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Short communication

Effects of chronic exposure to ELF magnetic fields on the reproductive system of female mice

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1. Introduction

The functional activity of the reproductive system is a result of the dynamic interplay of excitation and inhibition within and between the hypothalamus–hypophysis–gonad axis. Environmental injuries can act on that axis affecting the normal reproductive physiology, particularly in females where the interaction between the ovary and exogenous factors is important in determining the mechanism(s) through which ovulation and pregnancy are regulated.

Recently there has been an increase in reports of experimental data obtained with rodents [1] and other animals [2] that have shown some physiological responses to electric and electromagnetic fields whose effects could vary according to the intensity and time of exposure.

Some results obtained from studies of rodents [3] have shown no significant differences between experimental and control mice at the level of histological structures and no statistically significant effects on litter size, birth weight or fetal development [4]. In contrast, Lazetic and Pekaric-Nadj [5] have demonstrated an increased body weight and a smaller litter size in experimental rats. The results of the effects of electric and magnetic fields on adult rats also show discrepancies; some authors have reported that long exposures did not affect the fertility, nurturing and survival of rat offspring females [6–8], whereas others have shown some effects at the endocrine level [9].

The lack of agreement in the results could be the consequence of large differences in experimental design. In order to determine the effects of continuous extremely low frequency (ELF) magnetic fields on the reproductive performance of adult female OF1 mice we used an improved and standardized experimental design developed at the Bioelectromagnetic Institute "Alonso de Santa Cruz" (BIASC), Madrid, Spain.

2. Material and methods

This study was carried out using the second generation of mice exposed to a chronic experimental electromagnetic field. The animals selected were OF1 mice, purchased from a regular supplier (IFFA CREDO) who provided the animal health report regarding both microbiological and serological controls. This mouse strain is characterized by the absence of spontaneous tumor development before the age of 6 months.

Control and experimental animals were housed separately in the same room, with a daily mean temperature of about 22 ± 2°C, and were exposed to natural daylight cycles. The Macrolon standard cages in which the control mice were housed were those currently used by scientific laboratories. For the experimental animals, some standard metal-free cages were adapted to allow free access to pellet food and tap water, and were covered with the same Macrolon material. Food and bedding (purchased from Panlab) were renewed three times per week.

In the experimental design, two flat circular coils of radius 0.375 m located in parallel with a common axis and separated by 0.375 m in the vertical plane formed a system of Helmholtz coils. Each coil consisted of 220 turns of 0.12 cm diameter thin copper wire. The coils were series wound and were connected to a supply system of 50 Hz sinusoidal wave designed at BIASC [10]. The magnetic field in the laboratory was controlled with an EMDEX-II

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