

## **PINEAL AND GONADAL RESPONSE TO CONTINUOUS LIGHT IN INDIAN GARDEN LIZARD, *CALOTES VERSICOLOR***

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Effect of constant light condition (LL) was studied on the gonads and pineal gland of male Indian garden lizard, *Calotes versicolor*. No significant effect was observed after exposure for twenty days. After forty days, the animals under LL revealed a significant increase in the testicular and vas deferens weights and their seminiferous tubule diameter. A corresponding significant decrease was noticed in the pineal gland weight and its protein content. Exposure for sixty days further increased the testes weight and seminiferous tubule diameter and was accompanied by a significant reduction in the weight and protein level of the pineal gland. It is, therefore, suggested that LL exerts a stimulatory effect on the testes of this reptile and the pineal gland appears to be involved in this phenomenon.

**Key Words:** Pineal, testes, lizard, light.

### **INTRODUCTION**

Most animals are exposed to environments having periodic changes in important climatic variables which provide predictive information for their reproductive functions. Changes in day length and temperature are the most important factors and animals need to adapt themselves in order to cope with these variables (Assenmacher and Farner, 1978). The pineal gland is involved in the integration of the variations in the environmental factors thereby helping the animal in long term adaptation of seasonal reproduction (Follet and Follet, 1981; Kappers and Pevet, 1979 and Reiter, 1978, 1981). Antigonadotropic and progonadotropic activity of the pineal gland have been reported in the case of mammals (Bittman and Zucker, 1981; Hoffman, 1981 and Wurtman *et al.*, 1968).

Information related to the environmental control of gonadal function,

in relation to the pineal gland is incomplete in the case of reptiles. Therefore, the present study was designed to observe the effect of continuous illumination on the testes and pineal gland of a tropical species, the Indian garden lizard, *Calotes versicolor*.

## MATERIALS AND METHODS

Fifty adult male lizards (*Calotes versicolor*) were obtained from local suppliers in the first week of February. The animals were kept in wire net cages and acclimatized to laboratory conditions for two weeks. They were then divided randomly into two groups of twenty four animals each. Animals of Group I were exposed to a constant light condition (LL) while those of Group II were kept under natural daylength (NDL). Group II served as controls for Group I. Eight animals from each group were weighed individually and then sacrificed by decapitation after 20, 40 and 60 days of the onset of the experiment. Testes and vas deferens were removed, weighed and then fixed in Bouin's fluid for routine histology. Pineal glands were dissected out, weighed on a microelectrical balance and processed for the estimation of total protein by the method of Lowry *et al.* (1952). Seminiferous tubule diameter of the testes was measured with the help of an ocular micrometer. The data was analysed with Student's test.

## RESULTS

The results are presented in Table 1. No significant effect was observed on testes and pineal gland, after exposure to LL, for 20 days. A significant reduction was observed in the pineal gland weight and its protein content after forty and sixty days of exposure to LL. As compared to the controls, the animals under LL showed a significantly higher testicular and vas deferens weight and larger seminiferous tubule diameter both after forty as well as sixty days of exposure.

## DISCUSSION

Our experimental results clearly indicate that continuous illumination has an inhibitory influence on the pineal gland of this tropical lizard. The changes of photoperiod are constant throughout the year. Therefore, it is used by many animals as an indicator of season (Gwinner, 1981) and the pineal

**Table 1:** Effect of continuous illumination (LL) on the pineal gland, vas deferens and testes of the Indian garden lizard. *Calotes versicolor*.  
Relative weights of pineal gland, vas deferens mg/100 g body weight and testes - g/100 g body weight.

Group	Pineal gland		Vasdeferens Weight	Testes	
	Weight	Protein ( $\mu$ g/100 mg tissue)		Weight	Seminiferous tubule dia- meter ( $\mu$ m)
<b>20 DAYS</b>					
NDL	3.04 $\pm 0.20$	126.21 $\pm 7.20$	14.20 $\pm 2.15$	89.60 $\pm 5.60$	158.60 $\pm 6.21$
LL	3.00 $\pm 0.12$	120.10 $\pm 5.45$	18.00 $\pm 2.00$	100.24 $\pm 7.00$	162.42 $\pm 12.12$
<b>40 DAYS</b>					
NDL	2.64 $\pm 0.15$	121.00 $\pm 4.62$	18.10 $\pm 1.01$	105.41 $\pm 4.61$	164.00 $\pm 7.11$
LL	2.01 <sup>c</sup> $\pm 0.09$	103.36 <sup>a</sup> $\pm 5.20$	23.12 <sup>c</sup> $\pm 0.80$	137.21 <sup>d</sup> $\pm 4.40$	198.30 <sup>b</sup> $\pm 10.37$
<b>60 DAYS</b>					
NDL	2.00 $\pm 0.10$	112.62 $\pm 8.72$	22.00 $\pm 0.90$	156.70 $\pm 6.10$	188.41 $\pm 6.00$
LL	1.80 <sup>d</sup> $\pm 0.03$	86.50 <sup>a</sup> $\pm 5.40$	27.16 <sup>c</sup> $\pm 1.31$	190.00 <sup>d</sup> $\pm 7.93$	216.90 <sup>c</sup> $\pm 6.20$

NDL - Natural daylength

Significance of difference from NDL - a,  $p < 0.05$ ; b,  $p < 0.02$ , c,  $p < 0.01$ ; d,  $p < 0.001$ .

gland is considered a link between annual photoperiodic changes and seasonal reproduction (Haldar and Saxena, 1990; Hoffman, 1979; Reiter, 1978 and Rhodes, 1989). Anatomical, biochemical and physiological changes, in the pineal gland, in response to alterations in lighting conditions have been reported (Meissl *et al.*, 1978 and Pevet, 1979). However, reports are scanty regarding the response of reptilian pineal and gonad to different artificial lighting regimens.

In the present study continuous light for forty days resulted in significant increase in the testicular weight ( $p < 0.001$ ) and its seminiferous tubule diameter ( $p < 0.02$ ). The effect was more pronounced after exposure to LL for sixty days. On the contrary, LL had an opposite effect on the pineal gland of animal and led to a significant decline in its weight after forty days ( $p < 0.01$ ) and sixty days ( $p < 0.001$ ) of exposure. A significant reduction was also noted in the protein level of the gland. This result enables us to suggest that the activity of testes and pineal gland of the Indian garden lizard may be inversely related to each other. Studies of Rosalyu *et al.* (1976) show that LL for seventy days, in the case of mouse, causes significant reduction in pinealocyte size and Golgi complex size. Their electron microscopic studies also indicated a marked decrease in concentration of pinealocyte granulated vesicles and they suggested that these vesicles contain anti-gonadotrophic secretory material. Hence, it might be possible that LL leads to a decreased secretion of antigonadotrophin from the pineal which, in its own turn, may be responsible for causing gonadal stimulation.

The significant increase observed in the vas deferens weight of the animals after forty ( $p < 0.01$ ) and sixty days ( $p < 0.01$ ) of continuous light exposure further confirms the stimulation of gonads. In rodents, LL has also been shown to cause pineal gland reduction in weight (Fiske *et al.*, 1962 and Quay, 1961), lipid (Quay, 1961) and serotonin content (Quay and Halevy, 1962). The present results reveal that the effect of LL on the gonad and pineal gland of this lizard are stimulatory and inhibitory in nature, respectively. LL for twenty days was without any significant effect either on the testes or pineal gland. Possibly this time period was not sufficient enough and a longer duration is required for the expression of the effect.

It has been proposed that the different 5-methoxyindoles synthesized by the pineal are implicated in a system enabling the pineal and some other part of the brain to perceive, differentiate and integrate environmental information in response to which pineal would then synthesize and release proteic/peptidic hormone(s) which would affect the reproductive system (Pevet, 1985). This study provides evidence for the effect of LL on the pineal gland and consequently the testes of this tropical lizard but further investigations are required to elucidate the role of pineal gland in the transduction of the photo-periodic information as well as other environmental factors to the reproductive axis of this animal.

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