

UDC: 616.688: 537. 531:615.37

Sharapova E.N.*Dnipropetrovsk State Medical Academy, Department of Urology, Operative Surgery and Topographic Anatomy, Dnipropetrovsk, esharapova@ukr.net***MORPHOLOGICAL AND FUNCTIONAL CHANGES OF RATS TESTES AFTER THE ACTION OF ELECTROMAGNETIC FIELDS OF HIGH VOLTAGE WITH LOW FREQUENCY**

Abstract. *In this article the author established the structural and functional changes in rats testes irradiated by an electromagnetic field with high voltage and low frequency. It is determined that the electromagnetic field causes an increase in specific volume of convoluted seminiferous tubules and a reduction in stromal components of testicular tissue of animals. Also, an analysis of the processes occurring in the testis of irradiated animals, the mechanism of the immune response of the testis to the action of damaging factor was conducted. The source of immune complexes in autoimmune processes in the testis, their distribution and the response of testicular tissue to their appearance was traced. The author proved the influence of immune complexes on the testicular tissue, where they have an effect on autoimmune processes.*

Key words: *testis, convoluted seminiferous tubule, electromagnetic field, immunity.*

Introduction. Individual variability and the complexity of the human organism in the conditions of aggressive external environment directly depends on the influence of harmful factors. One of them is electromagnetic field. The development of industry in Ukraine is of interest of both native and foreign researchers in order to prevent the damage of industrial electromagnetic fields on the body of people who work on the manufacture. At home, sharing household devices that emit electromagnetic waves, also have a negative impact on the human body. In particular the most vulnerable organs in humans body are cardiovascular system, neural, visual and reproductive system. One of the most significant factors of the impact of the electromagnetic field is the state of genetic apparatus and of the regenerative function and the effect of long-term factor may be manifested in subsequent generations. Clinical and experimental studies show the development of effects of electromagnetic fields – embryotoxic, gonadotoxic and teratogenic effects. Despite the differences of researches results about the influence of electromagnetic field, it can be assumed that the electromagnetic field is a bioactive factor which negatively affects the reproductive function, embryogenesis, and heredity of living organisms.

Objective: to definition of morpho-functional changes of rats testes after their exposure to electromagnetic field voltage of 750 kV and frequency 50 Hz.

Materials and methods. The study was conducted on the gonads of 30 Mature male albino rats of Wistar population. Control group of rats was in the basement of morphological building under concrete slabs. Experimental animals were exposed by power lines, radiating electromagnetic field, a voltage of 750 kV and frequency 50 Hz five days a week for 30 minutes each day. The control group consisted of 6 rats. The animals underwent euthanasia at 14, 30 and 45 days from the beginning of the experiment by overdose of ether anesthesia. Histological sections of testes were stained with hematoxylin and eosin. The specific content of convoluted seminiferous tubules and stromal component of testicular tissue with the subsequent statistical processing of the results was calculated.

Results and discussion. It is known that the wall of convoluted seminiferous tubule in the norm consists of 3 layers: the basal, muscular and fibrous. It is lined with spermatogenic epithelium inside and consists of 2 cell types - support (sustantivites and spermatogenic with varying degrees of maturity (spermatogonia, spermatocytes I, II, spermatids). Sustantivity form a microenvironment for the development of maturing sex cells, isolate their toxins and antigens, synthesize biologically active substances, which regulate the process of spermatogenesis, and phagocytose defective sex cells.

On the 14th day after irradiation by an electromagnetic field in the seminiferous tubules of the testes of animals the disruption and destruction of seminiferous epithelium,

swelling of the membranes of convoluted and straight tubules, its deformation was detected. We have calculated the relative amount of convoluted seminiferous tubules of testes and it decreased to $79,11 \pm 3,66\%$, and the proportion of stromal component increased to $20,89 \pm 1,15\%$ ($p < 0.05$). The number of tubules with spermatozoon decreased, tubules devastated. At 30 days after exposure to electromagnetic field it was observed a further decrease in the volume fraction of the seminiferous tubules to $76,65 \pm 2,36\%$ and increasing of the relative amount of stromal component to $23,35 \pm 1,51\%$ ($p < 0.05$). The number of tubules with spermatozoon decreased to $52,5 \pm 2,5\%$ ($p > 0.05$). The processes of destruction in elements of hepatolenticular barrier and spermatogenic epithelium of the testes took place. At the 45th day after irradiation the animals to the electromagnetic field an extensive area of sclerosis in the testes was observed. Desquamation of seminiferous epithelium, vacuolization and lysis of the cytoplasm of spermatozoon was determined. The increasing of the number of fibrous structures in the adventitia shell of the efferent tubules of the testis was defined. Vacuolization of the cytoplasm of the epithelium of the efferent tubules of the testis was observed. The relative volume of seminiferous tubules decreased to $76,21 \pm 1,15\%$ and the volume fraction of stroma increased to $23,79 \pm 2,05\%$ ($p < 0.05$). The relative volume of tubules with spermatozoon was $40,3 \pm 2,2\%$ ($p < 0.05$).

Conclusion. During the experiment, after irradiation of the electromagnetic field with high voltage and low frequency the number of convoluted seminiferous tubules of testicular tissue decreased by 3.7% ($p < 0.05$). Atrophy and degeneration of germinal epithelium, respectively, increasing of proportion of stromal component was determined. Fragments of the destroyed cells of seminiferous epithelium and sustentocytes got into the bloodstream and become autoantigens, the appearance of which the body reacted to the activation of cellular and humoral immunity. Part of the antigens fall into the thymus, where they increased the proliferation of T-lymphocytes, which were sent to the paracortical area of lymph nodes and periarterial zone of lymph follicles of the spleen. In these areas there are specialized macrophages - Interdigitated cells, capable of translating corpuscular antigen in the molecular

form and fix on the surface complexes of the antibody+antigen. With the accumulation the molecular form of antigen was antigen-dependent propagation of T lymphocytes in these areas, which have gained the specialization to this type of antigen - fragments of seminiferous epithelium. Next, T-lymphocytes, with a sensitivity of spermatogenic epithelium layer, through hepatolenticular barrier got in the spermatogenic epithelium layer and intensified destructive processes in cells through enhancing the phagocytosis of spermatogenic epithelium. The result was a growing number of autoantigens, which led to a further increase in the number of T-lymphocytes. Under the action of antigens and T-helper cells were stimulated by the formation of plasma cells and the synthesis of autoantibodies. In many cases, the process included both cellular and humoral immunity, leading to autosensibilization of seminal gland tissue and enhance the autoimmune process in the testicle. Autoimmune reactions increased degenerative processes in the testes of irradiated rats.

Prospects of further research. In further studies it is planned to determine the degree of damage of seminiferous epithelium of rat testes of immature, mature and senile age, irradiated by electromagnetic field.

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