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STRUCTURAL FEATURES OF THE LUNGS OF LABORATORY RATS AND MICE

At present time the biological modeling of diseases becomes the most important method of scientific investigation. This fact causes the necessity of the creation of models that correspond to the human pathologic processes. Laboratory animals are an integral part of experiments, hence carring out of such research is impossible without profound knowledge of the laboratory animal biology. Literary datas concerning structural features of the experimental rodents are not numerous. Taking into consideration the above mentioned facts we made an attempt to study histologic structure of the lungs of laboratory rats and mice.

Keywords: *rat, mice, lung, bronchus.*

Actuality. At present time the biological modeling of diseases becomes the most important method of scientific investigation. This fact causes the necessity of the creation of models that correspond to the human pathologic processes. Laboratory animals are an integral part of experiments, hence carring out of such research is impossible without profound knowledge of the laboratory animal biology. Literary datas concerning structural features of the experimental rodents are not numerous [1, 2, 3]. Taking into consideration the above mentioned facts we made an attempt to study histologic structure of the lungs laboratory rats and mice.

Methods. For investigation of the pulmonary tissue of the adult laboratory rats and mice (at childbearing age), thoracic cavity of the killed animals was dissected; caudal parts of the lungs were extracted and fixed in the solution of formalin. Paraffin sections were stained with hematoxylin-eosin and examined under the light microscope.

Discussion. Outer surface of the rat's lungs are covered by serous tunic that consists of flattened mesothelium and subepithelial connective tissue. The mesothelium is 4,13±0,19 micrometers in height, its cells contain oval and rod-shaped nuclei. Connective tissue layer is made up of numerous cellular elements (the densely stained nuclei of which are oval in shape), and fibres running parallel to the surface of the organ. In some sites the fibres are wavy arranged. The thickness of the serous tunic is 19,2±1,1 micrometers.

The bulk of the pulmonary parenchyma is made up of alveoles between which the bronchi of different size are found. The inner alveolar surface is lined by flattened epithelial cells containing rod-shaped nuclei. Luminal diameter of the alveoles situated in the periphery of the organ is 21,1±1,6 micrometers. Luminal diameter of the alveoles situated in the deeper zones of the organ is 21,63±1,26 micrometers. Hence the conspicuous difference between those indices is absent.

The number of alveoli in one microscopic visual field (ocular 15, objective 40) in the periphery of the organ is 6,73±0,26 and in the deeper zones it is 7,66±0,33. Hence the difference in compactness of the alveolar arrangement depending on the location is not prominent either.

The alveoles are separated from one another by means of thin alveolar septa that are permeated by capillaries. The alveolar septa consist of: a) densely arranged cells the rounded and oval nuclei of which contain prominent nucleoli and masses of chromatin; b) thin connective tissue fibres. In the peripheral zones of the lungs the thickness of the alveolar septa is 9,75±0,49 micrometers, and in the deeper zones their thickness is 8,73±0,43 micrometers.

Bronchi of any size are accompanied by blood vessels. Arteries are characterized by considerable development of smooth muscle elements in their media. Large veins have valves, amount of their smooth muscle elements is less than that in the arteries of the same size. Small veins are devoid of smooth muscle tissue.

The walls of the bronchi, the lumen of which is eight hundred to one thousand micrometers in diameter, contain cartilaginous plates that are 54,05±3,06 micrometers in thickness. Within the plates the oval and irregular shaped cartilaginous cells are densely arranged. Diameter of the cells is 15,44±0,8 micrometers. Their rounded and oval nuclei (5,38±0,21 micrometers in diameter) have conspicuous nucleoli and masses of chromatin.

Mucous tunic of the bronchi forms folds that are made up of epithelium and mucosal lamina propria. In the bronchi the lumen of which is eight hundred to one thousand micrometers in diameter the height of the folds is 62.01±3,01 micrometers. The folds overlap small part of the bronchial lumen, this fact is probably due to presence of thick cartilaginous plates that prevent constriction. In the bronchi the lumen of which is six hundred and fifty to seven hundred and fifty micrometers in diameter the height of the folds is 103,89±5,09 micrometers. In the bronchi the lumen of which is three hundred and fifty to four hundred and fifty micrometers in diameter the height of the folds is 60,38±3,2 micrometers. In the bronchi the lumen of which is two hundred to two hundred and fifty micrometers in diameter the height of the folds is 63,35±3,2 micrometers. In the bronchi the lumen of which is eighty to one hundred micrometers in diameter the height of the folds is 39,25±1,9 micrometers. Towards the smallest bronchi the mucosal folds overlap more and more considerable part of the bronchial lumen.

Inner surface of the bronchi is lined by pseudostratified epithelium. Densely stained nuclei of the epithelial cells are oval in shape and are centrally and basally situated. Borders of the cells are not prominent. Towards the smallest bronchi the size of the epithelial cells gradually decreases due to decrease of the amount of their cytoplasm. In the bronchi the lumen of which is eight hundred to one thousand micrometers in diameter the height of epithelium is 27,69±1,26 micrometers. In the bronchi the lumen of which is six hundred and fifty to seven hundred and fifty micrometers in diameter the height of epithelium is 20,36±0,86 micrometers. In the bronchi the lumen of which is three hundred and fifty to four hundred and fifty micrometers in diameter the height of epithelium is 15,56±0,53 micrometers. In the bronchi the lumen of which is two hundred to two hundred and fifty micrometers in diameter the height of epithelium is 13,33±0,64 micrometers. In the bronchi the lumen of which is eighty to one hundred micrometers in diameter, the height of epithelium is 10,8±0,5 micrometers.

Lamina propria of the mucous tunic consists of: a) numerous cellular elements containing densely stained different shaped nuclei; b) thin connective tissue fibres.

Smooth muscle of the bronchial mucous tunic is made up of compact bundles of smooth muscle cells that are separated by connective tissue. Pale nuclei of the myocytes are oval in shape. Towards the smallest bronchi the thickness of the smooth muscle gradually decreases. In the bronchi the lumen of which is eight hundred to one thousand micrometers in dimeter the thickness of the smooth muscle is 73,0±3,6 micrometers. In the bronchi the lumen of which is six hundred and fifty to seven hundred and fifty micrometers in diameter the thickness of the smooth muscle is 41,65±2,0 micrometers. In the bronchi the lumen of which is three hundred and fifty to four hundred and fifty micrometers in diameter the thickness of the smooth muscle is 21,72±1, 08 micrometers. In the bronchi the lumen of which is two hundred to two hundred and fifty micrometers in diameter the thickness of the smooth muscle is 17,94 ±0,8 micrometers. In the bronchi the lumen of which is eighty to one hundred micrometers in diameter the thickness of the smooth muscle is 7,89±0,3 micrometers.

Within bronchial wall one can find lymphatic nodules. Bronchial adventitia consists of numerous cellular elements containing densely stained rounded and oval nuclei, and of thin fibres running in different directions. Bronchial connective tissue is continuous with alveolar septa and outer layer of blood vessels.

The lungs of mice (in comparison with those of rats) are characterized by more conspicuous difference between size of alveoli situated in the peripheral pulmonary zones and those situated in the deeper parts. Peripherally situated alveoles are 17,94±0,55 micrometers in diameter, and alveoles situated in the deeper parts are 20,75±1,0 micrometers in diameter. The number of alveoles in one visual field (ocular 15, objective 40) in the periphery of the organ is 14,3±0,47 and in the deeper zones it is 12,6±0,35. Hence in mice the difference of the alveolar arrangement depending on the location is more prominent.

Mucous tunic of the bronchi forms folds. In bronchi the lumen of which is more than two hundred micrometers in diameter, the height of the folds is 18,25±0,74 micrometers. In bronchi the lumen of which is one hundred and fifty to two hundred micrometers in diameter the height of folds is 17,3±0,59 micrometers. In bronchi the lumen of which is one hundred to one hundred and fifty micrometers in diameter the height of the folds is 16,8±0,56 micrometers. In the bronchi the lumen of which is less than one hundred micrometers in diameter the height of the folds is 17,0±0,63 micrometers.

Smooth muscle in the bronchial mucous tunic is poorly developed.

Conclusion. Structural features of the lungs of laboratory rats and mice correspond to those typical of mammals, but at the same time some differences are found.

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ТӘЖІРИБЕЛІК ЕГЕУҚҰЙРЫҚТАР МЕН ТЫШҚАНДАРДЫҢ ӨКПЕ ТІНДЕРІНІҢ ҚҰРЫЛЫМДЫҚ ЕРЕКШЕЛІКТЕРІ

Түйін: Тәжірибелік егеуқұйрықтар мен тышқандардың өкпе тіндерінің морфологиялық және морфометриялық ерекшеліктеріне сипаттама берілді. Осы жануарлардың өкпе тіндерінің микроқұрылымы сүтқоректілерге тән жалпы заңдылықтарға сәйкес келгенімен, бірқатар ерекшеліктерінің бар екені де анықталды.
Түйінді сөздер: егеуқұйрық, тышқан, өкпе, бронх.

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СТРУКТУРНЫЕ ОСОБЕННОСТИ ЛЁГКИХ ЛАБОРАТОРНЫХ КРЫС И МЫШЕЙ

Резюме: Описаны морфологические и морфометрические особенности лёгочной ткани лабораторных крыс и мышей. Микроструктура лёгочной ткани данных лабораторных грызунов соответствует общим закономерностям присущим млекопитающим, однако были выявлены некоторые межвидовые особенности особенности.
Ключевые слова: крыса, мышь, лёгкое, бронх.