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# FORMATION OF SMALL INTESTINAL WALL MORPHOLOGY IN EARLY POSTNATAL ONTOGENESIS

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**Abstract**
Modern society emphasizes the importance of the period of early postnatal ontogenesis for the process of morphofunctional differentiation of organs and systems of the future organism, since anomalies in their formation during ontogenesis can be a potential cause of the development of a variety of congenital pathologies. The results of our experimental studies confirm that by the time of birth of rabbits the main structural components of the small intestine wall are formed, but their morphometric parameters and morphological characteristics differ significantly from the small intestine of adults. The small intestine of rabbits at the age of 10 days shows significant morphometric and structural differences from the small intestine of newborn rabbits. The total wall thickness increases mainly due to an increase in the

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size of the mucosa and submucosa, and the formation of villi and crypts in a different shape from adults begins.

**Keywords**: Small intestine, newborns, morphology, mammals, ontogenesis, congenital pathologies, regulatory structures.

## Introduction

The development and structural and functional formation of the digestive system during early postnatal ontogenesis have been the subject of numerous studies for many years. Organogenesis and systemogenesis as critical periods of postnatal development cause increased interest of researchers in the study of morphofunctional development and organ formation in early postnatal ontogenesis (3,9,10). In this process, special importance is given to the integrating and determining role of regulatory structures, namely the endocrine and immune apparatuses of internal organs (1,2,5). Recently, increased interest has been shown in the diffuse endocrine apparatus in the dynamics of physiologic development. (2,8,11).

There are scientific data that have made a great contribution to the study of morphology and formation of structures of the small intestine wall, as well as the sources of development of the diffuse endocrine system (4,6,7). However, the data on the development and functional formation of small intestine structures are insufficient.

**Purpose of the study.** To determine morphological features of development and functional formation of rabbit small intestine structures in early postnatal ontogenesis.

**Objective of the study.** To study morphological and morphometric features of development of the small intestine of rabbits during early postnatal ontogenesis.

**Material and methods of research.** The material for our research was the small intestine of 15 newborn and 10 day old rabbits. To achieve the goal and solve the problems we used general histological, morphometric and statistical methods of analysis.

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**The results of the study and their discussion.** In our experimental studies, it is shown that the wall of small intestine of newborn rabbits has all shells and layers, however they differ from other ages both morphologically and morphometrically. The thickness of the wall of the small intestine of newborn rabbits is 273.4±5.31 µm. The mucosa has all 3 layers and its thickness is 103.09±3.65 µm. Relief of the mucosa has a characteristic pattern, but crypts are not fully formed yet. Crypts more often have elongated oval shape with different depth and width. Some of them have a large width with a narrow apex closed by the base of the villi. The depth of crypts was 113.38±2.66 µm. Goblet cells are rarely found in the crypt epithelium. The villi are leaf-shaped with a narrow base like a leaf stem. The upper part of the villi expands like a petal, narrowing at the apex.

The own lamina in the area of the base of the villi is insignificantly expressed, while in the expanded part it is well developed and rich in various cellular elements. The height of villi in newborn rabbits is 1063.23±21.58 µm. Goblet cells are found in the epithelium, the number of which increases closer to the apex of villi. The submucosa is rich in connective tissue cells and blood vessels. The average thickness of submucosa was 78.85±1.99 µm. This sheath has the greatest thickness in the area of mesentery attachment. The muscular sheath is expressed, myocytes are well distinguished, and also circular and longitudinal layers are well distinguished. The average thickness of muscular and serous membranes together equals 98.11±1.99 µm. The wall of the jejunum of 10-day-old rabbits has an identical structure to the jejunum of newborn rabbits. However, some morphometric and structural differences are noted. The thickness of the jejunum wall of 10-day-old rabbits is 369.52±5.31 µm, which is 35% greater than that of newborns. The mucosa has a well-defined single-layer prismatic bordered epithelium. The crypt epithelium contains more goblet cells in contrast to the crypt epithelium of the jejunum of newborn rabbits. The thickness of the mucosa is 166.83± 2.98 µm, which is 61.8% more than in newborn rabbits. Crypts in them also have an oval shape with narrowed apex and widened bottom in total resembling a drop. The depth of crypts is 99.6±1.99 µm, which is 12.2% less than in newborn rabbits. The villi have an elongated shape with a narrowed apex. The transverse dimension of the middle third of the villi is narrower than in newborn rabbits, and the base is broader. The own lamina of villi is also rich in cellular elements of various shapes and sizes. The number of goblet cells is greater than in the crypt epithelium. The height of villi of jejunum of 10-day old rabbits is 1499±19.92

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microns, which is 41% more than in newborn rabbits. The submucosa is also rich in blood vessels and cellular elements, but has a slightly compacted appearance, compared with the submucosa of the jejunum of newborn rabbits. Its thickness was 105.58±2.32 μm, which is 34% more than in newborn rabbits. Muscle sheath is expressed, consists of two layers: circular and longitudinal. Its thickness amounted to 99.93±1.66 μm.

## Conclusions

Our experimental studies show that by the time of birth in rabbits the main structural components of the jejunum wall are formed, but they differ significantly from the adult jejunum by their morphometric parameters and morphological picture. Crypts are not fully formed yet, they have different depth and width with narrowed apex. The epithelium of some crypts lacks goblet cells. It should be noted that some crypts have relatively wide cavities, which can be mistaken for edema. The villi are formed.

The jejunum of 10-day-old rabbits has morphometric and structural differences from the jejunum of newborn rabbits. The total wall thickness is significantly increased mainly due to mucosa and submucosa. Crypts begin to change in shape, but the depth is less than in newborn rabbits. The transverse size of the villi is already in the middle third and they have a greater height and a relatively broad base. The submucosal base has a more compact appearance.

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