

Study the effect of electromagnetic field on cortisol hormone some biochemical and hematological parameters in adult female rabbits

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Abstract

This study was investigated the effects of static magnetic field (SMF) on the serum cortisol hormone, biochemical and hematological parameter in 12 mature female rabbits, six of them were exposed to electromagnetic field of 104 μ T for 30 minutes twice daily for 15 days. The other six female rabbits served as control. Blood samples were collected from treated and control rabbits. Results revealed that there were significant ($p < 0.05$) increase in triglycerol, high density lipoprotein (HDL), and total WBC count. There were significant ($p < 0.05$) decrease in serum total protein, albumin, globulin, serum cholesterol, low density lipoprotein (LDL), glucose, and cortisol hormone. statically magnetic field also caused significant decrease in RBC count, PCV% and Hb concentration.

Key words. Electro magnetic field , female rabbits, cortisol, biochemical and hematological.

Introduction

The effect of electromagnetic field on the live microorganisms seems to be very complicated(7). The initial effect of electromagnetic field is to actuate the key biochemical processes in different metabolic pathways(6), due to daily exposure of electromagnetic fields produced by electrical devices, it's important to study various biological effects of different electromagnetic fields. previous studies show that only some electromagnetic fields could interact with an electrical fields of human body and may cause some physiological changes(2), it penetrate the animal body and act on all organs, altering cell membrane potential and the distribution of ions and dipoles(4), and these alterations may influence biochemical processes in the cell, thus changing both biochemical parameter and enzyme activities of serum (16) Numerous biochemical studies on human and animal which exposure to MF have showed that significant disturbances in the

metabolism of carbohydrate, lipid and protein reflected by altered blood glucose levels and by accelerated glycolysis and glycogenolysis(12,13) ,it is known to be strongly lipolytic and glycogenolytic in rats (5,9), inducing a prominent increase in blood cortisol level. Also, several studies have demonstrated that MF may increase in risk of various type of cancer , including leukemia, brain and breast tumor, the characteristic biological effect of MF appear to be functional changes in central nervous system , endocrine and immune system(1 ,14). Moreover many reports indicate that magnetic field is involved in cancer induction as a co carcinogenic factors able to be enhance the effect of other mutagenic substances(3). This study aimed to detect the effect of the electromagnetic field exposure of mature female rabbits on cortisol hormone and some biochemical parameters in addition to some hematological parameter .

Materials and methods

Twelve adult female rabbits, their mean body weight was 2 -2.5 kg; were housed at the animal house of the college of veterinary medicine at similar conditions at room temperature as each two animals in one cage under normal periods of light/dark with free access of

food and water . They were randomly divided into two experimental groups of six animals for each. First group was severed as controls and the others were exposed to electromagnetic field. The intensity of magnetic field was measured and standardized at 104 μ T and influx

density of 175gaus. Adult female rabbits were exposed to static magnetic field(SMF) for 30 minute twice daily for 15 days. The control rabbits group was positioned at the same place without applying magnetic field .Treated and control rabbits were scarified immediately after the last exposure. Blood samples(0.5 ml) were collected in vials containing EDTA for hematological investigation ,another blood sample (1.5ml)were collected in vial without any coagulant agents and immediately centrifuged to get serum which were frozen at $-20\text{ }^{\circ}\text{C}$ for hormonal and biochemical analysis .

Hormonal and Biochemical analysis:

Cortisol analysis is intending use :the quantities determination of the total cortisol concentration in serum by micro plate enzyme immunoassay ,kit was used (Monobind Inc .Lake forest

Results and Discussion

Exposure of female rabbits to electromagnetic field at $104\text{ }\mu\text{T}$ caused a significant increase at ($p<0.05$) triglycerol ,HDL,,and WBCs count table(1) as well as significant ($p<0.05$) decreased in cortisol ,glucose, serum cholesterol, LDL, total protein, albumin ,globulin, RBCs count, PCV %and Hb concentration. All the above measured parameters of treated female rabbits were compared with control group.Table(1) showed that treatment caused a significant decrease in cortisol and glucose level. these results were agree with (23), in guinea pigs , which suggestion that the decreases of the cortisol level had result from hormone synthesis in the kidney was controlled by peptides hormones ,but the changes in glucose level can be attributed to accelerated glucolysis and glycogenolysis with a metabolic block of conversion of pyruvic acid to acetyl coenzyme A .In relation to the cholesterol and LDL level during this experiment found significant decrease in those parameters which are similar to work of (17) whose reported that LDL is the basic carrier of cholesterol which provides necessary cholesterol for nervous tissue ,synthesis steroid and cell

CA92630,USA).The biochemical tests(triglyceride ,total cholesterol, HDL, LDL, glucose, total protein, albumin and globulin) were done by using Chemistry auto analyzer made in Germany by human star company serial no.20628.

Hematological analysis:

Red Blood Cells count (RBC) (Cell/mm^3) and Total White Blood Cell count (WBC) (Cell/mm^3) were obtained according to(5).Hemoglobin concentration (Hb) (g/dl) was measured by the use of (Sahli appliance). Packed cell volume (PCV) (%) was measured by the use of microhematocrit method (19)

Statistical analysis:

Data were reported as means $\pm\text{SE}$. statistical significance of the difference between mean was assessed by students t-test according to(21)The level of significance was set at($p<0.05$).

membrane ,after removing of LDL and cholesterol sending message to cells ,causes the plasmatic cholesterol to decrease. While HDL was high significant regarded to (15)in rabbits, but these data disagree with results of (11) in human. In the other hand triglyceride level was accelerated in exposure female rabbits, this finding opposite to(8) in guinea pigs, but its agree with(22) in rat which exposed to electromagnetic radiation.In this study found that SMF exposure significantly decreases the total protein level, albumin and globulin which same as work of (14) when showed changes occurred in all electrophortic protein fraction of serum but the level of albumin and globulin were most affected .The present data showed that MF exposure significantly decreases the red blood cell count ,pcv% and hemoglobin concentration .Those results similar to(10) in rat , but these data different from (18)when they found significant increase in the above parameters. The only hematological parameter was WBC count which reported significantly increases compared with control group and other hematological parameter similar to (10,20) .

Table 1. Effect of electromagnetic field exposure on cortisol hormone, biochemical and hematological parameters of mature female rabbits. (means±SEM.)

parameter	treatment±SE	control±SE
Cortisol ng/ml	2.083±0.030 b	8.25±0.076 a
Glucose mg/dl	135.16±0.703 b	315.00±23.629 a
Cholesterol mg/dl	66.16±0.909 b	84.00±0.365 a
LDL mg/dl	20.58±0.212 b	38.34±0.924 a
HDL mg/dl	51.681±0.434 a	51.380±0.407 b
Triglycerol mg/dl	121.85±2.762 a	71.48±0.378 b
Total protein g/dl	36.80±1.181 b	70.68±0.327 a
Albumin g/dl	4.30±0.015 b	4.52±0.011 a
Globulin g/dl	61.58±0.314 b	67.53±0.292 a
RBCs cell/ mm ³	5452.16±1958.19 b	8219.50±15.085 a
PCV %	30.16±0.307 b	30.38±0.477 a
Hb (g/dl)	6.750±0.214 b	8.75±0.214 a
WBCs cell/ mm ³	2750.83±2.386 a	1574.66±1.33 b

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دراسة تأثير المجال الكهرومغناطيسي على هرمون الكورتيزول وبعض الصفات الكيمياءحيوية والدموية في إناث الأرانب البالغة

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الخلاصة

هذه الدراسة تبحث في تأثير المجال المغناطيسي المستقر على تركيز هرمون الكورتيزول في مصل الدم، والتغيرات الكيمياءحيوية والدموية في اثني عشر أنثى أرانب بالغة، عرضت ستة منها الى مجال كهرومغناطيسي بشدة 104 مايكروتسلاير لمدة ثلاثين دقيقة مرتين في اليوم ولفترة 15 يوما، أما الستة الأخرى فلم تعرض الى المجال المغناطيسي واعتبرت كمجموعة سيطرة. جمعت نماذج دم من جميع الحيوانات المعاملة والسيطرة على حد سواء أظهرت النتائج زيادة معنوية عند مستوى المعنوية (5%) في كل من الكليسيردات الثلاثية، البروتين الدهني عالي الكثافة والعدد الكلي لكريات الدم البيض بينما تم الحصول على نقصان معنوي عند مستوى (5%) في كل من البروتين الكلي لمصل الدم، الألبومين، الكلوبين، الكولسترول الكلي، البروتين الدهني واطىء الكثافة، الكلوكوز، هرمون الكورتيزول، العدد الكلي لكريات الدم الحمراء، حجم كريات الدم المرصوصة وتركيز الهيموغلوبين .