AMERICAN Journal of Pediatric Medicine and Health Sciences
Volume 01, Issue 09, 2023 ISSN (E): 2993-2149

Different Types of Rays and Their Effects on the Testes

Baymuradov R. R.
Bukhara State Medical Institute, Bukhara, Uzbekistan

Abstract: Radiation therapy (radiotherapy) is a type of cancer therapy in which specialists destroy cancer cells in a patient's body by exposing them to ionizing radiation such as X-rays, gamma rays, high-energy electrons or heavy particles. It is one of the most widely used cancer treatments. Approximately half of all cancer patients require radiation therapy at some point during the course of their illness. But the use of rays, while being useful, can also be harmful.

Keywords: radiotherapy, x-rays, testes.

Radiation therapy carried out in sick children with cancer also affects the reproductive system. But research results are contradictory. And the interpretation of the results of the latest study [8] does not support concerns about inherited genetic changes affecting the risk of stillbirth and neonatal death in the offspring of men exposed to gonadal irradiation. Another study revealed dysfunction of Leydig cells associated with radiation therapy (after 24 months) [4].

Regarding radiation during pregnancy, two doses of 0.8 g of radiation on days 10.5 and 11.5 of pregnancy increased the incidence of testicular germ cell tumors in the offspring from 45% to 100% [7]. This is evidence of the induction of testicular cancer by an environmental agent and suggests that the male fetus of women exposed to radiation at approximately 5–6 weeks of gestation may have an increased risk of developing testicular cancer. An experiment with medaka embryos confirms the connection between irradiation and gestational age [9]. Since, a lot of apoptotic cells were found in the tissues of the testes of fetuses after birth.

[5] used 3 biological indicators of importance for health risk, i.e. cell death, inflammation and global DNA methylation, to determine the late effects of low doses (0.05 or 0.1 g) of 137Cs γ rays on testicles examined 6 months after irradiation. All tissues from mice exposed to 0.1 or 1.0 g showed significantly increased levels of cell death and inflammation, including significant loss of global 5-hydroxymethylcytosine. Also, the data showed not only no harm, but also hormesis in mice exposed to 0.05 g. However, the hormonal effect appears to be biologically and tissue dependent.

They came to a similar conclusion [1,2]. They examined the recovery of spermatogenesis 10 weeks after 5-g irradiation in seven species of rats. The percentage of tubules containing differentiated cells and the number of sperm in the testes showed that the Brown-Norway and Lewis species were the most sensitive to radiation. The rest are more resistant to radiation. Although, all rats had atrophic tubules without differentiated germ cells, which indicated a block in their differentiation. Thus, it was concluded that differences in radiation sensitivity of spermatogenesis restoration between rat species of different genetic backgrounds can be explained by differences in the degree of radiation-induced block of spermatogonial differentiation.

[6] studied in vivo changes occurring several weeks after irradiation and identified cell-specific features of testicular lipid classes. Finally, at week 30, the lipid and fatty acid profile reflected the radiation-induced permanent testicular involution and the importance of Sertoli cells in maintaining lipid homeostasis during normal spermatogenesis.

Spermatogonia are generally more radiosensitive and prone to apoptosis than somatic cells. Among spermatogonial subtypes, the DNA damage response is differentially modulated; undifferentiated spermatogonia, including spermatogonial stem cells (SSCs), are relatively radioresistant, whereas differentiating spermatogonia are very radiosensitive. For a clearer understanding of these mechanisms, a study was conducted to study the effect of ionizing radiation on these cells [10]. Undifferentiated stem cells showed greater regulation of p53 in response to radiation than differentiated stem cells. Higher levels of p53 protein in undifferentiated spermatogonia may preferentially induce cell cycle arrest, thereby giving these cells more time to repair the DNA damage caused and increase their radioresistance.

Sometimes radiation in another part of the body also affects the functioning of the testes. For example, when mice were given fractional irradiation to the right thorax, the ultrastructure of the blood-brain barrier was damaged along with the induction of apoptosis in the testes, and sperm count and viability were dramatically reduced such that both the fertility and survival of their offspring were reduced. This study demonstrates for the first time that thoracic irradiation induces structural and functional damage in the distal testes and subsequently causes decreased fertility in irradiated male mice.

Fractional irradiation at a total dose of 2.0 Gy in combination with anabolic drugs (example phenobolin at a dose of 2.5 mg/kg) led to a significant decrease in the relative weight of the testicles and, in particular, epididymis, as well as a decrease (3-5 times) the number of mature germ cells in the epididymis.

The effect of ionizing radiation with iron ions (2 Gy) on the reproductive organs was studied. The indicators decreased (including sperm motility) day after day and were the lowest 2 weeks after irradiation. A similar experiment was carried out with carbon ion beams at a dosage of 0.5 Gy and 4 Gy.

Scientists studied the state of the reproductive function of male rats after irradiation at a dose of 2.0 Gy and stress (immobilization - 6 hours / day for 7 days) and their combined effects. On the 30th day after the combined exposure (37 days after irradiation), a decrease in testicular weight by almost 50% and lesions associated with the process of spermatogenesis are observed. In the long-term period - on the 60th day (67th after irradiation), the effect of irradiation and irradiation in combination with immobilization stress leads to a sharp drop in the number of sperm (up to 18% in relation to the reference group) and a decrease in their viability.

People analyzed iodine-containing and sex hormones in F1 rats. Their parents were in places with a high dose of radiation. And after puberty, the level of hormones not only of the thyroid gland, but also of sex hormones is disrupted. This entails serious hyper and hypofunctions of all body systems, including reproductive.

In addition, electromagnetic fields of different radio frequency ranges also have a negative effect. RF EMF with a frequency of 1890 MHz over a long period (30 days) has a pathogenic effect on animal organs. The central nervous system is inhibited, metabolism is disrupted, the osmotic resistance of testicular cells decreases, and the weight of the testes decreases throughout the experiment (500 μW/cm2). With a decrease in the exposure dose, changes in the testes continued in a negative direction.

24-hour exposure to 1950 MHz 3 W/kg electromagnetic radiation also causes adverse effects on Leydig cell proliferation and testosterone secretion. Cell proliferation is clearly reduced, and cell cycle distribution, testosterone secretion capacity, and P450scc mRNA levels are reduced. The level of cell apoptosis, ROS and steroidogenic acute regulatory protein mRNA did not change significantly.

Scientists provided results on the effect of EMF on the reproductive and nervous system of laboratory animals. Cumulation occurs, which disrupts the integrity of the sperm located in the epididymis.

The results of the influence of light desynchronosis are also very interesting. During one of them, the consequences were studied for 1 to 21 days. First, the number of spermatids decreases, by the 10th day the number of spermatogonia in the free lumen decreases, by the 21st day interstitial cells decrease (size and number).

Scientists have determined that exposure to a low dose of radiation attenuates the apoptotic death of testicular cells induced by type 2 diabetes. It has also been proven that radiation promotes immunological recognition of the tumor showed that low dose radiation (0.7 mGy/h) does not damage spermatogenesis and probably stimulates the restoration of damaged spermatogonial stem cells in male mice. It was found that irradiation of mice at 630 nm with a He-Ne laser increases the level of intracellular calcium and increases their ability to fertilize [3].

Despite numerous materials, the results still remain inconsistent, and this confirms the need for further research

References:

1. Abuelhija M, Weng CC, Shetty G, Meistrich ML. Differences in radiation sensitivity of recovery of spermatogenesis between rat strains. // Toxicol Sci. – 2012. - № 126. - 545–53. doi: 10.1093/toxsci/kfs021. 70
2. Abuelhija M, Weng CC, Shetty G, Meistrich ML. Rat models of post-irradiation recovery of spermatogenesis: interstrain differences. // Andrology. – 2013. - № 1. - 206–15. doi:10.1111/j.2047-2927.2012.00034.x. 71
3. Cohen N, Lubart R, Rubinstein S, Breitbart H. Light irradiation of mouse spermatozoa: stimulation of in vitro fertilization and calcium signals // Photochem Photobiol. - 1998. Sep. - № 68(3). - 407-13. 77
4. Ghezzi M, De Toni L, Palego P, Menegazzo M, Faggian E, Berretta M, Fiorica F, De Rocco Ponce M, Foresta C, Garolla A. Increased risk of testis failure in testicular germ cell tumor survivors undergoing radiotherapy. // Oncotarget. - 2017 Dec. - № 7;9(3). - 3060-3068. doi: 10.18632/oncotarget.23081. 83
5. Jangiam W, Udomtanakunchai C, Reungpatthanaphong P, Tungjai M, Honikel L, Gordon CR, Rithidech KN. Late Effects of Low-Dose Radiation on the Bone Marrow, Lung, and Testis Collected From the Same Exposed BALB/cJ Mice. // Dose Response. - 2018 Dec 19. - № 16(4). - 1559325818815031. doi: 10.1177/1559325818815031. 90
6. Oresti GM, Ayuza Aresti PL, Gigola G, Reyes LE, Aveldano MI. Sequential depletion of rat testicular lipids with long-chain and very long-chain polyenoic fatty acids after X-ray-induced interruption of spermatogenesis. // J Lipid Res. – 2010. - № 51. - 2600–2610. DOI 10.1194/jlr.M006395 114
7. Shetty G, Comish PB, Weng CCY, Matin A, Meistrich ML Fetal Radiation Exposure Induces Testicular Cancer in Genetically Susceptible Mice. // PLoS ONE. – 2012. - № 7(2). - e32064. doi:10.1371/journal.pone.0032064 119
8. Signorello, L. B. et al. Stillbirth and neonatal death in relation to radiation exposure before conception: a retrospective cohort study. // Lancet. – 2010. № 376. - 624–630. doi:10.1016/S0140-6736(10)60752-0. -122
9. Yasuda T, Ishikawa Y, Shioya N, Itoh K, Kamahori M, Nagata K, et al. Radical change of apoptoticstrategy following irradiation during later period of embryogenesis in medaka

(Oryzias latipes). // PLoS ONE. - 2018. - № 13(8). - e0201790. https://doi.org/10.1371/journal.pone.0201790 130

10. Zheng Y, Lei Q, Jongejan A, Mulder CL, van Daalen SKM, Mastenbroek S, Hwang G, Jordan PW, Repping S, Hamer G. The influence of retinoic acid-induced differentiation on the radiation response of male germline stem cells. // DNA Repair (Amst). - 2018 Oct. - № 70. - 55-66. doi: 10.1016/j.dnarep.2018.08.027. 134
11. Баймурадов, Р. Р. (2021). Морфофункциональное состояние семенников при остром и хроническом радиационного облучении (обзор литературы). Биология и интегративная медицина, (4 (51)), 4-23.
12. Равшан Баймурадов (2021). Анатомические и физические параметры развития крыс и их семенников после облучения. Общество и инновации, 2 (2/S), 504-509. doi: 10.47689/2181-1415-vol2-iss2/S-pp504-509
13. Baymuradov, R. R. (2020). Teshaev Sh. J. Morphological parameters of rat testes in normal and under the influence of chronic radiation disease. American Journal of Medicine and Medical Sciences.–2020.-10 (1)–P, 9-12.
14. Radjabovich, B. R., & Jumayevich, T. S. (2021). Characteristics of Anatomical Parameters of Rat Testes in Normal Conditions and Under Irradiation in the Age Aspect. International Journal of Trend in Scientific Research and Development, March, 106-108.
15. Шамирзаев Н.Х. и др. Морфологические параметры семенников у 3-месячных крыс в норме и при хронической лучевой болезни // Морфология, 2020. Т. 157. № 2-3. С. 241-241.
16. Muzafarovna, K. S., Radjabovich, B. R., & Joraboy, S. (2022). Morphometric Parameters of the Trunk in Children with Scoliosis. Central Asian Journal of Medical and Natural Science, 3(3), 144-147.
17. Тешаев Ш.Ж., Баймурадов Р.Р. Морфологические параметры семенников 90-дневных крыс в норме и при воздействии биостимулятора на фоне радиационного облучения // Оперативная хирургия и клиническая анатомия (Пироговский научный журнал). -2020. - 4(2). - С. 22-26.
18. Pulatovna, A. N., Muzaffarovn, K. S., & Radjabovich, B. R. (2023). Results of anthropometric studies of the maxillofacial region of children with hypertrophy of the adenoids. Open Access Repository, 4(3), 1183-1194.
19. Sh.J.Teshaev, & R.R.Baymuradov. (2021). CHARACTERISTICS OF THE ANATOMICAL PARAMETERS OF THE TESTES OF WHITE OUTBRED RATS IN NORMAL CONDITIONS AND UNDER CHRONIC IRRADIATION. Archive of Conferences, 61-62.
20. Rajabovich, B. R. (2022). Impact of Radiation on Male Reproductive System. Miasto Przyszłości, 24, 123-126.
21. Кароматов Иномжон Джураевич, Баймурадов Равшан Раджабович, & Шодиева Мушарраф Садировна (2018). Биологически активное вещество растительного происхождения ресвератрол - лечебные свойства (обзор литературы). Биология и интегративная медицина, (3), 178-198.
22. Baymuradov, R. R. (2022). PARAMETERS OF BLOOD VESSELS OF TESTES OF OUTBRED RATS. World scientific research journal, 3(1), 3-10.
23. Баймурадов Равшан Раджабович, Кароматов Иномжон Джураевич, & Шодиева Мушарраф Садировна (2018). Маш - пищевое и лекарственное растение. Биология и интегративная медицина, (6), 202-208.

24. Teshaev, S. J., Baymuradov, R. R., Khamidova, N. K., &Khasanova, D. A. (2020). Morphological parameters rat testes in normal conditions, with the background of chronic radiating disease and under the influence of an antiseptic stimulator. International Journal of Pharmaceutical Research, 12(3), 4898-4904
25. Тешаев, Ш. Ж., & Баймурадов, Р. Р. (2018, November). Использование новейших инновационных технологий при преподавании фундаментальных предметов (на примере анатомии). In Роль и место инновационных технологий в современной медицине» международная научно-практическая конференция. Таджикистан (p. 260).
26. Ходорова, И., Тешаев, Ш. Ж., Хожиев, Д. Я., Баймурадов, Р. Р., & Хасанова, Д. А. (2018). Роль инновационных технологий для развития межвузовского сотрудничества по преподаванию предмета «анатомия». ТОМ–II, 297.
27. Khamdamov, B. Z., Islomov, A. A., Khamdamov, A. B., Baymuradov, R. R., & Khamdamov, I. B. (2017). Comparative analysis of the results of various methods of amputation at the shin level in severe purulent-necrotic lesions of the lower extremities against the background of diabetes mellitus. In 3rd International Scientific and Practical Congress" Diabetes Mellitus and Surgical Infections". Moscow (pp. 87-88).
28. Кароматов И.Д. Инжир как функциональное и лечебное средство/И.Д. Каро-матов, Р.Р. Ваймурадов, А.А. Мавлонов//Научная статья. - 2017. - Бухара. - 34 с.
29. Radjabovich, B. R. . (2022). The Effect of Antiseptic Stimulant on the Body. Research Journal of Trauma and Disability Studies, 1(9), 240–245.
30. Баймурадов Равшан Раджабович, & Тогбоев Комил Темурович (2019). Значение лекарственного растения портулак огородный при метаболическом синдроме. Биология и интегративная медицина, (2 (30)), 175-183.
31. Эшонкулов, А. Х., Тешаев, Ш. Ж., Баймурадов, Р. Р., & Хасанова, Д. А. (2017). Влияние биогенных стимуляторов на организм млекопитающих. Журнал проблемы биологии и медицины,(2 (94)), 193-196.
32. Тешаев Ш.Ж., Норова М.Б., Ядгарова Г.С., Баймурадов З.З., Тухсанова Н.Э., Хожиев Д.Я., Тешаев У.Ш., Хасанова Д.А. Морфометрические параметры головы и челюстно-лицевой области у детей с сахарным диабетом и их соответствие принципу «Золотой пропорции»// Научно-теоретический медицинский журнал «Морфология», 2016. № 3. С. 204.
33. Тешаев Ш.Ж., Норова М.Б., Баймурадов Р.Р., Намозов Ф.Ж. Программа для оценки морфометрических показателей головы у здоровых детей и с сахарным диабетом 1-го типа// Свидетельство об официальной регистрации программы для электронно-вычислительных машин. 2013. 03. 04. № DGU 02903.
34. Baymuradov, R. R., & Opolovnikova, K. S. (2022). Indicators of Physical Development and Testes of Outbred Rats and Anatomical Parameters of the Testes. INTERNATIONAL JOURNAL OF HEALTH SYSTEMS AND MEDICAL SCIENCES, 1(6), 183-186.
35. Баймурадов Равшан Раджабович, Тогбоев Комил Темурович Лекарственное растение буквица облиственная // Биология и интегративная медицина. 2019. №2 (30).
36. Нурмухамедова Рохатой Абдишариповна, Кароматов Иномджон Джураевич, & Баймурадов Равшан Раджабович (2017). Мандрагора и медицина. Биология и интегративная медицина, (4), 187-195.
37. Kamalova Shakhnoza Muzaffarovn, Baymuradov Ravshan Radjabovich, Alimova Nigina Pulatovna. (2023). CHARACTERISTICS OF ANTHROPOMETRIC PARAMETERS OF THE UPPER EXTREMITIES IN CHILDREN AND ADOLESCENTS WITH SCOLIOSIS. Open Access Repository, 4(3), 1211–1215. https://doi.org/10.17605/OSF.IO/43CEF

38. Тураева Наргиза Илхомовна, & Баймурадов Равшан Раджабович (2018). Продукт животного происхождения мускус -лечебное средство древней медицины. Биология и интегративная медицина, (1), 395-402.
39. Баймурадов Равшан Раджабович, & Ражабова Дилафруз Муродовна (2017). Перспективное лекарственное растение ятрышник. Биология и интегративная медицина, (11), 161-167.
40. I.F.Yodgorov, & R.R.Baymuradov. (2023). General principles of the structure of testes and epididymis in mammals. Texas Journal of Medical Science, 24, 19–21.
41. Ёдгоров, И. ., & Баймурадов , Р. . (2023). КАЛАМУШ МОЯКЛАРИГА ПОЛИПРАГМАЗИЯ ВА АНОР ДАНАГИ ЁҒИНИНГ ТАЪСИРИ. Инновационные исследования в современном мире: теория и практика, 2(24), 70–72.
42. Baymuradov, R. R. (2023). Radioprotectors and Medicine. Scholastic: Journal of Natural and Medical Education, 2(4), 119-123.
43. Yodgorov, I. F., & Baymuradov, R. R. (2023, September). INFLUENCE OF NSAIDS, DEXAMETHASONE ON THE REPRODUCTIVE ORGANS OF MALE RATS. In International Scientific and Current Research Conferences (pp. 93-96).
44. Radjabovich, B. R., Pulatovna, A. N., & Muzaffarovn, K. S. (2023). THE USE OF RADIOPROTECTORS IN PRACTICAL MEDICINE. Open Access Repository, 4(3), 1195-1198.
45. Opolovnikova, K. S., & Baymuradov, R. R. (2022). Variant Morphology of the Maxillary Sinus Partitions. INTERNATIONAL JOURNAL OF HEALTH SYSTEMS AND MEDICAL SCIENCES, 1(6), 195-202.
46. Баймурадов Равшан Раджабович, Вафоева Шоира Шавкатовна, & Рахматова Дилбар Бахриддиновна (2022). ПЕРСПЕКТИВЫ ПРИМЕНЕНИЯ КУРКУМЫ В ЛЕЧЕНИИ И ПРОФИЛАКТИКЕ ЗАБОЛЕВАНИЙ КОСТЕЙ И СУСТАВОВ. Биология и интегративная медицина, (2 (55)), 153-176.
47. Шамирзаев, Н. Х., Тешаев, Ш. Ж., Норова, М. Б., Ядгарова, Г. С., и Баймурадов, Р. Р. (2018). Сравнительная характеристика морфометрических параметров головы и челюстно-лицевой области у детей с сахарным диабетом. Морфология, 153(3), 313-313. doi: 10.17816/morph.409693
48. Баймурадов Равшан Раджабович, & Вафаева Дилафруз Ортиковна (2018). Illumination of questions of sanitation and hygiene in the Canon of medical science of Avicenna. Биология и интегративная медицина, (3), 227-233.
49. Тешаев, Ш. Ж., Норова, М. Б., Ядгарова, Г. С., Баймурадов, Р. Р., Тухсанова, Н. Э., Хожиев, Д. Я., Тешаев, У. Ш., и Хасанова, Д. А. (2016). МОРФОМЕТРИЧЕСКИЕ ПАРАМЕТРЫ ГОЛОВЫ И ЧЕЛЮСТНО□ЛИЦЕВОЙ ОБЛАСТИ У ДЕТЕЙ С САХАРНЫМ ДИАБЕТОМ И ИХ СООТВЕТСТВИЕ ПРИНЦИПУ ЗОЛОТОЙ ПРОПОРЦИИ. Морфология, 149(3), 204-204а. doi: 10.17816/morph.409294
50. Norova, M. B., Teshaev, S. J., & Baymuradov, R. R. (2014). Anthropometric parameters of the head and maxillofacial part in children with diabetes mellitus and its complience to the principle of the golden ratio. European science review, (9-10), 41-43.
51. Ёдгоров, И. Ф., & Ражабович, Б. (2023). Влияние Аспирина И Парацетамола На Семенники. AMALIY VA TIBBIYOT FANLARI ILMIY JURNALI, 2(5), 381-383.
52. Baymuradov R.R., Khamidova N.K. VASCULARIZATION OF THE TESTES OF WHITE OUTBRED RATS IN POSTNATAL ONTOGENESIS //New Day in Medicine 4(42)2022 24-28

53. Muzafarovna, K. S. (2023). PATHOLOGICAL CHANGES OF THE FOOT IN CHILDREN WITH SCOLIOSIS. *Horizon: Journal of Humanity and Artificial Intelligence*, *2*(4), 148-153.

54. Muzaffarovna, K. S. (2023). Scoliotic Changes in Morphometric Parameters of Children and Adolescents. *Scholastic: Journal of Natural and Medical Education*, *2*(4), 124-128.