ON THE ROLE OF AFFERENT NEURON IN MAINTAINING STRUCTURAL INTEGRITY AND ADEQUATE DIFFERENTIATION OF TISSUE

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Abstract: The article studies the dynamics of changes in the activity of nonspecific esterase in large and small alveolar cells of differentiated cat lung. Sensory denervation of the lungs in mammals was achieved by bilateral extirpation of the corresponding spinal nodes, as well as by removing the vagus nerve. Sensory denervation of the lungs causes the appearance of a complex of typical changes in its tissues.

Keywords: dogs, cats, rabbits, rats, cells, nucleus, denervation, differentiation, tissue, lungs.

О РОЛИ АФФЕРЕНТНОГО НЕЙРОНА В ПОДДЕРЖАНИИ СТРУКТУРНОЙ ЦЕЛОСТНОСТИ И АДЕКВАТНОЙ ДИФФЕРЕНЦИРОВАННОСТИ ТКАНЕЙ

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Резюме: В статье изучены динамика изменения активности неспецифической эстеразы в больших и малых альвеолярных клетках дифференцированного легкого кошки. Чувствительная денервация легких у животных класса млекопитающих достигалась двусторонней экстирпацией соответствующих спинномозговых узлов, а также удалением блуждающего нерва.

Чувствительная денервация легких вызывает появление в его тканях комплекса типичных изменений.
Ключевые слова: собаки, кошки, кролики, крысы, клетки, ядро, денервация, дифференцированность, ткань, легкие.
Introduction. Literature data indicate that the appearance of giant cells is characteristic of various types of poorly differentiated tissues [1,5,6]. Chronic inflammatory processes in the human lungs, refractory to antibiotic therapy, may in some cases be the result of a pathological process caused by impaired nerve conduction [4,2,7]. Morphological changes in tissues after deafferentation are the end result of destructive lesions, the origin of which lies in metabolic disturbances. Changes in metabolic processes in denervated tissues have been studied by many researchers [3,8,9].

Purpose of the study. To investigate the role of afferent neurons in maintaining the structural integrity and adequate tissue differentiation.

Materials and methods. Dogs, cats, rabbits, and rats served as experimental animals. Lung tissue served as the subject of the study. Sensory denervation of the lungs in mammals was achieved by bilateral extirpation of the corresponding spinal ganglia, as well as by removal of the vagus nerve. Both standard hematoxylin and eosin staining methods, such as the Vanison method, and specialized neurohistological methods, such as the Bilshovsky-Gross method modified by Lavrentiev, were used.

Study results. The data obtained indicate the occurrence of similar changes in the lung tissue of experimental animals of this class after both types of surgery. Microscopic changes in differentiated lung tissue are similar in all types of experimental animals. They are characterized primarily by severe vasomotor disturbances. All layers of the vascular wall exhibit a number of morphological changes. Endothelial cells appear swollen and hypertrophied. Smooth muscle cell nuclei often become elongated, constricted, and tortuous. Exudation of the liquid portion of the blood from the vessels leads to pulmonary edema. Exudative phenomena are most pronounced in rodents. One of the characteristic features of deafferentation changes in all experimental animals is the penetration of polynuclear cells from dilated vessels into the tissue, forming massive leukocyte infiltrations in various areas of the lung. The greatest intensity of this phenomenon is observed 10-12 days after surgery. Despite a subsequent decrease in infiltration, it remains pronounced at all subsequent observation periods. Leukocyte infiltration of lung tissue is most intense in rodents and cats. The lymphoid nature of filtration is clearly one of the reasons for the moderate Ron tissue filtration by pseudoeosinophilic leukocytes in representatives of this class of animals. It should be noted that during organ deafferentation, despite the dilation of vascular lumen, researchers have never observed pronounced edema or tissue infiltration by leukocytes. Obviously, factors somehow related to the specific trophic function of various types of nerve fibers play a role in this process. Against the background of vascular disorders, edema, and tissue infiltration by polymorphonuclear leukocytes, a number of signs indicating a disruption of the normal structure of lung tissue components appear. By the end of the first week after deafferentation, the bronchial lumen, especially the small ones, is filled with mucus containing leukocytes, macrophages, and cells of desquamated epithelium. In some areas of the bronchial epithelium, a transition from multi-row to single-row is observed. In other cases, bronchial epithelial cell proliferation is visible. Goblet cells hypertrophy, and their numbers increase sharply. Bronchial glands are characterized by a decrease in secretion. Proliferating glandular cells can completely or partially obstruct the gland lumen. In the lungs of rodents and birds, this phenomenon occurs earlier and is more pronounced than in dogs and cats. The main elements of lymphoid clusters are lymphocytes and reticular cells of varying degrees of maturity. The latter vary greatly in size, and their cytoplasm becomes more basophilic. A sharp increase in the number of mitoses in reticular cells is noted. Both in the area of lymphoid clusters and in other areas of the lung parenchyma, the number of plasma and mast cells increases significantly. The appearance of giant cells in the tissue is characteristic of deafferentation changes. Giant cells are rare in intact mammalian lungs. We have never encountered them in the lungs of unoperated animals of other classes. Giant cells with several peripherally located small nuclei are also observed in rodents. Along with parenchymal changes, certain abnormalities are also observed in the stroma of differentiated lungs. Fibroplastic cells become polymorphic, their nuclei vary in size, and the nucleoli become larger. Changes in the fibrous structures of the perivascular, peribronchial, and septal connective tissue can be destructive or formative. In some cases, fragmentation of some collagen fibers is observed. Destructive changes in the elastic fibers occur later and consist of a loss of their tortuous shape, sometimes with clumpy disintegration. Long-term observations reveal a slight decrease in the intensity of deafferentation changes. The observed morphological changes in the tissues of differentiated lungs indicate the appearance of signs indicating a loss of the high specificity of the tissue elements. Numerous studies show that when poorly differentiated cells appear, they also exhibit an increase in the nuclear-to-plasma ratio. This increase in the nuclear-to-plasma ratio during cell differentiation is associated with the loss of specialization and the primary function of autonomic function. Analyzing cytophysiological data from tissue cells deprived of sensory innervation suggests a shortened latency period and increased proliferative and mitotic activity.

Conclusion. Thus, the occurrence of similar changes in lung tissue after sensory denervation in animals of various species, families, and classes demonstrates the important role and pivotal significance of the sensory neuron in maintaining the structural integrity and adequate differentiation of the areas of the body it innervates. The most significant characteristic of deafferentation changes is the acquisition of a poorly differentiated character by cellular elements and the loss of their high morphofunctional specificity.

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