

EFFECT OF EXOGENOUS MELATONIN ON THE DEVELOPMENT OF INTRASPECIFIC AND INTERSPECIFIC AGGRESSION IN RATS UNDER MODERATE ELECTROMAGNETIC SHIELDING

Temuryants N. A., Tumanyants K. N., Chuyan E. N., Khusainov D. R., Cheretaev I. V., Chajka A. V., Yarmolyuk N. S.

*V.I. Vernadsky Crimean Federal University, Simferopol, Crimea, Russian Federation
E-mail: timur328@gmail.com*

It was found that exogenous melatonin affects the development of intra- and interspecies aggression in rats located in moderate electromagnetic shielding. Exogenous melatonin administered daily at 1 mg/kg or 5 mg/kg eliminates increasing interspecific aggression under the influence of moderate electromagnetic shielding. Effect of exogenous melatonin on the development of intraspecific aggression is dose-dependent: the administration of 1 mg/kg daily does not cause changes in intraspecific aggression in rats under electromagnetic shielding. Exogenous melatonin in a dose of 5 mg/kg eliminates the increase of intraspecific aggression in rats in conditions of electromagnetic shielding.

Keywords: electromagnetic shielding, intraspecific aggression, interspecific aggression, rats, melatonin, dose.

References

1. Tan D.-X., Zheng X., Kong J., Lucien C. Fundamental issues related to the origin of melatonin and melatonin isomers during evolution: relation to their biological functions, *Int. J. Mol. Sci.*, **15**, **9**, 15858 (2014).
2. Reiter R. J. Pineal melatonin: cell biology of its synthesis and of its physiological interactions, *Endocrine Rev.*, **12**, 151 (1991).
3. Reiter R. J. Electromagnetic fields and melatonin production, *Biomed. Pharmacother.*, **47**, **10**, 439 (1993).
4. Reiter R. J. Static and extremely low frequency electromagnetic field exposure: reported effects on the circadian production of melatonin, *J. Cell. Biochem.*, **51**, 394 (1993).
5. Reiter R. J. The melatonin rhythm: both a clock and a calendar, *Experientia.*, **49**, **8**, 654 (1993).
6. Arushanyan E. B. *Unikal'nyy melatonin*, 400 p. (Stavropol', 2006).
7. Rapoport P. I. *Melatonin: theory and practice*, 100 p. (M.: Medpraktika, 2009).
8. Manchester L. C., Coto-Montes A., Boga J. A., Andersen L. P., Zhou Z., Galano A., Vriend J., Tan D. X., Reiter R. J. Melatonin: an ancient molecule that makes oxygen metabolically tolerable, *J. Pineal Res.*, **59**, **4**, 403 (2015).
9. Hardeland R., Cardinali D. P., Srinivasan V., Spence D. W., Brown G. M., Pandi-Perumal S. R. Melatonin – a pleiotropic, orchestrating regular molecule, *Progr. Neurobiol.*, **93**, 350 (2011).
10. Anisimov V. N. *Melatonin: a role is in an organism, application in a clinic*, 40 p. (SPb.: System, 2007).
11. Malhotra S., Sawhney G., Pandhi P. The therapeutic potential of melatonin: a review of the science, *MedGenMed.*, **6**, **2**, 46. (2004).
12. Kostoglou-Athanassiou I. Therapeutic applications of melatonin, *Ther Adv Endocrinol Metab.*, **4**(1), 13 (2013).
13. Arushanyan E. B. Universal'nye therapeutic possibilities of melatonina, *Clinical medicine*. V. 91(2). P. 4-8. (2013).
14. Siah K. T., Wong R. K., Ho K. Y. Melatonin for the treatment of irritable bowel syndrome, *World J Gastroenterol.*, **20**(10), 2492 (2014).
15. Semm P., Schneider T., Vollrath L. Effects of Earth-strength magnetic field on electrical activity of pineal cells, *Nature.*, **288**, 607 (1980).
16. Wilson B. W., Anderson L. E., Hilton D. I., Phillips R. D. Chronic exposure to 60 Hz electric fields: effects on pineal function in the rat, *Bioelectromagnetics.*, **2**, **4**, 371 (1981).
17. Touitou Y., Selmaoui B. The effects of extremely low-frequency magnetic fields on melatonin and cortisol, two marker rhythms of the circadian system, *Dialogues in Clinical Neuroscience*, **14**, **4**, 381 (2012).
18. Lewczuk B., Redlarski G., Żak A., Ziółkowska N., Przybylska-Gornowicz B., Krawczuk M. Influence of Electric, Magnetic, and Electromagnetic Fields on the Circadian System: Current Stage of Knowledge, *BioMed Research International*, **2014**, 13. (2014).
19. Arushanyan E. B. Epifiz and depression, *Magazine of neurology and psychiatry the name of S. S. Korsakova*, **91**(6), 108 (1991).
20. Pacchierotti C., Iapichino S., Bossini L., Pieraccini F., Castrogiovanni P. Melatonin in psychiatric disorders: a review on the Melatonin involvement in psychiatry, *Front Neuroendocrinol.*, **22**, 18 (2001).
21. Munro S., Lewin S., Swart T., Volmink J. A review of health behaviour theories: how useful are these for developing interventions to promote long-term medication adherence for TB and HIV/AIDS?, *BMC Public Health.*, **7**, 104. (2007).
22. Temur'yants N. A., Kostyuk A. S., Tumanyants K. N. The electromagnetic screening is changed by the conduct of rats, *Magazine of higher nervous activity the name of I. P. Pavlova*, **65**(2), 222 (2015).
23. Temur'yants N. A., Khusainov D. R., Tumanyants K. N., Kostyuk A. S., Cheretaev I. V., Yarmolyuk N. S., Chajka A. V. The electromagnetic screening is changed by the aggressiveness of rats, of VII International congress the «Weak and superweak fields and radiations in biology and medicine», 199 (it is Saint Petersburg. 2015).
24. Zamoschina N. A., Krivova M., Khodanovich Yu., Truhanov K. A., Tukhvatulin R. T., Zaeva O. B., Zelenskaya A. E., Gul E. V. Effect of simulated conditions hypomagnetic deep space missions on the rhythmic organization of behavioral activity of rats, *Aerospace and environmental medicine*, **1**, 17, (2012).
25. Khodanovich M. U., Gul E. V., Zelenskaya A. E., Pan E. S., Krivova N. A., Effect of long-term weakening of the geomagnetic field on the aggressiveness of laboratory rats and activation of opioidergic neurons, *Bulletin of the Tomsk State University. Biology*, **1**(21), 146, (2013).

26. Devitsin D. V., Palchikova N. A., Trofimov A. V., Selyatitskaya V. G., Treasurers V. P., Dynamics of physiological characteristics and emotional-behavioral reactivity of animals in performed geomagnetic environment, *Bull. SB RAMS*, **25**, **3**, 71, (2005).
27. The European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes, Strasbourg, March 18, **3(6)**, (1986).
28. Markel' A. L. To the estimation of basic descriptions of conduct of rats in a test the «opened field», *Magazine of higher nervous activity the name of I. P. Pavlova*, **31(2)**, 301 (1981).
29. Temuryants N. A., Kostyuk A. S., Tumanyants K. N., The dynamics and rhythm infradian temperature / pain sensitivity mollusk *Helix* in terms of exposure to electromagnetic fields, *Neurophysiology*, **42(4)**, 329, (2010).
30. Buresh I., Bureshova O., Kh'yuston D. P. Aggression, caused pain, *Methods and basic experiments on the study of brain and conduct*, 130 (M.: Higher school., 1991).
31. Touitou Y., Selmaoui B. The effects of extremely low-frequency magnetic fields on melatonin and cortisol, two marker rhythms of the circadian system, *Dialogues in Clinical Neuroscience*, **14**, **4**, 381 (2012).
32. Frey A. H., Electromagnetic field interactions with biological systems, *FASEB J.*, **7**, **2**, 272 (1993).
33. Temuryants N. A., Kostyuk A. S. The alternating magnetic field at 8 Hz corrects the activity of opioid system in molluscs in a ferromagnetic screening, *Aerospace and Environmental Medicine*, **3**, 45 (2014).
34. Temuryants N. A., Kostyuk A. S., Tumanyants K. N., Involvement of melatonin in changing nociception mollusks and mice with prolonged electromagnetic shielding, *Ros. Fiziol. Zh. them. I.M. Sechenov*, **99(11)**, 1333 (2013).