

INFLUENCE OF MODERATE ELECTROMAGNETIC SHIELDING ON INTERMALE RATS AGGRESSION IN RESIDENT-INTRUDER TEST

*Chajka A. V.¹, Sheikhametova N. N.^{1,2}, Nikitina Yu. O.¹, Rakhlev A. A.^{1,3},
Khusainov D. R.¹, Tumanyants K. N.¹*

¹*V. I. Vernadsky Crimean Federal University, Simferopol, Russian Federation*

²*Dzhankoy central district hospital, Dzhankoy, Crimea, Russia*

³*Feodosiya Medical Center, children's hospital with a children's polyclinic, Feodosiya, Crimea, Russia*

E-mail: andrew.chajka@yandex.ru

Aggression is an effective instrument of competition for food, territory, and exclusive rights to mating, and it serves to protect offspring from other animals. Intraspecific aggression is a universal form of behavior that occurs in animals at various stages of the evolutionary ladder, from insects to primates. Sociobiology considers aggression as a positive phenomenon in the life of an individual and in evolution. At the same time, the aggression between two individuals of the same species entails certain risks for these animals, especially when this behavior is abnormal or pathological. In the world, billions of people are subjected to violence, while aggressive behavior is not limited to murder. A wide range of criminal activities, such as rape, street fights, domestic violence, kidnapping, cruelty to animals etc., can be attributed to this area. In the light of these data, the study of intraspecific aggression and methods of eliminating its pathological forms becomes especially important. Despite a lot of experiments, we are still far from a complete understanding of the neurobiological mechanisms of intermale aggression. A prerequisite for understanding the initiation, execution and cessation of the act of aggression is a detailed account of each distinctly pronounced behavioral element in the course of manifestations of intraspecific aggression.

The geomagnetic field (GMF) is part of the environment in which life has evolved, so heliogeophysical factors are of great importance for the spatial and temporal organization of biosystems at all levels, including humans. Magnetobiology has gathered a huge evidence base that even normal fluctuations of GMFs have a significant impact on terrestrial life. In normal comfortable conditions, harmonic relationships are established between the body and the environment. When they are violated, various deviations in the functions of the organism can occur in the form of illness, reducing the speed of mental, sensory and motor reactions.

Nevertheless, the mechanisms of the influence of the hypogeomagnetic fields on biological objects are still not entirely clear, although they have been studied for about half a century. In addition, systematic studies on the effects of continuous (during weeks and months) constant exposure of experimental animals on electromagnetic shielding (EMS), as well as studies of the mechanisms of the effect of this factor, are presented by single studies. At the same time, such work is necessary to create measures to adapt organism to hypogeomagnetic conditions, as well as to normalize the environment of human living. Accordingly, the purpose of this study is to determine the effect of 21-day moderate EMS exposure on intermale aggression in rats.

Studies were carried out on 19 white outbred male rats weighing 260–290 g. After the background level of intermale aggression was registered, animals were divided into two groups: "control" (n = 10) and "EMS" (n = 9). Then, the EMS group underwent a 21-day moderate shielding, every day for 24 hours, except for the cases when the cages were cleaned (once a week in order to avoid additional stress and to form pronounced odor labels of the home cage) for 30 minutes outside zone of action of a EMS. The control group was kept in standard vivarium conditions. On the 21st day, the behavior of the animals was re-registered. The behavior of the rats was evaluated in the classic "resident-intruder" test: during 5 minutes, two animals were monitored – an animal from the "control" or "EMS" group (resident) in his home cage with a male intruder, who was placed from the outside. For each resident, a new intruder was chosen (n = 19), which, as expected by the method, should be smaller than resident, in our case – males weighing 180-220 g. The following behavioral patterns were recorded:

1) Investigation of the opponent – sniffing the body and the genitals of the enemy. Despite the fact that these behavioral acts are traditionally attributed to a non-aggressive type of behavior, we noted that sniffing often has an element of aggressive coercion – the animal can lean its forepaws on its back, and/or press on/rest on the head of another rat for more convenience in investigation. Accordingly, this behavior was singled out as a separate group of "aggressive investigation".

2) Allogrooming - grooming one individual another, often in the neck and back.

3) Vertical posture ("boxing") – the rat stands on its hind legs in response to an approach or vertical pose of the opponent. They can cling to each other's front paws.

4) Suppression and submission: the dominant rat occupies a vertical position and does not allow the enemy to rise from the floor, which often lies on his back. The dominant can be pressed to the opponent's floor, and also bite on it.

For each of these behavioral elements, except for allogrooming, a latent period was recorded. As the main criterion of aggressiveness, a latent period of the emergence of the

boxing was adopted. In the event that a certain type of behavior is absent, the number of behavioral interactions is taken as zero, and the latent period is recorded by the maximum test time of 300 s.

The weakening of the background EMS was achieved by using a shielding camera with a size of 2x3x2 m, made of double-layered iron "Dynamo". The shielding coefficient B_{DC} , measured with a flux gage magnetometer, is 4.4 for the vertical component, and 20 for the horizontal component. The shielding coefficient of the camera at frequencies 50 and 150 Hz is of the order of three. In the frequency range from 150 Hz to 100 kHz, weak shielding occurs, whereas at frequencies above 1 MHz there was a complete shielding.

It has been established that a 21-day moderate EMS mildly increase aggression in outbred male rats in the "resident-intruder" paradigm, which is manifested in increase number of boxing postures on 311 %.

Keywords: intermale aggression, resident-intruder, electromagnetic shielding, rats.

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