EMBRYONIC DEVELOPMENT OF THE NERVOUS SYSTEM OF THE STONEFLY, KAMIMURIA TIBIALIS (PICTET) (PLECOPTERA: PERLIDAE)

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The embryonic development of the ventral nerve cord and brain of the stonefly, *Kamimuria tibialis* was observed, and the number of neuroblasts in each ganglion of the mandibular to the 10th abdominal segments was counted.

The ventral nerve cord of K. tibialis develops in the same way as in embryos of other insects, and the neuroblasts differentiate in 3 gnathal, 3 thoracic and 11 abdominal segments, but those in the 11th abdominal segment are transient and do not form, as in other abdominal segments, a pair of abdominal ganglia. In the later development, the 7th to 10th abdominal ganglia fuse, and the metathoracic and 1st abdominal ganglia do so also. The median cord of ventral nerve cord is derived from the median invagination of the ventral ectoderm as observed in embryos of other insects, but the fate of it could not be traced. The neurilemma seems to arise from the peripheral ganglion cells. In the early embryogenesis of *Locusta migratoria* (Bate, 1976) and *Gryllus bimaculatus* (Miyamoto and Shimozawa, 1983; Miyamoto, 1983), the anlage of the nervous system shows the segmental homology, not only within the gnathal and thoracic ganglia, but also between the thoracic and abdominal ones. In *K. tibialis*, the segmental homology within each thoracic ganglion was demonstrated in the early embryogenesis by the result of cell counting, but it should be stressed out that the neuroblast number in the mandibular ganglia is smaller than that of the maxillary and labial ganglia. This difference of the neuroblast number in gnathal ganglia may be related to the differences of their structure, that is, the mandibular segment bears a pair of simple appendages, while the maxillary and labial segments bear complicated appendages with palpes.

In the abdominal segments, no appendages are formed except the pleuropodia in the 1st abdominal segment, so that the significant differences in structure within abdominal segments do not occur. However, the neuroblast number in the 10th abdominal segment was extremely small, and it was likely that this segment shows its own functional specialization or difference. Thus, in K. tibialis the segmental specialization of ganglia of the madibular and 10th abdominal segments occurs in the early neurogenesis.

In K. tibialis, the protocerebrum consists of 4 pairs of lobes, that is of the 1st to 4th protocerebral lobes. It is generally conceded that neuroblasts do not take part in the formation of optic lobes in insects, but the 1st protocerebral lobes of this species are composed of large neuroblast-like cells. It is thought that these large neuroblast-like cells of the 1st protocerebral or optic lobes in K. tibialis correspond to usual neuroblasts in following points; they are as large as the neuroblasts of other lobes, and are stained lightly with haematoxylin. Therefore, it may be postulated that the neuroblasts take part in the formation of the optic lobes in K. tibialis. The 4th protocerebral lobes are observed as in Carausius morosus and Periplaneta americana (Malzacher, 1968; Rohrschneider, 1968; Scholl, 1969), but the present author could not decide whether they were the paired ganglia of the preantennal segment.

In general, in insects no commissure is formed between the lobes of the deutocerebrum, but in K. tibialis the deutocerebral commissure taking part in the formation of the supraoesophageal commissure or pars intercerebralis, exists. The neuroblasts of the tritocerebrum in K. tibialis appear in the intercalary segment and anterolateral region of the stomodaeum, on the other hand, those of many other insects appear only in the intercalary segment.

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