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SCANNING AND TRANSMISSION ELECTRON MICROSCOPIC OBSERVATIONS ON THE OENOCYTES OF THE LANTERN BUG, *PYROPS CANDELARIA* LINN. (HOMOPTERA: FUGORIDAE)

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Wilkin Wai-Kuen Cheung and Alan Turnard Marshall (1981) Scanning and transmission electron microscopic observations on the oenocytes of the lantern bug, *Pyrops candelaria* Linn. (Homoptera: Fulgoridae). *Bull. Inst. Zool., Academia Sinica* **20**(2): 69-72. The oenocytes of *Pyrops candelaria* are oval or rounded cells. The nucleus has scattered chromatin materials. The cytoplasm has numerous mitochondria, dense bodies, vacoules and rough endoplasmic reticulum. The basement membrane is invaginated. The significance of the above ultrastructure in relation to the possible function of the midgut sheath is discussed.

Oenocytes are usually very large calls, yellowish colour, scattered throughout the insect body cavity. They are of ectodermal origin, found beneath the cuticle, between the epidermis and underlying muscle fibres, around the spiracles, and sometimes interspersed with the mesodermal cells of the fat body[6,8,10].

Light and transmission electron microscopic studies of oenocytes in relation to insect moulting have been investigated by workers such as Diehl[2], Locke[4], Romer[7] and Wigglesworth[9]. These workers think that oenocytes may be involved in the production of lipids or lipoprotein materials. Their precise role, however, is still by no means clear[6,10].

During the course of ultrastructural studies on the digestive system of the lantern bug, *Pyrops* (*Fulgora*) *candelaria* Linn., we have observed a layer of oenocyte-like cells surrounding the midgut epithelium[1,5]. This layer of cells has been previously reported by Goodchild on fulgorid insects such as *Phalix titans* and *Pyrops tenebrosus*[3] in the light microscopic level. A scanning and transmission electron microscopic study is reported here for the first time. This information may throw some light on their functions in association with the lantern bug midgut.

Adults of *Pyrops candelaria* were collected from Lychee aud Longan groves in the New Territories of Hong Kong Colony. Dissections were made in 0.2 M phosphate buffer, pH 7.2, and pieces of *Pyrops* midgut were fixed in 2.5% glutaraldehyde in 0.2 M phosphate buffer, pH 7.2, for 1 hr., postfixed in 1.0% osmium tetroxide in phosphate buffer and embedded in araldite, epon or spurr resin after dehydration with acetone series. Sections were cut with a Porter-Blum ultrotome II or Reichart ultrotome and were stained with uranyl nitrate or acetate and lead citrate. Sections were observed in a JEOL JEM120 or Zeiss EM 9S-2 transmission electron microscope. Thick sections for light

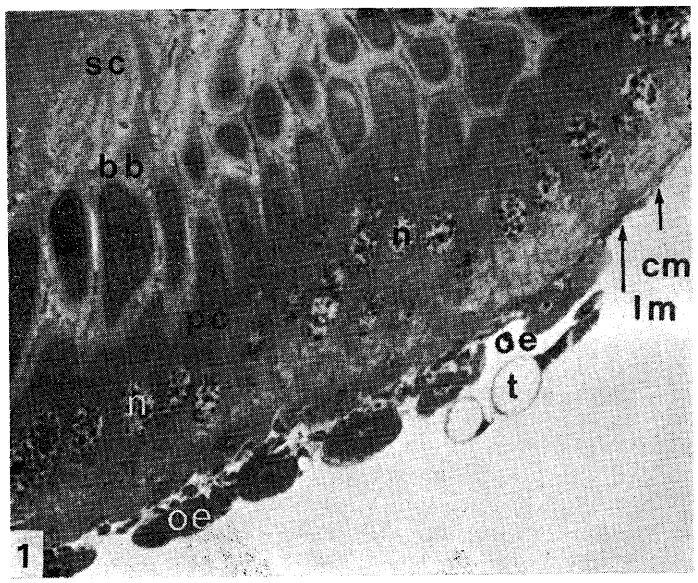

Fig. 1. Transverse section of anterior midgut. Light micrograph of araldite section. Showing principal cells (pc) with prominant nuclei (n) and an extensive surface coat (sc) on the brush border (bb). Tracheoles (t), oenocytes (oe), circular muscles (cm) and longitudinal muscles (lm) surround the epithelium. ×400.

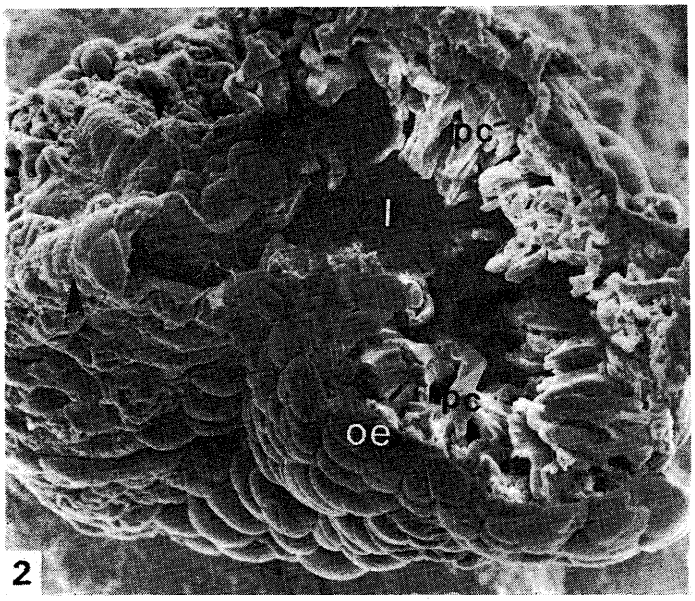

Fig. 2. Scanning electron micrograph of anterior. Showing principal cells (pc), gut lumen (l) and oenocytes (oe). Broken pieces of the midgut sheath (arrow heads) are also shown. ×100.

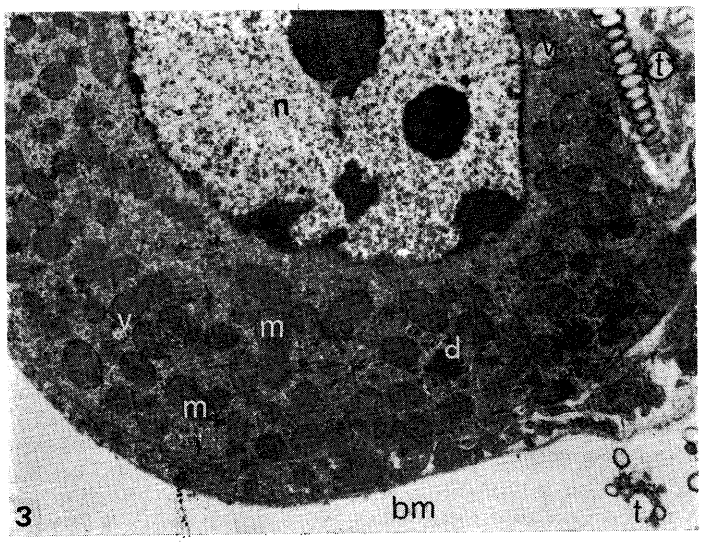

Fig. 3. Transverse section of an oenocyte. Showing nucleus (n), mitochondria (m), dense body (d), vacuoles (v), basement membrane (bm) and tracheole (t). ×9.800.

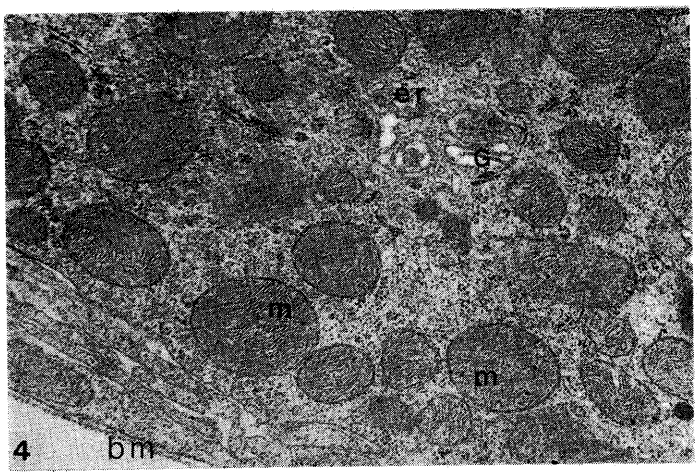

Fig. 4. As above. Showing mitochondria (m), Golgi body (G), endoplasmic reticulum (er) and basement membrane (bm). ×28,500.

microscopy were also cut with a Porter-Blum ultrotome II or Reichart ultrotome and were stained in 1% toluidine blue in 1% borax.

For SEM, the insect gut was fixed in 2.5% glutaraldehyde in 0.2 M phosphate buffer, pH 7.2, for 1 hr. A small portion of it was cut with a razor blade, air-dried, coated with gold and examined in a JSM-35 scanning electron microscope.

Examination of *Pyrops* midgut oenocytes by light microscope, SEM and TEM shows that oenocytes are oval or rounded cells with single nuclei (Figs. 1, 2, 3). The nucleus is usually placed in a central position, with scattered chromatin material (Figs. 1, 3). Scattered in the cytoplasm are numerous mitochondria, some

dense bodies, vacuoles, and rough endoplasmic reticulum (Figs. 3, 4). The basement membrane is variedly invaginated (Figs. 3, 4).

Oenocytes generally are believed to play a part in intermediary metabolism and secretion of metabolites[8]. The occurrence of numerous mitochondria suggests this.

Goodchild[3] postulated that the oenocytes and the midgut sheath (intestine sheath) could act as an osmotic barrier between the gut lumen and the dody haemolymph. Since the midgut sheath has to transfer nutrients into the haemolymph as part of the intestinal absorptive process, the oenocytes may play a part in contributing to water and ion regulation in the spaces enclosed by the midgut sheath.

An elevation of osmotic pressure inside the midgut sheath by ion or protein secretion could possibly facilitate a diffusion gradient of solute flow (such as simple sugars and amino acids) from the sheath space to the haemolymph since absorbed nutrients have to cross this sheath.

Although no physiological data are available to justify this proposal, the occurrence of numerous mitochondria, golgi bodies and vacuoles suggest this function. It is therefore tempting to suggest that the oenocytes, together with the midgut sheath (whose ultrastructure shows a mineral transport function, Cheung, unpublished observation), could act as an effective barrier regulating the passage of nutrients into the haemolymph.

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龍眼角蟬扁桃細胞之掃描與透視電鏡觀察

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龍眼角蟬（俗名龍眼鷄）扁桃細胞爲圓型或橢圓型細胞，細胞核有分散之染色質，細胞質有許多粒線體、結實體、空泡及顆粒之內質網，基膜呈現摺疊狀。關於以上這種超微構造之意義，與龍眼角蟬中腸膜之可能功能，本文均予以討論。