

MORPHOLOGICAL STRUCTURE OF NEUROEPITHELIAL CELLS IN RABBIT LUNGS

Rakhmonova H.N., Mukhitdinova S.M., Rakhmonov F.Z.

Samarkand State Medical University

Samarkand, Uzbekistan

Summary. The morphofunctional features of NET in the developing respiratory lung have been studied. Lungs of 23 rabbits aged 1-30 days served as a material for the study. Paraffin sections were stained with hematoxylin and eosin, according to the Van-Gizon method, impregnated according to the Grimelius method. Histochemical detection of acetylcholinesterase (AChE) activity was carried out on frozen sections of unfixed lungs by the method of M. Karnovsky and L. Roots. The study allowed to establish that in the rabbit lung NET cells are detected in the respiratory section. NET cells are located at the bronchiolo-alveolar junction, as well as within the alveolar sacs. NET cells range in size from small to quite large. NET cells have AChE activity. The location of NET cells at the bronchioloalveolar junction and the presence of AChE in their cells suggest their important role in the processes of growth and differentiation of pulmonary acinus structures.

Key words: lungs, neuroepithelial cells, lung APUD-system.

Резюме. Изучены морфофункциональные особенности НЭТ в развивающемся респираторном отделе легких. Материалом для исследования служили легкие 23 кроликов в возрасте 1-30 дней. Парафиновые срезы окрашены гематоксилином и эозином, по методу Ван-Гизона, импрегнированы по методу Гримелиуса. Гистохимическое выявление активности ацетилхолинэстеразы (АХЭ) проведено на замороженных срезах нефиксированных легких по методу М.Карновского и Л.Рутс. Проведенное исследование позволило установить, что в легком кролика обнаруживаются НЭТ в респираторном отделе. НЭТ располагаются на бронхиолоальвеолярном переходе, а также в составе альвеолярных мешочков. Размеры НЭТ колеблются от мелких до довольно крупных. Клетки НЭТ обладают активностью АХЭ. Расположение НЭТ на бронхиолоальвеолярном переходе и наличие в их клетках АХЭ позволяет предположить их важную роль в процессах роста и дифференцировки структур легочного ацинуса.

Ключевые слова: легкие, нейроэндокринные тельца, АПУД-система легких.

Introduction. Single pulmonary endocrine cells and NET cells are united in the pulmonary APUD system. The microenvironment of NET cells tightly surrounds innervated groups of pulmonary neuroendocrine cells. These are covered by Clara-like cells and are thought to be important during development and for the repair of adult airway epithelium after severe exposures. A highly reproducible and minimally invasive model of lung inflammation confirms the induction of selective activation of a quiescent stem cell population in the NET cells microenvironment. The model provides new opportunities to unravel the cellular mechanisms of the pathways regulating inhibition, activation, proliferation and differentiation of this unique population of epithelial stem cells during postnatal ontogeny [6]. Remodelling of the airway epithelium is a common finding in the chronically damaged lung and is associated with an increased risk of lung cancer. Pulmonary neuroendocrine cells and NET cells, play a central role in each of these processes. These data suggest that the microenvironment of NET cells, which include Clara cells, is a reservoir of pollutant-resistant progenitor cells that respond to depletion of airway precursors [5].

Purpose of the study. To reveal structural peculiarities cytological and morphological indices of NET cells in the bronchial epithelium of rabbits.

Materials and methods of research. The ultrastructure and morphometric indices of NET cells on electronograms of bronchial epithelium in rabbits were studied. The magnification of electronograms is equal to 3000 and 4000. After studying the ultrastructural features of the cells constituting the NET, their morphometric indices were determined. The height and width of the base of the cells constituting NET were measured with a flexible ruler. The nuclear-cytoplasmic ratio was determined using a transparent plate on which points at a distance of 0.33 cm were plotted.

Results and Discussion. NET cells in the bronchial epithelium in rabbits are represented by a group of endocrine cells that are surrounded by non-endocrine epitheliocytes. NET cells permeate the entire epithelial layer, with their broad base they are located on the basal membrane, and their narrow apical pole slightly protrudes into the bronchial lumen. There are 6-7 short microvilli on the apical pole. Nuclei of endocrinocytes are large and located in the basal part of the cells. The

shape of the nuclei is irregular, invaginations of the karyolemma deep into the nucleus are frequent, some of them very deep. Heterochromatin granules are mainly located under the karyolemma, with a smaller number in the karyoplasm. The location, size and number of heterochromatin granules are characteristic of differentiated cells. Endocrine granules are characterised by high electron density. The location of granules in different endocrinocytes is not uniform. Most often they are localised in the basal and lateral parts of cells, in some cells they are abundant in the apical part. This arrangement, apparently, reflects the fact that endocrinocytes are at different stages of the secretory cycle. Morphometric parameters of endocrinocytes are as follows: the base of the cells is $152.15 \mu\text{m}$, in the apical part the cell narrows to $2.75 \pm 0.48 \mu\text{m}$. Consequently, the base of cells is 5.5 times wider than their apical part. The difference in the size of the basal and apical parts of the cells reflects polar differentiation. Cells with such morphology are attributed to the receptor role of the apical part, while the basal part provides hormone release in response to stimulation of the receptor part. The nuclear-cytoplasmic ratio in NET endocrine cells is 0.71 ± 0.03 , which reflects the prevalence of the cytoplasmic volume over the nucleus volume. This confirms the above mentioned that endocrinocytes of NET are highly differentiated cells. Single apudocytes of the open type of bronchial epithelium have a similar structure. Apparently, apudocytes and NET cells jointly perform a regulatory function in the lungs in response to changes in air composition.

Conclusions. Cytological and morphological parameters of NET cells in the bronchial epithelium of rabbits show a high degree of their receptor-endocrine differentiation and similarity with the structure of apudocytes. NET endocrinocytes together with apudocytes perform regulatory function in the lungs, forming their endocrine apparatus.

Список литературы.

1. Cheburkin A.V., Cheburkin A.A. Constitutional (congenital) bronchial hyperreactivity - a factor of predisposition to bronchoobstructive diseases in children // Paediatrica. 2008. № 4 (87). - С. 116-119.
2. Filippova L.V., Nozdrachev A.D. Bronchopulmonary nerve-receptor apparatus // Vestnik of St. Petersburg University. 2010. Ser.3. Vyp. 3. -С.54-77.
3. Oripov F.S., Dehkanov T.D., Blinova S.A. Pre- and perinatal ontogenesis of tissue and immune structures of the mucous membrane of the small

intestine of rabbits // Bulletin of Science and Education. - 2020. № 12(90). Part 3. С.97-102.

4. Блинова С.А., Орипов Ф.С., Дехканов Т.Д. Морфофункциональные особенности нейроэпителиальных телец в респираторном отделе легких // Вестник науки и образования. - 2020. № 10 (88). Часть 3. - С. 82-85.

5. Блинова С.А., Хамидова Ф.М., Юлдашева Н.Б. Структурные и молекулярные особенности эндотелия кровеносных сосудов легких//Проблемы биологии и медицины. - 2021. №2. - С. 251-255.

6. Блинова С.А., Юлдашева Н.Б., Хотамова Г.Б., Морфофункциональные свойства сосудов легких при бронхоэктатической болезни у детей // Вопросы науки и образования. - 2021. № 10 (135). -С.60-65

7. Блинова, С. ., Хамидова, Ф. ., & Рахмонова Х. (2022). Возрастание роли фундаментальных исследований в пульмонологии при коронавирусной пандемии. Журнал кардиореспираторных исследований, 1(SI-1), 51–52. <https://doi.org/10.26739.2181-0974-2020-SI-1-11>

8. Блинова, С. А., Орипов, Ф. С., Рахмонова, Х. Н., & Юлдашева, Н. Б. (2020). Морфофункциональные свойства нейроэпителиальных телец респираторного отдела легких. Проблемы биологии и медицины, 1, 181-183.

Research Science and Innovation House