CHAPTER-IV

DISCUSSION

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The present investigation was undertaken with a view to find out whether the Dorsal body which has been described in some of the molluscs by various neuroendocrinologists is also present in the two locally available stylommatophoran gastropods under study i.e. Semperula maculata and Cryptozona semirugata. It was also proposed to localize neurosecretory cells in the cerebral ganglia and optic tentacles in these species. Another purpose of this study was to find out the interrelation between the neurocretion in the cerebral ganglia and in the optic tentacles and gametogenetic activity in the ovotestis during reproduction of these gastropods.

1 CONFIRMATION OF DORSAL BODIES :

The observations on the histological staining procedures and the special histochemical staining procedures employed for the identification of neurosecretory cells in the present investigation revealed that some scattered cell groups were present in the connective tissue surrounding the cerebral ganglia of S. maculata. But such cells were not observed in the usual site of the dorsal body, in the region above the cerebral ganglia. Hence, it is doubtful about the presence of dorsal body in S. maculata. On the contrary typical neurosecretory large cells were packed in a connective tissue sheath and they

were located in the above area of cerebral commissure in C. semirugata indicating the presence of distinct dorsal body in this species.

The presence of dorsal body has been particularly demonstrated in the snail species of gastropods. It has been reported in H.duryi (Miksys and Saleuddin, 1988). in L. stagnalis (Ebberink et al., 1983), and in H. aspersa (Nolte et al, 1986). The results of our study also confirm the observations of all these investigations that the dosal body is present distinctly in a snail gastropod under study .i.e. C. semirugata. Similarly our results also support the observation of Saleuddin et al .,(1989) about the place of dorsal body, above the dorsal surface of the cerebral commissure in case of C. semirugata. But for the observation Saleuddin et al.,(1989) had used gastropod species; (H. duryi) belonging to basommatophoran sub-order of pulmonata,. But the species,C. semirugata, selected for our study belongs to sub-order stylommotophora. Secondly, all the above refered snail species belong to the aquatic habitat and the snail species under study belongs to the terrestrial habitat. From the results of the present study and from the earlierreports it seems that the presence of dorsal body is independant irrespective of the position in the systematics and irrespective of the habitat of the concerned gastropod species. Of course for the confirmation of habitat dependant presence of dorsal body in the gastropods more species should be examined.

2 *LOCALITIES OF NEUROSECRETORY CELLS IN CEREBRAL GANGLIA :*

Though the neurosecretory cells in the gastropod molluscs have been studied in detail in the entire body of the cerebral ganglia, there is no detailed report on the distribution of these cells in this organ. On the basis of their localization in the cerebral ganglia of S.maculata and C.semirugata, four distinct localities or regions could be marked. They are- dorsomedian region, dorsolateral region, ventromedian region and ventrolateral region. Therefore, the results of the present study will be the first report on this aspect in gastropod species. Now, it should be noted that the above refered four regions only contain the neurosecretory cells in the cerebral ganglia of S.maculata and C. semirugata. Such regional distribution of neurosecretory cells could be studied in other gastropod species also.

3 *CELLULAR DIVISION OF LABOUR IN NEUROSECRETION BY CEREBRAL GANGLIA (?) :*

The investigation of neurosecretion by the cerebral ganglia of two terrestrial stylommatophorans. A slug and a snail, was undertaken with a view to augment the understanding of cell types in the ganglia in general and its probable role in the physiology of reproduction of gastropod molluscs in particular. Till recent times, there was contraversy about the number of neurosecretory cell types in the cerebral ganglia. It was considered to be only two in slug, Arion (von Mol, 1967) and in snail, H. pomatia (Krause, 1960), five in

F. shimekaii (Lever, 1957), Seven in I. exustus (Shinde, 1991) and eight to ten in L.alte (Jawalikar, 1989). In the present investigation, we noted eight different cell types in S. maculata and seven cell types in C. semirugata. The number of neurosecretory cells is less in case of terrestrial snail, C. semirugata and the number of these cells is more in the terrestrial slug, S. maculata, belonging to the same sub-order stylommatophora. But whether all the snails have less number of neurosecretory cells than the slugs of the same sub-order is not known. For the concrete proof on this observation, such study must be performed on large number of snails and slugs, of the same habitat and same sub-order.

Besides making the above significant addition to our existing knowledge of the neurosecretory cell types in the cerebral ganglia of stylommatophoran gastropods, the present investigation also reveals another interesting aspect concerning the cellular site of secretion of neurosecretory substances. The very fact that the neurosecretory cell types can be classified into eight distinct types in S. maculata and seven distinct types in C. semirugata. The cellular concentrations, visualised by histochemical methods, differ in different types of cells. It is very confusing that whether all these cell types are having different identity or they are in different transitory states of the single type during its maturation process. Unless electromicroscopic study and cell culture technique used to study the different stages of cell development the present doubt can not be cleared.

4 *SEASON DEPENDANT ALTERATIONS IN THE NEUROSECRETORY CELLS OF CEREBRAL GANGLIA :*

The seasonal studies on the alteration in the number of neurosecretory cell types in the cerebral ganglia and the concentration of neurosecretory material in these cell types bring out interesting functional features of neurosecretory substances in the reproductive physiology of gastropods.

It is known that the neurosecretory cells of cerebral ganglia in gastropods show a maximum activity at the time of gametogenesis (Joosse, 1964; Kuhlmann and Nolte, 1967; Smith, 1967). In the present study, the size and staining reactivities of neurosecretory cells in the cerebral ganglia of S. maculata and C. semirugata were increased in their breeding months i.e. June, July, August and September when their gametogenesis activity had reached at the peak. Not only the size and staining reactivities had increased but also their ingradients of the neurosecretory material had reached at their maximum levels. It has been observed that the glycogen and protein contents of the neurosecretory cells reached their heighest concentration at time of gametogenesis. It indicated that the neurosecretion play important role at the time of gamete formation in the reproductive physiology of gastropod molluscs.

This fact could be further confirmed by the observations on the numerical variations of neurosecretory cells during seasonal breeding aestivation cycles. The number of the cells was moderate in the pre-breeding season in months of

March, April and May. It was increased and reached the maximum value during the breeding season in the months of June, July, August and September. Again the values started decreasing in the Post breeding or aestivation period in the month of October and showed the minimum values during active aestivation months from November to April. These observations again substantiate the role of neurosecretion in the reproduction of the two gastropods under study. The reduction in the number of neurosecretory cells and lowered concentration of neurosecretory material in the aestivation indicated negative role during this inactive period of annual cycle when gametogenetic activity of both the gastropods was completely ceased.

5 INTERDEPENDANCY OF NEUROSECRETION IN CEREBRAL GANGLIA AND OPTIC TENTACLES DURING GAMETOSENESIS OF GASTROPODS :

It was interesting to note the changes in the number and in the concentration of neurosecretory products in the neurosecretory cells localized in the cerebral ganglia and those localized in the optic tentacles. As pointed out earlier, the size, number and the concentration of neurosecretory granules of the neurosecretory cells in the cerebral ganglia were moderate in the pre-breeding season when the gametogenesis in the ovotestis was just initiated, maximum in the breeding season when the ovotestis was full of mature sperms and ova and lowest in the aestivation period when the ovotestis was without any ova or with very few matured sperms. The parallel changes were noticed in the

neurosecretory cells localized in the optic tentacles of S. maculata and C. semirugata. Such parallel changes in the optic tentacles might have induced due to neurosecretion elaborated in the neurosecretry cells of the cerebral ganglia indicating their interdependancy in the control of gametogenesis in the ovotestis during the breeding season.

The field of neurosecretion and its control over reproduction forms an open field for future research. Though some ideas concerning the gametogenesis and its neuroendocrine control both from the cerebral ganglia and optic tentacles have been suggested, the studies on this aspect of neuroendocrine control in the physiology of reproduction in gastropods is poor. Unless similar more work on different gastropod species belonging to various sub-classes of gastropoda and belonging to different habitats is carried out, such endocrine controls cannot be studied in detail.