

Inner layer formation in the embryo of *Kamimuria tibialis*  
(Pictet) (Plecoptera: Perlidae)

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Inner layer or mesoderm formation is one of the important processes in the insect embryogenesis, but our knowledge of the process in hemimetabolan embryo is still unsatisfactory. The elucidation of this process has been difficult in hemimetabolan embryos, due to the rapidity with which it takes place, to the difficulties to distinguish mesodermal cells from ectodermal ones in early developmental stage, and to technical problems posed by the tough chorion and dense yolk. In the stonefly *Allonarcys* (= *Pteronarcys*) *proteus*, inner layer formation has been classified as of the localized immigration type by Miller (1940)

In the present study inner layer formation of *K. tibialis* will be described.

In stage 1 (2.5 days after oviposition), unlayered germ disc is formed at or near the posterior pole of the egg. The germ disc bends and sinks in the yolk to form the saclike embryonic rudiment in stage 2 (3 days after oviposition). Between the embryonic rudiment and the yolk a slight gap occurs. Several yolk cells are arranged at the yolk boundary bordering the embryonic rudiment. They are continued with cytoplasm, forming yolk-cell membrane as known in the embryogenesis of some insects (Roonwal, 1936; Louvet, 1964), but the yolk-cell membrane has not been observed in that of *A. proteus* by Miller (1940).

When the embryo begins to elongate, cell proliferation is found at the mid-dorsal wall of embryo, consequently that wall becomes multi-cell-layered. This proliferating cells are mesoderm. No gastral furrow is formed. The mesodermal cells are difficult to distinguish from the other ectodermal cells. In stage 3 (4 days after oviposition), the saclike embryo becomes pear-shaped which is consist of protocephalon and protocorm. The mesodermal cells actively proliferate. The ectodermal wall under the mesodermal cells becomes depressed. The mesodermal cell layer is so far thicker in the posterior of mid-dorsal portion than in the other. The layer spread over the dorsal surface of the embryo and it becomes thinner as spreading proceeds. The mesodermal cells may easily be distinguished from the ectodermal ones, since the former are cuboidal and the latter are columnar. The yolk-cell membrane disappears at this stage.

Finally in stage 4 (5 days after oviposition), the thin cell layer spreads uniformly over the dorsal surface of the embryo except the anterior end of the protecephalon. Though the ectodermal segmentation occurs at this stage, the mesodermal layer is still continuous.

The inner layer formation in *K. tibialis* is characterized as follows; 1. no gastral furrow is formed, 2. inner layer cells are formed by localized cell proliferation of ectoderm, 3. temporary yolk-cell membrane is formed.

The mode of inner layer formation in *K. tibialis* is almost the same as in *A. proteus* and is also similar to that in the Isoptera (Strindberg, 1913; Striebel, 1960) concerning the above-mentioned characteristics (1 and 2).

#### References

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