The Occurrence of Argyrophilic and Argentaffin Cells in the Gut of Ciona intestinalis L.

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Summary. Argyrophilic and argentaffin cells occur in the stomach and intestinal epithelium of the sea-squirt, Ciona intestinalis L.. These cells are characterized by their basal swelling which contains the nucleus surrounded by small secretory granules and by a filamentous cell-apex which reaches the gut lumen. The cells are scattered unevenly within the epithelium. Their number decreases rapidly towards the lower part of the intestine. The localization, size of granules and their shape are features which differentiate these cells from other secretory cells in the gut epithelium such as mucous cells. These cells are thought to possess an endocrine function.

Key words: Gut epithelium - Ciona intestinalis - Argyrophilia - Argentaffinity - Light microscopy.

Introduction

Only recently have histological, cytochemical and ultrastructural studies provided a solid basis for the classification of endocrine cells in the mammalian gut (Pearse, 1968, 1969, 1971, 1974; Dawson, 1970, 1975; Forssmann, 1970; Solcia et al., 1970). Although insulin or at least an insulin-like activity has been observed in the digestive tract of invertebrates and lower vertebrates (Wilson and Falkmer, 1965; Mehrotra and Falkmer, 1969; Falkmer, 1972; Davidson et al., 1972; Falkmer et al., 1973; Van Noorden and Pearse, 1974; Fritsch et al., 1976) there is still no definitive evidence for the presence of endocrine cells in the intestine of invertebrates.

By means of chemical and biological reactions, the presence of enteramine or of an enteramine-like substance in the gastric intestinal tract of Ciona intestinalis has been demonstrated by Erspamer (1946), 5-Hydroxytryptamine (5-HT) by...
Ersparmer and Asero (1952), Welsh and Loveland (1968). Thomas (1970) described four cell types in the gastric epithelium of *Ciona intestinalis*, but did not describe cells which could be compared with those of the above authors.

The present study was designed to determine the localization of supposed endocrine cells in the gut of *Ciona intestinalis* L.

**Material and Methods**

*Ciona intestinalis* L. were dredged in the western Baltic sea. The animals (30–40 mm long) were often attached to *Laminaria saccharina* (Phaeophyceae). They were kept in seawater (16%) in plastic basins at 5°C.

**Histological Methods**

The oesophagus, stomach and intestine were dissected out. Fixation in various fixatives was followed by standard embedding with paraplast and sectioning.

Fixatives: Methanol-free-Formaldehyde (MFF) (Polak et al., 1971), Bouin, 6% Glutaraldehyde and Glutaraldehyde-Picrinic-Acid (GPA).

Tissues fixed in Bouin's fluid and GPA were stained by the Grimelius technique (Grimelius, 1968) for argyrophilia and with PAS-Light-green. Those fixed in glutaraldehyde and MFF were stained for argentaffinity (Solcia et al., 1969).

**Results**

Throughout the entire gut cells stained by the Grimelius technique for argyrophilia could be observed (Fig. 1 a). The prismatic cells were scattered unevenly as single elements among a largely predominant population of epithelial non-endocrine cells within the columnar epithelium of the gut. They were numerous in the stomach region, where they seemed to form clusters in the stomach wall. They appeared to rest on the basal lamina of the single-layer epithelium and their filamentous apex extended to the gut lumen. The nucleus was located in the basal part of the cell, surrounded by a variable number of argyrophilic granules. Some granules were also seen in the apical part of the cells, although fewer in number (Fig. 1 b).

The number of cells which stained positively with the Grimelius technique for argyrophilia decreased rapidly towards the upper and lower intestine. In the latter region they were sparsely distributed.

Cells stained with the Grimelius technique were not PAS-positive (Fig. 1 c, d) at the level of the granules (Arrows Fig. 1 a, d) in serial sections.

Cells stained with PAS, which might indicate mucus or glycogen, could not be observed in the vicinity of argyrophilic cells. The test for argentaffinity for differential staining of catecholamines, 5-HT and related compounds (Solcia et al., 1969) was positive (Fig. 1 e). The argentaffin granules were mainly accumulated in the basal part of the cell, surrounding the nucleus. Some granules could be observed in the cell apex.