Effect of High-Frequency Low-Intensity Irradiation on Reproductive Function in C57Bl/6 and Randombred Mice

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Translated from *Byulleten' Eksperimental'noi Biologii i Meditsiny*, Vol. 138, No. 12, pp. 626-628, December, 2004
Original article submitted January 22, 2004

The effect of high-frequency low-intensity radiation on reproductive function was studied on C57Bl/6 and randombred mice. We revealed a progressive decrease in the number of offspring, prevalence of males over females in all generations, and the appearance of stillbirths. The decrease in the number of offspring was probably related to increased number of homozygotes and decreased number of heterozygotes in the population under the influence of nonthermal radiation.

Key Words: *reproduction; high-frequency radiation; mutagenesis; homozygote; heterozygote*

Ultrahigh-frequency electromagnetic radiation (UHF EMR) produces various effects on living organisms. The bioinformational effect of low-intensity UHF EMR is manifested in activation of adaptive processes at the subcellular, cellular, and tissue levels [4]. Published data show that this treatment stimulates regeneration and differentiation of stem cells in the red bone marrow and activates intracellular regeneration of hepatocytes [5,6].

The studies of this phenomenon concern changes in individual organs and systems not involved in the transfer of genetic information during reproduction. Short duration of experiments does not allow evaluating the probability of somatic mutations in the genome of various cells in organs and tissues. Theoretically, delayed mutagenic changes in somatic and sex chromosomes can develop in the follow-up period. Experiments on drosophilae and plants showed that information fields play a role of the mutagenic factor [2,3]. However, these results should be carefully extrapolated to warm-blooded animals. The question arises whether UHF EMR can be responsible for distant transfer of genetic information from one organism to another [1].

Here we studied the bioinformational effect of UHF EMR on reproductive function in C57Bl/6 mice.

MATERIALS AND METHODS

C57Bl/6 and randombred mice were irradiated for 4 months. Each experimental family consisted of 1 male and 2 females. The animals were exposed to UHF EMR (f_{oper}=37 GHz) for 6 h. Irradiation was performed in the following series: 3 families of males and nonpregnant females, mating during the experiment, 10-day irradiation (series I); pregnant females (series II); mouse pups from series 1 and 2 animals, observation from birth to reproductive age (series III); mouse pups from intact non-irradiated parents, observation from birth to reproductive age (series IV); and families of mice from series 1, 3, and 4 animals, observation from birth to reproductive age and appearance of the first offspring (series V). Series 2 did not differ from the control and was excluded from the analysis.

We estimated the number and sex ratio of newborn animals, terms of birth, and presence of visible somatic abnormalities.

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0007-4888/04/1386-0554

RESULTS

In series I three families of C57Bl/6 and randombred mice of reproductive age were irradiated. The first offspring of C57Bl/6 and randombred mice appeared 13 and 17 days after the start of the experiment, respectively. The family of C57/Bl6 mice produced 4 live pups without visible somatic abnormalities (1 female and 3 males).

In series II C57Bl/6 mice produced 5 pups (2 females and 3 males) on day 6 after the start of the experiment. The family of irradiated randombred mice produced 10 pups on day 7 after treatment (6 females and 4 males). Newborn animals had no visible somatic abnormalities.

In series III the first-generation mice from series I and II animals were irradiated. The second generation of C57Bl/6 and randombred mice consisted of 1 (male) and 7 pups (4 females and 3 males), respectively. The animals had no visible somatic abnormalities.

Series I was repeated (series Ia), because C57Bl/6 mice had only 1 pup in series III. C57Bl/6 and randombred mice produced 5 (1 female and 4 males) and 10 pups (6 females and 4 males), respectively. A new family included 1 male from series III mice, females of series Ia, and females from series I parents. The family of irradiated randombred mice included 1 female and 2 males from series III parents.

The newly formed families were irradiated. The series Ia female produced 1 dead pup (male). The series I female had 3 live male pups. Randombred animals produced 5 pups (2 females and 3 males).

Control groups of C57Bl/6 mice were composed of 3 generations. The first, second, and third generations of C57Bl/6 mice produced 6 (3 females and 3 males), 9 (4 females and 5 males), and 7 pups (3 females and 4 males), respectively. The first, second, and third generations of randombred mice produced 10 (6 females and 4 males), 10 (5 females and 5 males), and 8 pups (3 females and 5 males), respectively. Newborn pups survived and had no somatic abnormalities.

The number of offspring from C57Bl/6 mice progressively decreased compared to the control, males predominated in all generations, and one stillbirth was observed. The number of pups in the litter from C57Bl/6 mice did not exceed 5. It should be emphasized that control animals produced 6-9 pups in 3 generations. The predominance of males over females was observed in the offspring of control C57Bl/6 mice. However, these differences were less significant compared to treated animals. Significant intergroup differences were revealed in experiments on randombred mice. It was probably related to genotypic characteristics of C57Bl/6 mice. The offspring of C57Bl/6 mice included only T/t heterozygotes, while homozygotes T/T and t/t died during embryogenesis. The decrease in the number of offspring was probably related to increased number of homozygotes and decreased number of heterozygotes in the population after exposure to UHF EMR.

We did not estimate the number of dead embryos in C57Bl/6 females to preserve the offspring of this rare strain. The decreased litter size can be explained by increased population of homozygous embryos. The mechanism for UHF EMR-induced changes in reproductive function of C57Bl/6 mice is poorly understood. These changes can be associated with genomic reconstruction in sex cells or distant transfer of morphogenetic information with the involvement of endogenous physical fields. It can contribute to a progressive decrease in the number of male offspring from C57Bl/6 mice and predominance of males over females.

It should not be concluded that experiments on hybrid animals produced negative result. As distinct from C57Bl/6 mice, dominant and recessive hybrid animals were viable and did not differ from heterozygotes in external appearance.

It cannot be excluded that experimental mice carry mutations developing in several tens or hundreds of generations. This specific feature probably contributes to the absence of visible abnormalities in experimental animals over a short period of observations.

Our results indicate that the basic factor can be substituted for directed treatment of biological matrices with UHF EMR and transfer of information to the developing living organism.

In vivo study of UHF EMR with the whole biological organism is more informative than *in vitro* experiments.

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