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MORPHOLOGICAL CHANGES IN THE LUNGS UNDER THE EFFECT OF ACUTE RADIATION IN EXPERIMENTAL STUDIES

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Acute radiation depends on the frequency and duration of ionizing radiation, and develops at different levels depending on the radiation sensitivity of the organs. The most sensitive organs in acute radiation are immune organs (spleen, lymph nodes, malt and salt structures, bone marrow and thymus), mucous membrane of the gastrointestinal tract (labile cells), exo- and endocrine glands (pituitary gland, thyroid gland, adrenal gland). , gonads (ovaries, testicles, prostate gland) are among the mixed glands. Organs that are less sensitive to radiation are the heart, kidneys, liver, brain and spinal cord, bone tissue and joints.

In the process of irradiation, the membrane of biological tissues first comes to a state of destabilization: an increase in membrane permeability leads to the entry of liquid and various micro- and macroelements into the cell, including calcium ions, activation of proteins located freely in the cytoplasm, decomposition of intracellular structures of lysosomal enzymes, development of hydropic dystrophy in the epithelia of kidney tubules. will come Hepatocyte hypoxia due to venous congestion in the liver tissue leads to the development of fatty dystrophy with large, medium and small droplets

External ionizing radiation occurs only during its impact on the body, as a result of which various radioactive substances appear in the body. Until a certain time, the affected organism becomes a carrier of these radionuclides, as a result of which internal radiation develops [Ulanova A.M. et al., 2016; Uzbekov D.E. et al., 2016; Singh V.K., Seed T.M., 2020]. Radioactive substances enter the body through the skin, gastrointestinal tract, and respiratory tract. After that, they become a source of internal radiation and spread to other organs and tissues of the body through blood and lymph flow.

The indirect effect of radiation is explained by the formation of radiolysis of water, which makes up 70-80% of the body, when water is ionized, radicals with oxidizing and alkaline properties are formed. In addition, the formation of atomic hydrogen, hydroperoxyl radicals, hydrogen peroxide is also important. Free oxidizing radicals enter into an enzymatic reaction, as a result of which active

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sulfhydryl groups are converted into inactive disulfide compounds. These biochemical processes lead to a decrease in the catalytic activity of enzyme systems, which in turn leads to a decrease in DNA and RNA in cell nuclei, which disrupts the processes of their renewal.

After chest radiation, respiratory injury is common in large-volume lung radiation in lung, breast, esophagus, and hematologic tumors. Clinical signs of acute radiation injury occurring 1-3 months after radiation therapy include shortness of breath, cough, and fever, which are characterized as radiation pneumonitis. Symptomatic pneumonitis occurs in 5–10% of patients irradiated for mediastinal lymphoma or breast cancer (Marks et al., 2010).

In this phase, the release of proteins into the alveoli, infiltration of inflammatory cells, and epithelial desquamation occur. When exposure limits are exceeded, pneumonitis can worsen and lead to death. Radiation fibrosis of the lungs can be asymptomatic, but with the development of fibrosis there is a slight deterioration of lung function. Development of chronic respiratory failure, shortness of breath, reduced ability to exercise, cyanosis. In addition, the lungs are susceptible to the entry of microorganisms and chronic respiratory infection

The purpose of the work was to study and evaluate the changes in the morphological characteristics of the lungs in laboratory animals under the influence of acute radiation in experimental studies.

Material and research methods. For experimental studies, 60 white male rats weighing 160-180 g were selected. All laboratory animals were obtained from the same vivarium and were of the same age. These adult (3-month-old) white outbred rats were kept under standard vivarium conditions with relative humidity (50-60%), temperature (19-220 C) and light regime (12 h dark and 12 h light).

N.A. Nuraliev in the formulation of a standard vivarium food ration for laboratory animals. and all. [2016] followed the recommendations outlined in the methodological guide. All biological safety rules and ethical principles of working with laboratory animals in keeping, devitalizing and anatomical dissection of laboratory animals [Nuraliev N.A. et al., 2017] was strictly followed.

All laboratory animals were divided into 2 groups: the main group - laboratory animals fed with standard vivarium ration and drinking water (n=30), which were totally irradiated once with a dose of 5 Gray (acute radiation); control group - laboratory animals fed with standard vivarium diet and drinking water (n=30), they were not irradiated - intact;

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In the experiment, laboratory animals were irradiated using the AGAT-R1 (Estonia) γ-therapeutic apparatus, in which the radiation source was So-60. Research related to animal irradiation was conducted at the Bukhara branch of the Republican Specialized Oncology and Radiology Research Center of the Ministry of Health of the Republic of Uzbekistan.

Research methods widely used in experimental studies were used to study the morphological parameters of the lungs of laboratory animals (anatomical dissection). All biological micro-objects were viewed using an HL-19 model trinocular microscope (PRC) with software. The main objects of the study were histological preparations made from the organs of purebred rats. The preparation of histological preparations consisted of 4 stages and was carried out by traditional methods. A YD-315 mechanical rotary microtome (XPR) was used to prepare the preparations, the prepared sections were stained with hematoxylin and eosin.

Lungs isolated from albino rats exposed to a single 6 Gray dose of acute radiation under laboratory conditions were fixed in 10% formalin and stained with hematoxylin and eosin. The micropreparations were photographed under a microscope with dimensions of 4x10, 10x10, 20x10, 40x10.

The statistical processing of the obtained material was carried out using the Excel program using traditional variational statistics methods. The principles of evidence-based medicine were used in the organization and conduct of research.

The obtained results and their discussion. Macroscopic examination of the lungs of laboratory animals belonging to the main and control groups did not show any visible morphological changes, according to the results of this study, all animals did not differ from each other. In all cases (n=60), pulmonary imaging showed healthy lungs.

When the histological preparations of lung tissue of all animals were examined under a microscope, a normal microscopic picture was observed in the field of view in the control group, while pathological morphological changes were observed in the field of view in the main group. Although these changes were not observed in all laboratory animals, they were evident. Below, we found it necessary to give the picture of the histological preparations in which these pathomorphological changes were detected and refer to their interpretation.

Figure 1 shows the histological picture of the lung of a purebred rat belonging to the main group. It revealed fullness of venous blood vessels against a general background in the lung tissue (80.0%, n=24), atelectasis in the alveolar spaces in the center of the lung tissue, and edema in the interstitial wall (86.67%, n=26). It is noteworthy that these pathomorphological changes were detected only in the main

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group. If we consider that atelectasis is a decrease in lung tissue accompanied by loss of lung volume, leading to lung failure and pneumonia, we are sure that this pathomorphological sign can have serious consequences. We believe that this condition, among others, is an external effect on the lungs - the effect of acute radiation. Another histological preparation showing pathological morphological signs (Fig. 2) attracted our attention to the thickening of the alveolar wall in the lung tissue (56.67%, n=17), and at the same time foci of leukocyte infiltration in the parabronchial areas (60.0%, n=18).This situation showed the depth of pathomorphological changes in the lung tissue.

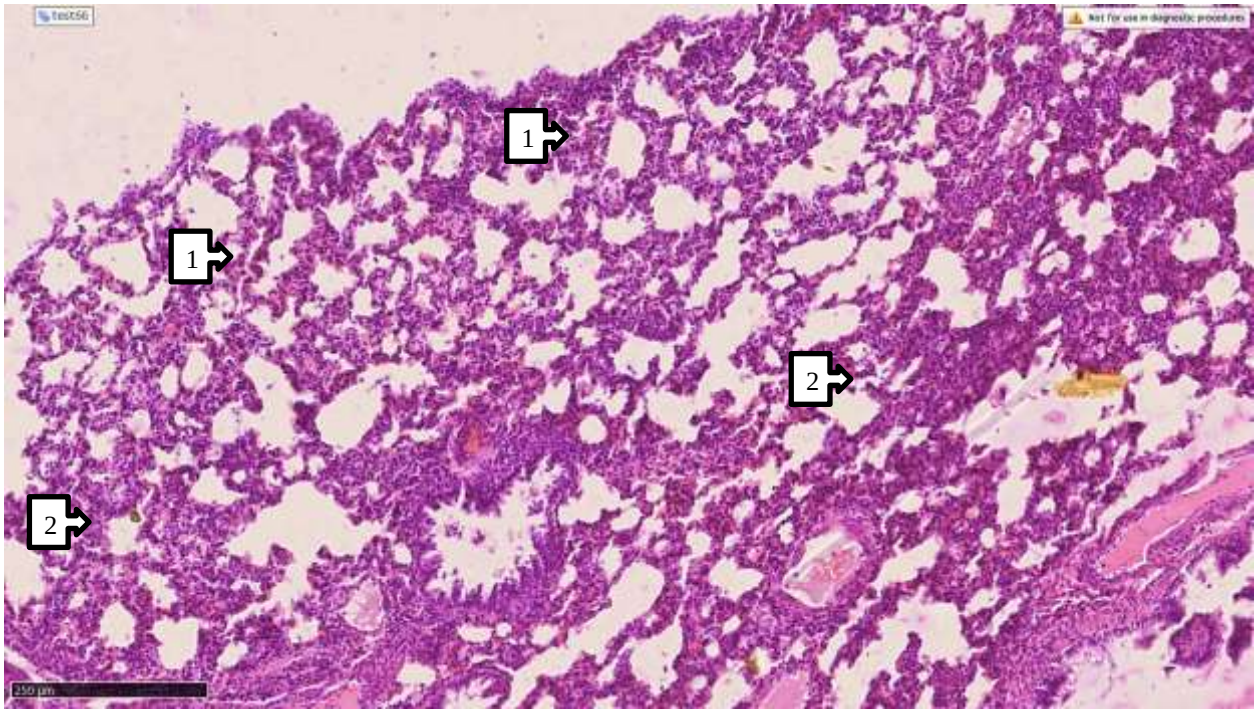

Figure 1. Microscopic view of the lung of a non-white breed rat that underwent acute radiation (the alveolar wall was thickened (1), leukocyte infiltration foci were detected in the parabronchial branches (2). Stained with hematoxylin-eosin, 10x10).

In addition to these changes, other pathological morphological features are presented in Figure 3 below.

The mentioned morphological changes are that the alveolar wall is full of blood vessels (83.33%, n=25), there are foci of desquamation in the mucous membrane of the bronchioles (40.0%, n=12), as well as focal emphysematous expansion (43.33%, n= 18) was characterized by its determination. Considering that desquamation is the migration of mucous membrane epithelium for different periods, and therefore different changes are manifested due to this, this pathomorphological sign is also a condition that requires serious attention.

We found it necessary to cite another histological preparation (Fig. 4) as evidence of other pathological morphological changes. It showed that alveoliocytes had dystrophic and desquamation foci (46.67%, n=14), and metaplastic changes (46.67%, n=14) in bronchial mucosa epithelium. Metaplastic changes are characterized by the transition of the tissue from a single-line structure to a multi-line structure.

Conclusions.

1. Macroscopic examination of the lungs of white rats subjected to acute irradiation did not reveal any significant morphological changes in the animals of the main and control groups.

2. Fullness of venous blood vessels (80.0%) and alveolar wall blood vessels (83.33%), atelectasis in alveolar spaces and swellings in the interstitial wall (86.67%) were found in the lung tissue of white non-breed rats belonging to the main group. These pathomorphological changes were identified only in the main group.

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