ENTEROCHROMAFFIN CELLS OF THE RAT DUODENAL MUCOSA

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Enterochromaffin cells of the rat duodenal mucosa were revealed by the Falk–Hillarp fluorescence histochemical method, the Masson–Hamperl method, and the diazo method with Fast Red. These cells are components of the surface epithelium of the crypts and villi. In the villus they are bottle-shaped and in the crypts triangular. The number of cells detected by the three methods specified above differed in the crypts and villi. They were most numerous when revealed by the Falk–Hillarp method, and less so when the Masson–Hamperl and diazo methods were used.

KEY WORDS: enterochromaffin cells; fluorescence histochemical method.

Recent work has shown that the gastrointestinal tract contains a local endocrine intramural apparatus, composed of several types of cells. Six types of cells have been distinguished in the stomach: EC (enterochromaffin), F (gastrin-producing), ECL (enterochromaffin-like), A-like (resembling the A-cells of the pancreas, which produce glucagon), and D and D_1 (whose function is uncertain). The following cells are found in the small intestine: EC, S (producing secretin), EG (producing enteroglucagon), G, I, D, and D_1.

There is no precise information as yet on the topography of cells of the local endocrine intramural apparatus or on their quantitative characteristics in different animals.

It was accordingly decided to study the enterochromaffin (EC) cells of the duodenal mucosa in rats.

EXPERIMENTAL METHOD

Experiments were carried out on 35 noninbred male albino rats weighing 140 g. EC cells were detected by the Masson–Hamperl method, by the diazo method with Fast Red B, and by the Falk–Hillarp fluorescence-histochemical method. In the last method, paraformaldehyde with a water content of 67% was used to process the material. To distinguish autoluminescence not connected with the presence of serotonin, the sections were treated without formaldehyde vapor. In that case no fluorescence appeared. The specimens were examined with the ML-2 microscope. The EC cells were counted in 100 crypts and villi for each animal.

EXPERIMENTAL RESULTS

The Masson–Hamperl and fluorescence-microscopic methods (Figs. 1 and 2) revealed EC cells in the surface epithelium of the crypts and villi. In the villi they were bottle-shaped, but in the crypts they were triangular. As a rule endocrine granules were located in the basal part of the cell. By the Masson–Hamperl method they stained brown. In the fluorescence-microscopic investigation these cells were recognized by their deep yellow fluorescence. The fluorescent substrate was located chiefly in the subnuclear region and was connected with granules. The cytoplasm gave a diffuse yellow fluorescence. Stronger fluorescence was found in the basal part of cells in the villi; the intensity of their fluorescence in the crypts was lower and there were very few granules.

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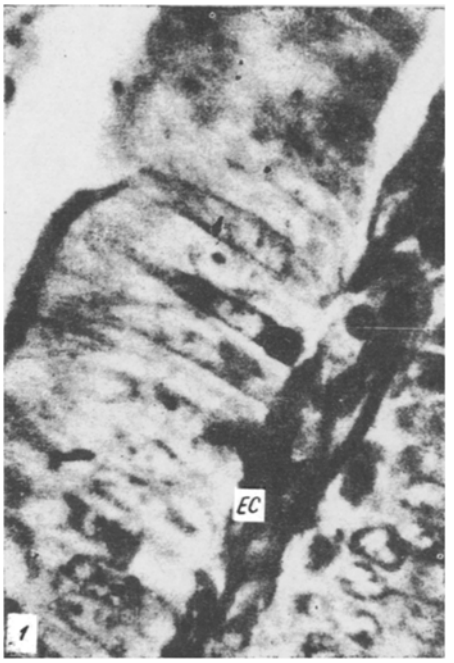

Fig. 1

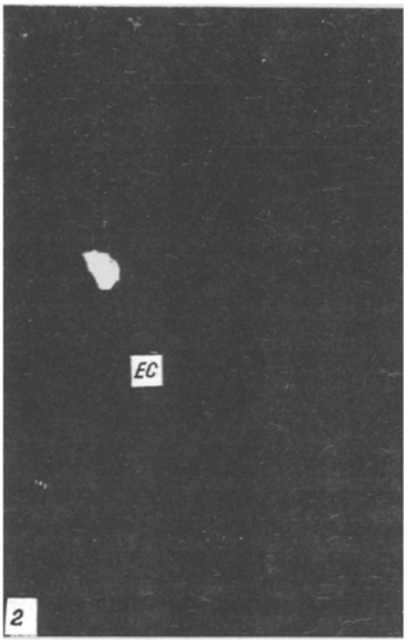

Fig. 2

Fig. 1. EC cell of rat duodenal mucosa. Masson–Hamperl stain, 400 ×.

Fig. 2. EC cell of rat duodenal mucosa. Falk–Hillarp method, 250 ×.

After staining by the diazo reaction, EC cells located chiefly in the epithelium of the villi were revealed; only single cells could be seen in the crypts. Their shape and localization were similar to those described above and their granules were stained an orange-red color. Cells lying nearer to the end of the villus were brighter in color. The largest number of EC cells were revealed by fluorescence microscopy (210.4 ± 0.02), followed by the Masson–Hamperl method (182.5 ± 0.05) and the diazo method (73.7 ± 0.02).

It must be noted that these cells were secretory and in different stages of synthesis of the hormone the number of granules and their properties could vary. It has been shown by fluorescence microscopy [1] that serotonin is present in the EC cells of the rat stomach and pancreas not only in granules, but also dissolved in the cytoplasm, i.e., the cells are revealed not only in the phase of accumulation of secretion but also in the phase of its synthesis. The Masson–Hamperl and diazo methods revealed EC cells only if they contained secretory granules. Although doubts have been expressed regarding the possibility of detecting EC cells not containing granules [2], the investigation described above confirms that this is indeed possible and that the Falk–Hillarp fluorescence-histochemical method is the most sensitive for this purpose and is essential if EC cells are to be revealed not only in the stomach and pancreas but also in the intestine of the rat.

LITERATURE CITED

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