

EPITHELIAL ENDOCRINE CELLS OF THE COLON MUCOSA OF MAMMALS

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The structure of the intestines of mammals and humans is very similar. The large intestine consists of the colon, cecum, sigmoid colon and rectum. The structure of the intestinal wall (regardless of the section) is usually divided into mucosal, submucosal, muscular and serous layers. The intestinal mucosa consists of single-layer columnar epithelium of the intestinal type. In mammals, the length of the colon varies and is mainly species-specific, reaching up to 1.4 meters in humans. In rats it is 35-47 cm.

The mucous membrane of the colon has its own relief, forming crescent-shaped folds and crypts. The morphometric characteristics of these formations in animals depend on the type of animal, that is, the type of structure and type of nutrition [1,9].

Epithelial cells are divided into absorptive, absorptive, goblet, endocrine, Paneth cells and stem cells. Absorptive epithelial cells consist of two types of cells: bordered and unbordered. The main function of these cells is to ensure absorption processes. The degree of differentiation of goblet cells varies depending on their location. Less differentiated cells are located at the bottom of the crypts. The crypts of endocrine epithelial cells differ in the composition and shape of the secretion. Paneth cells are located in the crypts, and some literature states that Paneth cells are absent from the colonic mucosa [7,3].

Normally, the mucous membrane of the large intestine (colon) of mammals is characterized by the formation of folds, allowing for expansion of the inner surface of the intestine. Also in the colon there are many unbranched crypts, in the lower parts of which there is a small group of stem cells. The depth of the colon crypts varies depending on the species and linear age of the animal (in adult rats $187 \pm 73 \mu\text{m}$, in mice $187 \pm 208 \mu\text{m}$). The intercrypt spaces are filled with porous fibrous unformed connective tissue. The crypts contain goblet cells that produce large amounts of mucus, protect the surface of the mucosal epithelium and allow the easy sliding movement of feces. In the lamina propria of the mucous membrane we see the accumulation of a large amount of lymphoid tissue [15,8].

The structure of the mammalian rectal epithelium changes from columnar epithelium caudally to stratified cuboidal epithelium, and then abruptly to stratified squamous non-keratinizing epithelium, which gradually gives way to cutaneous-type epithelium (keratinizing). Crypts in the rectal mucosa are deeper than in the colon, but are located less frequently. The crypts disappear in the lower rectum [2,13].

The epithelium contains a large number of intraepithelial lymphocytes that perform a protective function against a sharply increased number of bacteria (according to some data, up to 75% of feces consists of dead and living bacteria).

In the lamina propria of the mucous membrane there are a large number of lymphoid nodes, sometimes lymphoid nodes are replaced by large ones, but there are no Peyer's patches, as in the small intestine [4,12].

The muscular plate of the mucous membrane consists of an inner circular and outer longitudinal layer of smooth myocytes. The submucosal layer consists of loose fibrous connective tissue.

The muscle layer consists of two layers: the inner circular and the outer longitudinal-longitudinal, which do not completely cover the large intestine, but form three longitudinal stripes. They are shorter than the large intestine, so in appearance they resemble an “accordion” [3].

The serous layer, on the contrary, consists of loose fibrous unformed connective tissue and mesothelium containing adipose tissue, as well as sebaceous tumor-like appendages.

The endocrine gastroenteropancreatic system (GEP-system) is a collection of endocrine cells that are diffusely located in the epithelium of the mucous membrane of the digestive system of vertebrates.

75% of the endocrine system of the GEP consists of endocrinocytes of the DNIE (diffuse neuroimmunoendocrine) system. Cells of the DNIE system are diffusely located in the mucous membranes of the entire body and are part of various organs and associated glands. Endocrine cells can be of different types depending on their origin and location, but they perform the same functions. This is the absorption of amines, their decarboxylation or the synthesis of biogenic amines necessary for the formation and activity of peptides (hormones) that regulate them. DNIE cells are identified by the Grimelius method (argyrophilic cells, the entire population of endocrinocytes, with the exception of D-cells) and the Masson-Gamperl method (argentaffin cells), immunohistochemical methods, as well as ultrastructural analysis [6, 10].

The elements of the endocrine system of the GEP include cells of the pancreatic islets of the pancreas, endocrinocytes of the epithelium of the digestive tract (from the esophagus to the rectum). In the pancreas, endocrinocytes are compact (in the form of islets of Langerhans) between exocrine cells and isolated, while in other organs (including the intestine) they are located diffusely in the epithelium of the mucous membrane. In the cytogenesis of endocrine cells, one can distinguish: stem cells, agranular cells, endocrinocytes, which subsequently differentiated into various endocrine cells of the GEP system due to an increase in the number of membrane structures in the cytoplasm and the accumulation of endocrine granules, as well as cells that became endocrinocytes as a result of the transformation of exocrine cells [11.14].

Among the endocrine cells of the intestine, open and closed endocrinocytes can be distinguished. The apical part of open-type endocrine cells reaches the surface of the mucous membrane, contains several microvilli and performs receptor functions. They sense chemical influences and pH changes in the stomach. Closed endocrinocytes do not communicate with the crypt cavity; they stimulate secretion as a result of various influences (pressure, temperature changes, etc.). In the basal part of the cytoplasm of endocrine cells there are secretory granules containing polypeptides and monoamines. The shape, size and composition of secretory granules serve as the basis for the classification of these cells. Secretions from endocrinocytes can enter the intercellular space and then into the blood and directly affect target cells (paracrine and endocrine secretory pathways). In the cells of the GEP system, in addition to endocrinocytes, there are exocrine and endocrine “mixed” cells that simultaneously contain two types of secretory granules in the cytoplasm (exoendocrine cells), and endocrinocytes that simultaneously contain granules with different endocrine properties. in their cytoplasm.

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