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The formation of the germ rudimens and embryonic membranes in the mnesarchaeid moth, *Mnesarchaea fusilella* (Lepidoptera : Mnesarchaeidae)*

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Formative processes of the blastoderm, germ disk, germ rudiment and embryonic membranes in the mnesarchaeid moth, *Mnesarchaea fusilella*, are described, and their phylogenetic significance is discussed.

The eggs of *M. fusilella* for examination were obtained from Wilton's Bush near Wellington, New Zealand, in October of 1988 and 1989. The egg period was three to four weeks under the condition of about 17°C, and the eggs of early developmental stages ranging from 8 to 62 hours after oviposition were fixed, cut, and stained by the ordinary paraffin method.

The egg is ovoid, about 0.32mm by 0.48mm in size. Below the thin chorion lies a very thick (1.5-2.0μm) vitelline membrane (Fig. 1A). In the newly laid egg, this membrane is colourless, but it becomes blackly scrclotized about 30 hours after oviptsition. The blastoderm completes at about 18 hours after oviposition. Its cells, when completed, differ in size and appearance according to the egg region (Fig. 1A). In the posterior and posteroventral regions, they are small and globose, and contain one nucleus and a few yolk globules. This is a future embryonic area. On the other hand, in the anterior and anterodorsal regions, the blastodermal cells are wide and thick, and usually have two nuclei (Fig. 1C) and contain many yolk granules in their basal part. This region is an extra-embryonic area or future serosa. The cells of the future embryonic area then divide actively and aggregate to form a circular germ disk in the posterior region at about 22 hours after oviposition. The germ disk then shifts its position to the ventro-posterior region of the egg, and its central part begins to invaginate into the yolk. As invagination proceeds, all marginal regions of the germ disk flex ventrally and the amnio-serosal folds are formed; thereby the germ disk becomes a sac-shaped germ rudiment (Fig. 1B). Its opening accordingly becomes narrower and finally closes

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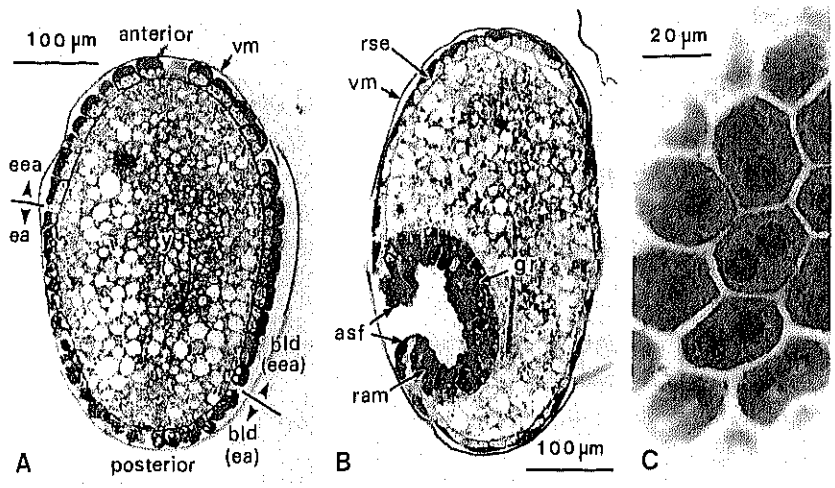

Fig. 1. A. Longitudinal section of 18-hr-old egg of *Mnesarchaea fusilella* showing blastoderm covering whole egg surface. B. Sagittal section of 27-hr-old egg showing sac-shaped germ rudiment. C. Frontal section of 18-hr-old egg showing blastodermal cells having two nuclei in extra-embryonic area. asf: amnio-serosal fold, bld: blastoderm, ea: embryonic area, eea: extra-embryonic area, gr: germ rudiment, ram: rudimentary amnion, rse: rudimentary serosa, vm: vitelline membrane, y: yolk.

at about 28 hours after oviposition. The germ rudiment then separates from the rudimentary serosal or extma-embryonic area. Its inner region later develops into the embryo, and its outer one into the amnion. The lumen surrounded by these layers is the amniotic cavity. The serosa which is now covering whole egg surface slightly attenuates during the formation of the germ rudiment, aud each of its cells still has two nuclei.

The mode of the early embryonic development of *M. fusilella* described above is very similar to that of the hepialid moths, *Endoclita sinensis* and *E. excrescens* (ANDO and TANAKA 1980), in the following aspects or characters: 1. Differentiation of the circular germ disk in the posterior region of the egg. 2. Formation of the sac-shaped germ rudiment. 3. Formation of the thick, blackly screlotized vitelline membrane. 4. Presence of thick, binucleated serosal cells. In these characters, the former two are considered to be primitive in insect embryogenesis (KOBAYASHI and ANDO 1988). Whereas the latter two characters are highly specialized ones, and therefore can be presumed to be synapomorphies between *M. fusilella* and the hepialid moths.

In conclusion, these embryological findings add further weight to the view that the Mnesarchaeidae and Hepialidae are properly associated in the taxon Exoporia.

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