Associations of Mitochondria with Desmosome-Like Structures in the Oocytes of *Raillietiella aegypti* (Pentastomida, Cephalobaenida)

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The oocytes of the cephalobaenid Pentastomid *Raillietiella aegypti* were studied by electron microscopy. A prominent feature of vitellogenic oocytes are numerous spherical, oval and elongated mitochondria. Some of these are shown with desmosome-like structures. The associations between mitochondria and the desmosome-like structures have always been observed to lie freely in the oocytoplasm; there are no apparent connections with the oocytous plasma membrane. Possible functional roles of these complexes are evaluated.

Mitochondrial-desmosomal associations have been demonstrated in several animal tissues [1–5] as well as in man after contracting a number of different liver diseases such as Acute Intermittent Porphyria [6] or hepatitis, liver cirrhosis, Hodgkin's disease and Boeck's disease [7]. These complexes occur in differentiating as well as in adult tissues. Here, for the first time, such associations are reported for oocytes. This paper describes the association of mitochondria with desmosome-like structures in the oocytes of the Pentastomid *Raillietiella aegypti*.

Mature *Raillietiella aegypti* were taken from the lungs of *Eumeces schneideri* (Reptilia, Scincidae) caught in Egypt. All electron microscopical methods (fixation, post-fixation, dehydration, embedding) were as described in two previous papers [8, 9]. A Reichert ultramicrotome Ultracut was used for sectioning. Sections were double-stained with uranyl-acetate and lead citrate [10] and examined in a Philips EM 301 at 80 kV.

Associations of mitochondria with desmosome-like structures have only been observed in vitellogenic oocytes. They are apparently absent in previtellogenic oocytes. The cytoplasmic matrix of vitellogenic oocytes is characterized by an abundance of mitochondria, rough endoplasmic reticulum, ribosomes and pinocytotic vesicles. Many mitochondria are scattered in the cytoplasm, but a greater number aggregates at the poles and accumulates to participate in the formation of Balbiani body (Fig. 1).

Profiles of sectioned mitochondria are spherical, oval or elongated. Some of the mitochondria undergo transformation: profiles show a loss of cristae and crystalline configurations appear on parts or the complete section. Other mitochondria form the mitochondrial-desmosomal-like associations (Fig. 2). The desmosome-like structures normally connect a pair of mitochondria (Fig. 3). This may be achieved by one such structure but they can occur in pairs and may even share two mitochondria (Fig. 4). Single desmosome-like structures in mitochondria are rather less frequent than these which have an opposite counterpart.

Higher magnifications of the complexes show that the mitochondria are connected by the dense material of the desmosome-like structure and not by tonofilaments (Figs. 3 and 4). In the oocytes of *Raillietiella aegypti* desmosome-like structures always lie freely in the cytoplasm. Connections with the plasma membrane which are known to occur in differentiating epithelia of mice [2], rat thyroid gland [4], mammary gland secretory epithelium of lactating cows [5] and in human diseased livers [6, 7] are apparently absent.

In human diseased livers mitochondrial-desmosomal associations are a typical pathologic alteration [6, 7]. Mitochondrial-desmosomal associations are, however, common throughout the whole animal kingdom in a number of different healthy cell types [1–5].

The functional properties of these mitochondrial-desmosomal complexes are largely unknown. One can only speculate about their role with reference to known properties in other animal cells: 1. Mitochondria are necessary for desmosome formation as a supplier of ATP and calcium [1, 2]. 2. Mitochondria are required for the stability of the desmosome [6]. 3. Mitochondria supply metabolic products required for the functions of other organelles in their vicinity, *e.g.* endoplasmic reticulum [2, 11]. 4. Associations participate in active transport of water and solutes [12].

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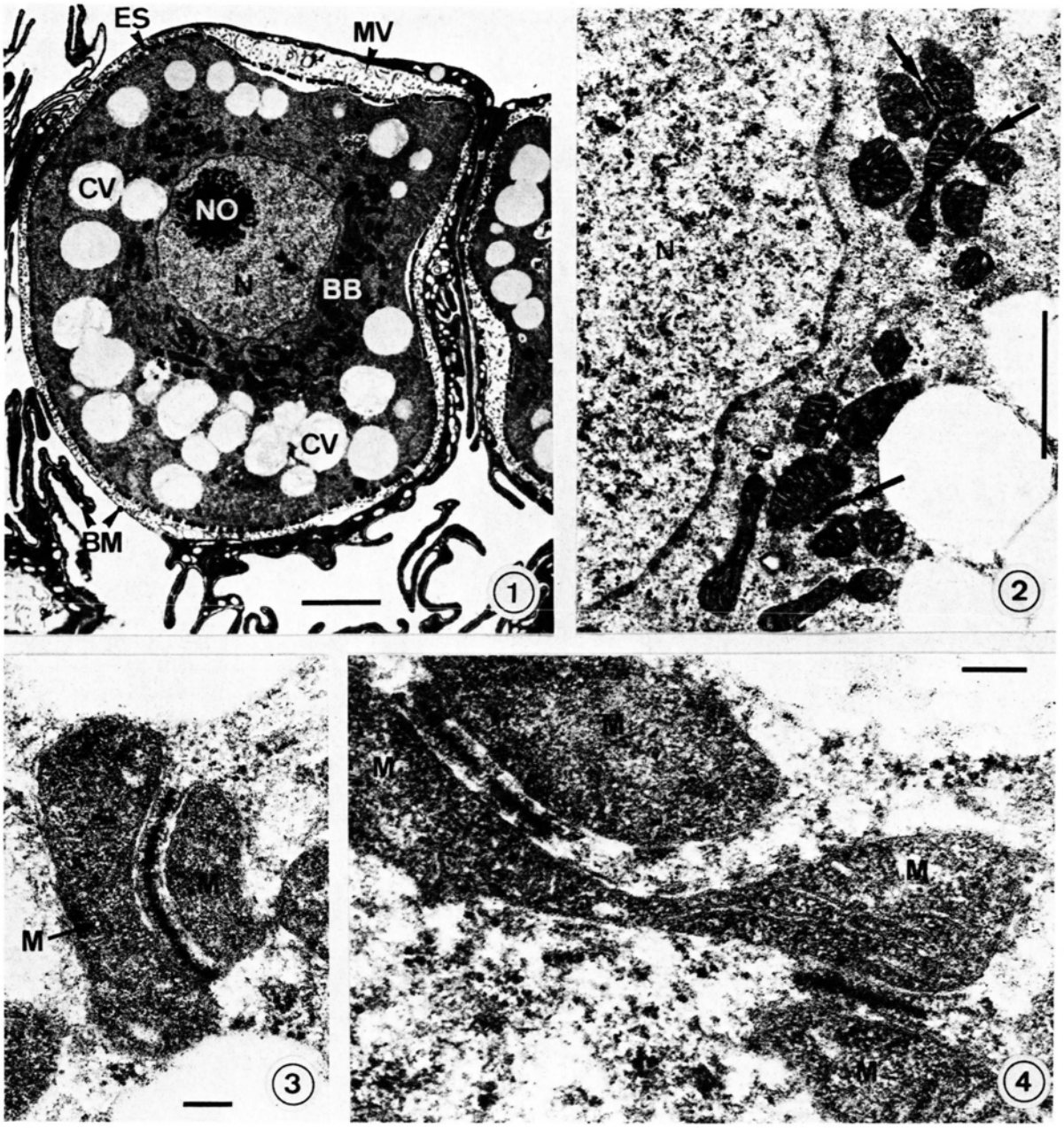

Fig. 1. Vitellogenic oocyte of *Raillietiella aegypti* with well developed egg-shell. Mitochondria form the Balbiani body (bar = 2 μm).

Fig. 2. Low power magnification of three mitochondrial-desmosomal-like associations (arrows; bar = 1 μm).

Figs. 3 and 4: High power magnifications of desmosome-like structures connecting two respectively three mitochondria (bars = 100 nm).
BB = Balbiani body, BM = basement membrane, CV = cortical alveoli, ES = egg-shell, M = mitochondria, MV = microvilli, N = nucleus, NO = nucleolus.

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