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SHORT NOTE

THE PERITROPHIC MEMBRANE IN *DYSDERCUS FASCIATUS* SIGN. (PYRRHOCORIDAE : HEMIPTERA)

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The oesophageal valve in *D. fasciatus* is formed by the invagination of the oesophagus into the cavity of the midgut as an inner tube forming a finger-like projection which then becomes reflected upon itself, passing forward to unite with the wall of the midgut on either side. It consists of a double lamella of short thin cells which are distinct from the succeeding midgut cells in that they lack an apical striated border, they have remarkably small nuclei and they are more deeply stained. Hanging from the finger-like projection formed by these cells is a flap-like structure bearing a strong resemblance to a short peritrophic membrane (Khan, 1961). This structure has also been reported in *Anasa tristis* De G. (Brenkey, 1936), in *Leptocoris trivittatus* (Say) (Woolley, 1949) and in a number of corixids where it was designated as 'entonnoir' (Sutton, 1951).

Microscopic examination of the gut contents of *D. fasciatus* reveals the presence of small granules of variable size in different gut portions. All these granules are under 10 micron in diameter and thus can easily pass through the narrow food meatus (18.6 micron, in diameter). It is possible that the phytophagous Heteroptera may make use of particulate food in addition to the predominantly fluid diet. In this feature they would show a closer resemblance to the blood-sucking Hemiptera, which ingest corpuscles, than to the smaller highly specialised Homoptera. On the other hand, it is not inconceivable that the utilization of a fine suspension rather than a liquid as food, represents a more primitive stage in the adaptation of insects to plant feeding, and that the primitive ancestral Homoptera from which the Heteroptera were derived (Jeannel, 1960) were not fully adapted to a completely liquid diet.

In insects with a well defined peritrophic membrane it is either secreted by the midgut epithelium generally or by specialized cells of the proventricular region. In *Dysdercus* the cells of the oesophageal valve are quite

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distinct from the midgut epithelium and from those lying on the inner aspect of the valve adjoining the lining of the oesophagus. In their morphology and staining characteristics they resemble the cells often described as secreting a peritrophic membrane in other insects (Wigglesworth, 1930). The appearance and position of this structure suggests that it is possibly a rudimentary peritrophic membrane, although specific tests for chitin have not been applied for its definite identity. The function of this structure is probably to increase the efficiency of the oesophageal valve in preventing the regurgitation of food passed into the midgut.

If the proventricular cells did once secrete a peritrophic membrane as postulated by Sutton (Loc. cit) or the 'entonnoir' itself, then it suggests that the membrane produced by delamination from the midgut epithelium in corixids is a secondary development. However, it is quite likely that the production of the membrane by delamination is in fact the more primitive method in insects. If this is the case, the 'entonnoir' structure in Hemiptera is less likely to be a rudimentary peritrophic membrane and more likely to be simply a specialized functional addition to the oesophageal valve. It is also less likely that the valve itself served to mould a membrane produced by the proventriculus as Sutton postulates. Nevertheless, it should be pointed out that Weir (1957) has suggested that primary and secondary peritrophic membranes have distinct functions and one is not necessarily a more primitive structure than the other. The function or functions of peritrophic membrane are not completely understood, although it is usually said to prevent damage to the epithelium by food. Bocharova-Messner (1959) has recently provided a new instance of its occurrence in Hemiptera. He found that a membrane is produced by delamination from the first ventricular epithelium of a pentatomid, *Eurygaster integriceps* Put. In this case the membrane is present only in the hibernating or non-feeding insects and therefore, the prevention of mechanical damage seems unlikely to be its primary function. Before any final conclusion could be drawn more data would be necessary on the presence or absence of the valve and peritrophic membrane in a wide range of Hemiptera. If these structures are of any evolutionary significance, detailed comparative data on the occurrence and mode of formation of the peritrophic membrane in primitive arthropods would be of great value.

The peritrophic membrane is always said to be lacking in purely fluid feeders. Since, as shown above, *D. fasciatus* does not appear to belong strictly to this category, the presence of a peritrophic membrane in the immediate ancestors of these phytophagous Heteroptera is not wholly improbable.

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