes, and combs. When, however, the extract was injected against the background of thyroxine administration, the response of the thyroids and testes was significantly weakened. However, the decrease in the degree of hypertrophy of the gonads was not accompanied by any decrease in the reaction of the combs. Consequently, thyroxine differed in its effects on the response of the thyroids and gonads, on the

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TABLE 1. Response of Thyroids, Combs, and Testes to Injection of Pituitary Extract against the Background of Thyroxine and MTU Administration

Group	Character of treatment	Number of cocks	Mean weight of testes (in mg/100 g body weight)	Mean weight of comb (in mg/100 g body weight)	Mean weight of thyroids (in mg/100 g body weight)
1	No treatment	17	26.5 ± 1.4	24.4 ± 1.5	7.0 ± 0.12
2	Injection of pituitary extract	20	60.6 ± 4.2	317.4 ± 37.6	19.6 ± 1.3
3	Thyroxine for 18 days Pituitary extract from 9th to 18th days inclusive	19	47.4 ± 4.6	365.9 ± 54.0	11.7 ± 0.82
4	MTU for 18 days Pituitary extract from 9th to 18th days inclusive	32	79.7 ± 3.4	68.6 ± 7.7	67.9 ± 5.1

Note. During comparison of weights of testes in cocks of groups 2 and 3 $P < 0.05$, of groups 2 and 4 $P < 0.001$. During comparison of weight of thyroids from cocks of groups 2 and 3 and of groups 2 and 4, $P < 0.001$.

TABLE 2. Effect of Pituitary Extract and Androgen on Comb Regeneration

Character of treatment	Number of cocks	Mean weight of regenerating comb (in mg/100 g body weight)	Mean weight of testes (in mg/100 g body weight)	Mean weight of thyroids (in mg/100 g body weight)
No treatment	10	8.1 ± 3.3	23.4 ± 6.8	5.8 ± 0.46
Injection of pituitary extract	12	177.1 ± 18.1	78.02 ± 6.1	36.0 ± 2.92
No treatment	14	9.8 ± 1.9	—	—
Injection of testosterone propionate for 10 days	18	167 ± 19.1	—	—

one hand, and of the comb on the other. Against the background of MTU administration, pituitary extracts caused more marked hypertrophy of the thyroids and testes. The response of the comb in this case was sharply depressed ($P < 0.001$).

MTU thus also acted differently on the response of the thyroids, testes, and combs.

Differences in the effect of pituitary extracts on the thyroid and testes against the background of thyroxine and MTU administration may be due to differences in the rate of inactivation and elimination of pituitary tropins under these conditions [2, 3].

Thyroxine is an essential condition for the normal response of the comb to androgen secreted under the influence of gonadotropins. For this reason, during MTU administration, the response of the comb to injection of pituitary extract was depressed, although stimulation of the testes under these conditions was actually more marked.

The results given in Table 2 show that pituitary extract stimulated comb regeneration considerably. Since marked activation of the gonads was present, it could be considered that stimulation of comb regeneration was due to increased secretion of androgens. In fact, injection of testosterone propionate stimulated comb regeneration. The weight of the regenerating comb was much greater than the weight of normal combs of cocks of the same age. However, since hypertrophy of the thyroid of these cocks took place under the influence of pituitary extract, this extract evidently contained not only gonadotropins, but also thyroid hormone. Since the response of the normal comb to androgens is potentiated by thyroxine, it could be postulated that thyroid hormones also potentiate the ability of androgen to stimulate regeneration of the comb and its growth. This hypothesis was fully confirmed by experiments to study the effect of androgen on

TABLE 3. Effect of Testosterone Propionate on Regeneration of Cock's Combs against the Background of Thyroxine and MTU Administration

Group	Treatment	Number of cocks	Mean weight of regenerating comb (in mg)	Mean weight of regenerating comb (in mg/100 g body weight)	Mean weight of testes (in mg/100 g body weight)
1	Control	13	1.8 ± 1.1	3.5 ± 1.8	18.6 ± 1.0
2	Androgen for 10 days	14	73.21 ± 15.38	133.6 ± 21.7	18.1 ± 1.3
3	MTU for 20 days. Androgen given in addition from 11th to 20th days of experiment inclusive	15	9.5 ± 3.6	18.9 ± 6.3	18.7 ± 1.3
4	Thyroxine for 20 days. Androgen given in addition from 11th to 20th days of experiment inclusive	12	210.45 ± 32.31	365.1 ± 45.7	18.1 ± 1.0

Note. During comparison of relative weights of regenerating combs in groups 2 and 3, $P < 0.001$, in groups 2 and 4, $P < 0.001$, in groups 1 and 3, $P < 0.05$.

comb regeneration against the background of thyroxine and MTU administration. If thyroxine was given simultaneously, the action of androgen on comb regeneration was considerably increased, but MTU sharply reduced the stimulant effect of androgen (Table 3).

The changes in the effect of testosterone propionate when given against the background of MTU or thyroxine administration could be due to a decrease or increase, respectively, in the secretion of endogenous androgen.

An increase in androgen secretion in adult hens and cocks following thyroid administration and a decrease in its secretion after thyroidectomy were described by Voitkevich [1]. However, in the present experiments thyroxine and MTU modified the weight of the testes.

In addition, the decrease in the ability of testosterone propionate to stimulate comb regeneration against the background of MTU administration was too sudden to allow it to be attributed to a hypothetical decrease in secretion of sex hormone by the testes, more especially because infantile cocks were used in the experiments.

It is considered that thyroxine is essential for manifestation of the stimulant effect of male sex hormone on comb regeneration and for the normal response of the normal comb to endogenous and exogenous androgen.

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