Bahrain Medical Bulletin, Vol. 37, No. 2, June 2015

Effects of Short-Term Exposure to (1mT, 50 Hz) Electromagnetic Fields on Calcium Concentration in Different Brain Regions of Mice: The Role of Calcium Channel Blocker

Afnan Freije, PhD* Lama Saknini, PhD** Rukaya Abdul Ghafoor, BSc*** Tariq Al Shaibani**** Amer Kamal, PhD*****

Objective: To evaluate the effect of short-term exposure to 50 Hz (1 mT) extremely low frequency electromagnetic fields (ELF EMFs) on the Ca^{2+} concentration in 4 different regions of the mice brain (cortex, cerebellum, hippocampus and brainstem).

Setting: University of Bahrain, Arabian Gulf University.

Design: Prospective Randomized Controlled Study.

Method: Adult BALB/c male mice were exposed to 50 Hz (1 mT) ELF-EMFs for 2 hours/day for five consecutive days and were treated orally with the calcium channel blocker Amlodipine. Calcium was extracted from the mice brain tissues and the concentration of Ca^{2+} was determined using atomic absorption spectroscopy.

Result: The effect of ELF EMFs exposure on the Ca^{2+} concentrations varied in different regions of the brain, with a significant increase ($P<0.05$) only in the hippocampus and the brainstem. This increase occurred during short-term exposure to ELF EMFs and the Ca^{2+} concentrations started to decrease during the interval of no exposure.

Conclusion: The rise in Ca^{2+} concentration due to ELF EMFs exposure did not occur in mice treated with the calcium channel blocker Amlodipine. The increase in Ca^{2+} concentrations could have involved activation of the voltage-gated calcium channels (VGCCs) by ELF EMFs.

---

* Associate Professor
Department of Biology
** Assistant Professor
Department of Physics
*** Student
Department of Biology
College of Science
University of Bahrain
**** Student
***** Professor
College of Medicine
Arabian Gulf University
Kingdom of Bahrain
Email: afreije@uob.edu.bh