ELECTRON-MICROSCOPIC STUDY ON THE FLAGELLA OF VIBRIO COMMA

JUTARO TAWARA

Department of Bacteriology, Okayama University School of Medicine, Okayama, Japan

Received for publication July 20, 1956

There are three opinions regarding the attachment of flagella to bacteria. First that of Meyer (1912), who stated that these structures were attached to the ectoplasm; second, Zettnow's Houwink and Van Iterson (1950) showed by the same means that the flagella of Proteus vulgaris were attached to granules located between the cell wall and protoplasmic membrane.

Figures 1, 2, 3, and 4. Vibrio comma after 36 hours cultivation; the flagella can be observed to be attached to the granules. These granules are 150 to 200 nm in diameter. Figures 1 and 2 are non-shadowed, whereas figures 3 and 4 are chromium-shadowed. Mag. × 35,000.

(1918) view that they were attached to the cell membrane and third, that of Fuhrmann (1910) who stated that they arose from blepharoplasts. None of these opinions was accompanied by clear cut photographic evidence.

The development and use of the electron microscope has made it possible to observe structures which were invisible with the light microscope. Thus Mudd and Anderson (1942) made electron micrographs of Vibrio comma showing the flagella attached to the protoplasm.

MATERIALS AND METHOD

The organism used in this study was Vibrio comma Inaba Strain which was grown on nutrient agar adjusted to a pH of about 7.8. The cells were washed from the agar with saline and centrifuged. The supernatant fluid was poured and the cells washed two more times in the same medium.

After washing, the cells were suspended in distilled water and then mounted on a collodion membrane for making electron micrographs.
Cells which had not been centrifuged were used as controls to show the influence of centrifugation, if any, upon the cells and flagella.

RESULTS AND DISCUSSION

Young *V. comma* cells were filled with a dense endoplasmic mass and the inner structure could not be observed. As the cells grow older the dense mass contracts to the center of the cell leaving the end transparent.

Now it can be observed that the flagella at the ends of the cells are attached to a dense granule which in turn is connected to the dense mass in the center of the cell by protoplasmic fiber. These fibers disappear after 36 hours and then the flagella can be observed to be attached to the granules. In young cells these granules are 150 to 200 m\(\mu\) in diameter but are smaller after 36 hr. The granules are located in the cytoplasm and form the base of the flagella. These facts were verified by freezing and thawing (Tawara and Kawata, 1951). It is the opinion of the writer that similar granules with flagella attached may be observed in other bacterial species.

SUMMARY

A study of the manner of attachment of the flagella on *Vibrio comma* was made. It was found that each flagellum was attached to a granule (blepharoplast) which was embedded in the cytoplasm. The granules ranged in size from 150 to 200 m\(\mu\).

REFERENCES


