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ONTOGENESIS OF TISSUE AND IMMUNE STRUCTURES OF THE MUCOUS MEMBRANE OF THE SMALL INTESTINE

Abstract: Organogenesis and systemogenesis as critical periods of pre- and postnatal development are the most sensitive to the effects of extreme factors. The later development of immune structures in the small intestine compared to tissue structures, the formation of the efferent link of immunogenesis after the afferent, apparently reflect the gradual transition of immunosuppressive reactions to immunostimulating ones.

Keywords: rabbits, small intestine, extreme factors, immune structures, organogenesis and systemogenesis.

INTRODUCTION

Organogenesis and systemogenesis as critical periods of pre- and postnatal development are the most sensitive to the effects of extreme factors. This causes increased interest of researchers in studying the morphofunctional development and formation of various organs, including the digestive system, during these periods of ontogenesis [3]. Particular importance in the processes of intestinal morphogenesis is given to the integrating and determining role of such a regulatory structure as the immune apparatus [1]. Intrauterine development of the fetus occurs in sterile conditions, therefore the state of its immune system normally differs from that of an adult organism [2].

MATERIALS AND METHODS

The material for the study was the jejunum of 15-, 20-, 25-day-old fetuses and newborn rabbits. A total of 30 animals were examined. Pregnant does and newborn rabbits were slaughtered under sodium ethylamine anesthesia in accordance with the European Convention on Animals Used for Scientific Purposes. 10- and 20-day-old fetuses were fixed whole with a fragment of the uterus. 30-day-old fetuses were removed from the uterus after slaughter of the does. The materials were fixed in 12% neutral formalin and Bouin's fluid; after appropriate wiring, the material was embedded in paraffin. Serial histotopographic sections of early fetuses were glued whole to a glass slide. In 30-day-old fetuses and newborn rabbits, the jejunum was carefully dissected and fixed in a stretched form. The material was embedded in paraffin according to the generally accepted technique. Paraffin sections were stained using general histological methods. On a certain section area, all types of lymphocytes, cellular elements of the mucous membrane were counted, and their ratio was determined. The digital material was subjected to variation statistics methods.

RESULTS AND DISCUSSION

On the 15th day of intrauterine development, the jejunum is characterized by clearly defined mucous, submucous, muscular and external membranes. The surface of the mucous membrane is smooth, there are no villi or crypts. The mucous membrane is formed by the epithelium and connective tissue base. The epithelium lining the intestinal surface is clearly outlined and has a "false multi-row structure". The brush border on the apical surface of the epithelium is weakly expressed, it is a thin, intensely colored layer. The epithelial cells are poorly differentiated, polymorphic. The muscular plate of the mucous membrane is not formed, therefore the proper plate and submucous base are not delimited and together form a loose network consisting of numerous mesenchymal cells of various shapes. On the 20th day of prenatal ontogenesis, the internal relief of the mucous membrane of the jejunum is uneven, there are longitudinal folds of various

configurations and heights, in the cross section of the intestine they form a lumen of a weakly expressed star-shaped form. Depressions of the mucous membrane are formed between the folds. The "false multi-row" of the epithelium is preserved. In the proper plate of mesenchymal cells, endothelial, smooth muscle and other cells are intensively differentiated. They are located more densely than in the forming submucosa. The muscular plate of the mucous membrane is not formed, it consists of single myocytes stretching in the circular direction between the proper plate and the submucosa. On the 25th day of prenatal ontogenesis, the villi of the mucous membrane are formed. Most often, they are leaf-shaped with a narrow base and a pointed tip, the distances between their bases are relatively large. The villi are covered with a single-layer, single-row prismatic epithelium with a weakly expressed brush border. Crypts are not defined. In newborn rabbits, the villi are formed, the middle part of the villi is wide, and narrow in the apex area. The proper plate in the area of the base of the villi is slightly expressed, and in the expanded part it is well developed and rich in various cellular elements. The crypts are not yet fully formed, as they have different depths and widths.

In the stroma of the formed villi, among the reticular cells (11.2±0.3%), there are relatively many lymphoid cells (30.2±1.4%), blasts (28.6±1.8%), fibroblasts and fibrocytes (26.0±2.8%). Eosinophils, mast cells, and macrophages are rare and their total share is 4.2±0.6%. All cellular elements are loosely arranged. Newly formed and growing capillaries are numerous in all types of villi, from barely forming to formed. In cross sections, they are rounded, with a diameter ranging from closed to 4-5 μm. In capillaries that are in a closed state, the endothelium lining their lumen is cubic.

CONCLUSION

As noted by numerous authors, the process of differentiation of the neonatal immune system begins before the birth of the child. According to modern data, the features of the formation of the fetal immune system are influenced by amniotic fluid, which is swallowed and absorbed by the intestine. An alternative option for fetal transmission of antigens and stimulation of the immune system is the passage of proteins through areas of maximum contact between the maternal decidua and fetal tissues. Warner J.A. et al. [3] showed that starting from the 22nd week of gestation, mononuclear cells of human fetuses respond to antigens coming from the mother's body. Clinical and experimental materials show that at all stages of development, the fetus, newborn and child of the first months of life have a certain immunoreactivity. It is characterized by low responsiveness to antigen stimuli and higher susceptibility to tolerance induction than in adults [2]. The defect of phagocytic activity, in particular, is expressed in a decrease in the migration of neutrophils, their adhesion, oxygen-dependent cytotoxicity, chemotoxic and microbicidal activity [4]. The later development of immune structures in the small intestine compared to tissue ones, the formation of the efferent link of immunogenesis after the afferent, apparently reflect the gradual transition of immunosuppressive reactions to immunostimulating ones.

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