

An Electron Microscopic Study of Virus Particles in Rhesus Monkey Placenta

(C-type particles/chorionic villi/decidual basalis)

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ABSTRACT Examination of chorionic villi from rhesus monkey placenta revealed the presence of C-type virus particles budding from syncytial trophoblast, pericytes, Hofbauer cells, and mesenchyme.

In addition, particles, distinctly different in size and structure from C-type particles, were found budding from cells of the cytotrophoblastic cell column and decidual basalis. They measured 30 nm in diameter, had a dense central core, surrounded by a narrow, electron-lucent zone, and were enclosed by an outer unit membrane.

Several investigators (1-4) have described C-type virus particles in placental chorionic villi of the rhesus monkey, baboon, and man. Attempts to confirm these observations in rhesus monkey placentas obtained from a totally different source* resulted in the demonstration of C-type particles in chorionic villi, and, in addition, distinctly different particles in other regions of the placenta. This is a preliminary report of these initial observations.

MATERIALS AND METHODS

Placentas from two rhesus monkeys were examined. One monkey was brought to LEMSIP from India in 1970. It was delivered at 71-days gestation. The second monkey was pregnant when brought to LEMSIP from the wild in India. Its gestational age was estimated at 120-125 days by uterine size and x-ray of ossification centers of long bones. The fetuses from both monkeys were delivered by Cesarean section.

At LEMSIP, fragments of placenta were placed in phosphate-buffered 4% glutaraldehyde and submitted to this laboratory. The specimens were then post-fixed in phosphate-buffered 1% osmic acid and processed as previously described (5). Consecutive thick and thin sections were cut on a Porter-Blum microtome, using a diamond knife. Thin sections were carbon coated and stained with uranyl acetate, followed by lead hydroxide. They were examined in a Philips 300 electron microscope at 60 kV. Thick sections were placed on glass slides and stained with methylene blue-azure II.

RESULTS

In the chorionic villi of both rhesus monkeys, C-type virus particles appeared to bud from the plasma membrane of mesenchymal cells, Hofbauer cells, pericytes surrounding fetal capillaries, and the basal surface of syncytial trophoblast cells. Immature C-type particles were located proximal to these

cells; mature C-type particles with electron-dense nucleoids were not observed.

Fig. 1 is part of a chorionic villus illustrating syncytial trophoblast (S), cytotrophoblast (C), basal lamina (B), and a fetal capillary (F). In the basal zone of the syncytial trophoblast several cytoplasmic processes are present. An immature virus particle surrounded by one of these processes in the outlined area appears at a higher magnification (arrow) in Fig. 1a. This particle differs from the typical C-type particle in its internal structure. Characteristic budding and immature C-type particles have a distinct dense inner layer and a clear zone separating a less dense intermediate layer from the outer unit membrane. In contrast, a dense inner layer is lacking and instead a thick dense homogeneous band appears to directly underlie the outer unit membrane of this particle (Fig. 1a). Its average diameter is about 100 nm, which is similar to that of C-type particles.

Several tissue blocks from one monkey placenta contained regions from the basal plate, cytotrophoblastic cell column (Fig. 2), cytotrophoblastic shell, or decidual basalis (Figs. 3 and 4). When sections of these blocks were examined, a moderate number of small, dense particles was observed budding from, or proximal to, the plasma membrane of individual cells or clusters of cells. They were spherical, measuring approximately 30 nm in diameter. The central core of the budding particles (arrows—Figs. 2, 3, and 4) varied in density†. Occasionally an inner layer concentric with the outer unit membrane was observed. Mature particles (*m*—Figs. 3 and 4) had a voluminous dense central core surrounded by a narrow electron-lucent zone enclosed by an outer membrane.‡

DISCUSSION

The results of this study corroborate observations of other investigators (1) regarding the morphology and location of C-type virus particles in the chorionic villi of rhesus monkey placenta. The disparity in ultrastructure between typical C-type virus particles and those found in monkey placental chorionic villi may be due to the specificity of the virus itself,

† The thickness of the sections cut was similar to the diameter of these particles. Consequently, a sectioned particle usually contained various amounts of other material as well, thereby influencing the particle image observed in the electron microscope.

‡ **Note Added in Proof.** Recent examination of baboon placenta revealed the presence of C-type particles in the chorionic villi and both C-type particles and 30-nm particles in the decidual basalis.

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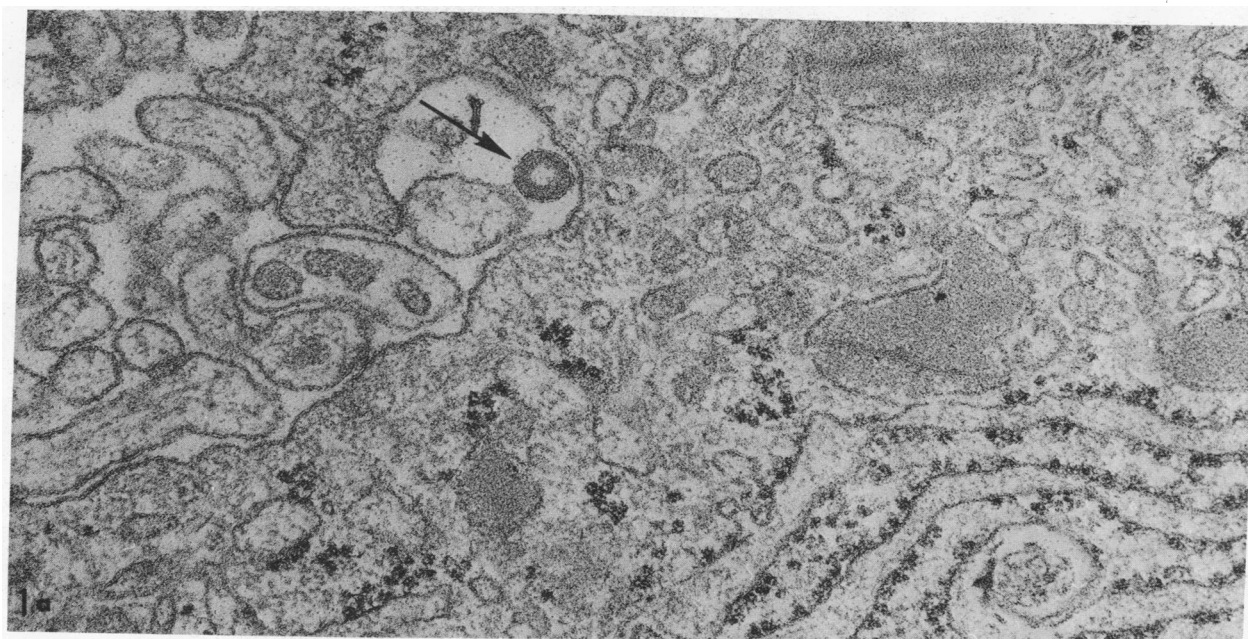
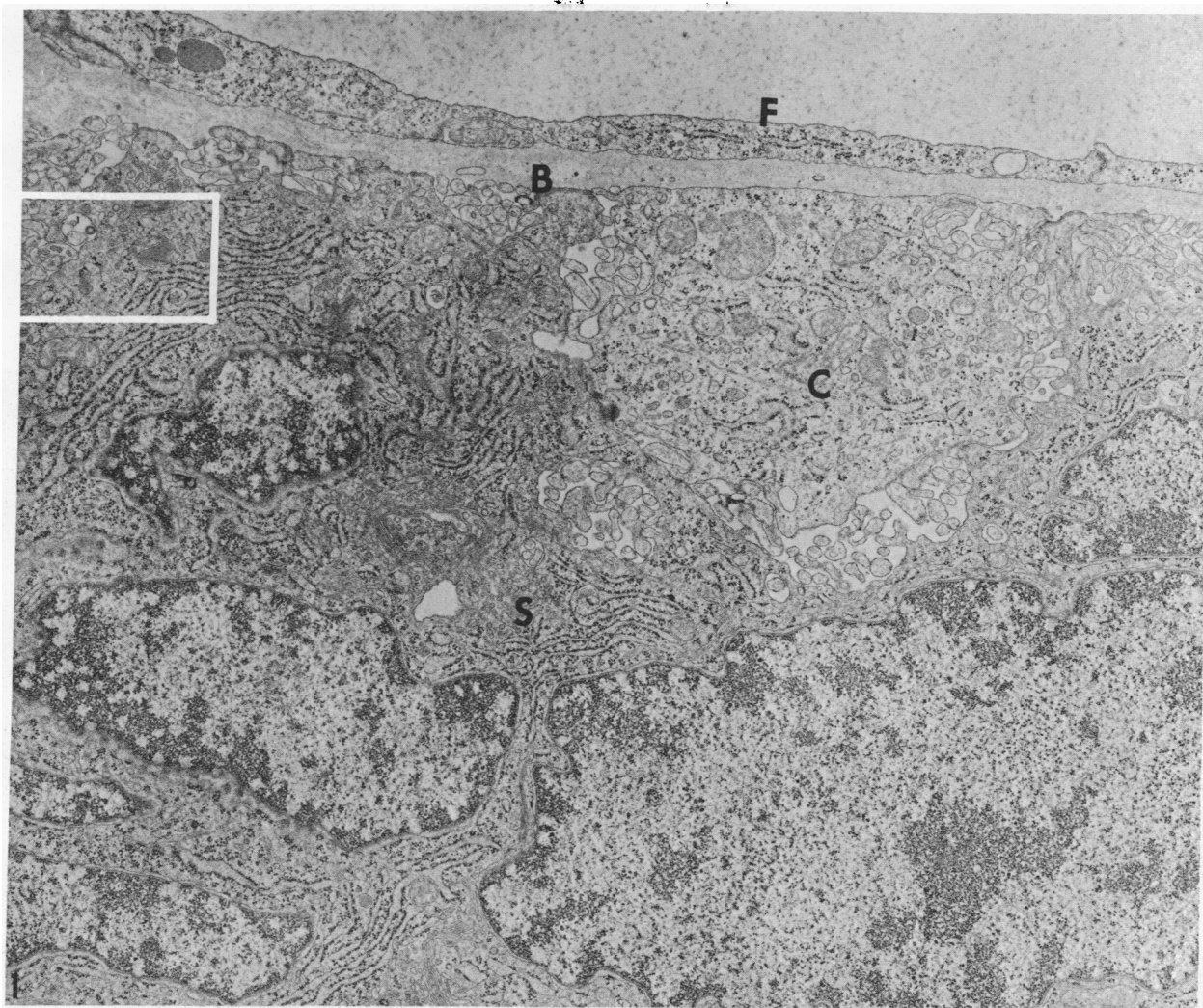


FIG. 1. A section through a chorionic villus illustrating syncytial trophoblast (S), cytotrophoblast (C), basal lamina (B), and fetal capillary (F). $\times 24,816$. (a) A higher magnification of the outlined area in Fig. 1 demonstrating an immature C-type virus particle (arrow). $\times 67,680$.

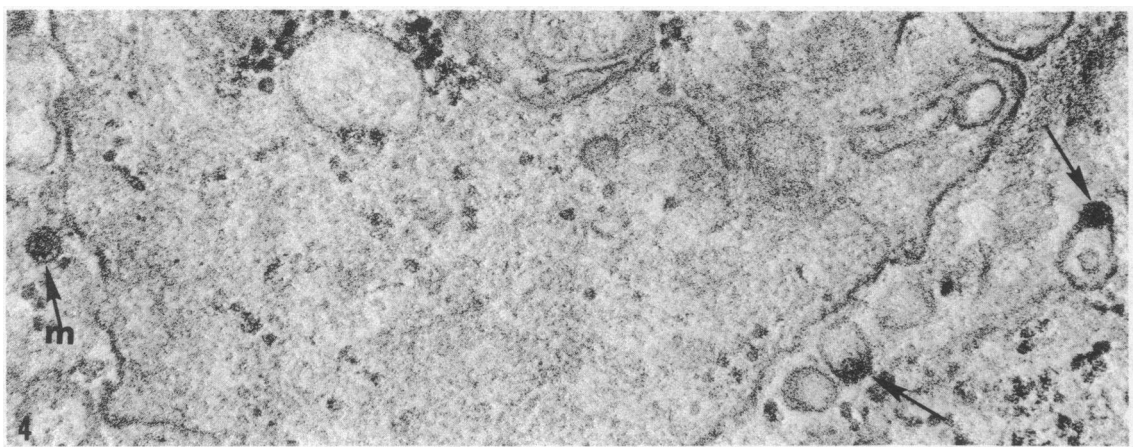
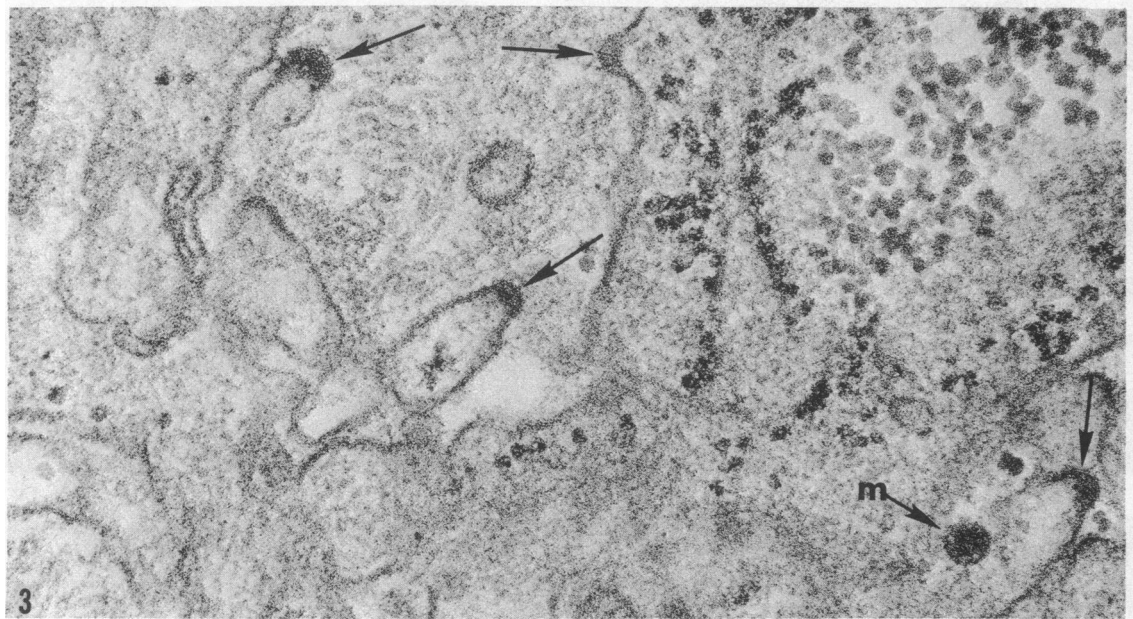
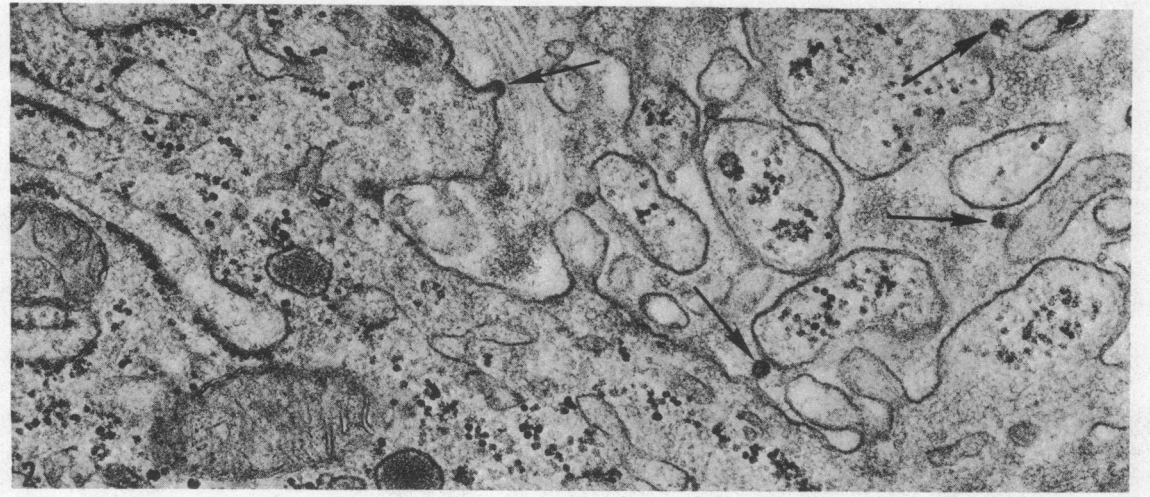


FIG. 2. Area of cytotrophoblastic cell column with several 30-nm particles (arrows) budding from the plasma membrane. $\times 79,344$.
FIGS. 3 and 4. Parts of cells from the decidual basalis showing budding (arrows) and mature (*m*) 30-nm particles. Fig. 3. $\times 162,864$.
Fig. 4. $\times 140,292$.

the tissues from which it is produced, or the species with which it is associated. Although these particles are morphologically similar to C-type virus particles with attributed oncogenic potential, their biologic potential for the monkey is yet to be determined.

Several features of the smaller particles observed in rhesus monkey placenta differ from those of C-type particles. These particles measure 30 nm in diameter, about one-third the size of C-type particles, but similar to that of papova viruses. While they resemble C-type virus particles in their formation by budding from the plasma membrane and the presence of a nucleoid in their mature form, their internal structure is dissimilar. The absence of these small particles from the chorionic villi and their location in areas proximal to, in the boundary of, or actually within the maternal component of the placenta is especially interesting.

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