

ASSESSMENT OF BEHAVIOR AND BIOCHEMICAL PARAMETERS OF BLOOD IN EXPERIMENTAL ANIMALS UNDER CONDITIONS OF A TECHNOGENIC ROTATING ELECTRIC FIELD

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Abstract: in the modern world, every person is daily exposed to constant exposure to electromagnetic fields (EMF), which are generated by various electrical devices. At present, the intensive use of electrical energy in everyday life causes a manifold increase in the effect of the Earth's electromagnetic background. Objective. To assess the influence of a technogenic rotating electric field on behavioral reactions and blood biochemical parameters in experimental animals. Methodology. The experiments were carried out on 11 white outbred male rats, which were preliminarily divided into two groups: 8 experimental rats, the rest control. Experienced were divided into 2 groups of 4 rats in each, which were in the conditions of VEP with different durations in time: 1.5 and 2 hours, respectively. The experiments were carried out daily for 10 days. Thus, the conducted experimental study to study the effect of a technogenic rotating electric field on experimental animals, revealed changes in behavioral reactions, namely, a decrease in motor activity and vegetative manifestations. At the same time, in the blood plasma and internal organs (liver, kidneys, heart), a decrease in total protein was observed, which indicates an increase in catabolism processes and an increase in TBA of active products, reflecting an increase in lipid peroxidation processes.

Keywords: rotating electric field, stress, corticosteroids, lipid peroxidation.

ОЦЕНКА ПОВЕДЕНИЯ И БИОХИМИЧЕСКИХ ПОКАЗАТЕЛЕЙ КРОВИ ЭКСПЕРИМЕНТАЛЬНЫХ ЖИВОТНЫХ В УСЛОВИЯХ ТЕХНОГЕННОГО ВРАЩАЮЩЕГОСЯ ЭЛЕКТРИЧЕСКОГО ПОЛЯ Набиев Б.Б.¹, Худойбердиев Д.К.², Наврузов Р.Р.³

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Аннотация: в современном мире каждый человек ежедневно подвергается постоянному воздействию электромагнитных полей (ЭМП), которые генерируются различными электрическими устройствами. В настоящее время интенсивное использование электрической энергии в повседневной жизни многократно усиливает влияние электромагнитного фона Земли. Задача. Оценить влияние техногенного вращающегося электрического поля на поведенческие реакции и биохимические показатели крови экспериментальных животных. Методология. Эксперименты проведены на 11 белых беспородных крысах-самцах, которые предварительно были разделены на две группы: 8 опытных крыс, остальные - контроль. Опытные были разделены на 2 группы по 4 крысы в каждой, которые находились в условиях ЗВП с разной продолжительностью по времени: 1,5 и 2 часа соответственно. Эксперименты проводились ежедневно в течение 10 дней. Таким образом, проведенное экспериментальное исследование воздействия техногенного вращающегося электрического поля на экспериментальных животных выявило изменение поведенческих реакций, а именно снижение двигательной активности и вегетативных проявлений. При этом в плазме крови и внутренних органах (печень, почки, сердце) наблюдалось снижение общего белка, что свидетельствует об усилении процессов катаболизма и повышении ОЧТ активных продуктов, отражая усиление процессов перекисного окисления липидов.

Ключевые слова: вращающееся электрическое поле, стресс, кортикостероиды, перекисное окисление липидов.

Introduction. In the modern world, every person is daily exposed to constant exposure to electromagnetic fields (EMF), which are generated by various electrical devices [3-12]. At present, the intensive use of electrical energy in everyday life causes a manifold increase in the effect of the Earth's electromagnetic background [14-17]. In rooms not protected by a screen, a rotating electric field (VEP) and a rotating magnetic field (VMP) [18-24], emitted by sources of three-phase networks, can account for up to 80% of all EMF [1, 2, 13]. People living in such rooms adjacent to these sources are exposed to high levels of magnetic induction around the clock.

Objective. To assess the influence of a technogenic rotating electric field on behavioral reactions and blood biochemical parameters in experimental animals.

Methodology. The experiments were carried out on 11 white outbred male rats, which were preliminarily divided into two groups: 8 experimental rats, the rest control. Experienced were divided into 2 groups of 4 rats in each, which were in the conditions of VEP with different durations in time: 1.5 and 2 hours, respectively. The experiments were carried out daily for 10 days.

The animals were kept under standard vivarium conditions. The protocol of the experiment, keeping animals and removing them from the experiment was carried out in accordance with the principles of bioethics set forth in the "International Recommendations for the conduct of biomedical research using animals" (1985). The animals of the control group were placed in this unit, but were not exposed to VEP. At the end of the experiment, blood was taken from all animals to determine the level of adrenal hormones in blood plasma - 11-oxy corticosteroids (11-OCS) by fluorescence in a sulfuric-alcoholic solution [1]. The content of total protein and TBA (thiobarbituric acid) of active products was determined in blood, liver, kidneys and heart [2, 15].

Before and after the end of the experiments, in order to determine the effect of VEP on the behavior of experimental animals, testing was carried out according to the "open field" method for 5 minutes and the following indicators were determined: horizontal and vertical motor activity, latent period of the first movement, latent period of exit to the center, the number of crossed squares, number of racks, total grooming time and vegetative values (number of boluses).

Video recording and assessment of the behavior of experimental animals was carried out using the "Rattest" software package [3, 18, 23].

Results and its discussion. In our studies, the rotating electric field caused a change in the concentration of stress hormones in the blood plasma of both experimental groups. In the first experimental group (exposure to VEP for 1.5 hours), the level of 11-ACS increased by 25%, in the second experimental group (exposure to VEP for 2 hours) it increased by 30% compared to the control group. At the same time, an inverse dependence of the total protein content in the blood on the time spent by experimental animals in the conditions of VEP was revealed. The most pronounced decrease in total protein was observed in rats of the 2nd experimental group by 27% compared to the control. Scientific studies [4, 13, 21] have shown that stressful influences lead to an increase in catabolic processes, including by reducing the concentration of total protein in the blood plasma. It is known that thiobarbituric acid (TBA) is widely used as a reagent for the determination of lipid peroxidation products.

Lipid peroxidation (LPO) is the oxidative degradation of lipids, which occurs mainly under the influence of free radicals. The accumulation of TBA-active products in the blood and tissues of internal organs is one of the indicators of a violation of the redox balance.

In our experiment, under the influence of VEP, a change in the amount of TBA-active products was observed, which was most pronounced in the 2nd experimental group of animals. So, in blood plasma by 60%, 208% in the liver, 144% in the kidneys and 40% in the heart compared with the control.

Evaluating the behavioral reactions of experimental animals of both experimental groups, it was noted that the EEP has the greatest effect on the motor component (the number of crossed squares) and on the vegetative (grooming), a decrease by 30% and an increase by 226%, respectively, compared with the initial indicators of the same animals.

Conclusions. Thus, the conducted experimental study to study the effect of a technogenic rotating electric field on experimental animals, revealed changes in behavioral reactions, namely, a decrease in motor activity and vegetative manifestations. At the same time, in the blood plasma and internal organs (liver, kidneys, heart), a decrease in total protein was observed, which indicates an increase in catabolism processes and an increase in TBA of active products, reflecting an increase in lipid peroxidation processes. In parallel with this, the content of 11 - OCS (stress hormones) in the blood plasma increased. The data obtained give grounds to consider the influence of a rotating electric field as a stressful effect.

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