Effect of Aestivation on Neuro secretion in *Pila globosa*

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ABSTRACT

Aestivation is a physical state to withstand environmental adversity, scarcity of food resources induce altered behavioural pattern in animal. Endocrine and neuronal coordination should be essential for the onset, maintenance and arousal of that hypometabolic state. Indian apple snail, *Pila globosa* aestivates in summer. Microscopic observations had established distinct changes between control, aestivation and arousal state in cerebral ganglia in *Pila globosa*. In cerebral ganglia neuro-secretion was limited during aestivation in Pila sp. Soon after arousal, neuro-secretion was evident.

Key words : Aestivation, Arousal, Cerebral, *Pila sp*

Aestivation is a physical state to withstand environmental adversity, scarcity of food resources induce altered behavioural pattern (Chown and Storey, 2006) in animal. Aestivation is a strategy against environmental adversities like aridity and heat (Storey, 2006). Reduced metabolic activities and definite biochemical changes are developing 'Hypometabolic state".

The nervous and endocrine components of animal coordination mechanism are linked by neuro secretary system. Endocrine and neuronal coordination should be essential for the onset, maintenance and arousal of hypometabolic state or aestivation.

Indian apple snail, *Pila globosa* aestivates in summer when the ponds, streams, paddy fields, where it inhibits, were dried up (Meenakshi, 1964). In laboratory condition aestivation period may extend up to 3-5 years (Prasad, 1925). The snail switches over to uricotelism during aestivation (Lal and Saxena, 1952).

Neuro secretary cells in molluscs were first reported in *Aplysia* and *Pleurobranchia* by Scharrer (1935) and observed granules or droplets in the in cells of most of the ganglia. Elaborate investigations on neuro-secretion in molluscs were initiated by Gabe (1951, 1953). Experimental studies have revealed involvement of neuro-hormones in reproduction in many gastropods (Pelluet and Lane, 1961) and in bivalves (Antheunnisse, 1963, Salank and Elona, 1963). Main functions of neuro-secretions are a) Maintenance of water balance, b) Gamete metabolism, c) Blood sugar content maintenance, d) excretion (Neyeeuninisa, 1972) and e) respiration (Meenakshi, 1957, Reddy, 1967).

Materials and Method

Active specimen of Pila globosa was manually collected from natural habitats of North 24 Parganas district of West Bengal. Collected specimens were transported to the laboratory and acclimated in aerated glass container at an ambient temperature of 25-30ÚC, and uniform light ratio of 12:12 dark light cycle were maintained in the container throughout aestivation the acclimation period. One group of specimen was induced for aestivation through incubation without water for 45 days. After 45 days one group of aestivated *Pila sp* was again introduced in water with ample food (Green lettuce leaf). Animals were scarified for cerebral ganglia collection. Collected specimens were processed for Histological studies.

Results:

Microscopic observations had established distinct changes between control(Fig 1A), aestivation (Fig 1B) and arousal state (Fig 1C) in cerebral ganglia in *Pila globosa.* Neuro-secretary cells observed are oval or pyriform with a large nucleus at centre. No secretary cells are observed in connectives and commissure. Homogenous fine granules accumulate to form droplet with the onset of aestivation, secretary activity was decreased. But when aestivated specimens were reintroduced into water, the neuro-secretary cells of cerebral ganglia starts to secretary granules within 24 hours.

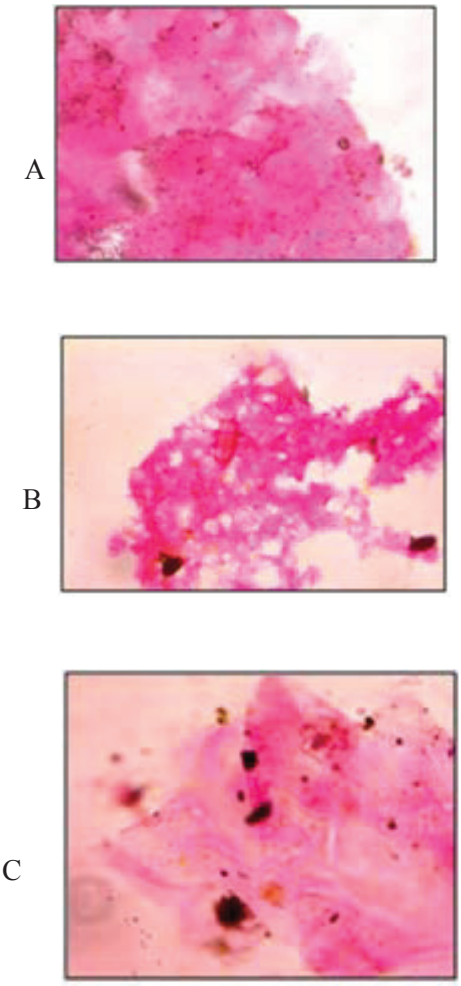

Fig: 1 Plate showing histological section of Cerebral Ganglia of *Pila globosa* during A) Normal condition, B) Aestivation and C) Arousal condition

Discussion:

Gomoris neuro-secretary stain positive granules or droplets in the nerve cells are the evidence of neuro-secretion (Bern, 1962). But neuro-secretary phenomenon was complicated due to absence of axonal transport (Martoza, 1972). But most of the neuronal ganglia exhibit neuro-secretary cells as histological traits (Simpson et. al. 1966; Gabe, 1966; Martoja, 1972).

Distinct changes were reported in the neuro-secretary cells in *P. globosa* during active (Fig 1A) and aestivating phases (Fig 1B). During aestivation, uric acid accumulation was also reported in *Pila sp.* (Neyeeunisa, 1972).

Hypometabolic state during aestivation adopted the strategy to with stand oxidative stress through accumulation of uric acid. Soon after arousal, activity was regained in cerebral ganglia.

During aestivation decrease in acetylcholine esterase, ATP- ase and Calcium were observed.Hsp70 and Hsp 40 expression may regulate hypometabolism. Decrease in neuronal activity may be the outcome of decline in ATP-ase activity in tissue decreased ganglionic glucose was also evident.

Through present study it was revealed that in cerebral ganglia neuro-secretion was limited during aestivation in Pila sp. As soon as arousal signal was reached neuro-secretion was evident. Regulatory mechanism and candidate molecule for neuro-secretion control during aestivation arousal cycle was not yet identified. Further study may reveal molecular cross talk between environment and organism.

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