Adaptation of a *Coli* Phage to an Acridine Derivative

Fitzgerald and Lee[1] have shown that certain acridine derivatives, in concentrations tolerated by the bacteria, prevent the multiplication of the corresponding coliphage *T* 2. They were able to neutralize this inhibiting action by the addition of nucleic acid.

With a different coliphage and the corresponding *Esch. coli*, we have obtained similar results. The inhibitor used was 3,6-diamino-10-methylacridinium chlorhydrate. Incidentally, we may mention that heparin and another sulphuric ester, that of cellulose, suppress this inhibiting action.

Using the Hershey technique for counting the phage particles, we have obtained the following results. If instead of ordinary agar we use nutrient agar plates containing 0·0002 per cent of the inhibitor, the majority of the phage particles fail to give rise to plaques, a plaque count from a typical experiment giving 15,000 particles per c.c., a parallel count on ordinary agar giving 2,400 million particles per c.c. If, however, one of the plaques from the 'acridine' agar is transferred to broth containing 0·0002 per cent inhibitor, and subcultures are made, a count after ten passages gives the following results: on ordinary agar, 3,400 million particles; on 'acridine' agar, 2,760 million particles per c.c. This adapted phage, after three passages in 'acridine' broth, was subcultured eight times in ordinary broth, a subsequent count giving, on ordinary agar, 1,900 million particles and on 'acridine' agar 1,090 million particles per c.c.

Coliphage can be adapted to produce plaques on 'acridine' agar, and adaptation persists after eight passages in ordinary broth, each passage entailing an initial phage dilution of 10^{-4}. The adapted phage also shows a certain adaptation towards acridine orange, the only other derivative tried to date.

Whether this adaptation is due to selection or mutation is still an open question. Full details of these experiments will be published elsewhere.

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[1] *J. Immunol.*, **52**, 127 (1946).

Electron-Microscope Study of the Peritrophic Membrane in *Dixippus morosus*

During the course of an examination of natural membranes, which might be studied directly with the electron-microscope, it was observed that the peritrophic membrane of the intestine of *Dixippus morosus* presented several interesting features. It has a submicroscopic structure more or less comparable with that of the nuclear membrane in oocytes of *Triturus torosus* and *Xenopus lævis*[1].

The mid-gut was emptied and the peritrophic membrane isolated, washed in distilled water, placed wet on the object-carrier, and allowed to dry in the atmosphere. The electron-microscope examination was carried out using a tension of 60 kV. The peritrophic membrane shows a more or less regular network structure, probably fibrous, with a thin film stretched across the holes of the network (Fig. 1). This thin film shows no visible structure. Rapid drying, or the action of an intense electron beam, brings about a tearing of the film or a reduction in thickness, leaving, apparently, true holes in the network. On gold-shadowed preparations a relief structure appears, the thicker fibrous network standing out above the thin films (Fig. 2).

The relative number of 'holes' and of 'thin films' in the meshes of the network varies from one preparation to another (compare Figs. 2 and 3).

Further work is required before discussing the interpretation of this structure, its origin and its physiological function; in particular, membranes from other species of insects must be studied.

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Nov. 15.

[1] Callan, H. G., Randall, J. T., and Tomlin, S. G., *Nature*, **163**, 280 (1949).

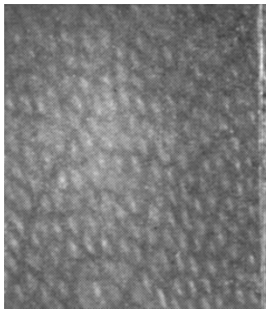

Fig. 1

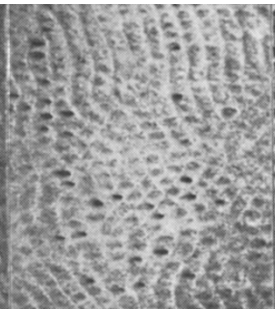

Fig. 2

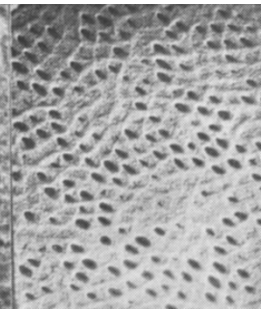

Fig. 3

Quinone-tanning in the Mollusca

The presence of proteins tanned by an orthoquinone has been established in certain arthropodan cuticles[1-3] and in trematode egg capsules[4]. Recently, Dennell[5] has shown that the chætæ of the earthworm *Allolobophora* are hardened by quinone-tanning. He also suggested that quinone-tanning of protein structures may be a widespread occurrence in the invertebrates. Observations which have been recently made on the bivalve ligament indicate the presence of a similar phenomenon.

The ligament of *Anodonta*, like that of many other bivalves, consists of two main layers, the outer and the inner[6]. The former is amber in colour and appears to consist largely of tanned proteins; the inner layer is calcified, is white in colour and only occasionally shows signs of slight tanning. The Millon and xanthoproteic tests give positive results only in the outer layer. Evidence that the amber coloration of the outer layer of the ligament is due to tanning by an orthoquinone is given by the fact that, even after boiling, it induces a rapid oxidation of the Nadi reagent (a mixture of dimethyl*para*phenylenediamine and α-naphthol), which has been used to indicate orthoquinones in insect and crustacean cuticles[2,3]. The argentaffine reaction for polyphenols and