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EFFECTS OF CONSTANT LIGHT AND DARK TO THE NUCLEUS PREOPTICUS OF *CHANNA GACHUA* (HAM.)

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Fresh water air breathing fish *Channa gachua* were exposed to continuous light and dark for the period of 30 days. The fishes which received exposure of continuous light showed increase diameter of the nuclei of neuronal bodies and marked depletion of neurosecretory material in the nucleus preopticus, while fishes received continuous darkness showed the reduced diameter of the nuclei of the neuronal bodies and tendency of accumulation of neurosecretory material in nucleus preopticus.

Key words: Constant light, Nucleus preopticus, *Channa gachua*.

Introduction

Light is an important ecological factor in controlling the reproductive activity in fishes [5-9]. The regulation of gonads stimulating hormones by the pituitary is initiated by environmental stimuli through hypothalamic centre [1].

A series of articles are devoted to demonstrate the anatomical and chemical details, development and functional aspects of hypothalamic centres which are involved in the control of pituitary secretion in fishes [13-20]. Effect of light and dark to the hypothalamic neurosecretory centres have been investigated in mammals, birds, amphibians and fishes by very few workers [4,9-12,21]. These studies were made to establish the inhibitory or stimulatory role of ecological factor in the secretion of hypothalamic hormones. Stimulation and inhibition of hypothalamic hormones in histomorphological demonstrated by the depletion and accumulation of aldehyde fuchsin positive neurosecretory material in the hypothelamic centre. Looking to the importance of the subject, the present work was, therefore, taken up to evaluate the effect of constant light and dark on the nucleus preopticus in *Channa gachua* (Ham.) to provide further information for experimental studies.

Materials and Methods

30 Adult *C. gachua* (B.W. 50-60 g) used in this study were collected from the vicinity of Jhabua and were acclimatised under the laboratory conditions for seven days prior to starting the experiment. Fishes used in this experiment were divided into three groups. Each group comprising of ten fishes was subjected to the following treatments.

Group I. Fishes of this group were kept in an aquarium containing 10,000 cc. of tap water which was continuously illiminated by day and night by 60 watt milk electric bulb, placed seven inches above from one end. The bulb was adjusted without shade and directed towards the roof of the lab. In this way the light reaching to the aquarium was diffused. This aquarium was kept in well ventilated lab. Water of this aquarium was changed after every six days.

Group II. Fishes of this group were kept in an aquarium containing 10,000 cc. of tap water, completely covered with a black paper. This aquarium was kept in well ventilated lab. Water of the aquarium was changed after every six days.

Group III. Fishes of this group were also kept in an aquarium containing 10,000 cc. of tap water maintained in normal day and night laboratory illumination. The management of aquarium was same as described earlier.

After 30 days, the fishes from each group were sacrificed. Brain was dissected out alongwith the pituitary and fixed in Bouin's fluid. Paraffin sections were cut at 6 µm thick and were stained by Gomori's chorm-alum haematoxylin phloxine (CHPh) method as recommended by Bargmann [2] and Gomori's aldehyde fuchsin (AF) method as recommended by Dawson [3].

Results and Discussion

No mortality was observed among the control and experimental groups during the entire experimental period. The temperature of the water of the experimental aquarium was not significantly increased during the course of experiment.

Thirty days exposure of continuous illumination to fishes, showed extensive depletion of AF positive neurosecretory material from the cells of nucleus preopticus (NPO) as is evident by heavy vacuolization in the cytoplasm of these cells. The mean diameter of the cells of NPO was measured 9.25± 0.05 µm (Table 1). In control group fishes, vacuolization was least and diameter of nuclei of the cells of NPO was 7.5±0.05µm (Table-1). While the effect of 30 days exposure of continuous darkness on the cells of NPO was found opposite to the continuous illumination. The cells of NPO were observed to have more AF positive neurosecretory granules accumulated in the cytoplasm, in comparison to the control and light

TABLE 1. SUMMARY OF THE EFFECT OF CONSTANT LIGHT AND DARK ON THE CELLS OF NUCLEUS PREOPTICUS OF *CHANNA GACHUA* (TOTAL DURATION OF EXPERIMENT: 30 DAYS).

Group No.	Treatments	Total No. of animal used	Intensity of NSM in nucleus preopticus	Mean diameter of neuronal nuclei of NPO in μm ± S.D.
I.	Normal fish (control)	10	±+	7.50±0.05
II.	Light adapted fish	10	+	9.25±0.50
III.	Dark adapted fish	10	+++	6.20±0.04

+=Less intensity; ++= Moderate intensity; +++= Highest intensity; ± SD= Standard deviation.

adapted fishes. The average diameter of nuclei of the cells of NPO was found reduced and measured 6.20 ± 0.04 μm (Table 1). Vacuolization was hardly observed.

A histological response by the hypothalamic neurosecretory system to a change in external illumination has been observed in mammals, birds, amphibians and fishes by several workers [4, 10, 11]. The most pronounced change was observed in stainability of neurons and axons in birds [11]. Oztan *et al.* [12] stated that exposure of continuous light to larval lampreys caused a depletion of neurosecretory material from the cell bodies and axons of the preoptic nucleus, while continuous darkness caused a strong accumulation of neurosecretory material in the same. Fiske *et al.* [4] reported that the cells of the supreoptic nucleus were largest and appeared to be most active in the lighted rats and smallest and least active in the rats housed in darkness. Sathyaneson [21] observed a substantial quantitative reduction of AF + ve secretory granules from the hypophysectomized *Porichthys notatus* subjected to continuous light for 15 days. In *Channa gachua* author has noticed that the diameter of the nuclei of neuronal bodies increased considerably and there was a marked depletion of neurosecretory material in nucleus preopticus when fishes were subjected to 30 days exposure of continuous light, while fishes kept in continuous darkness for same duration the diameter of nuclei of neuronal cells was reduced and AF positive secretory granules showed the tendency of accumulation in cell bodies of nucleus preopticus. Thus present experiment results reveal that the effect of continuous light on the nucleus preopticus enhance the releasing phenomenon of neurohormones and the effect of darkness inhibits the same process and influences the accumulation of neurosecretory material (neurohormones) in nucleus preopticus.

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