Comparative Study of Neurosecretory Cells in Female Penaeus Indicus after Unilateral Eyestalk Ablation

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Abstract- In *Penaeus indicus* neuroendocrine organs plays an important role in the growth and reproduction. In *Penaeus indicus* four different types of neurosecretory cells such as A cell, B cell, C cell, D cell were identified. The Eyestalk of *Penaeus indicus* shows many neurosecretory cells, but the Brain and Thoracic ganglion shows only few neurosecretory cells. After the unilateral Eyestalk ablation the Brain and Thoracic ganglion has many neurosecretory cells. The neuroendocrine glands are stimulatory and inhibitory in function. Brain , Thoracic ganglion are stimulatory principles of growth and reproduction. But the neurosecretory cells in the Eyestalks are inhibitory influence of these function.

Index Terms- Eyestalk, Brain, Thoracic ganglion, Neuro secretory cells .

I. INTRODUCTION

Marine water prawn *Penaeus indicus* are available in the various coast of india in different seasons. The environmental stimuli induces the neuroendocrine system of crustaceans that plays an important role in physiological changes (Adiyodi and Adiyodi, 1970; Anilkumar and Adiyodi, 1985).

Observation of synthetic phase , vacuolar phase and secretory phase in *P. homarus,* and the synthesis and movement of neurosecretory substances in invertebrates (Bern 1963) and (Bern and Hagadorn 1965). The detailed study of neurosecretory cells in *P.indicus* (Mohamed, 1989) and in *P. monodon* (Joseph, 1996). In M.rosenbergii the cytoarchitecture of Eyestalk shows simi lar structure when compared to M.kistnensis (Mirajkar et al., 1984). Hence the aim of the study is to compare the neurosecretory cells in *P.indicus* before and after the Eyestalk ablation. The reason for giving much importance to the neurosecretory cells is that induces the reproductive organ, resulting the faster maturation of reproductive organs after the Eyestalk ablation.

II. MATEIALS AND METHODS

Penaeus indicus (Indian white prawn) were collected in and around the Pattipuzham near Mahabalipuram. The specimens were collected from the Madha Prawn Hatchery Centre. The prawns were collected by the local fishermen and they were reared in a big cement tank having the capacity of 0.5 tones water. The cement tank was filled with sea water which was aerated continuously and the water was removed periodically in every 12 hours.

For the histological studies, healthy female *Penaeus indicus* was selected, dissected and the following tissues were taken out from the normal and unilateral Eyestalk ablated female *Penaeus indicus*, namely Eyestalk, Brain and Thoracic ganglion. For the fixation process Aqueous bouin's solution was used as the fixative. Haematoxylin & eosin stains are used for staining process.

III. RESULTS

Morphology of Eyestalk, Brain and Thoracic ganglion :
Eyestalk:

The Eyestalks are covered with chitinous structure. It is situated in the anterior region at the sides of the cephalic regions of carapace (Figure 1).

Brain:

Brain or supraoesophgeal ganglion lies at the base of rostrum, anterior to the oesophagus. It looks white in color and bilobed in structure (Figure 2).

Thoracic ganglion:

It was elongated and oval in structure . It was situated above the thoracic sternal plates . It is white mass in colour giving rise to many nerves. It has 5 segmaent .(Figure 3).

Figure 1. *Penaeus indicus* unilateral Eyestalk ablation

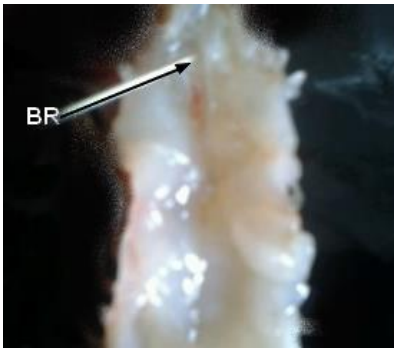

Figure 2. Brain of *Penaeus indicus*
BR- Brain

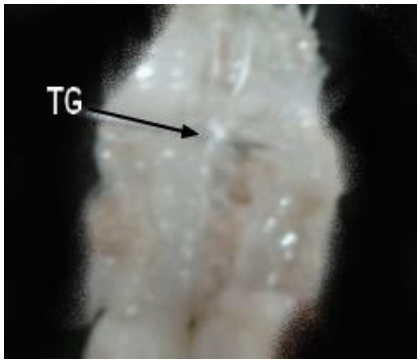

Figure 3. Thoracic ganglion of *Penaeus indicus*.
TG- Thoracic ganglion

Histology of Eyestalk , Brain and Thoracic ganglion:

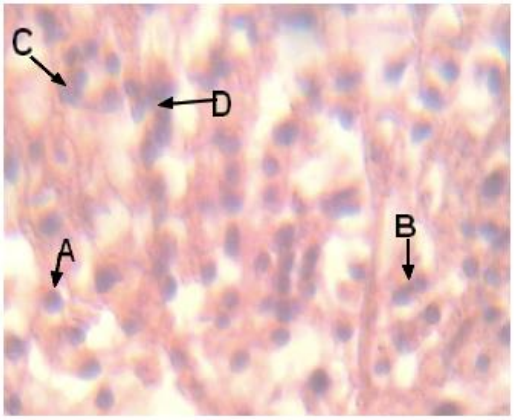

Figure 4 . Eyestalk of *P.indicus*
A- Unipolar cell, B- Bi-polar cell, C- Tripolar cell, and D- Multipolar cell.

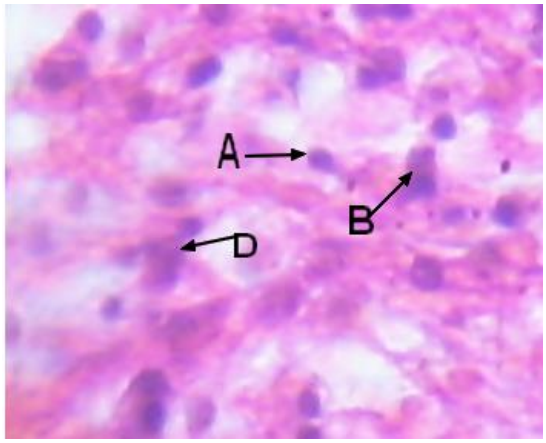

Figure 5. Brain of *P.indicus* before unilateral Eyestalkl ablation
A- Unipolar cell, B- Bi-polar cell, and D- Multipolar cell.

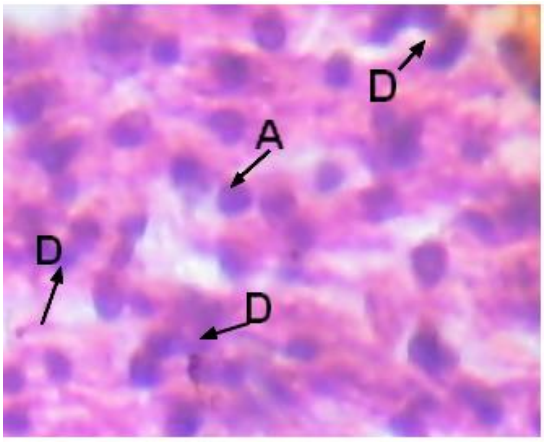

Figure 6. Brain of *P.indicus* after unilateral eyestalk ablation
A- Unipolar cell and D- Multipolar cell.

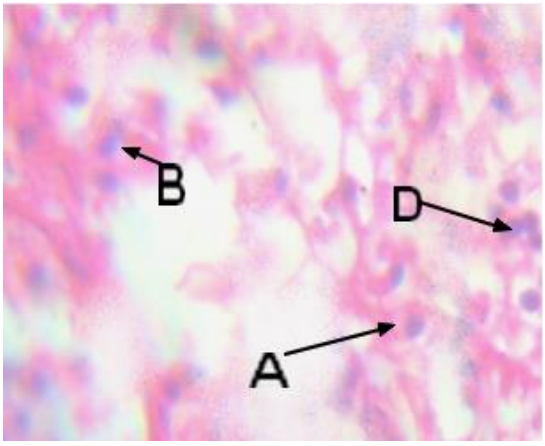

Figure 7. Thoracic ganglion of *P.indicus* before unilateral Eyestalk ablation
A- Unipolar cell, B- Bi-polar cell and D- Multipolar cell.

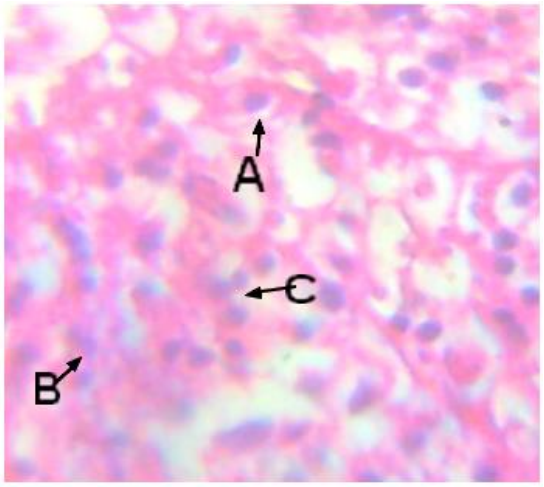

Figure 8. Thoracic ganglion of *P.indicus* after unilateral Eyestalk ablation
A- Unipolar cell, B- Bi-polar cell, and C- Tripolar cell.

Before the unilateral Eyestalk ablation:

In *Penaeus indicus* , before the unilateral Eyestalk ablation the Eyestalk contains many number of neurosecretory cells such as unipolar , bipolar , tripolar, and multipolar cells and it was named as A,B,C,and D (Figure 4). These cells secretes GIH (gonadal inhibiting hormone) that inhibits the gonadal maturation. But Brain and Thoracic ganglion contains less number of neurosecretory cells than in the Eyestalk . In Brain and Thoracic ganglion (Figure 5 & 6) there are three types of neurosecretory cells such as A, B, and D were identified . These cells secretes GSH (gonadal stimulating hormone) that stimulates the gonadal maturation. So that the secretion of neurohormone GIH is more than the GSH, that inhibits the gonadal maturation.

After the unilateral Eyestalk ablation:

In *Penaeus indicus* , after the unilateral ablation the Brain contains many number of neurosecretory cells such as A and D cells (Figure 7). In Thoracic ganglion A,B,and C cells were seen (Figure 8). Especially the number of D cells are more in the Brain of *Penaeus indicus* (Figure 7). After the unilateral Eyestalk ablation the number of neurosecretory cells were reduced which inturn reduces the secretion of GIH. So that the inhibition of gonadal maturation was reduced. Simultaneously, the Brain and Thoracic ganglion containing many number of neurosecretory cells that stimulates the secretion of more GSH resulting the faster gonadal maturation.

IV. DISCUSSION

The secretory activity of different types of neurosecretory cells in different phases such as Quiescent phase, vacuolar phase, secretory phase of the Eyestalk of prawn that induces the gonadal development in *Squilla holoschista* (Deecaraman and Subramoniam 1983a). The formation of granulation is more in sinus gland of immature crabs, but it is less or totally absent in sinus gland of mature crabs *S. holoschista* (Deecaraman and Subramoniam 1983b). In five species of crabs such as , *Eriocheir japonicus, Chionectes opilio, Potaman dehanni, Neptunus trituberculatus, Sesarma intermedia* , different types of neurosecretory cells were explained . But the optic ganglia of *P. homarus* and optic ganglia of the above mentioned five species of crabs are similar in structure and size. In *P. homarus* has many different types of neurosecretory cells but these cells are differ from the other crustaceans. The size of the neurosecretory cells also larger in *P. homarus* when compared to other crustaceans (Matsumoto, 1958).

The distribution of neurosecretory cells and the synthesis of neurohormones , which control the vitellogeneisis in female *Panulirus homarus* after Eyestalk ablation (Radhakrishnan and Vijayakumaran, 1984). In metapenaeus affinis giant neurons were not seen in the Eyestalk (Rao et al., 1988). In spiny lobster , molting and gonadal maturation was controlled by the hormones of Eyestalk(Quackenbush and Herrnkind , 1981). The present investigation in *Penaeus indicus* after the unilateral ablation of Eyestalk that shows many number of neurosecretory cells in Eyestalk , Brain, and Thoracic ganglion that induces the gonadal maturation.

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