LETTERS TO THE EDITORS

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Intranuclear Changes in the Polyhedrosis of *Tipula paludosa* (Diptera)

THE technique of cutting ultra-thin sections for electron microscopy has made it possible to follow the behaviour of certain viruses in the cell, and this is particularly true of the nuclear virus diseases of insects. The present note describes the remarkable behaviour in the nucleus of the polyhedral virus which causes a blood disease in the larva of the fly, *Tipula paludosa*[1]. Sections through blood cells in the early stages of infection show an apparent condensation of the chromatic material in the centre of the nucleus in which the virus rods can be seen developing (Fig. 1). Most of the virus rods at this stage are concentrated in the centre though some occur scattered throughout the nucleus. The virus rods are never observed on the outer side of the nuclear membrane.

As the disease progresses, what is apparently a large thin-walled vesicle develops around individual virus rods which collect in masses on the inner edge of the nuclear membrane. These vesicular masses are apparently held together, probably by a thin membrane (Fig. 2). The vesicles are much less dense than the surrounding medium, and the virus rod in each vesicle is thinner and more sharply defined than the rods remaining outside. The appearance of the vesicle and the fact that each rod is suspended away from the sides suggest that there may be a fluid, possibly a protein solution, inside the vesicles. Next, the edge of the mass nearest the nuclear membrane becomes denser, and the vesicles at this point are apparently compressed and much smaller. As crystallization proceeds all the vesicles become greatly reduced in size, possibly because of the osmotic effect of the medium surrounding them, until each vesicle, empty now of fluid and closely pressed around the virus rod, eventually forms the capsule in which each virus rod in the polyhedral crystal is enclosed. It may be that fluid forced out of the vesicles is used in the crystal formation.

All these changes take place inside the nucleus; but the final position of the completed crystal is outside the nucleus with its inner edge along the nuclear membrane. Apparently as the crystal forms it is forced out of the nucleus until it reaches that position.

The accompanying electron micrographs were taken by S. Vernon-Smith.

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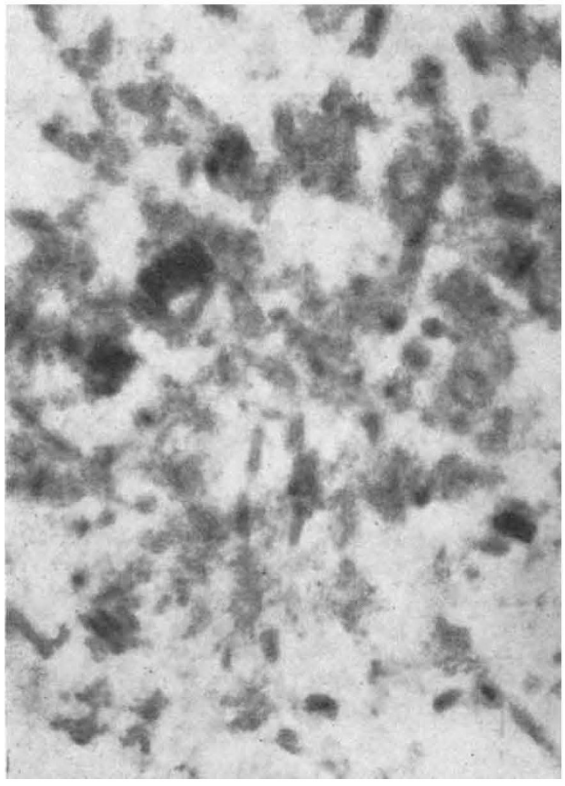

Fig. 1. Thin section through part of the centre of a diseased nucleus, showing the developing virus rods. × 50,000

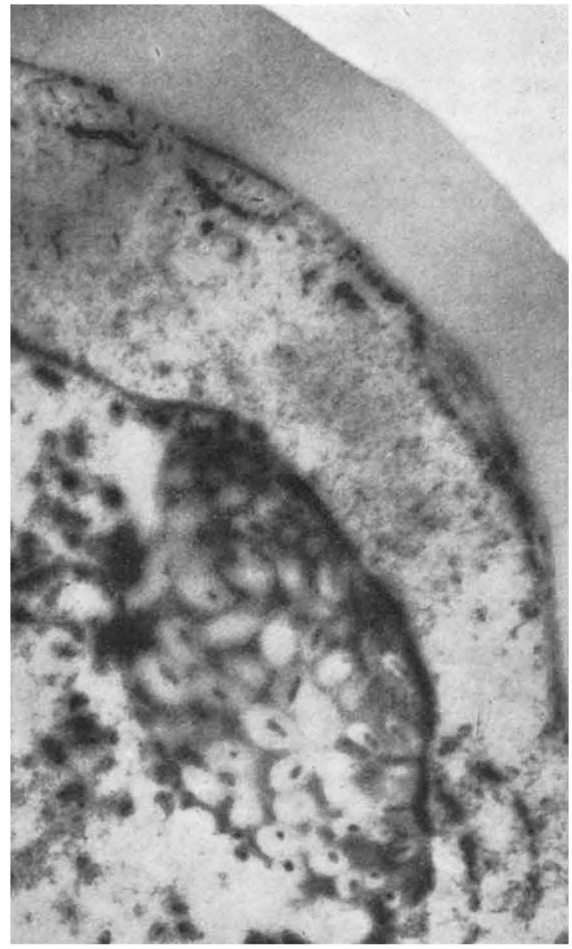

Fig. 2. Segment of a diseased blood cell, showing the mass of vesicles against the inner edge of the nuclear membrane. × 25,000

[1] Smith, Kenneth M., and Xeros, N., *Nature*, **173**, 866 (1954).