

EFFECTS OF AN WEAK ELECTROMAGNETIC FIELD UPON RAT BLOOD PARAMETERS

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Abstract: Wistar rats were treated 5, 10 and 20 days with an constant electromagnetic field (EMF, 100Hz) 10 min. daily. It were determined: number of haematies and total leucocytes, haematocrit, hemoglobin, mean erythrocyte volume (MEV) and hemoglobin erythrocyte mean content (HEMC). It was realized a comparison between the results of treated and control lots. EMF induced an increase of haematies number, of haematocrit and hemoglobin correlated with an increase of HEMC and decrease of MEV. The total leucocytes number fluctuated: decrease at 5 and 20 days and increase at 10 days of treatment.

INTRODUCTION

The electromagnetic radiations is an environment factor with important impact on leaving beings especially in the last decades along with advanced technologies development.

En earlier series of researches had evidenced different biological effects of EMF, especially the high frequency and intensity (Zamfirescu et all. 2000). It were evidenced, at same the time, some specific effects of weak EMF upon animal (Jitariu, 1987) and vegetal organisms (Gheorghita, 1987; Corneanu, 1989) as well as microorganisms (Ailiesei, 1996).

In some earlier works we observed evident effects of weak EMF upon ion dynamics (Maniu and Neacsu, 2004) and enzymes activity (Maniu et all, 2004) from rat blood. In present paper we follow, in the same conditions, the EMF action on sanguine cells dynamics according to the treatment duration.

MATERIAL AND METHODS

Experiments were performed on six lots of Wistar rats: three control lots (untreated) and other three, treated with EMF (100Hz) generated by an Magnetodiaflux device. EMF was applied constantly 10 min. daily, 5, 10 and 20 days. The control lots were manipulated similar to the treated ones. After the each period, the animals were killed and the blood collected with anticoagulant. It was determined the number of haematies and total leucocytes by hemocytometric method, haematocrit by micro haematocrit techniques, hemoglobin by Sahli method, MEV and HEMC by specific mathematical relations (Neacsu and Cimpeanu, 1999). The obtained data were statistically appreciated (R. A. Fisher, 1925, J. Fowler, L. Cohen, P. Jarvis, 2000).

RESULTS AND DISCUSSIONS

The sanguine parameters of untreated animals (control lot), present a series of modifications – increasing and decreasing of the values depending on experimental duration, determined especially animal manipulation. For take off these modifications were established control lots for each experimental phase (5, 10 and 20 days).

At treated lot 5 days (fig.1 6) it was recorded in comparison with control low values of haematies number (97.56%), total leucocytes (83.65%), haematocrit (92.88%) and MEV (94.47%), and also increase values of hemoglobin (111.16%), correlated with a HEMC augmentation (114.42%).

After 10 days of treatment were obtained insignificant modifications of the values (fig.1 6): a decrease of haematies (97.44%), haematocrit (92.40%) and MEV (94.66%) and an increase of hemoglobin (101.36%), HEMC (104.45%) and total leucocytes (103.49%).

At 20 days, the treatment induce some different modification (fig.1 6): a increased values of haematies (125.33%), haematocrit (119.38%) and hemoglobin (104.29%) and decreased values of total leucocytes (83.96%), MEV (95.14%) and HEMC (82.29%).

The obtained data highlights a series of characteristic effects of EMF action on rat sanguine parameters depending on parameters type and treatment duration. Thus, EMF had a different influence on haematies and leucocytes dynamic number. A such an effect can be determined by a selective action of EMF on haematopoietic processes and the cell maturation rhythm and on sanguine reservoir. Same selective action of EMF was observed on other sanguine components: ions, proteins, leukocytary formula (Jitariu, 1987, Maniu and Neacsu, 2004).

During the experiment, haematocrit modifications (fig.3) follow the haematies number fluctuations (fig.1). Hemoglobin (g/%) record an increase values (fig.4) according to increasing of HEMC values (fig.6), indicating a better level of respiratory performances of haematies as a result of EMF action. The increasing of hemoglobin values (g/%) takes places especially by an increase of HEMC and less by an increase of haematies number. This effect assume a hemoglobin synthesis stimulation by EMF.

MEV recorded low values, possible owing to an effect of EMF on membrane permeability with a lost of the cellular water and a cellular volume reducing. This effect is accompanied by the HEMC increase with preserve of cellular respiratory capacity.

CONCLUSIONS

EMF influence determines number modifications of haematies and leucocytes as well as the erythrocytary parameters. Number of haematies record a decrease after 5 and 10 days, followed by an increase at 20 days. Leukocyte dynamics is inconstant: a decrease at 5 and 20 days and an increase at 10 days. The haematocrit, MEV and HEMC record specific modification under EMF.

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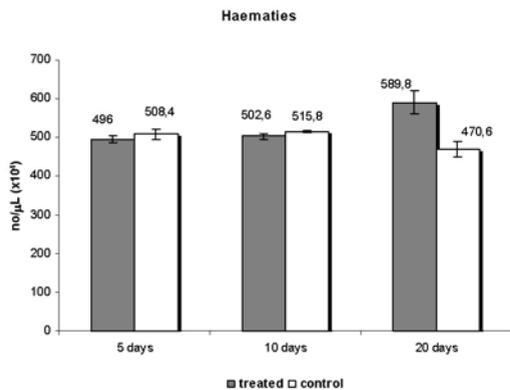


Fig. 1

Total leucocytes

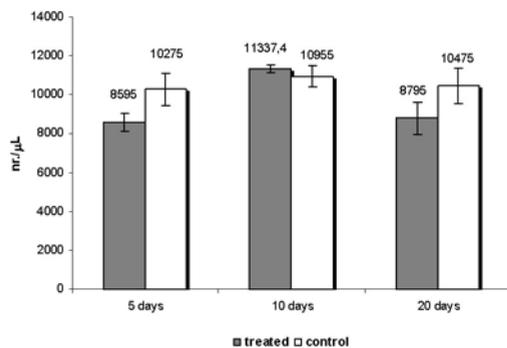


Fig. 2

Haematocrit

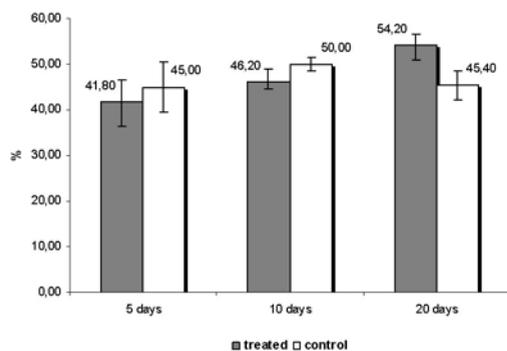


Fig. 3

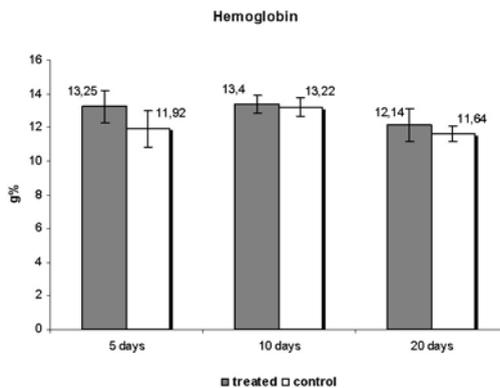


Fig. 4

Mean Erythrocyte Volume (MEV)

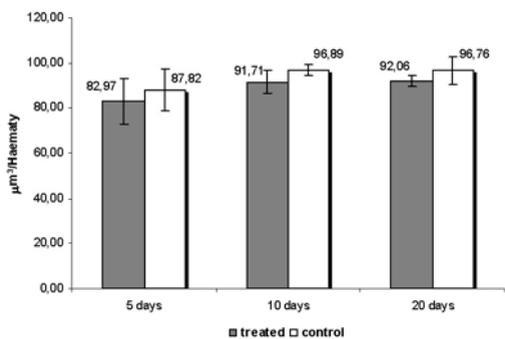


Fig. 5

Hemoglobin Erythrocyte Mean Content

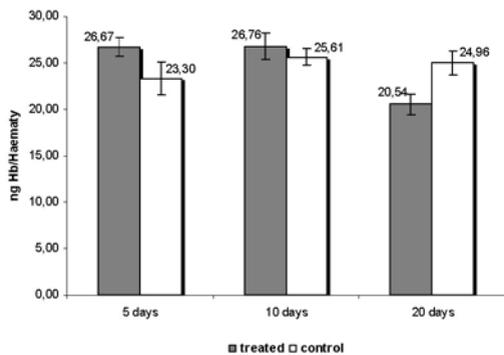


Fig. 6