შესახებ ქალის რეპროდუქციულ ჯანმრთელობაზე. ცნობილია, რომ კორონავირუსის წინა აფეთქებები ხასიათდებოდა მძიმე მწვავე რესპირაციული სინდრომით - Severe Acute Respiratory Syndrome (SARS, 2002-2003 წწ.) და მწვავე რესპირაციული სინდრომით ახლო აღმოსავლეთში - Middle East Respiratory Syndrome (MERS, 2012 წ.). მონაცემები, საერთო პოპულაციასთან შედარებით, ორსულების მეტი მიმღებლობის შესახებ COVID-19-ის მიმართ დღემდე არ არსებობს.

სტატიაში წარმოდგენილია სამეცნიერო ლიტერატურის ანალიზი რესპირაციული ვირუსების კლასიფიკაციის, მათი გადაცემის გზების, გავრცელების ხელშემწყობი ფაქტორების, კლინიკური სიმპტომების და COVID-19-ის ლაბორატორიული დიაგნოსტიკის შესახებ. განხილულია ექიმის მოქმედების ალგორითმი პაციენტების კვლევის, ორსულობის მიმდინარეობაზე ვირუსის გავლენის და პანდემიის პირობებში ახალშობილების მართვის ტაქტიკის თვალსაზრისით, ასევე, სამედიცინო დაწესებულებაში ვირუსის გავრცელების საწინააღმდეგო ღონისძიებები.

IMPACT OF HOUSEHOLD MICROWAVE OVEN NON-IONIZING RADIATION ON BLOOD PLASMA CORTISOL LEVELS IN RATS AND THEIR BEHAVIOR

Dondoladze Kh., Nikolaishvili M., Museliani T., Jikia G., Zurabashvili D.

I. Beritasvhili Center of Experimental Biomedicine, Department of Radiobiology;
Iv. Javakhishvili Tbilisi State University, Medical Department, Tbilisi, Georgia

At present it is scientifically proven that microwave radiation enjoy a negative influence on living organism. High levels of microwaves cause a painful burn, changes rhythms energy and dynamics of cerebral electroactivity [2], damages eyes and the testes [5].

Most vulnerable to microwave radiation is brain, especially hippocampus [13]. Microwave radiation, as well as other electromagnetic radiation, causes various mechanism oxidative stress in the cells, in particular, in its action the formation of free oxygen radicals occurs, which leads to the acceleration of the processes of neuronal degeneration, peroxidation of the cell lipid membrane, apoptosis.

Reactive oxygen species (ROS), which are formed when exposed to microwave radiation act with the reactive nitrogen species (RNS) causing nitrosative stress and as a result of cell damage.

in medical literature is known that the 24 hour action of 900 MHz 2W/kg radiation caused the neuronal apoptosis through mitochondrial pathway activation in rat [9].

Mitochondrial injury of Brain tissue cells occurs much earlier than in the cells of other organs [10]. Respectively, the microwave radiation affects these parts of the brain and changes behavior. For example: after irradiation of pregnant rats with microwaves, in their offspring were observed anxiety-related behaviors [24].

In addition to the direct action of the organism, microwave radiation changes the chemical composition of food [11].

Material and methods. To find out what danger microwave radiation can cause, which escape from household microwave oven and how it affects the body, namely the nervous system, which is very sensitive to it, we decided to study the effect of microwave radiation on the body weight, the levels of stress hormones such as cortisol and behavior: the emotion and the locomotor activity.

Animals*:* for research we have selected 20 weeks Wistar line 20 rats (male and female). Animals was divided into two groups: 10-10 rats in each. One group were placed in the cage near (in 0.5 cm distance) microwave oven (microwave radiation exposure group). Second group were placed in identical condition (same lighting and nutrition), but in another room (Control group of rats).

Before beginning of experiment, both groups of rats were weighed by the scales with ± 0.1 g accuracy. Their weight was 364±3,175 gr.

Generation of microwave radiation: for microwave generation we used LG microwave oven, from which 727,24±84,55 Mw/m² Power Density Microwave radiation is escaped (when the oven is turned on and the door of oven is closed). Escaped radiation we measured with a special tool - Cornet microsystem, elecrtosmog meter.

Research design: microwave radiation exposure group of rats were placed in plexi cage on the next side of the microwave oven door. Twice a day, at 10:00 and 18:00, we switched the oven in 'micro' mode for 3-3 minutes. In microwave oven we placed vessels with water. The study was conducted for 10 days.

To study the influence of microwave radiation on body weight, on the 11th day we measured the weight of both group of rats: in microwave radiation exposure group and in control group of rats.

To study the stress level caused by microwave radiation we have measured the concentration of cortisol in plasma. Blood was obtained from the lateral tail vein of rats. Cortisol has been measured using enzyme-linked immunosorbent assay (ELISA).

To study the influence of microwave radiation on emotion state and locomotor activity, we conducted an open field test. The open field maze was developed as a test to assess of the animal›s (rodents) motion and emotional activity: general locomotor activity levels, anxiety, and willingness. Open field is round arena, whose diameter is 120 cm, the field is marked with a 42 grid and square crossings. The open field is illuminated with 1 m height of 200 watts. The duration of each session in the open field was 180 seconds, and the results were transferred to the electric computing machine, with a special program. A video camera recorded following parameters: total distance traveled, the distance passed, the movement duration, average speed, line

crossings, center square entries and time spend in it – for assessment locomotor activity, and number of vertical upright positions, rearing – for an exploratory behavior and anxiety assesments. For hyperactivity assessment the number of crossings and rearings behaviors are counted. To measure an animal emotional activity, number of fecal boli deposits or defecation and to discussed the stereotypical activity – number of grooming was counted.

After completing the survey we analyzed the data obtained.

For statistical analysis of obtained data from sham control and microwave radiation exposure groups, we used Single Variable Data Analysis (one-way ANOVA). The results are presented (mean+/-standard error (SE), in statistical significance of evidence p<0.05. In case of nonsignificant effect, through t-test, we have identified the possible differences between the groups. Program used: Prism - GraphPad.

Living conditions of animals for the experimental research were agreed by Beritashvili Center for Experimental Biomedicine committee. The principles of ethical treatment of animals were protected in accordance with the legislation of Georgia and international treaties.

Results and discussion. *Weight changes induced by microwave radiation exposure.*

In order to study the influence of microwave radiation on weight, on the 11th day we weighed both groups of rats. The microwave radiation exposure group rats weight gain was more than the control group rats 26,7±2,22 and 18,55±3,6 gr, respectively n=20 (p<0,05, Fig. 1).

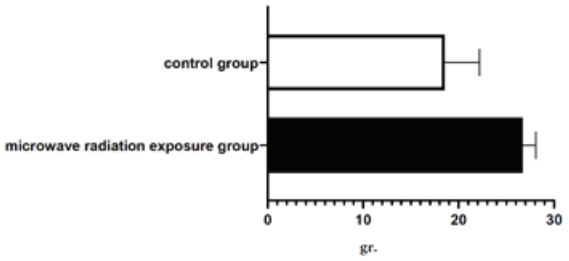

Fig. 1. The weigh changes after 10 day in microwave radiation exposure and in control group rats. The results showed that after 10 days of microwave radiation exposure, body weight gain increase more in microwave radiation exposure group of rats, p<0,0001

Plasma cortisol level changes induced by microwave radiation exposure. The plasma cortisol level was increased in microwave radiation exposure group rats, than in control group rats 0,32±0,08 and 0,64±0,12 ng/ml respectively n=20, p<0,05 (Fig. 2).

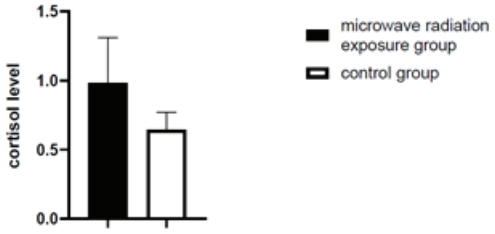

Fig. 2. The cortisol level changes after 10 day in microwave radiation exposure and in control group rats. n=20. p<0,05; Plasma cortisol level by ELISA revealed an increase Concentration after 10 days of 727,24±84,55 Mw/m² Power Density Microwave radiation exposure

Locomotor activity after microwave radiation exposure. As for the open field test, the test records seemed that locomotor activity was more frequently observed in microwave radiation exposure group rats, namely: line crossings, center square entries and time spend in it, total distance moved. Immediately after being placed in the arena the microwave radiation exposure group rats began to move in arena, freely crossing the lines, entering the center after a few seconds (Fig. 3).

In microwave radiation exposure and in control group rats total distance traveled was 1366,2±362,9 and 1050,4±259,6 cm (p<0,05), line crossings number: 104,1±14,82 and 84,40±15,89 (p<0,05) consequently. In central square of open field arena microwave radiation exposure group rats spends more time than control group rats (5,2±1,93 and 1,6±0,94, consequently).

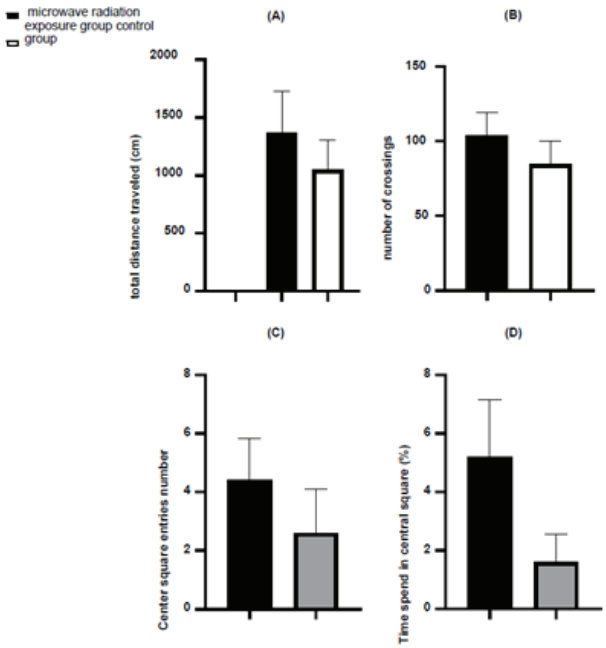

Fig. 3. The locomotor activity in microwave radiation exposure and in control group rats. The open field test results; Task performance duration: 180 Sec.; n=10. Microwave radiation exposure group rats exhibit hyperactivity according the results. (A) The total distance traveled p<0,0382 (B) Line crossings number; p<0·05 (C) Center square entries number; p<0,05 (D) Time spend in central square, (%=duration of time the rat spent in the central square is divided on total test time/100 (180 sec); p<0,0001; n=20

Exploratory behavior and stereotypical activity after microwave radiation. For hyperactivity assesment the number of crossings and rearings behaviors are counted.

In open field test the microwave radiation exposure group rats have slightly more grooming cycles (6,70±1,52 in microwave radiation group and 3,65±1,69 in control group rats, p<0,05) and rearing (8,60±2,64 in microwave radiation group and 5,85±2,25 in control group rats, p<0,05) number than in control group rats, which means an exploratory behavior and stereotypical activity increasing after microwave radiation; Stretch attend postures number was higher than in control group rats 20,85±6,15 and 14,60±1,66, consequently (p<0,05, Fig. 4).

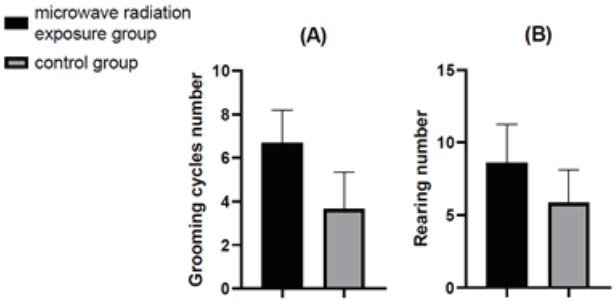

Fig. 4. The exploratory behavior and stereotypical activity in microwave radiation exposure and in control group rats. The open field test results; Task performance duration: 180 sec. n=20. (A) Grooming cycles number in microwave radiation exposure and in control group rats. P<0,0001; (B) rearing number. P<0,0011

Emotionality after microwave radiation. In order to study how microwave radiation affects emotionality, we calculate the number of bolus and urination during open field test. In our results, the microwave radiation exposure group rats have less fecal boli and urination, than in control group rats during test (p>0,05), which indicates a less emotionality of microwave radiation exposure group rats (Fig. 5).

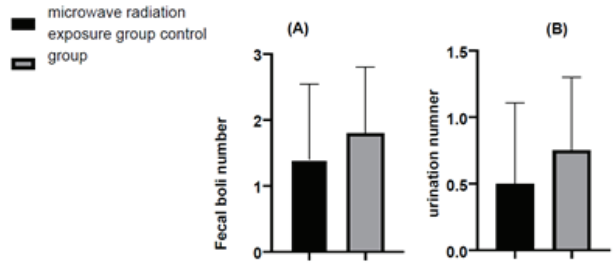

Fig. 5. Emotionality in microwave radiation exposure and in control group rats. The open field test results; Task performance duration: 3 minutes; n=20. (A) Fecal boli number in microwave radiation exposure and in control group rats. (B) urination in microwave radiation exposure and in control group rats

In scope of this research, we studied changes in three parameters caused by microwave radiation: weight, cortisol and behavior.

As seen from the research results, the concentration of plasma cortisol significantly increase in the microwave radiation exposure group of rats than in the control-group of animals. This change can be explained by microwave radiation`s directly or indirectly acting on animal`s brain, hypothalamus and hippocampus.

Microwave radiation is non-ionizing radiation, which means that its energy can make the atoms move (vibrate) without emitting electrons and this results in heat generation. However, recent studies have shown that the heat produced by microwave radiation is generated on a mechanism that is different from ordinary heat [12] and it can also act differently on the body. This non-ionizing radiation acts on organisme like stressor, affects brain functioning and cause the release of cortisol, which controlled by the hypothalamus. In dorsomedial hypothalamus after repeated low-level exposure to extremely low frequency microwave radiation Changes on EEG was found [21]. Prolonged action of microwave radiation influence the morphology of the brain cells, 'neurons exhibit edema and are arranged irregularly. Nuclear pyknosis and capillary congestion are also observed' [25]. In rats, after microwave radiation exposure, the structures of the hippocampus were damaged and impairment of long-term potentiation, decreasment of neurotransmitter concentrations was found, which is clinically manifested in memory impairmen [27].

Microwave radiation cause subliminal stress, in result overactive adrenal glands produce extra level of cortisol and adrenaline. Existence of other symptoms described in the literature also prove that microwave radiation cause acute stress symptoms, example: headaches, insomnia, fatigue, vertigo, tinnitus etc. When television transmitter station workers left the source of microwave radiation, symptoms like headaches, stress, fatigue decrease [6].

Furthermore, repeated exposures to extremely low frequency-modulated microwave radiation has cumulative effect [21], this means that when small doses of radiation affect the body, eventually the dose is a total dose resulting from repeated exposure to ionizing radiation. People who use microwaves are at increased risk for many serious diseases and health conditions.

In addition, chronic problems like cancer [5], other harmful processes occur in the body under the influence of high or low frequency electromagnetic fields. In our earlier study, results shows that electromagnetic radiation effect cognitive processes and decreased attention and concentration in rats [7]. Changes in cognitive process was observed in mobile phone user children where electromagnetic field effect response time, number of errors in the Groton maze learning task, and response time for a Stroop interference task [3].

Significantly higher levels of cortisol, adrenaline and norepinephrine were found in the physiotherapist`s body (they work in the electromagnetic field) [20]. Which has also been observed in the results of our research, where high concentrations of cortisol have been found in microwave radiation exposure group rats. In open field test in this group rats locomotor activity is more evident than in control group rats, namely: microwave radiation exposure group rats are more actives, they began to move immediately after being placed in the arena, freely cross the lines, enter the center after a few seconds and respectively number of line crossings, center square entries and time spend in it, rearing was significantly more than in sham control group. The same results are described in studies, were a low-frequency (5 Hz) [15] and radio-frequency electromagnetic field (RF-EMF) [14] cause behavioral changes in rat: an increase in locomotor activation, the number of cases of rearing and sniffing, hyperactivity.

In our results, after 10 day of microwave radiation exposure, the study of emotional reactivity and movement activity in the open field test showed that the effect of radiation does not affect the emotional response. In animal, emotions are discussed in relation to fear reaction. According to the large amount of literature relationship between defecation events with emotionality was affirmed, the increase in emotional reactivity of the animal in the open field is expressed by increasing the number of bolus and urine [17]. In out case, microwave radiation did not effect this indicator: so, the effect of microwave radiation in rats does not cause increased emotions despite the fact that there was a increase number of rearing and grooming in microwave radiation exposure group, which means an activation of exploratory

behavior and stereotypical activity. The microwave radiation exposure group rats have fewer bolus and urination, than control group rats, which didn't shows changes in emotional response.

Depression of fear reaction can be caused by activation of excitation processes. The reason for this is the increase of cortisol level after microwave radiation exposure.

In general, electromagnetic field cause changes in excitation and inhibition amino acid ratio in the brain [25], resulting which is a pronounced change of behavior. Namely [18] found that the basis for behavior change (after 28 days) under the influence of microwave radiation is the reduction of the main excitatory amino acid - glutamic acid (Glu) [18], though, there is a dose-effect relationship between the level of excitatory and inhibitory amino acids and the radiation dose [22], for example: if microwave radiation from 10 to 50 mW/cm2 increases the concentration only glycine (Gly) and asparagine (Asp) in the cerebral cortex, 30 mW/cm2 radiation after 6 hour causes a decrease in the level of glycine, and 50 mW/cm2 microwave radiation increase the level of asparagine, glutamic acid, gamma-aminobutyric acid (GABA) and Gly.

In addition to the abnormal release of brain amino acids, microwave radiation causes an abnormal uptake process in the hippocampal neurons [16].

Mentioned neuroendocrine and biochemical changes caused by microwave radiation is followed by changes in excitation and inhibition processes, which is expressed in increased locomotor activity, exploratory behavior and stereotypical activity, otherwise the animal's hyperactivity. We can talk about hyperactivity, when a few signs are present: high levels of motor activity, attention deficit, low frustration tolerance, hyperexcitability, an inability to control impulses etc. [19], in our case for hyperactivity assessment the number of crossings and rearings behaviors are counted, also with the distance traveled, motor activity, center square entries, stretch attend postures and with general observation during open field test which was revealed in the microwave radiation exposure group rats and all of this was on the background of decreased emotional disturbance, which is also characteristic of hyperactivity.

As for the impact of microwave radiation on the weight, according to our research, weight gain is significantly higher in the microwave radiation exposure group rats, than in the control group rats. One of the reasons for this may be increased level of cortisol. Namely, microwave radiation cause mitochondria dysfunction, as a result, the energy balance is disturbed and obesity develops.

Cortisol effects fat storage and weight gain in stressed organisme, high level of cortisol leads to increased appetite. Chronic stress affect adrenocortical activity, cause insulin resistance and abdominal obesity [4], however there are studies where the correlation between cortisol concentration [1] and increase in weight is not confirmed [8].

Based on our results, we can clearly see the picture of the harmful effects of microwave radiation on the body, namely during the microwave stress, the concentration of stress hormones increases, which increases the demand for food. A person who is in the kitchen near microwave oven is exposed to microwave radiation escaped from the oven, the organism reacts to stress and with high concentration of cortisol, instead of the normal volume, gets much more food. Considering that the microwave radiation changes the chemical composition of food, after taking food that was prepare in microwave oven, in organism rapidly increasing the cholesterol level in blood, hemoglobin decreased significantly, increase in number of leukocytes, increase stress [11] and obviously, there is a real danger of weight gain.

If in addition we have the behavior changes, the hyperactivity without changing the emotional background, that we observed in microwave radiation exposed group of rats, the picture becomes more dramatic. However, it should be noted that our research was conducted on rats where the Specific (energy) Absorption Rate is different from humans. Therefore our goal is to continue research in this direction and study the dangers of microwave radiation on the human body.

To study the dose-effect relationship between biological effects and radiation, it is necessary to conduct in-depth studies.

Conclusion. The results of our research show that the microwave radiation generated by household microwave oven affects the biological system, namely: body weight, animal growth, behavior and cortisol level in the blood plasma.

REFERENCES

1. Abraham SB, Rubino D, Sinaii N, Ramsey S, Nieman LK. Cortisol, obesity, and the metabolic syndrome: a cross-sectional study of obese subjects and review of the literature. // Obesity. 2013.Jan;21(1):E105–17
2. Bachmann M, Lass J, Kalda J, Sakki M, Tomson R, Tuulik V, et al. Integration of differences in EEG Analysis Reveals Changes in Human EEG Caused by Microwave. Conf. Proc. IEEE Eng. Med. Biol. Soc. 2006. 1:1597–1600.
3. Bhatt CR, Benke G, Smith CL, Redmayne M, Dimitriadis C, Dalecki A, et al. Use of mobile and cordless phones and change in cognitive function: a prospective cohort analysis of Australian primary school children. // Environ Health. 2017 19;16(1):62
4. Brunner EJ, Chandola T, Marmot MG. Prospective effect of job strain on general and central obesity in the Whitehall II Study. // Am J Epidemiol. 2007.165:828–37.
5. Dart P, Cordes K, Elliott A, Knackstedt J, Morgan J, Wible P at al. 2013. Biological and health effect of microwave radio frequency transmission. [A report to the staff and directors of the Eugene water and electronic board]
6. Dasdag S, Balci K, Celik M, Batun S, Kaplan A, Bolaman Z, et al. Neurologic and biochemical findings and CD4/CD8 ratio in people occupationally exposed to RF and microwave.// Biotechnology and Biotechnological Equipment . 1992; 6:37–39. doi: 10.1080/13102818.1992.10818674
7. Dondoladze K, Nikolaishvili M, Museliani T, Jikia G, Zurabashvili D. The Impact of Electromagnetic Field on Conditioned Reflex Memory. // Neuro Quantology. 2018. 16(11)
8. Jelodar GA, Nazifi S. Effect of radiation leakage of microwave oven on body weight, cortisol and thyroid hormones of adult female mice.// Physiol Pharmacol. 2010. 13:416–422
9. Joubert V, Bourthoumieu S, Leveque P, Yardin C. Apoptosis is induced by radiofrequency fields through the caspase-independent mitochondrial pathway in cortical neurons. // Radiat Res. 2008. 169(1):38-45.
10. Hao Y, Zhao L, Peng R. Effect of Microwaver radiation on brain energy metabolism and related mechanisms. // Military Med. Res. 2015. 2(4)
11. Hertel UH. Microwave Ovens: A Hazard to Health. // Journal of Natural Science. 2002. Vol. 1 No. 2; Vol. 2 No. 4.
12. Hinrikus H, Bachmann M, Lass J. Understanding physical mechanism of low-level microwave radiation effect // International Journal of Radiation Biology. 2018. (1-6)
13. Kesari KK, Behari J. Fifty-gigahertz microwave exposure effect of radiations on rat brain. Appl Biochem Biotechnol. 2009.158(1):126-39.

14. Kim J, Yu D, Huh Y, Lee E, Kim H, Kim H. Long-term exposure to 835 MHz RF-EMF induces hyperactivity, autophagy and demyelination in the cortical neurons of mice. // Sci. Rep. 2017. 7:41129
15. Mahdavi SM, Sahraei H, Yaghmaei P, Tavakoli H. Effects of electromagnetic radiation exposure on stress-related behaviors and stress hormones in male wistar rats. // Biomol Ther 2014. 22:570–576
16. Mortazavi S, Rouintan M, Taeb S, Dehghan N, Ghaffarpanah A, Sadeghi Z, et al. Human short-term exposure to electromagnetic fields emitted by mobile phones decreases computer-assisted visual reaction time. // Acta Neurol Belg. 2012. 112:171–5
17. Ramos A, Berton O, Mormede P, Chaouloff F. A multiple-test study of anxiety-related behaviours in six inbred rat strains.// Behav Brain Res. 1997.85:57–69
18. Riedel G, Platt B, Micheau J. Glutamate receptor function in learning and memory. // Behav Brain Res. 2003.140:1–47
19. Sagvolden T, Russell VA, Aase H, Johansen EB, Farshbaf M. Rodent models of attention-deficit/hyperactivity disorder.// Biol Psychiatry. 2005. 57: 1239-1247.
20. Vangelova K, Israel M, Velkovaand D, Ivanova M. Changes in excretion rates of stress hormones in medical staff exposed to electromagnetic radiation. //Environmentalist. 2007. 27: 551-555
21. Vorobyov V, Janac B, Pesic V, Prolic Z. Repeated exposure to low-level extremely low frequency-modulated microwaves affects cortex-hypothalamus interplay in freely moving rats: EEG study. // Int J Radiat Biol. 2010. 86:376–383. doi: 10.3109/09553000903567938
22. Wang H, Peng R, Zhou H, Wang S, Gao Y, Wang L, et al. Impairment of long-term potentiation induction is essential for the disruption of spatial memory after microwave exposure. // Int J Radiat Biol. 2013. 89(12):1100-7
23. World Health Organization. 2005. Electromagnetic fields & public health: Microwave ovens. Accessed 2017. [Internet].
24. Zhang Y, Li Z, Gao Y. Effects of fetal microwave radiation exposure on offspring behavior in mice. // J Radiat Res. 2015. 56:261–268.
25. Zhi WJ, Wang LF, Hu XJ. Recent advances in the effects of microwave radiation on brains. // Mil Med Res. 2017. 4
26. Zurabashvili D, Nikolaishvili M, Mindiashvili N, Zazashvili N, Chichakua N. The influence of electromagnetic field on active avoidance reaction, biogenic amines and amino acids in brain of rats in spite of background of food-stuff addition seratonus. // Georgian Medical News 2010. (187): 61-65
27. Wang L, Hu X, Peng R. Influence of long-term microwave radiation on contents of amino acids and monoamines in urine of Wistar rats.// Chin J Indus Hyg. 2010. 28:445

SUMMARY

IMPACT OF HOUSEHOLD MICROWAVE OVEN NON-IONIZING RADIATION ON BLOOD PLASMA CORTISOL LEVELS IN RATS AND THEIR BEHAVIOR

Dondoladze Kh., Nikolaishvili M., Museliani T., Jikia G., Zurabashvili D.

I. Beritasvhili Center of Experimental Biomedicine, Department of Radiobiology; Iv. Javakhishvili Tbilisi State University, Medical Department, Tbilisi, Georgia

In medical literature is known that the electromagnetic waves own a harmful effect on human organism. Is convinced shows that surround household microwave oven exist certain quantity of non-ionizing radiation leak.

The aim of the present work is study the effect of non-ionizing radiation, emitted by household microwave oven, on the body weight, emotional and locomotor activity and cortisol blood plasma level in rats.

6 weeks Wistar rats cage were placed near microwaves oven, from closed door escape 727,24±84,55 Mw/m² Power Density microwaves. The oven was switch over two times a day for 3-3 minutes during 10 days. Experimental and control group rats are weighed before and after experiment. To assess the emotional state and locomotor activity open field test was performed and for determine stress level the concentration of plasma cortisol was measured. It was found that after 10 days, in microwave radiation exposure group rat body weight gain increase more than in control group. In open field test, microwave radiation exposure group rats spent more time in center square than control group rats, line crossings, center square entries, stretch attend postures are also more in microwave radiation exposure group rats than in control. Cortisol level in plasma were increased in microwave radiation exposure group rats than in control group.

Complete analysis of our results have convinced shown the necessary to study of household microwave oven non-ionizing radiation.

Keywords: microwave radiation, weight, cortisol, hyperactivity, behavior.

РЕЗЮМЕ

ВЛИЯНИЕ НЕИОНИЗИРУЮЩЕЙ РАДИАЦИИ, ОКРУЖАЮЩЕЙ БЫТОВЫЕ МИКРОВОЛНОВЫЕ ПЕЧИ, НА ПОВЕДЕНИЕ И УРОВЕНЬ КОРТИЗОЛА В ПЛАЗМЕ КРОВИ КРЫС

Дондоладзе Х.Н., Николаишвили М.Н., Муселиани Т.А., Джикиа Г.Д., Зурабашвили Д.З.

Центр экспериментальной биомедицины им. И. Бериташвили; Тбилисский государственный университет им. И. Джавахишвили, Грузия

Согласно существующим представлениям, конструкция бытовых микроволновых печей должна полностью исключать возможность утечки неионизирующей электромагнитной радиации. Однако её присутствие выявлено в пространстве, непосредственно окружающем бытовые микроволновые печи.

В исследовании представлены данные о влиянии неионизирующей радиации, окружающей бытовую микроволновую печь, на массу тела и поведение в открытом поле крыс линии Wistar, а также на уровень кортизола в плазме крови. Животные разделены на две группы: интактные крысы (контроль) и крысы, помещенные на расстоянии 0,5 см от закрытых дверей бытовой микроволновой печи, которую включали два раза на три минуты (утром и вечером) каждые 10 дней.

У крыс, получивших неионизирующее микроволновое облучение, прирост массы тела увеличился больше, чем в контрольной группе. В тесте «открытое поле» крысы, прошедшие микроволновое облучение, затратили больше времени на центральном квадрате, чем крысы группы контроля. Пересечение линий, колчество поз на растяжку, также превалировали у крыс, получивших микроволновое облуче-

ние. Уровень кортизола в плазме крови крыс, получивших микроволновое облучение, достоверно превышал контрольные показатели.

Исходя из вышеизложенного, авторы считают целесообразным дальнейшее исследование биологического действия неионизирующей радиации, окружающей бытовые микроволновые печи.

რეზიუმე

მიკროტალღური საოჯახო ღუმელების ირგვლივ არსებული არამაიონიზირებელი რადიაციის ზემოქმედება ვირთაგვების ქცევაზე და სისხლის პლაზმაში კორტიზოლის დონეზე

ხ.დონდოლაძე, მ.ნიკოლაიშვილი, თ.მუსელიანი, გ.ჯიქია, დ.ზურაბაშვილი

ი. ბერიტაშვილის სახ. ექსპერიმენტული ბიომედიცინის ცენტრი, ივ. ჯავახიშვილის სახ. თბილისის სახელმწიფო უნივერსიტეტი, საქართველო

თანამედროვე მონაცემების თანახმად, საოჯახო მიკროტალღური ღუმელების კონსტრუქცია მთლიანად გამორიცხავს არამაიონიზირებელი ელექტრომაგნიტური ველის გამოსხივებას, მაგრამ აღმოჩნდა, რომ საოჯახო მიკროტალღური ღუმელების ირგვლივ არსებობს საკმაოდ მნიშვნელოვანი არამაიონიზირებელი რადიაცია.

კვლევის მიზანს წარმოადგენს საოჯახო მიკროტალღური ღუმელების ირგვლივ არსებული არამაიონიზირებელი რადიაციის ზემოქმედების განსაზღვრა ვირთაგვების სხეულის წონაზე, ლოკომოტორულ აქტივობაზე და სისხლის პლაზმაში კორტიზოლის დონეზე.

6 კვირის Wistar-ის ხაზის ვირთაგვები მოთავსდა ღუმელების დახურულ კართან, 0,5 სმ დაშორებით. ღუმელის ჩართვა ხდებოდა დღეში ორჯერ, 3-3 წუთით, 10 დღის განმავლობაში. საკონტროლო ჯგუფი არ ღებულობდა მიკროტალღურ დასხივებას.

ნაჩვენებია მიკროტალღური რადიაციის ქვეშ მყოფი ვირთაგვების წონის მატება საკონტროლო ჯგუფთან შედარებით.

"ღია ველის" ტესტში, რადიაციის ქვეშ მყოფი ვირთაგვები ატარებდნენ უფრო მეტ დროს არენის ცენტრში, ვიდრე საკონტროლო ჯგუფის ვირთაგვები, ასევე ხაზების გადაკვეთა, ცენტრალურ კვადრატში შესვლის და ფეხზე წამოდგომათა რაოდენობა შესამჩნევად მეტი იყო რადიაციის ზემოქმედების ქვეშ მყოფ ვირთაგვთა ჯგუფში საკონტროლო ჯგუფთან შედარებით. კორტიზოლის დონე სისხლის პლაზმაში მიკროტალღური რადიაციის ზემოქმედების ქვეშ მყოფ ვირთაგვათა ჯგუფში სარწმუნოდ გაიზარდა.

ავტორებს მიზანშეწონილად მიაჩნიათ საოჯახო მიკროტალღური ღუმელების ელექტრომაგნიტური ველის ბიოლოგიური გავლენის შესწავლა.

INFLUENCE OF THE ACTING SUBSTANCE "SODIUM DICLOFENAC" ON BONE MARROW CELLS

[1,2]Ivanov O., [2]Haidash O., [2]Voloshin V., [2]Kondratov S., [2]Smirnov A.

[1]Kharkov Medical Academy of Postgraduate Education;
[2]The State Institution "Lugansk State Medical University", Rubizhne, Ukraine

Every day, the pharmaceutical industry improves the drugs that are used in the treatment of certain diseases, but the drugs and active substances of the group of non-steroidal anti-inflammatory drugs (NSAIDs) remain the most used. One of the first representatives of this group who has not lost its relevance and relevance to this day remains Diclofenac sodium (formula, Fig. 1), which is part of a large number of drugs [8].

A feature of this active substance is its ability to dissolve in hydrophilic or hydrophobic media, as well as excellent absorption from the gastrointestinal tract under oral conditions [5].

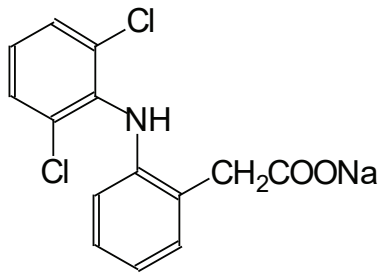

Fig. 1. Diclofenac sodium formula

The active substance is especially popular with doctors of therapeutic and surgical specialties. Indications for its use are injuries of various nature, Diclofenac sodium has proven itself as an anesthetic in the postoperative period, which reduces the number of narcotic analgesics and the risks of complications after their use [7]. Among doctors of therapeutic specialties, Diclofenac sodium, as an active substance, is used in the treatment of inflammatory processes [12]. On the recommendation of the WHO, Diclofenac sodium as an active substance can be used for pain relief in palliative patients for many years [10, 13]. Diclofenac sodium is one of the non-selective blockers of cyclooxygenase (COX), but recent studies speak of a predominant effect on COX-2, as the main factor in the development of the inflammatory process [14].

The effect of NSAIDs on the homeostasis system, the main representative of which is the bone marrow, does not lose its relevance. The effect of Diclofenac sodium as an active substance on the bone marrow of animals in the experiment remains insufficiently studied, since it is a weak organic acid. The research results suggest that Diclofenac sodium, as an active substance, affects the function of the body's immune system, as a result of which a refractory period of 2-3 days develops. NSAIDs have