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MICROWAVE RADIATION AND MALE REPRODUCTIVE FUNCTION

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ABSTRACT — The purpose of the paper is to study the effects of low intensity microwave radiation on morphofunctional state of testes in white rats. The intensification of lipid peroxidation was determined in testicular tissue, which correlated with worsening of morphofunctional state of epididymal spermatozoa. The leading disorders were broken and lost tails of spermatozoa. Therefore, microwave radiation of low intensity does not affect steroidogenesis considerably while it causes morphofunctional changes of spermatozoa.

KEYWORDS — microwave radiation, lipoperoxidation, spermatozoa.

Electromagnetic waves come in a very wide range of wavelengths: there are radio, mi-crowave, infrared (heat), visible light, ultraviolet, X-ray, and γ-ray waves. All are used in medicine in one way or another. Microwave radiation is used in certain kinds of heat treatment, where the heat is generated in the target tissue (as in a microwave oven) [1, 2]. At the same time there is little information about the influence of microwave radiation on functional state of reproductive system. In this regard, we investigated how low intensity microwave radiation affect morphofunctional state of testes in white rats as well as some biochemical indexes of different units of reproductive system in animals.

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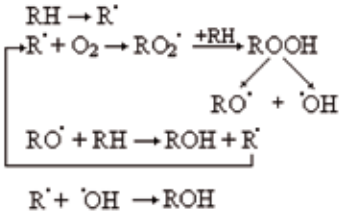
METHODS

White male rats of 215–240 g were subjected by microwave radiation with frequency of 42 GHz during 30 days for 30 min. daily. At the end of the experimental effects, the animals were decapitated under ether anesthesia in compliance with the Geneva Convention (1985). The level of lipoperoxidation in testicular and hypothalamic tissues was determined [3]. Testosterone and luteinizing hormone levels in blood plasma were measured by enzyme immunoassay method. Morphofunctional state of epididymal spermatozoa and testicular tissue were studied. All the data obtained during the study were statistically processed using Student's criterion, the differences were considered significant at $p < 0.05$.

RESULTS

Under conditions of low intensity microwave radiation, peroxide haemolysis of erythrocytes has been found to increase that testifies to oxidative stress development. Unsaturated phospholipids RH are oxidized to produce hydroperoxides ROOH which, in their turn, brake down to give rise to different oxygen-containing derivatives ROH and reactive oxygen species (ROS). Thus, oxidative stress development may be represented in the following way:



The hormone levels of testosterone and lutropin have been found not to differ trust-worthily from that of the control indexes. The relative weights of gonads and pituitary under experimental conditions were compared with the control group. The intensification of free radical oxidation processes was determined in testicular tissue, which correlated with the worsening of morphofunctional state of epididymal spermatozoa. The leading disorders were broken and lost tails of spermatozoa. Under the influence of microwave radiation, an increase in total number of Leydig's cells took place, which is likely to be a compensatory reaction of testes and may be connected with the resonance effect conditioned by microwave radiation.

CONCLUSIONS

Therefore, low intensity microwave radiation does not affect steroido-genesis considerably while it causes morphofunctional changes of spermatozoa.

REFERENCES

1. **Agarwal, A., Cocuzza, M., Abdelrazik, H.** (2008). Oxidative stress measurement in pa-tients with male or female factor infertility. In I. Popov, G. Lewin (Eds.), Handbook of Chemiluminescent Methods in Oxidative Stress Assessment (195–218). Transworld Research Network.
2. **Loginov, P. V., Teply, D. L.** (2014). Morphofunc-tional state of reproductive system in male rats under conditions of immobilization stress. Natural Sciences, 4(49), 47–54.
3. **Stalnaya, I. D., Garishvili, T. G.** (1977). The method of determining the malonic dialdehyde using thiobarbituric acid. In V. N. Orekhovich (Ed.), Mod-ern methods in biochemis-try (66–68). Meditsina Publ.