

ORIGINAL ARTICLE

Nutritional Behavior Oscillations of male Mice Exposed to Electromagnetic Fields

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ABSTRACT

Nowadays, electromagnetic field (EMF) and its hazardous or beneficial biological effects is subject of so many studies on human and animals. Aim of present study was to determine the effect of exposure to 50 Hz, 0.5 mT electromagnetic fields (EMF) nutritional behavior in male mice. Eighty mice were randomly divided into two groups, control (not exposed), treatment (exposed exposed to electromagnetic field). The animals were housed individually in metabolic cages with sawdust bedding. During 30 days treatment group, was exposed to electromagnetic field, 2hour/day. Control group was not exposed to any electromagnetic fields in mentioned period. In our experiment, we noticed food intake and water consumption in treatment group compared to control group were decreased from day 19 and 22 respectively. After treatment period, there was no statistically difference ($P<0.05$) between control and treatment groups in respect of body weight (gr). Frequencies of food intake and water consumption were measured in 6 days periods during these 30 days of exposing. Frequency of food intake in treatment group was significantly higher than control group ($p<0.05$), with exception of final 6days. Frequency of water intake in treatment group was considerably more than control group ($p<0.05$) with exception in second 6days.

Key words: Nutritional Behavior, Electromagnetic Fields, Mice, Body weight

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INTRODUCTION

With the ever increasing use of electronic devices, extremely low frequency electromagnetic fields (EMF) have become a fact of modern life. These fields are given off by all electronic devices including high energy sources like power lines, microwaves, home wiring, airport, and transformers [1]. Moreover, the biological effects of extremely low frequency electromagnetic fields have been concerned that the children living in homes with an excess of electrical wiring configuration suggestive of high current flow had a higher incidence of cancer [2], depression [3], birth and reproduction anomalies [4], brain tumor, leukemia, miscarriage, chronic fatigue, headache, cataracts, heart problems, stress, nausea, chest pain, forgetfulness and other health problems [5]. In addition to decreased membrane enzymes activities as alkaline phosphatase, acetylcholinesterase and phosphoglycerate kinase [6], also exposure to magnetic field may lead to physiological changes particularly in the field of mood disorders where the 5-hydroxyl tryptamine (5-HT) system is strongly involved. The precise mechanism underlying these effects is not known but the consensus is that extremely low frequency field (ELF) interacts with biological systems through electric fields, either applied or induced by time varying magnetic fields [7]. In recent years using of mobile phones exposed us to low-intensity electromagnetic radiation which play a role of that reactive oxygen species in EMF induced oxidative damage in tissue which is evident by the increase in MDA and NO level [8]. Our study, assessed a new subject related to effect of daily exposing electromagnetic fields on nutritional behavior in mice.

MATERIALS AND METHODS

Experimental Animals

All procedures that involved animals were approved by the Veterinary Ethics Committee of the Faculty of Para Veterinary Medicine of Ilam University. Eighty mice were randomly divided into two groups, control (not exposed), treatment (exposed exposed to electromagnetic field). The animals were housed individually in metabolic cages with sawdust bedding. Mice were kept in a 25 °C room with a 12h light: dark cycle, had free access to feed and clean water, and were stabilized for two

weeks before the start of the experiment. After the acclimatization period, control and treatment groups were evaluated in respect of food and water intake for 30 days.

Electromagnetic field exposure

One low-intensity magnetic field exposure apparatus (made in German PHYWE factory) was applied to generate a pulsed electromagnetic field. In pulsed electromagnetic field, in contrast to static electromagnetic field, the poles of the field are constantly being changed. By the way the pace of this changing is depended on frequency of the field. In this apparatus, one pair of identical Helmholtz coils, each of which contained 600 turns of enameled copper wire with diameters of 0.8 mm, were mounted coaxially at a distance of one coil radius (14.5 cm) from each other to produce a highly uniform horizontal field between them. The coils were connected to an amplifier driven by a pulse generator. This was set to produce a pulsed triangular form with a frequency of 50 Hz. During 30 days treatment group, was exposed to electromagnetic field, 2hour/day. Control group was not exposed to any electromagnetic fields in mentioned period.

Statistical analyses

The results were expressed as mean \pm SEM. Differences between means analyzed using one sample T-test. P-values of 0.05 or less were considered as statistically significant. Data were analyzed using version 15 of SPSS software.

RESULTS

In this research, we observed that, food intake and water consumption in treatment group compared to control group were decreased from day 19 and 22 respectively (Fig1 and Fig2). After treatment period, there was no statistically difference ($P < 0.05$) between control and treatment groups in respect of body weight (gr) (Fig3). Frequencies of food intake and water consumption were measured in 6 days periods. Frequency of food intake in treatment group was significantly higher than control group ($p < 0.05$), with exception of final 6days(Fig4). Frequency of water intake in treatment group was considerably more than control group ($p < 0.05$) with exception in second 6days(Fig5).

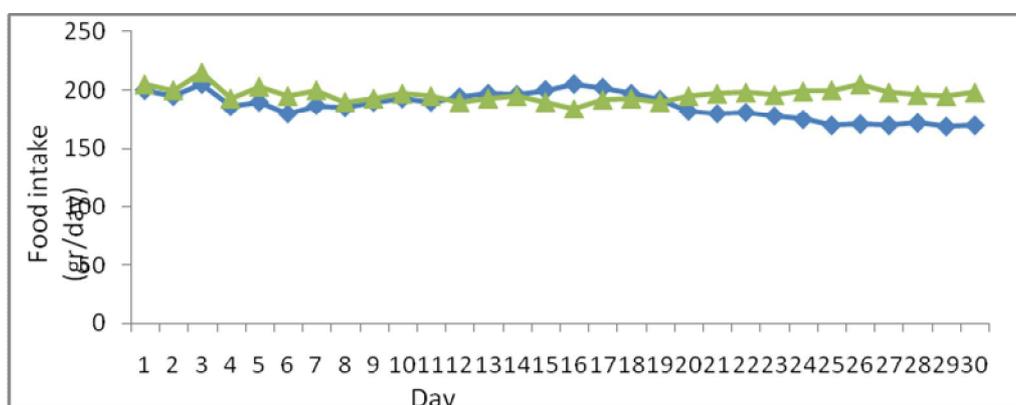


Fig1: Food intake (gr/day) in Control group ▲, and Treatment group ◆

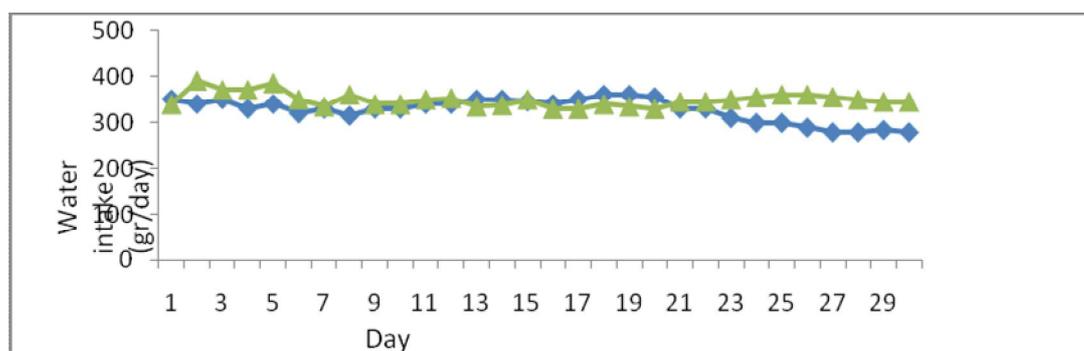


Fig2: Water intake (gr/day) in Control group ▲ and Treatment group ◆

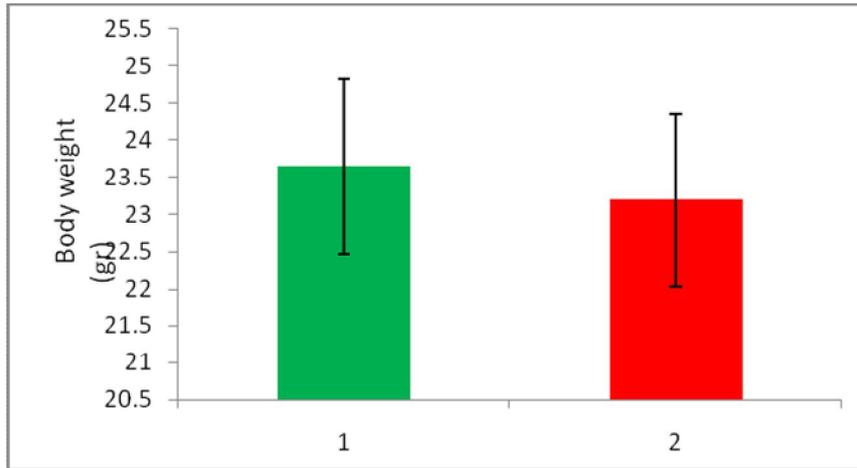


Fig3: Body weight (gr) of Control group(1)● and Treatment group(2)●

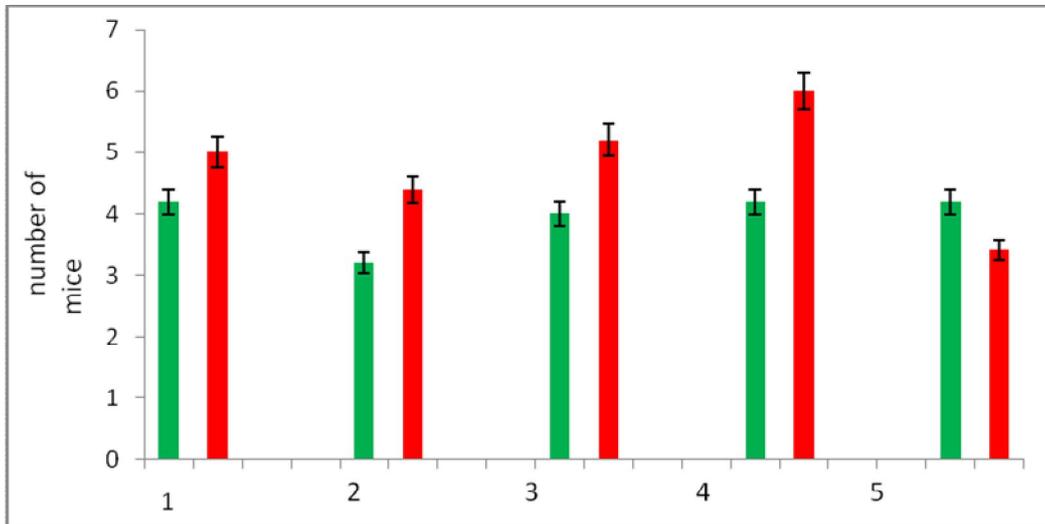


Fig4: Frequency of food intake of Control group● and Treatment group● exhibited in 6days periods. 1(first 6days period), 2(second 6days period), 3(third 6days period), 4(fourth 6days period), 5(fifth 6days period).

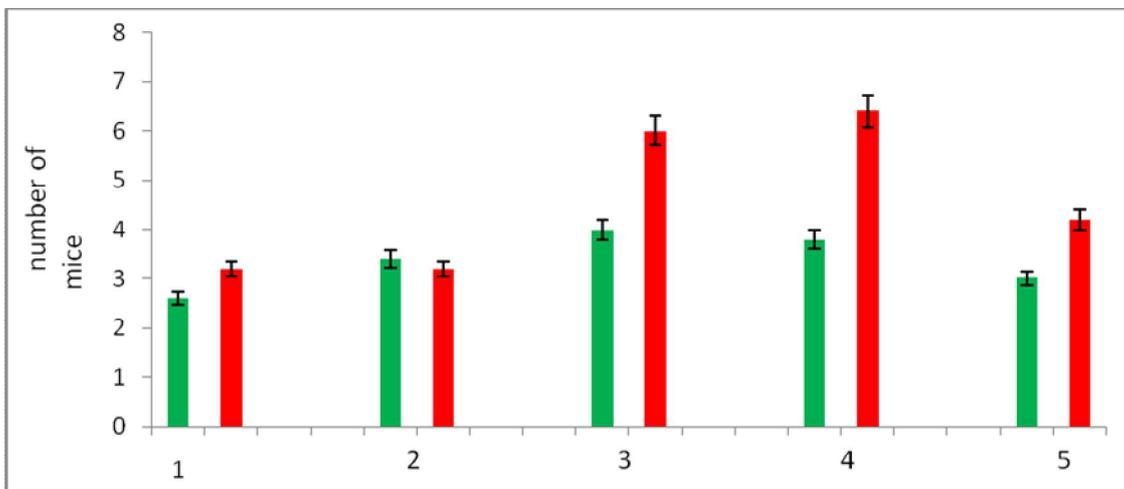


Fig5: Frequency of water intake of Control group● and Treatment group● exhibited in 6days periods.1(first 6days period), 2(second 6days period), 3(third 6days period), 4(fourth 6days period), 5(fifth 6days period).

DISCUSSION

A special attention must be devoted to the Earth's magnetic field, which provides an important source of directional information for the terrestrial organisms, but the sensory receptors responsible for the magnetic field detection have yet to be identified in most cases. In our experiment, we noticed no considerable change in the body weight following electromagnetic field exposure which in contrast with the results of Wilson *et al.* [9] and Gerardi *et al.* [10] and in agreement with research of González-Riola *et al.* [11]. We observed an increase in water intake after day 22 during exposing in treatment group nevertheless Öcal and *et al.* did not detect any alteration in water consumption [12]. Present study demonstrated that exposing to electromagnetic fields caused an increase in frequency of food intake and inversely a decrease in daily amount of food intake. In conclusion, the body weight did not change statistically in final day of exposing to electromagnetic fields.

CONCLUSION

It was concluded that electromagnetic fields increased food and water intake but it did not statistically affect the body weight of rats.

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