

THE EFFECTS OF FETAL ELECTROMAGNETIC FIELD EXPOSURE ON EXPRESSION OF ANXIETY BEHAVIOR AND ASSOCIATED GENES IN ADOLESCENT PERIOD

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Introduction

The stimulants that the mother is exposed during pregnancy may affect the baby in the future(1). Electromagnetic field exposure is an important external stimulus that we are subject to within the day. While the electric field component is formed in the presence of electric charges in the environment, the magnetic field occurs as a result of accelerated movement of electric charges(2). Anxiety; stress is characterized by physical symptoms such as anxious thoughts and increased blood pressure(3). It is thought that electromagnetic fields can affect anxiety behaviors as well as many effects. One of the basic brain structures responsible for the formation of emotional response is the hippocampus(4). The aim of this study is to investigate the molecular and behavioral effects of electromagnetic fields, that we are exposed in daily, on fetal hippocampus tissue in adolescent period.

Material and Methods

Male and female Wistar albino rats aged 12-14 weeks were taken from the Experimental Medicine Research and Application Center of Cukurova University (DETAUM). The rats were kept alive during the experimental period in a laboratory with a temperature of 22-23 ° C, humidity of 40-50% and illumination for 12 hours day / night.

In this study, a male group (PMA) [n: 10] was exposed to PMA for three weeks in pregnancy (prenatal) [n: 10] and a control male group [n: 5] born from a mother had no exposure during pregnancy.

Pregnant rats were exposed to a vertically oriented, 1.5 mT, 50 Hz frequency pulsed electromagnetic field made of helmholtz coil during gestation period in cages made of plexiglass (10: 00-12: 00 or 13: 00-15: 00) for 2 hours daily. The pups were not subjected to any experimental treatment and their development was monitored for 8-10 weeks. They were subjected to an elevated plus maze test during adolescence.

After the behavioral tests, hippocampus tissues were extracted in both groups and mRNA and protein expression profiles were examined by Real Time PCR and Western Blot.

SPSS 20 computer program was used for statistical analysis. Statistical significance was accepted as p <0.05. Behavioral test and Student-t test were used for pairwise comparisons. Data were expressed as Mean± SE. PCR and western blot results were stated as descriptive.

Results

According to our results, anxiety behaviors increased in PMA group. It was found that c-fos, Grin2d, 5-HT1A, Grin1, Adora1, Grin2a and Adora2a gene expressions decreased, only BDNF gene expression was induced by PMA exposure (Figure). Increase of BDNF gene was supported by western blot analysis

Conclusion

One of the environmental factors continuously exposed during pregnancy is electromagnetic fields. In Cao et al. study with pregnant mice, they applied 50 Hz / 1.2 mT magnetic field for 8 hours per day during pregnancy period and observed miscarriages, fetal losses and defective fetuses (5).

In another study; it was shown that 21 days / 4 hours low frequency (50 Hz / 2mT) electromagnetic field exposure causes anxiogenic effect According to the results of the raised plus labyrinth test (6). Pathological anxiety and chronic stress cause structural degeneration and dysfunction of the hippocampus and prefrontal cortex, leading to an increased risk of developing neuropsychiatric disorders, including depression and dementia (7). The hippocampus changes especially in adolescence period (8). In this context we performed our study on the hippocampus tissues of adolescents exposed to electromagnetic field in the womb during pregnancy.

The similarity of the anxiety-like behaviors observed in the PMA group with the results of He et al's study(6) suggests that electromagnetic field is a factor to be considered during pregnancy and that children of mothers exposed to electromagnetic field may be more susceptible to anxiety

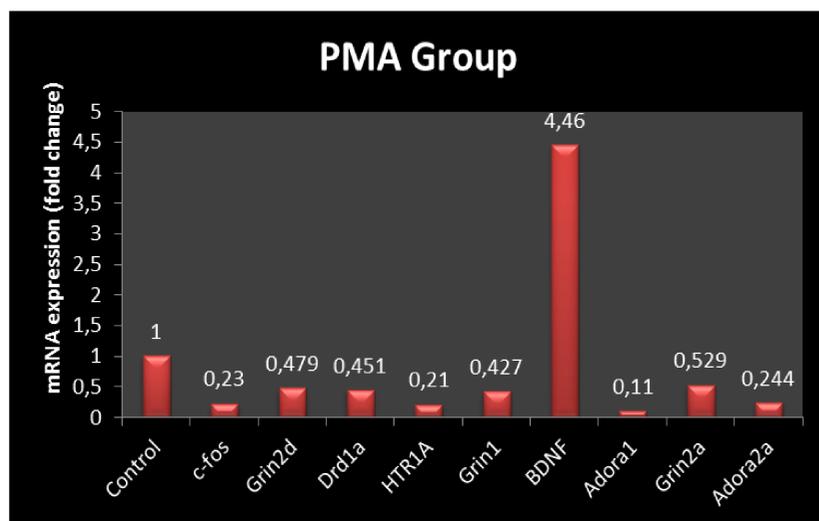


Figure. mRNA expression levels of the genes in PMA group

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