Endocrine Cells of the Stomach of Chicks Around the Time of Hatching*

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Summary. The proventriculus, gizzard and pyloric antrum (region between the gizzard and the duodenum) of 18-day Black Australorp chick embryos and of chicks within 30 h of hatching have been studied by electron microscopy. D and EC cells, and putative G, D₁ and A-like cells were identified (terminology of Solcia et al., 1973) but no ECL cells. No endocrine cells of any kind were revealed in the gizzard.

Key words: Endocrine glands — Avian stomach — Chick embryos — Electron microscopy.

Introduction

In the stomach of mammals, various endocrine cell types have been identified: EC (enterochromaffin) cells, G, A-like, ECL, D and D₁ cells (terminology of Solcia et al., 1973). Some authors (e.g., Solcia et al., 1974; Kubčeš et al., 1974) feel that the distinction previously made between D and X cells should be maintained.

Gastric endocrine cell types are well-described in the adults of various mammals but not birds. Hardly any studies have dealt with embryos. Gabe (1972) claimed to have distinguished G cells and cells comparable to ECL cells in the stomach of birds by light microscopy. Electron microscopy has shown cells with small granules in the proventriculus and gizzard of the adult fowl (Toner, 1964); in the pyloric antrum (region between gizzard and duodenum) of young fowls two to ten weeks old, Larsson et al. (1974) found G and D cells, and a few cells of a third type having minute granules.

To extend these observations, endocrine cell types have been sought in the different parts of the stomach of chicks shortly before and soon after hatching; findings for the intestine are reported in the preceding paper (Andrew, 1976).

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Material and Methods

Tissue from the proventriculus, gizzard and pyloric antrum of Black Australorp chick embryos of 18 days' incubation and from unfed chicks within 30 h of hatching, was fixed in Karnovsky's fixative and post-osmicated for electron microscopy. Processing of the specimens for routine electron microscopy, and estimation of granule size was as before (Andrew, 1976).

Results

The general ultrastructural features of the gastric endocrine cells are similar to those of the endocrine cells in the intestine (Andrew, 1976). Only three of the gastric cells studied (one EC and two G) reach the lumen, where they are flanked by junctional complexes; two end in tufts of microvilli (Fig. 1 a). Rare desmosomes link an endocrine cell with an ordinary epithelial cell. Lying in a lower epithelium in the stomach, many of the endocrine cells are flatter than those in the intestine.

The gastric endocrine cells of the chicks have been tentatively allocated to cell types, mainly on the basis of the morphology of their secretory granules.

G cells (Fig. 1 a) are numerous in the proventriculus and in the pyloric antrum, even in 18-day embryos. Granule profiles (Fig. 2 a) are circular. The mode of their maximum diameters is 190 nm; individual granules may reach 250 nm in diameter. The matrix is fairly electron dense and apparently homogeneous. The bounding membranes are sometimes rather loose. Granules of other cells in the same locations are similar except that some profiles within a cell are oval or elliptical.

?D1 cells (Fig. 1 b) occur in the proventriculus. Their secretory granules (Fig. 2 b) are tiny, the mode of the maximum diameters of their profiles being 130 nm. They are all circular. Within a cell, some granules are electron dense though most have a low density. The bounding membranes are not always obvious, but some are loosely fitting. Paler rounded areas between these granules (Fig. 2 b) might be exploded granules.

?A-like cells from the duodenum are included for convenience. Some A-like cells were found in the proventriculus (Fig. 1 c) and fewer in the pyloric antrum. Here, the granules (Fig. 2 c) do not reach the size of the largest granules in duodenal A-like cells (450 nm). In the stomach, the mode of the maximum diameters of granule profiles is 250 nm; the diameters may attain 330 nm. Most are circular; a few are slightly elliptical. All granules are very electron dense and most have tightly fitting bounding membranes. Granules of a pancreatic A cell (Fig. 2 d) are somewhat similar.

Fig. 1 a–d. Electron micrographs of endocrine cell types. a G cell from pyloric antrum of 18-day embryo. b ?D1 cell from proventriculus of hatched chick. c ?A-like cell from proventriculus of hatched chick. d D cell from ileum of hatched chick. BL basal lamina; J junctional complex; MV microvilli. × 12,000