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## MORPHOLOGICAL CHARACTERISTICS OF INTESTINAL ENDOCRINE CELLS IN EARLY POSTNATAL DEVELOPMENT OF RABBITS

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**Resume** In the early postnatal period of development of rabbits, typological differentiation and an increase in the morphometric characteristics of the endocrine structures of the small intestine are observed. The density and size of fluorescent apudocytes located in the

mucous membrane of the small intestine in rabbits almost corresponds to the general population of endocrine cells. On the 20th day of postnatal development, the morphometric parameters of endocrine cells increase sharply, which can be explained by the transition to a mixed type of nutrition at this time.

**Keywords.** morphology, endocrine cells, small intestine, postnatal ontogenesis.

## МОРФОЛОГИЧЕСКАЯ ХАРАКТЕРИСТИКА ЭНДОКРИННЫХ КЛЕТОК КИШЕЧНИКА В РАННЕМ ПОСТНАТАЛЬНОМ РАЗВИТИИ КРОЛИКОВ

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**Резюме** В раннем постнатальном периоде развития кроликов наблюдается типологическая дифференцировка и увеличение морфометрических характеристик эндокринных структур тонкой кишки. Плотность расположения и размеры флуоресцирующих апудоцитов, находящихся в слизистой оболочке тонкой кишки у крольчат, почти соответствуют общей популяции эндокринных клеток. На 20-й день постнатального развития, морфометрические параметры эндокринных клеток резко увеличиваются, что можно объяснить переходом на смешанный тип питания в это время.

**Ключевые слова.** морфология, эндокринные клетки, тонкая кишка, постнатальный онтогенез.

## ИЛК ПОСТНАТАЛ ДАВРДА ҚУЁНЛАР ИНГИЧКА ИЧАГИ ЭНДОКРИН ҲУЖАЙРАЛАРИНИНГ МОРФОЛОГИК ХУСУСИЯТЛАРИ

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### **Резюме**

Quyonglar rivojlanishining erta postnatal davrida tipologik farqlash va ingichka ichakning endokrin tuzilmalarining morfometrik xususiyatlarining ortishi kuzatiladi. Quyonglarda ingichka ichakning shilliq qavatida joylashgan sho'lalanuvchi apudotsitlarning zichligi va hajmi deyarli endokrin hujayralarning umumiy populyatsiyasiga to'g'ri keladi. Postnatal rivojlanishning 20-kunida endokrin hujayralarning morfometrik

ko'rsatkichlari keskin oshadi, bu hozirgi vaqtda aralash ovqatlanish turiga o'tish bilan izohlanadi.

**Калит сўзлар.** morfologiya, endokrin hujayralar, ingichka ichak, postnatal ontogenez.

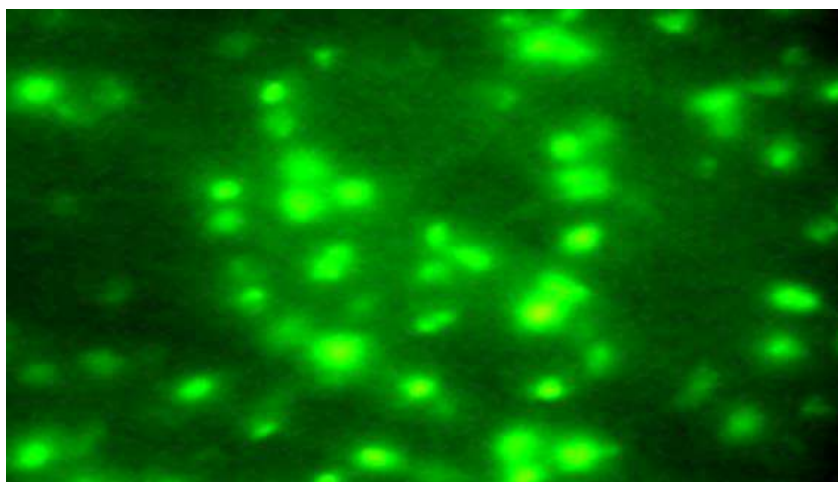
**Introduction.** Numerous scientific studies emphasize the significant importance of the early postnatal period in the development of an organism. This phase is crucial for the morphofunctional differentiation and the formation of organs and systems that will shape the future organism. Disruptions during this ontogenetic phase can potentially lead to the development of congenital pathologies. The local regulatory structures within the development of tissue structures within an organ play a pivotal role. Researchers worldwide are increasingly interested in studying the morphology of these regulatory structures, including endocrine and immune systems, and their role in adapting and integrating with bodily functions during postnatal ontogenesis (1,2,4,12,13,14,15).

While general patterns of organ development in the digestive system are well-established, our understanding of the formation of the small intestine and its regulatory structures during early postnatal ontogenesis remains incomplete (3,5,6,7,8,9,10,11). To date, our knowledge regarding the sequence of morphofunctional development of tissue and regulatory structures in the small intestine, as well as the specifics of their collaborative functions, remains fragmented.

It is hypothesized that there are morphological and morphometric distinctions in the cells of the diffuse endocrine apparatus and the formation of essential immune structures within the digestive tract during early postnatal ontogenesis in animals.

**Material and methods.** The material for the study was 15 rabbits of early ages (1, 10 days old) of the postnatal period. To achieve the goal and solve problems, general histological, histochemical, luminescent-histochemical, morphometric studies and the method of statistical analysis were used.

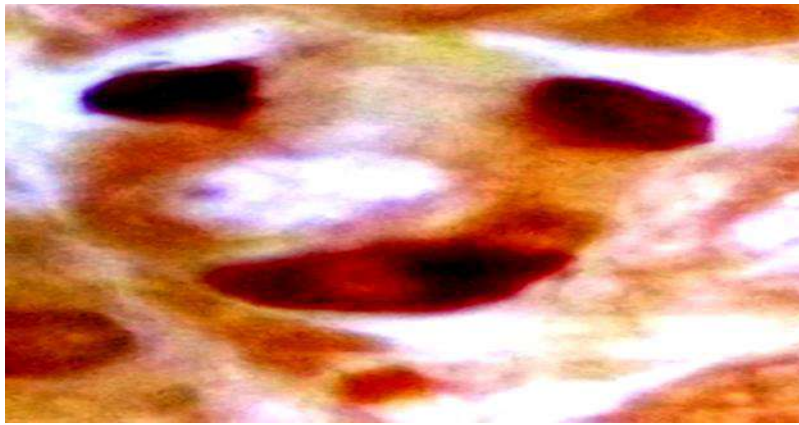
**Results and discussion.** In the epithelium of the mucous membrane of the small intestine, endocrinocytes (apudocytes) are located both in the crypts and villi. Their cytoplasm contains a large number of secretory granules, which contain fluorogenic amines (serotonin and catecholamines). Endocrine cells can fluoresce from green to green-yellow depending on the quantitative ratio of serotonin and catecholamines (Fig-1).



**Figure 1. Fluorescent endocrine cells of the epithelium of the mucous membrane of the small intestine of a newborn rabbit. Incubation in 2% glyoxylic acid solution. O6. 20, ca 3.**

When the cytoplasm of cells contains more serotonin, the cells glow with a predominant yellow tint and a greenish-yellow color. And if there are more catecholamines, then fluorescence of a greener hue predominates. With a high content of fluorogenic amines in the cytoplasm of cells, i.e. in the phase of secretion accumulation, the cells usually glow more intensely and have a greenish-yellow color. With a minimum amount of secretion, i.e. after secretion of secretion, the intensity of cell luminescence is weak. Apudocytes are often located singly and are generally conical or oval in shape. The expanded cell base is adjacent to a thin basement membrane, and the apical part reaches the intestinal lumen. The basal part of the cells contains a rounded nucleus in the form of a rounded dark spot, since there is no luminescence. Secretory granules are located depending on the phase of secretion: in the early stage, secretory granules are mainly located in the basal part, and this part usually glows more intensely than their apical part. The basement membrane beneath the epithelial cells is very thin and does not stain. In the crypt epithelium, apudocytes are often round in shape, while villi are oval or elongated. In the epithelium of the small intestine of newborn rabbits, the distribution density of fluorescent apudocytes is on average  $4.19 \pm 0.32$  conventional units.

Studying preparations impregnated with silver nitrate using the Grimelius method, it was established that apudocytes in the small intestine of newborn rabbits are located in the epithelium of the mucous membrane of both crypts and villi. They are characterized by a distinctive shape and the presence of secretory granules, which, when impregnated with silver, are stained with varying intensities. The nucleus is not stained and is often located in the center of the cell (Fig-2). The argyrophilic cell secretion is fine-grained and located in the basal and apical parts of the cells.



**Figure 2. Endocrine cells of the crypt epithelium of the small intestine of a newborn rabbit. A-cell nucleus; B-secretory granules. Impregnation according to Grimelius. O6. 40, ca. 10.**

The location and number of secretory granules in cells depends on the functional state of the cell. Endocrine cells, which are located in the crypt epithelium, are often irregularly round and oval in shape with an elongated apical part, in the shape of a drop of water. Apudocytes located in the villous epithelium have a more elongated, elongated cone-shaped shape. Endocrine cells are always adjacent to the basement membrane with their basal part.

When there are few granules in the cytoplasm of cells, they are mainly located in the basal part of the cells, and the cell boundaries are not clearly visible and therefore have different shapes. When secretory granules accumulate, they are located in both the apical and basal parts of the cells, and are stained intensely dark brown. At this point in the secretory cycle, apudocytes have clear contours and have an elongated cone shape. The outline of the nucleus is distinct, although it is not stained; the narrow apical part of the cell reaches the surface of the epithelium. Rarely, endocrine cells have a spindle or hourglass shape, or other odd shapes.

Mostly apudocytes are located singly, less often 2-3 endocrinocytes are located close to each other, but their clusters are not found. The distribution density of apudocytes per unit area of the epithelium of the small intestine of newborn rabbits is  $4.70 \pm 0.16$  per field of view of the microscope.

**Conclusion (conclusions).** During the early stages of postnatal development, there is a discernible occurrence of typological differentiation and a notable augmentation in the morphometric parameters of endocrine cells. The specific attributes such as shape, size, relative distribution density, and luminescent properties of endocrinocytes are, in part, contingent upon the phase of the secretory cycle during which

they are sampled. These cells manifest prominently when laden with accumulated secretions within the cytoplasm. The distribution density and dimensions of fluorescent apudocytes observed within the mucosal lining of the rabbit's small intestine in postnatal ontogenesis closely approximate those of the overall population of endocrinocytes. Non-secretory fragments of cells are indiscernible against a contrasting dark background. The significant surge in the morphometric characteristics of endocrine cells on the 10th day of postnatal ontogenesis could be attributed to their transition towards a mixed nutritional type.

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## THE ROLE OF ALGAE IN DETERMINING THE ECOLOGICAL AND SANITARY CONDITION OF BIOLOGICAL WATER PLANTS

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**Abstract.** Among the complex of anthropogenic factors, one of the leading places is occupied by the "water factor" associated with pollution of water sources, shortcomings in water purification and disinfection. Discharge of insufficiently treated and untreated wastewater into watercourses predetermines abnormal changes in their chemical composition and degradation of biocenoses. Municipal wastewater contaminated with organic and nitrogen-phosphorus-containing compounds, as well as bacteria and viruses, also contribute to the pollution of water bodies.