

NEUROTRANSMITTER PRECURSOR DRUGS AFFECT THYROID-GONAD RELATIONSHIP IN DOMESTIC PIGEON *COLUMBA LIVIA DOMESTICA*

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ABSTRACT

The aim of the present study was to test whether the temporal synergism of dopamine and serotonin could affect the thyroid-gonad inter-relationship in the domestic pigeon *Columba livia domestica*. Male birds were divided into four groups, each with six individuals. The thyroidectomised groups of birds receiving neurotransmitter precursor drugs (dopamine and serotonin) at 0 hr interval showed inhibitory responses in special reference to body weight, testicular weight and testosterone level. The results were found significantly lower in comparison to control at the level of $P < 0.05$. Results showed that the administration of dopamine and serotonin at 0 hr phase relationship inhibits the neuroendocrine-gonadal axis and body growth in *Columba livia domestica*. Possibly inverse thyroid – gonad relationship in this species may be related to seasonal changes in phase relationship between daily rhythm in serotonergic and dopaminergic activity of the central nervous system.

Keywords: Serotonin, Dopamine, Thyroid, Gonad, Pigeon.

INTRODUCTION

It was hypothesized that hormone injections may reset two circadian neuroendocrine oscillations and temporal interaction of these oscillations determine the complex of physiological conditions. Dopamine and serotonin may play an important role in the control of seasonal reproduction and their phase relation may determine appropriate seasonal conditions. Seasonal wave of reproductive activity is common in many vertebrate species [1-3]. It was also supported by Meier et al [4,5].

In view of interrelationship/ interdependence of neural oscillators and overt rhythms and seasonal variation in circadian rhythms and their phase relationship of serotonergic and dopaminergic activity may influence seasonal reproductive condition, present study was designed in such type of avian species which is monogamous and produces crop milk during brooding. In the present study the effect of our relationship was tested on thyroid-gonad interrelationship in domestic pigeon, *Columba livia domestica*.

MATERIALS AND METHODS

During the quiescent period (late April) 24 male pigeons were selected from bulk and divided into four groups of six birds in each. Group Ist and IVth were fed at normal diet and water *ad libitum* while Group IInd and IIIrd were fed at normal diet but drinking water mixed with thiouracil.

Administration of Thiouracil

Thiouracil dissolved in distilled water by the addition of 40% NaOH drop wise to adjust the pH to 8.0 to 8.5. The solution was filtered through glass wool and administered to birds along with the drinking water at the concentration of 0.1% for 3 weeks. After 3 weeks birds were weighed, and used for administration of the neurotransmitter precursor drugs.

Administration of Neurotransmitter Precursor Drugs

Group I (Normal control) and group II (thyroidectomised control) birds received two daily injections of normal saline.

Group III (thyroidectomised 0 hr) and group IV (0 hr) birds received injection of 5-HTP (5- Hydroxytryptophan, a serotonin precursor) and L-DOPA (L-Dihydroxyphenylalanin, a dopamine precursor) at 8:00 AM and considered as 0 hr for 13 days. The doses of 5-HTP and L-DOPA were 5mg/100gm body weight. During the course of the study the birds were provided with food grains and drinking water *ad libitum*. Birds were anesthetized and observations were made at 45 days post

treatment (after 45 days of last injections). Body weight was recorded. Testes were removed and weighed. Plasma testosterone level was measured. For the assay of testosterone blood collected directly from the left ventricle of heart. Hormones were assayed in private pathology lab. Observations were expressed in terms of Mean \pm SE. Statistical analysis was done by student's 't' test [6]. Experiment was conducted in triplicate and only consistent results were taken in consideration.

Figure 1. Effect of 0-hr temporal relationships of 5-HTP and L-DOPA on the Body Weight of Domestic pigeon

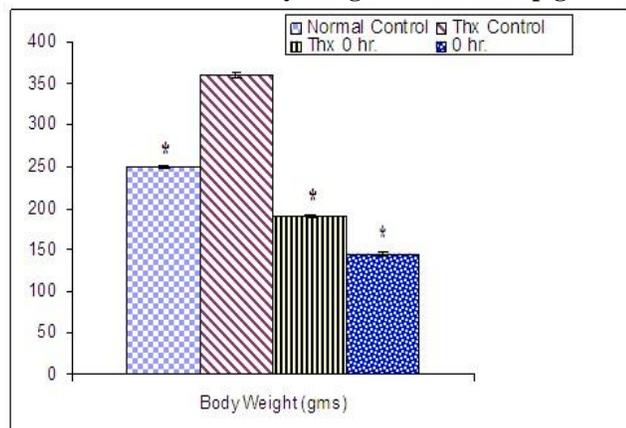


Figure 2. Effect of 0-hr temporal relationships of 5-HTP and L-DOPA on the Testicular Weight of Domestic pigeon

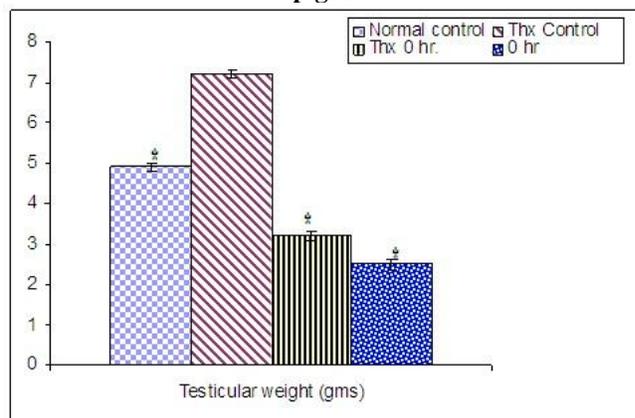
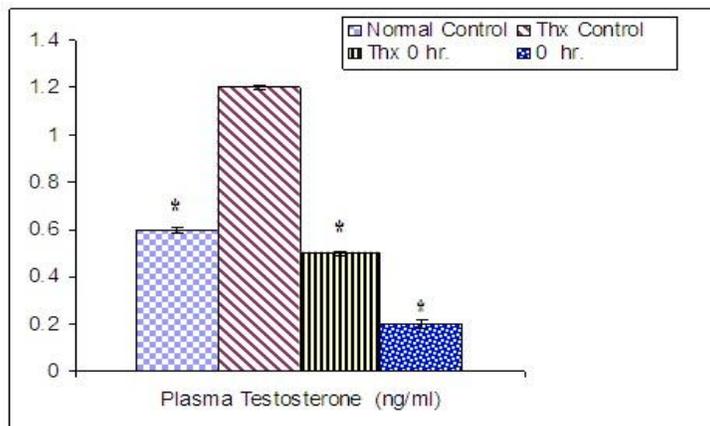


Figure 3. Effect of 0-hr temporal relationships of 5-HTP and L-DOPA on the Plasma Testosterone level of Domestic pigeon



RESULTS AND DISCUSSION

Results showed that the thyroidectomised birds receiving normal saline had significantly increased ($p < 0.05$) body weight, testicular weight and plasma testosterone level in comparison to normal control while the thyroidectomised birds receiving 5-HTP and L-DOPA 0 hr apart showed significantly decreased ($p < 0.05$) parameters in all respects. (graph 1, 2 and 3)

From the study it may be hypothesized that temporal interaction between circadian neural oscillations/rhythms is a result of seasonality. It is reported

that serotonin and dopamine precursors (5-hydroxytryptophan, 5-HTP and L-dihydroxyphenylalanine, L-DOPA respectively) administration at the interval of 12 hr (12-hr relation) induce the breeding condition while that of 8 hours (8-hr relation) leads to a non-breeding condition in many seasonally breeding birds such as in Japanese Quail [7,8]. Similar studies have been carried out in two mammalian species, Syrian hamster [9] and Palm Squirrel [10] and in one species of fish, Gulf killifish [11]. It is evident that gonadal stimulation and induced body weight occurs after thyroidectomy also during regressive phase of

reproductive cycle. And after 0hr phase relation of 5-HTP and L-DOPA inhibition occurs. Hence, it may be argued that gonadal decrease followed by 0hr relation was due to decreased activity of neuroendocrine axis. It is concluded that the hyperthyroidism as well as administration of serotonergic and dopaminergic drugs at the 0-hr interval inhibit the neuroendocrine-gonadal axis and body growth of *Columba livia domestica*. Possibly inverse thyroid-gonad relationship in this species may be related to the

seasonal changes in phase relationship between daily rhythm in serotonergic and dopaminergic activity of the central nervous system, but this pure speculation, till further study.

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