ELECTROMAGNETIC FIELDS INFLUENCE ON THE RAT PLASMATIC IONIC CONTENT

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Abstract: Four samples of white rats (Whistar) were use: a control sample, 5 days, 10 days and a 15 days treated lots in electromagnetic fields. The treatment was made with 700 μT electromagnetic fields at 50Hz frequency, daily, 10 minutes each animal.

It were determined the Na^+, K^+, Ca^+ ions concentrations with the flame photometer method, from sanguine plasma.

The electromagnetic fields influence induces a decrease of plasma ion concentrations after 5 days. After 10 days re-establishment of the plasma ion concentrations takes placed.

INTRODUCTION

A series of earlier researches concerning several characteristics of electromagnetic fields influence treatment on several animal species shows specific effects on physiological and biochemical parameters (2 6, 8).

MATERIAL AND METHOD

It was used 4 lots of 5 white female rats (Whistar) with a 180g mean weight. One is the control lot. The other three are treated with electromagnetic fields 5, 10 and 15 days. The treatment was realized 10 minutes each day. The electromagnetic field (EMF) used, have a 50Hz frequency and 0,7mT intensity with a continuous action. The electromagnetic field was generated with magnetodiaflux. The rats of the control lot were manipulated in the same way except the treatment. At the end of the treatment the animals were sacrificed and the blood was collected on anticoagulant (heparin), was centrifuged and separated the plasma by the cell elements. The Na^+, K^+, Ca^{2+} from plasma was determined with flame photometer. The results were statistically explained.

RESULTS AND DISCUSSIONS

The data of the control lot makes evident the average values for every ion plasmatic concentration. Na^+ had an average value of 326,8 mg/100ml, K^+ 31,4 mg/100ml and Ca^{2+} 16,8 mg/100ml. It has been found that Na^+ had a greater plasmatic concentration than the K^+. Ca^{2+} had smaller value than K^+ but had a normal proportion.

At the treated lots had recorded a modification of average values of all three ions concentration and a specific dynamic depending on ion and treatment time.

After 5 days, Na^+ mean value is 312,4 mg/100ml (95,59% from control mean value), after 10 days it is 362,4 mg/100ml (110,89%) and after 15 days it is 315 mg/100ml (96,28%).

The mean K^+ plasmatic concentration had a different dynamic, comparative with Na^+. After 5 days of treatment, a decrease of the K^+ plasmatic concentration had been recorded - 21,2mg/100ml (67,51% from control mean value), after 10 days the values are restored at 20,6mg/100ml (94,26%) and after 15 days the mean value is 30,6 mg/100ml (97,45%).

The dynamic of Ca^{2+} plasmatic concentration is similar with K^{+}. After 5 days of treatment the mean value of Ca^{2+} was 11,4 mg/100ml (67,85% from control mean value), after 10 days it was 19 mg/100ml (113,09%) a value that persist after 15 days.

Overall the plasmatic ion concentration had a decrease after 5 days (fig 1, 2, 3) and an increase after 10 days of treatment. The increase is different from ion to ion. The mean value of K^{+} concentration had a restored by 94,26% at 10 days and 97,45% at 15 days. The Ca^{2+} concentration had a similar restore, but the values at 10 and 15 days were 113,09% compared to control mean value (fig.1, 2, 3). The mean value of Na^{+} concentration was restored at 96,38% from control.

This dynamics of ion concentrations under the EMF influence had consequences under ion ratios (Na^{+}/K^{+}, K^{+}/Ca^{2+}) and sanguine cell permeability. Na^{+}/K^{+} ratio was 10,40 at the control lot. At the treated animals the ratio values were changed depending on time of the treatment.

After 5 days the ratio was changed to 14,73, and after 10 days is 12,24. It is clear that was an evident increase of Na^{+} comparative to K^{+}. After 15 days the value returns to normal (10,29). This fact makes evident that the animals have an adaptation tendency to EMF in these experimental conditions.

An important physiological ratio is K^{+}/Ca^{2+}. (1, 7) It has an important influence in membrane structure and function stability. At the control lot it is 1,86. After 5 days it is the same value. At 10 and 15 days it is a decrease confronted by the control lot (1,55; 1,61). The decrease of this ratio highlights the influence of EMF on the degree of membrane stability having in mind the Ca^{2+} stabilization properties. This effect can determine a decrease of the passive trans membrane ionic fluxes (1, 7)

These experimental results indicate an evident action of EMF upon ionic dynamics in rat sanguine plasma. Similar results had obtained by other authors, too by other species. (2, 4, 6)

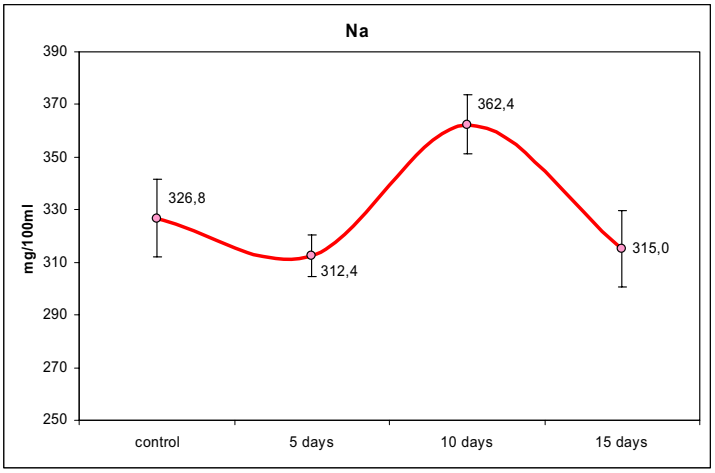

Fig. 1

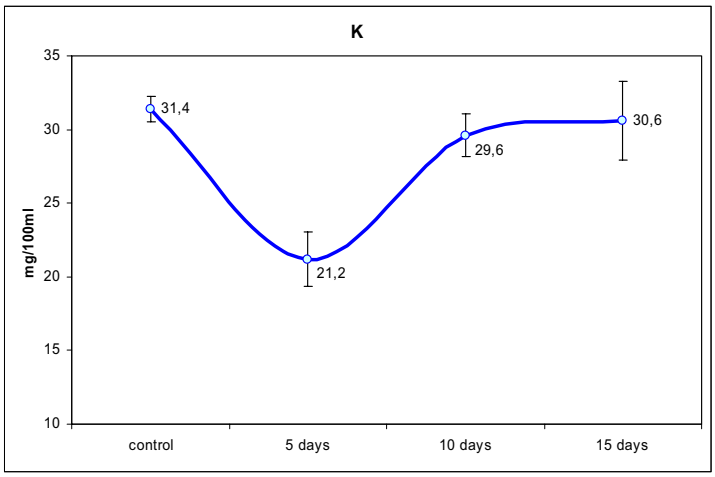

Fig. 2

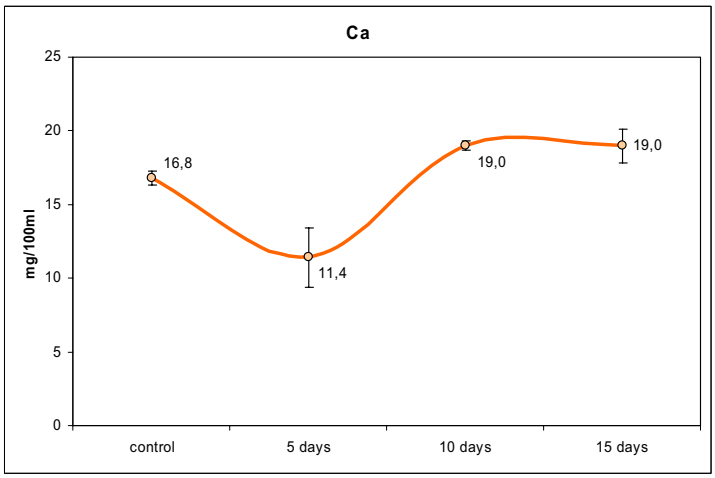

Fig. 3

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