

# PATHOMORPHOLOGICAL CHARACTERISTICS OF THE EPIDIDYMIS UNDER IRRADIATION

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**Abstract:** Testicular appendages in chronic radiation sickness after prolonged exposure to ionizing radiation, comparison of the morphometric and morphological characteristics of these organs when biostimulants are used at different intervals and, thus, the development of an optimal algorithm for prevention, diagnosis and treatment are among the priority tasks facing scientists. There are practically few works in the literature that would present detailed dynamic observation data in the period from the moment of development of changes in the epididymis under exposure to irradiation, especially in comparison with the results of pathoanatomical morphological studies.

**Keywords:** macro, microscopy anatomy, epididymis.

## Introduction

According to the World Health Organization, "...infertility is a common disease that affects about 70 million people worldwide..."<sup>1</sup>. Also, 9% of families around the world are struggling with fertility problems, and it is the male factor that is the cause of 50% of the problems. Male infertility has many causes, ranging from genetic mutations to lifestyle choices, the influence of various chemical and physical factors. Among these, ionizing radiation has a special role as it is classified as a Group 1 carcinogen by the International Agency for Research on Cancer and is listed by the International Labor Organization as an occupational carcinogen. Despite this, "... the number of radiation facilities and the number of their employees are also increasing by about 10 and 4% per year, respectively ...". This once again emphasizes that reproductive health and related aspects are not only a medical but also a social problem. All over the world, special attention is paid to research aimed at improving the early detection, treatment and prevention of diseases of the male reproductive system, including the epididymis, caused by various physical factors. In this regard, determine the amount of ionizing radiation, which leads to pathological changes in the male body; development of a system for monitoring the health of workers working with radiation sources; determine the level of risk of infertility and the occurrence and development of tumors in these individuals; study of the mechanisms of action of drugs that reduce the effects of radiation remains a priority of scientific research.

Testicular appendages in chronic radiation sickness after prolonged exposure to ionizing radiation, comparison of the morphometric and morphological characteristics of these organs when biostimulants are used at different intervals and, thus, the development of an optimal algorithm for prevention, diagnosis and treatment are among the priority tasks facing scientists.

In studies on the reproductive system associated with the tissues of the epididymis, there is practically no information about the localization, structural organization and cytological features of the tissue of the epididymis against the background of radiation sickness. In order to reduce the impact of socio-ecological factors on the body, the issue of obtaining biologically active substances for the correction of metabolism and immunity is currently being updated (Zavgorodniy I.V., 2016).

Biogenic stimulants and adaptogens increase the body's overall resistance to physical and emotional stress. A rich spectrum of biologically active compounds (BAS) contained in the raw materials of many plants provides a general healing (organoprotective) effect on the body along with a specific pharmacological effect (Kurkin V.A., 2010). ASD of the second fraction occupies a special place among the existing stimulants of biogenic origin. It stimulates the vital functions of the whole organism, regardless of the

methods of their administration (oral or parenteral) (Samuilenko A.Ya., 2016). The antiseptic effect dominates with local use (Belousova T.A., 2014). The multilateral effect of this drug on the body is to accelerate metabolism and redox processes, reduce blood acidity, normalize the activity of the cardiovascular and respiratory systems by improving metabolic cycles (Kiriyutkin G., 2010). The study of the available literature data revealed a lack of information about the effect of the ASD preparation on the reproductive system, namely on the function of the epididymis (Narizhny A.G., 2012).

**The purpose of the study:** to identify age-related changes in the epididymis in radiation sickness and under the influence of a biostimulator.

**Objectives of the study:** to study the anatomical parameters of the appendages of the testes of white outbred rats in the age aspect and compare with the parameters of physical development in chronic radiation sickness and when exposed to ASD against the background of chronic radiation sickness;

to study the microscopic structure of the testes of white outbred rats in different age periods, paying attention to changes in the mediastinum in the process and the presence of interlobular septa in chronic radiation sickness and when exposed to ASD against the background of chronic radiation sickness;

to determine the morphometric parameters of the spermatogenic epithelium, the diameter of the convoluted seminiferous tubules, the cross-sectional area and the index of spermatogenesis in the experiment, depending on age;

to compare the morphological and morphometric parameters of the epididymis of white outbred rats in different age groups with chronic radiation sickness and with exposure to ASD against the background of chronic radiation sickness.

The object of the study were 210 white outbred male rats of 3 days and 3, 6, 9, 12 months of age, which were divided into 4 groups: control, with chronic radiation sickness, white outbred rats, who took the ASD-2F biostimulator in parallel with irradiation and who took the ASD-2F biostimulator after irradiation. The subject of the study was the histological material obtained from various parts of the epididymis of the experimental white outbred rats.

Research methods. To solve the set tasks and achieve the goal, experimental, histological, microscopic, morphometric, morphological and statistical research methods were used.

An experimental study was carried out on material taken from the testes of 210 white non-linear rats from birth to 12 months of age, which were kept in a vivarium under a 12-hour light regimen, with a standard diet and free access to water. At the beginning of the experiment, all sexually mature rats were quarantined for a week, and after exclusion of somatic or infectious diseases, they were transferred to the usual vivarium mode. Animals were divided into 4 groups (n=210): Group I - (intact) control (n=69); II - group - rats that received radiation for 20 days from 71 days of age at a dose of 0.2 Gy (total dose was 4.0 Gy) (n=55); III - group - rats that received irradiation for 20 days from 71 days of age at a dose of 0.2 Gy (total dose was 4.0 Gy) and simultaneously received the drug ASD - 2 during irradiation at a dose of 0.1 ml of pure ASD - 2 dissolved in 0.4 ml distilled water (n=54); IV - group - rats that received radiation for 20 days from 71 days of age at a dose of 0.2 Gy (total dose was 4.0 Gy) and from 91 days of age for 20 days received the drug ASD - 2 at a dose of 0, 1 ml of pure ASD - 2 dissolved in 0.4 ml of distilled water (n=32).

Quantitative indicators were assessed for compliance with the normal distribution, for this, the Shapiro-Wilk test (with the number of subjects less than 50) or the Kolmogorov-Smirnov criterion (with the number of subjects more than 50), as well as indicators of asymmetry and kurtosis, were used. In the case of describing quantitative indicators with a normal distribution, the obtained data were combined into variational series, in which the calculation of arithmetic means (M), standard deviations ( $\sigma$ ) and standard error (m), boundaries of the 95% confidence interval (95% CI) was carried out.

## Conclusions

1. Irradiation, negatively affecting the morphological structures of the testes, leads to a lag in all

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parameters, including the thickness of the albuginea, spermatogenic epithelium. The lag is more pronounced in white outbred rats of 180 days of age and less pronounced in 360 days. This is due to the activation of the protective and compensatory mechanisms of the body, which are more pronounced in groups taking ASD-2 f.

2. In chronic radiation sickness, puberty is delayed. This is manifested by violations of the stages of spermatogenesis, changes in the cells of the spermatogenic series and late release of the lumen of the convoluted seminiferous tubules.

3. At sexually mature age (90 days) in white outbred rats of the control group, quantitative changes in Leydig cells are observed, characterized by a sharp numerical increase of 11.2 times, and in adulthood (360 days) this indicator increases by 1.4 times in relation to mature period. In all experimental groups in adulthood, the number of Leydig cells, as well as their diameter, is less than in the control. But the correction with a biostimulator brought these indicators closer to the control values.

4. Chronic radiation sickness adversely affects the vascular system of the testes and the convoluted seminiferous tubules, where the diameter of arterioles and venules, as well as the diameter of the convoluted seminiferous tubules, decreases more when exposed to radiation than when exposed to ASD-2 f. and compared with the control group.

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