Austin Journal of Pharmacology and Therapeutics

Open Access

Austin Publishing Group

Mini Review

Possible Mechanism of the Effects of the Pulsed Electromagnetic Field on Analgesia

Demirkazik A*
Department of Biophysics, Sivas Cumhuriyet University, Turkey

***Corresponding author:** Ayse Demirkazik, Department of Biophysics, Sivas Cumhuriyet University, Medical Faculty, Turkey

Received: March 18, 2021; **Accepted:** April 09, 2021; **Published:** April 16, 2021

Abstract

With the development of technology, it has become possible for various measuring devices to measure the size of electromagnetic fields nowadays. Therefore, it has been realized that biological creatures are under the influence of electromagnetic fields with increasing intensity. This mini-review aims to state that exposure to a very-low-frequency electromagnetic field affects living beings by using the systems we know and to draw the attention of researchers to this point. While very low frequency Electromagnetic Fields (ELF-EMF) affect living things thermally, researches that living things are made by strengthening or accelerating neurotransmitter-receptor interaction have increased in recent years.

Keywords: Electromagnetic field; Analgesia; Receptor mechanism; Rat

Introduction

The magnetic field is a space in which moving and electrically charged particles are under the effect of force, and it is formed by the electrons inside atoms revolving around the nucleus and themselves. With the development of technology, it has become possible for various measuring devices to measure the size of electromagnetic fields nowadays. Since humans also have charged ions and the resultant vector magnitude of the electromagnetic field, which the Earth has and is dispersed by the electrical devices we are constantly intertwined with in our daily lives, will increase further due to the advancing technology, and the effect direction may change and influence the orientation of charged particles or their spin rates, it is not possible for the systems contained by charged particles in humans not to be affected. Therefore, all the living beings on the Earth always live in the presence of an Electromagnetic Field (EMF) [1]. With the popularization of the wireless use of various technological devices, exposure to electromagnetic fields has also been prolonged. In various studies in this field, it has been asserted that a limit should be set for the intensities of the electromagnetic fields of countries through the evaluation by a center, which is the International Commission on Non-Ionizing Radiation Protection (ICNIRP) [2,3]. As a result, while humans have brought about technological developments, they have realized that these developments could inevitably have impacts on their own health. However, there is little research on how these impacts occur. The results of these studies are reported as positive or negative, and sometimes ineffective. The most significant reason for these differences may result from differences in the intensities of the electromagnetic field selected and the exposure time (intensity-duration interaction and the structural or functional change in the system subject to measurement). This mini-review aims to state that exposure to a very-low-frequency electromagnetic field affects living beings by using the systems we know and to draw the attention of researchers to this point.

The effect of electromagnetic field exposure on analgesia

Concerning the research areas in this field, electromagnetic waves can be classified as Extremely Low Frequency (ELF-EMF), RF-EMF, and microwave radiation, depending on the wavelength range. In all our studies, we found that Extremely Low Frequency (ELF-EMF) and pulsed electromagnetic field studies we carried out on experimental animals were affected, especially in the research we conducted considering the systems containing charged particles and diseases, and we published our studies in many scientific journals [4-8]. Afterward, we noticed that the electromagnetic field strengthens or weakens the effect on the existing neurotransmitter-receptor relationship. The first study where I noticed this was the study in which Laitl-Kobierska AL, et al. examined the effect of the alternative Extremely Low-Frequency (ELF-EMF) magnetic field on the pancreatic structure and function in rats. In this study, the researchers reported how the insulin hormone was trapped quickly inside the vesicle pre- pro in the daily exposure to the electromagnetic field while the blood glucose levels were measured in healthy rats and when the healthy rats were compared to the 1st, 6th, 9th, and 14th sham groups [9]. Here, ELF-EMF induced and accelerated the formation of the insulin hormone. When we investigated the functional effect of the electromagnetic field on thermal pain in the formation of pain, we tried to demonstrate the effect of ELF-EMF with pain tests by voluntarily blocking or activating some precursor sub-receptors we used over the serotonin, dopamine, and NO pathway, and we published these studies as a research paper in scientific journals [10-13]. Our research are ongoing, focusing on the interaction of pulsed very low frequency electromagnetic field with various neurodegenerative diseases and their mechanisms.

In conclusion, it is necessary to reveal the functional effect of ELF-EMF, which will mean that it can be used for treatment, in specifying the formation mechanisms of neurodegenerative diseases or in reducing the use of chemicals (drugs).

References

1. Hollenbach DF, Herndon JM. Deep-earth reactor: nuclear fission, helium, and the geomagnetic field. Proc Natl Acad Sci USA. 2001; 98; 11085-11090.
2. Repacholi MH. A History of the International Commission on Non-Ionizing Radiation Protection Health Physics. 2017;113: 282-300.

Citation: Demirkazik A. Possible Mechanism of the Effects of the Pulsed Electromagnetic Field on Analgesia. Austin J Pharmacol Ther. 2021; 9(2).1132.

3. Kim JH, Lee JK, Kim HG, Kim KB, Kim HR. Possible Effects of Radiofrequency Electromagnetic Field Exposure on Central Nerve System. Biomol Ther. 2019; 27: 265-275.

4. Kosar MI, Demir T, Demirkazik A, Ozdemir E, Gulturk S. Antinociceptive effects in normal and diabetic rats exposed to 50 Hz magnetic field. Neurophysiology. 2012; 44: 56-62.

5. Gulturk S, Demirkazik A, Kosar I, Dokmetas HS, Demir T. Effect of exposure to 50 Hz magnetic field with or without insulin on blood-brain barrier permeability in streptozotocin-induced diabetic rats. Bioelectromagnetics. 2010; 31: 262-269.

6. Kavak S, Emre M, Meral I, Unlugenc H, Pelit A, Demirkazik A. Repetitive 50 Hz pulsed electromagnetic field ameliorates the diabetes-induced impairments in the relaxation response of rat thoracic aorta rings. International Journal of Radiation Biology. 2009; 85: 672- 679.

7. Pelit A, Ozaykan B, Tuli A, Demirkazik A, Emre M, Günay I. The effects of magnetic field on the biomechanics parameters of soleus and extensor digitorum longus muscles in rats with streptozotocin-induced diabetes. Diabetes Technology and Therapeutics. 2008; 10: 294-298.

8. Demirkazik A, Ocal I, Gunay I. The effects of alternating magnetic field on the biomechanic parameters of streptozotocin-induced diabetic rat diaphragm muscles. IEEE International Symposium on Electromagnetic Compatibility. 2003; 2: 1215-1218.

9. Laitl-Kobierska A, Cieslar G, Sieron A, Grzybek H. Influence of Alternating Extremely Low Frequency ELFMagnetic Field on Structure and Function of Pancreas in Rats Bioelectromagnetics. 2002 23: 49-58.

10. Arslan G, Demirkazık A, Ozdemir E, Taskıran AS. he Effect of Dopamine D1 and D2 Receptors on Analgesia Induced by a Very Low Frequency Electromagnetic Field in Olca Kılınc Rats [The Effect of Dopamine D1 and D2 Receptors on Analgesia Induced with the Extremely Low-Frequency Electromagnetic Field in Rats]. PS051 Turkish Physiological Sciences Association 43rd National Physiology Congress Pamukkale University Congress Center. 2017.

11. Demirkazik A, Ozdemir E, Arslan G, Taskiran AS, Pelit A. The effects of extremely low-frequency pulsed electromagnetic fields on analgesia in the nitric oxide pathway. Nitric Oxide - Biology and Chemistry 2019; 92: 49-54.

12. Ozdemir E, Demirkazik A, Taskıran AS, Arslan G. Effects of 5-HT1 and 5-HT 2 Receptor Agonists on Electromagnetic Field-Induced Analgesia in Rats. Bioelectromagnetics. 2019; 40: 319-330.

13. Ozdemir E, Demirkazik A, Gursoy S, Taskıran AS, Kilinc O, Arslan G. Effects of extremely low frequency electromagnetic fields on morphine analgesia and tolerance in rats. General Physiology and Biophysics. 2017; 36: 415-422.