Egg of *Aedes (Gymnometopa) mediovittatus* (Diptera: Culicidae)

J. R. LINLEY[1] AND G. G. CLARK[2]

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ABSTRACT The egg of *Aedes mediovittatus* (Coquillett) is described from scanning electron micrographs. The egg is black, slightly tapered toward the posterior pole, and is approximately 771 μm long and up to 175 μm wide. On the entire egg surface there are about 970 polygonal outer chorionic cells, each bounded by a raised outer chorionic reticulum which forms a wall around each cell. Incorporated into the inner surface of this wall are 13–18 relatively small, poorly defined and variably shaped tubercles. In the center of each cell there is a large, buttonlike, more or less round tubercle with a pitted upper surface. Over most of the egg surface, the walls of this tubercle are connected by spokelike bridges of variable diameter to the cell floor or reticulum wall. The structure of the outer chorionic cells is somewhat modified in areas approaching the anterior and posterior poles.

KEY WORDS Insecta, eggs, *Aedes mediovittatus*, morphology

THE KNOWN DISTRIBUTION of *Aedes (Gymnometopa) mediovittatus* (Coquillett) extends from Cuba through the Cayman Islands, Jamaica, Hispaniola, Puerto Rico, the Virgin Islands, south to Venezuela (Knight & Stone 1977). The larvae inhabit various natural and artificial containers and are often found in the same habitats as *Aedes aegypti* L., although the two species differ to some extent in their proportionate distributions between specific container types (Moore 1983). With the recognition that *Ae. mediovittatus* is potentially an important maintenance vector of dengue viruses in Puerto Rico (Gubler et al. 1985), more attention has been focused on the biology of this species. As a contribution to this effort, this paper provides a description of the egg based on scanning electron micrographs.

Materials and Methods

Fully embryonated eggs on "egg papers" taken from a laboratory colony at the San Juan Laboratories were completely desiccated to dryness over calcium chloride. As is the case with many *Aedes* eggs, those of *Ae. mediovittatus* do not collapse when dried, and the few that do are probably infertile. Small squares of paper with attached eggs were cut out, cemented to stubs with conductive silver paint, then coated with gold. Specimens were examined in a Hitachi S-510 scanning electron microscope (SEM). The terminology used in this description follows that suggested by Harbach & Knight (1980).

Results

General Features. The egg is dull black, broadly cigar-shaped, and in most specimens tapers slightly overall toward the posterior end (Fig. 1). The mean length (±SE) in 10 specimens measured under SEM was 770.8 ± 8.0 μm (range, 742.1–807.9 μm) and the width (at the widest point) was 174.5 ± 3.0 μm (range, 163.5–190.5 μm).

Covering the entire surface of the egg, except for the micropyle, are clearly defined polygonal outer chorionic cells, each containing a large, more or less round central tubercle. As estimated from a count of all the chorionic cells visible in Fig. 1, there are approximately 970 present on the entire surface of the egg.

Detailed Structure. *Outer chorionic cells.* Although all the outer chorionic cells conform to the same basic structure, they are somewhat modified near the anterior and posterior poles (see below). Over most of the egg surface, the cells appear as in Fig. 2, which shows the outer chorionic cells approximately halfway along the length of the egg. Almost all individual cells are pentagonal or hexagonal in shape (Fig. 2a), with a prominent, more or less round central tubercle. The central tubercles are uniform in size over the entire egg surface and have a mean diameter (±SE) of 6.8 ± 0.1 μm (n = 10). The dome-shaped top of each tubercle is indented with shallow pits (Fig. 2b and c) and is supported mainly on a short, thick pillar, but also to some extent by a variable number of spokelike bridges. These are of varying diameter and are attached either to the excavated cell floor or to the raised inner rim of the outer chorionic reticulum. Also forming part of this inner rim are a variable

[1] Florida Medical Entomology Laboratory, Institute of Food and Agricultural Sciences, University of Florida, Vero Beach, Fla. 32962.

[2] Dengue Branch, San Juan Laboratories, Division of Vector Borne Viral Diseases, Center for Infectious Diseases, Center for Disease Control, Department of Health and Human Services, G.P.O. Box 4532, San Juan, Puerto Rico 00936.

Fig. 1. Entire egg of *Ae. mediovittatus*. Scale, 100 μm.

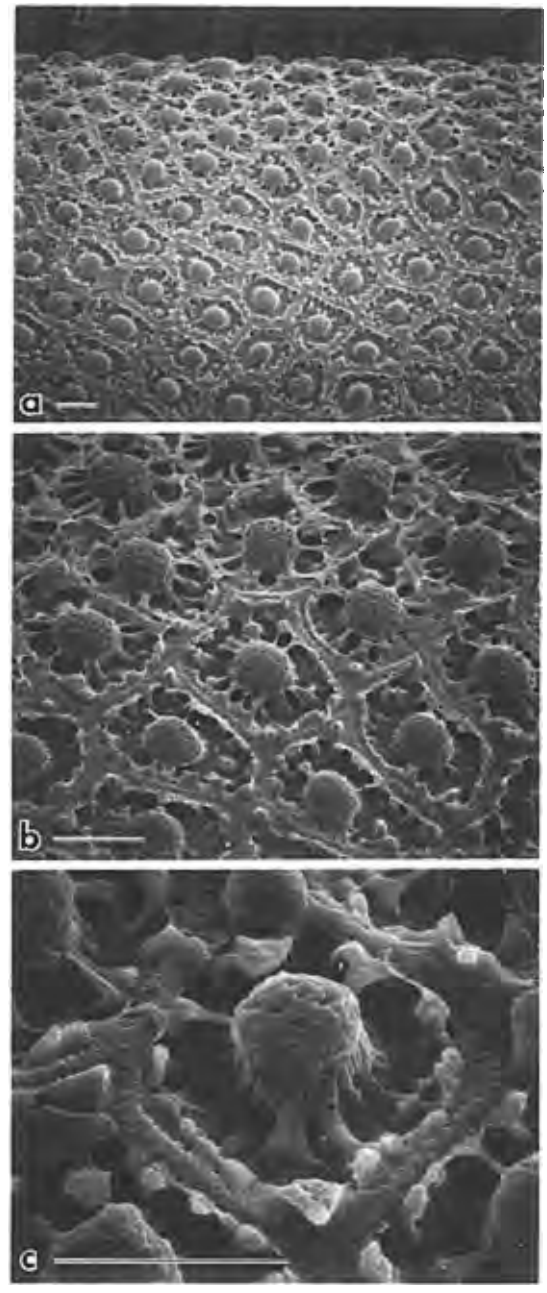

Fig. 2. (a) Typical outer chorionic cell pattern midway along length of egg. (b) Outer chorionic cells showing large, pitted central tubercle supported by spokelike bridges and elevated outer chorionic reticulum. (c) Single outer chorionic cell showing detail of central tubercle and supporting pillar, small tubercles fused to inner wall of reticulum, and pitted reticulum surface bearing a low dividing ridge. Scale, 10 μm.

number (13–18) of small, irregularly shaped tubercles which project somewhat above the reticulum wall. The raised polygonal walls (Fig. 2c) that form the reticulum are approximately 2.7 μm in

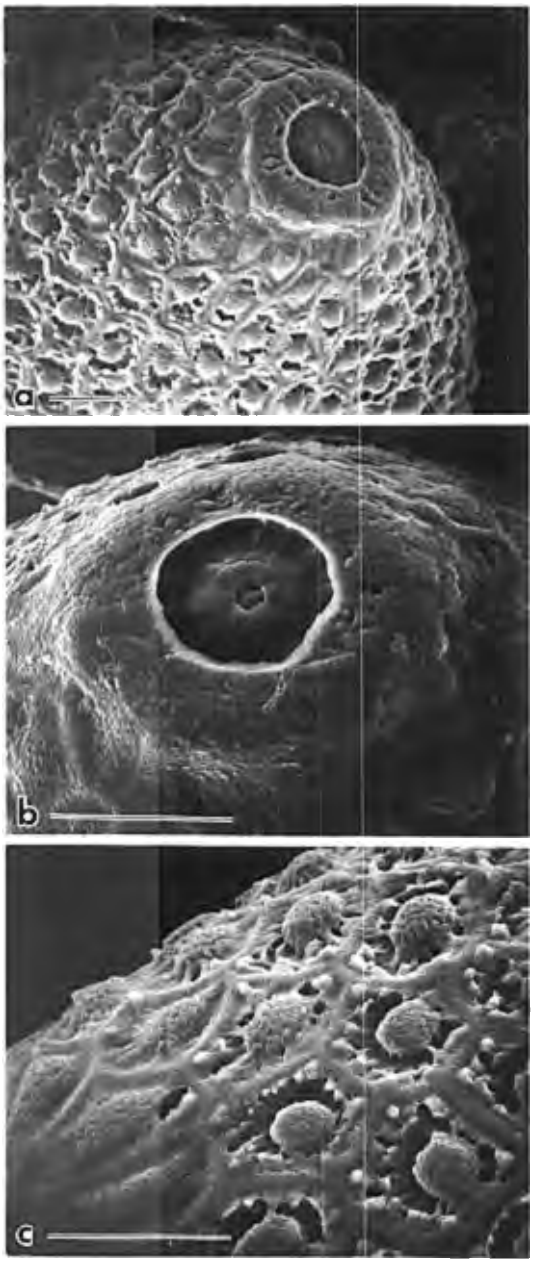

Fig. 3. (a) Anterior pole, showing pitted micropylar collar, micropylar disk, and modified outer chorionic cells immediately posterior to micropyle. (b) Detail of micropylar collar, disk, and micropylar aperture. (c) Detail of modified outer chorionic cells immediately posterior to micropylar collar. Scale, 20 μm.

diameter, pitted, and divided along the middle by a low ridge that delimits the actual boundary of an individual chorionic cell.

Anterior Pole and Micropyle. The low (approximately 7.7 μm high) walls of the micropylar collar (Fig. 1) are sufficiently prominent to be clearly

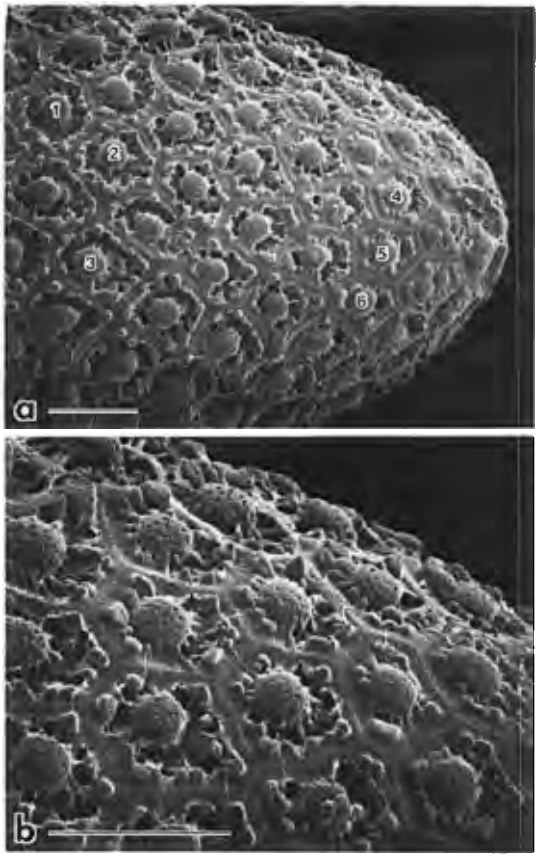

Fig. 4. (a) Posterior pole showing progressively modified outer chorionic cells. (b) Detail of modified chorionic cells near posterior pole. Scale, 20 μm.

visible at the anterior pole. The collar itself (Fig. 3a and b), which may be pitted to some degree, is approximately 44 μm in diameter with walls approximately 11 μm wide. It forms a circular boundary around the micropylar disk, which is approximately 18 μm in diameter. The micropyle (Fig. 3b), in which are seen three low, radiating partitions, is approximately 2.8 μm in diameter and is borne on a slight prominence approximately 9.2 μm in diameter.

In the exochorionic cells immediately posterior to the micropylar collar, the large central tubercle is recognizable, but its entire circumference is joined in a continuous sheet to the inner edge of the chorionic reticulum (Fig. 3a and c). In positions progressively more posterior to the micropyle, increasingly larger spaces appear in the connecting sheet as the outer chorionic cells progressively assume the more typical appearance described previously.

Posterior Pole. The outer chorionic cells in positions approaching the posterior pole undergo the same changes as seen at the anterior end of the egg, but in the reverse order (Fig. 4a). It is clear, however, that these changes are largely related to decreasing cell size nearer the posterior pole. The

size differences can be discerned in Fig. 4a and also to some extent in Fig. 4b. Quantitatively, the perimeters (measured along the central low ridge on the outer chorionic reticulum) of cells 1, 2, and 3 (Fig. 4a) are approximately 60.4, 62.5, and 63.6 μm, respectively, whereas for cells 4, 5, and 6 they are approximately 45.8, 46.9, and 43.8 μm. As the cell perimeter diminishes, the inner wall of the chorionic reticulum approaches the central tubercle (Fig. 4a) and eventually fuses with it (Fig. 4b) to form a continuous layer.

Discussion

The egg of *Ae. mediovittatus* is quite large compared with other *Aedes* species that have been described. In length it is larger than about half the 27 species described by Kalpage & Brust (1968), 16 of 23 species described by Myers (1967), and all 13 Taiwan species described by Matsuo et al. (1974). With respect specifically to *Ae. aegypti*, the egg of *Ae. mediovittatus* is considerably longer, but unfortunately not quite to an extent that would allow differentiation on this character alone. The mean length of the *Ae. aegypti* egg was reported by Matsuo et al. (1974) to be 624 μm (range 550–680 μm), whereas Moriya et al. (1973) cited a mean length of 664 μm (range 624–760 μm) (based on a large sample of 105 eggs). The mean for *Ae. mediovittatus* (770.8 μm) is substantially greater, but at the low end of the range (742.1–807.9 μm), a few eggs are shorter than the longest of *Ae. aegypti* eggs.

The structure of the outer chorionic cells is essentially similar to that found in many other species (Hinton & Service 1969, Moriya et al. 1973, Matsuo et al. 1974) inasmuch as there is a large, more or less round central tubercle, often with a pitted upper surface, surrounded by much smaller tubercles within the perimeter formed by the chorionic reticulum. The smaller tubercles occasionally may be scattered over the floor of the exochorionic cell (Matsuo et al. 1974), but more usually they line the inner reticulum wall or are partially fused to it. In *Ae. mediovittatus*, however, the height of the reticulum wall is unusually great and in no other species so far described are there such prominently developed spokelike bridges radiating from the central tubercles.

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