

Protective Effect of Pretreatment with Calcium Channel Blockers on Motor Coordination Deficit of Mice due to Exposure to Extremely Low-Frequency Electromagnetic Fields

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Background: The mechanisms of ELF-EMFs action on the brain are still poorly understood. One of the possible explanations of these effects could be due to the increase in the intracellular Ca^{2+} . This increase in Ca^{2+} may lead to a decrease in cholinergic activity. These changes in brain activities may lead to changes in motor coordination and motor learning and the possibility that calcium channel blockers might exert neuroprotective effects.

Objective: To evaluate the protective effect of calcium channel blocker (Amlodipine) on deficiency in motor learning abilities of exposed mice to extremely low-frequency electromagnetic Fields ELF-EMFs (1 mT, 50 Hz).

Setting: Animal House, Arabian Gulf University, Kingdom of Bahrain.

Design: An Experimental Animal Study.

Method: Mice were divided randomly into four groups: Group I: (Control group) 8 mice; Group II: 8 mice exposed to ELF-EMF (2 h/day) immediately before each session of training; Group III: 8 mice exposed to ELF-EMF and treated previously by calcium channel blockers (3mg/kg/day) for four weeks; Group IV: 8 mice exposed to ELF-EMF but left to rest for two weeks with no electromagnetic field exposure, then trained. Rotarod experiments were performed on the four groups. The effect of rotation speed (45,50,55,60 rpm) was tested on a 5-day course.

Result: Result revealed statistically significant enhancement in the motor coordination performance in Group II, III and IV, over the five days of training, but showed an appreciable deficit in motor learning abilities for Group II. The results from Group III revealed that learning abilities for exposed mice were improved by giving the mice a therapeutic dose treatment of calcium channel blockers Amlodipine. These results indicate that the deficiency in motor learning abilities effects is partially due to the increase of the calcium levels in specific parts of mice brains, namely; hippocampus and brainstem, which was supported by an earlier study.

Conclusion: Treating the mice with calcium channel blocker might prevent deficiency in motor learning abilities of exposed mice to ELF-EMF.