THE SEVERITY OF CYTOGENETIC CHANGES ON BONE MARROW CELLS IN THE EXPERIMENT AGAINST THE BACKGROUND OF CHRONIC RADIATION

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Abstract: *studies have established that the ionizing types of radiation include electromagnetic oscillations with a small wavelength, X-rays and gamma radiation, streams of α- and β-particles (electrons), protons, positrons, neutrons and other charged particles, α-radiation and X-ray radiation have a high penetrating power, β-radiation has a lower penetrating power. The aim of the study was to evaluate the effect of chronic radiation in the bone marrow cells of white mongrel rats in an experiment. To carry out the planned studies, 18 white mongrel male rats weighing 150-180 g were used, kept in standard vivarium conditions (room temperature 21-220C, relative humidity 50-60%, light mode - 12 hours of darkness and light). Thus, in laboratory animals after chronic irradiation, the severity of cytogenetic changes were bright, in intact animals there were no deviations from normal processes. Based on the conducted studies, cytogenetic changes in the bone marrow cells of laboratory animals receiving acute and chronic irradiation were studied and evaluated.*
Keywords: *diabetic foot syndrome, anesthesia, cellular and humoral immunity.*

ВЫРАЖЕННОСТЬ ЦИТОГЕНЕТИЧЕСКИХ ИЗМЕНЕНИЙ КЛЕТОК КОСТНОГО МОЗГА В ЭКСПЕРИМЕНТЕ НА ФОНЕ ХРОНИЧЕСКОГО ОБЛУЧЕНИЯ

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Аннотация: *исследованиями установлено, что к ионизирующим видам излучений относятся электромагнитные колебания с малой длиной волны, рентгеновское и гамма-излучение, потоки α- и β-частиц (электронов), протонов, позитронов, нейтронов и других заряженных частиц, α-излучение и Рентгеновское излучение обладает высокой проникающей способностью, β-излучение имеет меньшую проникающую способность. Цель исследования — оценить влияние хронического облучения на клетки костного мозга белых беспородных крыс в эксперименте. Для проведения запланированных исследований использовали 18 белых беспородных крыс-самцов массой 150-180 г, содержавшихся в стандартных условиях вивария (температура помещения 21-22 ^{0}C, относительная влажность 50-60%, световой режим - 12 часов темноты и света). Таким образом, у лабораторных животных после хронического облучения выраженность цитогенетических изменений была яркой, у интактных животных отклонений от нормальных процессов не было. На основании проведенных исследований изучены и оценены цитогенетические изменения в клетках костного мозга лабораторных животных, получавших острое и хроническое облучение.*
Ключевые слова: *синдром диабетической стопы, анестезия, клеточный и гуморальный иммунитет.*

Introduction. Studies have established that the ionizing types of radiation include electromagnetic oscillations with a small wavelength, X-rays and gamma radiation, streams of α- and β-particles (electrons), protons, positrons, neutrons and other charged particles, α-radiation and X-ray radiation have a high penetrating power, β-radiation has a lower penetrating power [4, 9].

Radioactive substances can enter the body through intact skin, gastrointestinal tract, respiratory organs. After that, they are carried by the blood and lymph current to organs and tissues [2, 8].

The hematopoiesis system of the body is most susceptible to the effects of radiation, especially bone marrow cells. Under the influence of radiation, bone marrow aplasia develops, inhibition of mitotic processes in the organs of hematopoiesis, total death of low-differentiated bone marrow cells [1, 4, 7].

Chronic radiation sickness is a complex clinical syndrome that develops in the case of prolonged exposure to ionizing radiation in doses that exceed the permissible. Characteristic manifestations: duration and undulation of the course; the presence in clinical symptoms of both signs of damage to the body from the effects of radiation,

and manifestations of restorative and adaptive reactions. Periods of development of chronic radiation sickness: the period of formation, or actually chronic radiation sickness; the recovery period; the period of the consequences of radiation sickness [3, 6].

The aim of the study was to evaluate the effect of chronic radiation in the bone marrow cells of white mongrel rats in an experiment.

Materials and methods. To carry out the planned studies, 18 white mongrel male rats weighing 150-180 g were used, kept in standard vivarium conditions (room temperature 21-22^{0}C, relative humidity 50-60%, light mode - 12 hours of darkness and light). The maintenance of laboratory animals, feeding and caring for them, selection of animals, cleaning and disinfection of the vivarium premises were carried out according to Nuraliev N.A. et al. [5].

All laboratory animals were obtained from the same nursery. Before the start of experimental studies, all laboratory animals were kept in quarantine for 21 days. When working with experimental animals, all ethical principles of working with laboratory animals and rules of biological safety were strictly observed. All laboratory animals were divided into 2 groups: The main group - white mongrel rats (n=12), who received chronic radiation for 20 days at 0.2 Gray daily; The control group consisted of intact white mongrel rats (n=6) who did not receive acute and chronic radiation. Chronic irradiation was carried out using the gamma therapeutic apparatus AGAT-P1 (Estonia, 1991), the source of irradiation is Co-60. For experimental studies, bone marrow was selected from the femur of white mongrel rats during the autopsy of the animal.

Research results and their discussion. For the analysis, we used bone marrow cells of laboratory animals that received and did not receive different types of radiation, in which elements of the mitotic apparatus were detected. Out of 125 examined bone marrow cells of laboratory animals of the second group, normal metaphase plates were found in 48.0% (n=60) cells, the prophase stage was observed in 8.80% (n=11) cells, polyploid cells were found in 2.40% (n=3) cases, and 40.80% (n=51) cells with premature condensation of chromosomes were observed. Metaphase plates are a cluster of chromosomes in a plane perpendicular to the axis of division (the equatorial plane), in which the chromosomes are located equatorially in the metaphase of mitosis (the second phase of somatic cell division). The number of chromosomes in rats is normally 42 (diploid set). Of the 12 animals of the main group, 1 rat (8.33%) did not have mitotically dividing cells on the preparations, low cellularity, low blast transformation and inhibition of mitosis were observed. The presence of cells with pulverized chromosomes indicates the pathology of mitosis. The presence of a high concentration of cells (40.80%) with premature condensation of chromosomes in the bone marrow cells of rats of the main group indicates the inhibition of the normal mitotic cycle, which affects the proliferative activity of this tissue and the presence of cell clones with genetic pathology. In the main group of laboratory animals, which were examined after 20 days of chronic radiation with a daily dose of 0.2 Gray, a different picture was observed from the data of the control group. Pathology was noted in the division of bone marrow cells. At the same time, the nucleus of an animal bone marrow cell belonging to the main group contains an early phase with premature condensation of chromosomes. In addition, a late phase of premature chromosome condensation was also observed in the nucleus of bone marrow cells of laboratory animals. In the center of an animal bone marrow cell after chronic irradiation, a nucleus with premature condensation of chromosomes is observed, and interphase nuclei are visible around it. Unlike laboratory animals of the main group, which underwent chronic irradiation, no changes were observed in the bone marrow cells of white mongrel rats of the control group (intact), in all cases a normal karyotype was found - late and early metaphase.

Conclusions. Thus, in laboratory animals after chronic irradiation, the severity of cytogenetic changes were bright, in intact animals there were no deviations from normal processes. Based on the conducted studies, cytogenetic changes in the bone marrow cells of laboratory animals receiving acute and chronic irradiation were studied and evaluated. The obtained data allow us to use the proposed recommendations to improve the effectiveness of the methodology for studying and evaluating cytogenetic changes in bone marrow cells of laboratory animals in experimental studies to determine the effect of different doses of radiation on the body.

References / Список литературы

1. *Akhmedov R.M., Hamdamov B.Z., Hamdamov I.B.* Assessment of amputation methods at the shin level in severe forms of diabetic foot syndrome // Problems of biology and medicine. Samarkand, 2019. № 4 (113). P. 29-32.
2. *Bahodirovich N.B. et al.* Assessment of behavior and biochemical parameters of blood in experimental animals under conditions of a technogenic rotating electric field // Bulletin of science and education, 2020. № 23-2 (101). P. 6-10.
3. *Boltayev E.B.* Choice of respiratory therapy in severe patients with new coronavirus infection covid-19 // Achievements of science and education. Founders: Olympus. № 8. P. 70-74.
4. *Hamdamova M.T.* The problem of the development of iron deficiency by using a copper-bearing intrauterine contraceptive // Europaische Fachhochschule, 2014. № 3. P. 44-45.

5. *Khamidova N.K. et al.* Morphometric characteristics of parameters of physical development of children with various heart diseases //湖南大学学报 (自然科学版), 2021. T. 48. № 7. P. 137-142.
6. *Nuraliev N.A., Bektimirov A.M.T., Alimova M.T., Suvonov K.J.* Rules and methods of working with laboratory animals in experimental microbiological and immunological studies // Methodical manual. Tashkent, 2016. 34 p.
7. *Khamdamov B.Z. et al.* The role and place laser photodynamic therapy in prevention postoperative complication at treatment of diabetic foot syndrome // Applied Sciences: challenges and solutions, 2015. P. 27-31.
8. *Khamdamov B.Z., Nuraliev N.A.* Pathogenetic approach in complex treatment of diabetic foot syndrome with critical lower limb ischemia // American Journal of Medicine and Medical Sciences, 2020. T. 10. № 1. P. 17-24.
9. *Teshayev S.J., Tuhsanova N.E.* Morfometric characteristic of lymph cages infiltration of the epithelial cover of fibers of the rats'thin gut in norm and at influence of Cotorhane // Central Asian Journal of Pediatrics, 2019. T. 2. № 2. P. 40-42.
10. *Turdiev M.R., Teshaev S.J.* Comparative characteristics of the spleen of white rats in normal and chronic radiation sickness // Chief Editor. T. 7. P. 11.
11. *Zarifovich K.B. et al.* Method of prevention of postoperative complications of surgical treatment of diabetic foot syndrome // European science review, 2018. № 9-10-2. P. 194-196.