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Study of the effect of electromagnetic radiation on some genetic and physiological criteria in white rat males

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Abstract
The present study was conducted to investigate the effect of long exposure to mobile radiation on antioxidant rats
The first group (T1) was randomly assigned to irradiation of the mobile phone for two hours and for three periods (2-3-6), months of the second group (T2) was exposed to mobile phone radiation for four hours to three periods (2-3-6) mounth. The third group (T3) was exposed to mobile phone radiation for eight hours and three periods of time (2-3-6) months and the totals were presented to the telephone and frequency (900) MHZ
Blood samples were collected from the three groups after the end of the trial period and the following physiological criteria were studied :
The measurement of the concentration of mononaldehyde (MDA), the level of nitric oxide (NO) and the concentration of reduced clotathione (GSH) was added to the catales concentration (CAT) and superoxide dismutase (SOD) in :the serum, the results of the present study were as follows; significant increase (P <0.05) in the concentrations of manholdehyde (MDA)and nitric oxide (NO) and significant decrease (P <0.05) in the concentrations of Glutathione (GSH), catalase (CAT) and superoxide dismutase (SOD) in the serum for groups exposed to mobile phone radiation and for (2-3-6) Months and a period of (2-4-8) hours respectively compared to the control group for each group

INTRODUCTION

The rapid development of technologies in medicine and industry using fixed magnetic fields has led to increased human exposure to these fields and a number of scientific studies have examined their potential health effects (1). This technological development has increased the number of devices emitted by electromagnetic waves such as refrigerators , Freezers, Television, Radio, Microwave, Cameras, Computer Monitors, Halogen Lamps, Printers and Air Valve Enforcement Machines,(2), Radar, Magnetic Resonance Imaging (MRI) Wired and mobile phones are all examples of high frequency electromagnetic radiation sources (UHF EMR) and can be seen at airports, homes, schools, hospitals and industries (3)
Electromagnetic phenomenon (EM) was discovered by Henrik Hertz in the late 1880s. It shows how energy travels through a certain medium. The center can be air, water, air cable, optical fiber and the like Electromagnetic radiation is in the form of waves of electrical and magnetic energy (4 , 5)
This radiation has a wide range of frequencies including extremely low frequencies, radio frequencies (radio waves), radar waves, microwaves, infrared, ultraviolet rays, X-rays (3).
Concerns about the potential effects of radio frequency (RF-EMR) emitted from these devices on human health are increasing (Agarwal et al., 2008). Emo effects on living organisms depend on the wave frequency and intensity, and the serious effect of high radio waves is associated with frequency increase in body temperature (6)
Reported that electric fields cause high blood pressure, changes in white and red blood cell count, weak immune system, chronic stress effects, increased metabolism, fatigue
Chronic, disorders, and headaches (7) have shown that the use of cellular phones causes difficulty in concentration and also causes fatigue, headache and change in the pattern of brain electrophysiological planning and sleep disorder (8).

MATERIALS AND METHODS

Irradiation Animals

The animals were irradiated using electromagnetic radiation (EMR) emitted from the Samsung S3 Korean mobile phone. The rats were irradiated at a frequency of 900MH daily at 2 hours for two months, three and six months respectively for the first trial. Treatment T1
Four hours for two months, three and six months respectively for the second T2 treatment trial, Eight time for two months and three and six months respectively for the third trial T3 treatment ,Note that the rats were in cages, and each cage contains (5) rats.

Experimental design

The first group (T1) was offered for two hours to irradiate the mobile phone for a period of (2-3-6) months a day
The second group (T2) was offered for four hours to radiate the mobile phone for a period of (2-3-6) months per day
The third group (T3) was offered for eight hours to radiate the mobile phone for a period of (2-3-6) months a day**...**
At the end of experiment, the Rat were sacrificed by anaesthetized with chloroform, blood samples were collected from heart centrifuged at 1000 × g for 10 min and the serum samples were being harvested into Eppendorf tubes, deep-frozen for later biochemical analyses.

Malondialdehyde (MDA)

The Malondialdehyde was determined by using the method of ,thiobarbituric acid (TBA). Based on the reaction of TBA with MDA absorption was read at a 532 nm wavelength using spectrophotometer (9)

Reduced Glutathione (GSH)

Glutathione was measured using the Ellman's Reagent (DTNB) method described by(10). The absorbance was estimated at 412 nm using the spectrophotometer device.

Determination of the level of the catalase enzyme(CAT)

The method used to measure the effectiveness of the enzyme catalysis in the serum and the method is based on the decomposition of hydrogen

peroxide to two water molecules

One unit per microl of hydrogen peroxide decomposes per minute at 25 ° C in pH pH = 7.0 (11)

Determination of superoxide dismutase Activity (SOD)

The efficacy of superoxide decemiotase in the serum was measured using the chemo-photochemical reaction method

Nitroblue tetrazolium (NBT) using sodium cyanide as an inhibitor of peroxidase (12)

Determination of nitritic oxide (NO)

The sample containing peroynitrite was added to phenol at 50 ms

Phosphate buffer pH 7.4, after incubation for 2 h at 37 ° C, sodium hydroxide was added to produce nitro nitro salt, which has a maximum absorption at 412 nm. The yield of nitrophenol was calculated from ε 4400 M - 1cm – 1 (13).

Statistical Analysis

The analysis of the binary variance and the LSD test were used to show the difference between the computational variables of the studied variables. All statistical analyzes were performed using SPSS.V.25.

RESULTS

The effect of mobile phone radiation on the level of manholdehyde (MDA) in serum

The results of the present study showed in figure(1) a significant increase (p<0.05) in the serum MDA level compared to the control group of T1, T2, T3 for the time period (2,3,6) months for (8-4-2) hours respectively in groups exposed to mobile phone radiation. The highest effect in group T3 was for the period of 6 months and for)2-4-8) hours (17.68), (9.30) (5.66) respectively.

The effect of mobile phone radiation on the level of nitric oxide (NO)in the Serum

The results of the present study showed in figure (2) a significant increase in serum p <0.05 compared to the total control group of T1, T2, T3 in the period (2-3-6) months and (8-4.2 hours respectively in groups exposed to mobile radiation). The highest effect of the last group was T3 in the period 6 months and for(8-4-2) hours (112.18), (77.87) and (39.17) respectively.

The effect of mobile phone radiation on the level of GSH in the serum

The results of the present study showed in figure (3) a significant decrease (P <0.05) in the serum compared with the control group in groups T1, T2, T3 in periods (2-3-6) months (2-4-8) Respectively in groups exposed to mobile radiation and the highest effect of the last group T3 in the period of 6 months and for a period (2-4-8) hours (1.43) (2.56) (3.10) , respectively.

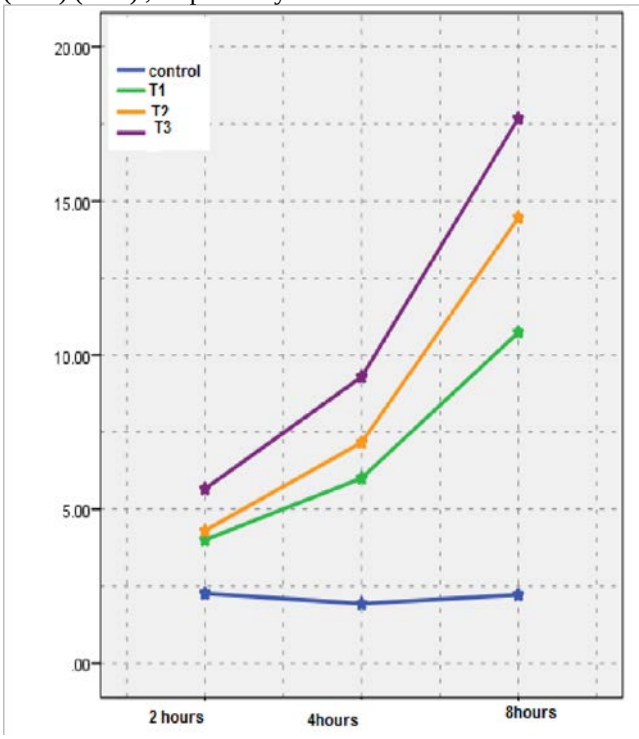

FIGURE1: The effect of mobile phone after treated on the level of MDA in blood serum. Data are showed as mean ± SD (n =5) and are analysed by Revised Least Significant Differences (L.S.D) test. Different letters refer to significant (P<0.05)

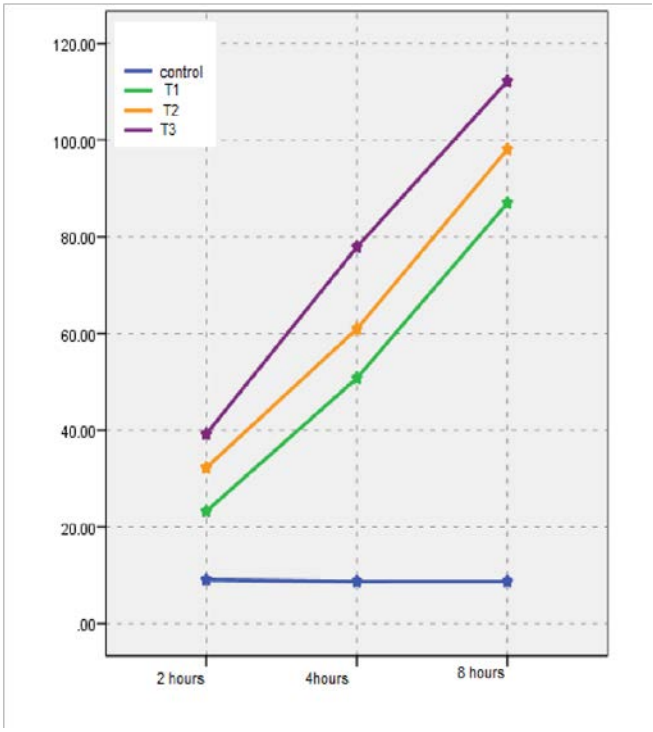

FIGURE2: The effect of mobile phone after treated on the level of NO in blood serum. Data are showed as mean ± SD (n =5) and are analysed by Revised Least Significant Differences (L.S.D) test. Different letters refer to significant (P<0.05)

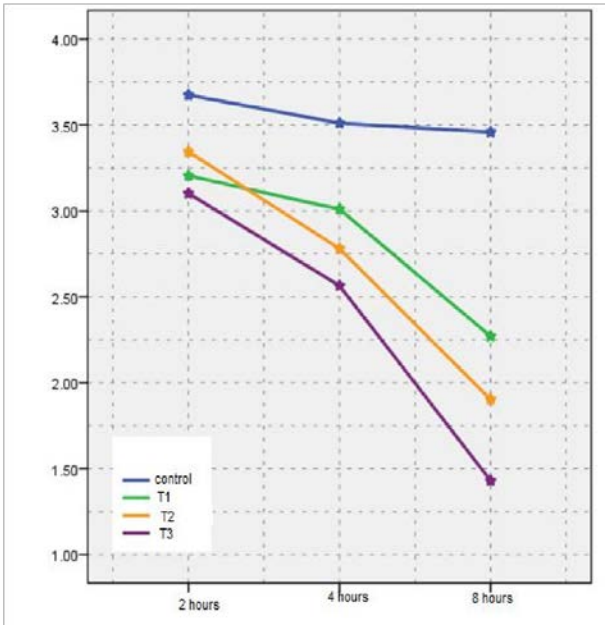

FIGURE3: The effect of mobile phone after treated on the level of GSH in blood serum. Data are showed as mean ± SD (n =5) and are analysed by Revised Least Significant Differences (L.S.D) test. Different letters refer to significant (P<0.05

The effect of mobile phone radiation at CAT level in serum

The results of the current study showed in figure (4) a significant decrease (P <0.05) in the serum compared to the control group of T1, T2, T3 in the period (2-3-6) months for (2-4-8) Respectively in groups exposed to mobile phone radiation and had the highest effect in the last group T3 for the period (6) months and for a period (2-4-8) hour (0.37), (0.62) and (0.87) respectively.

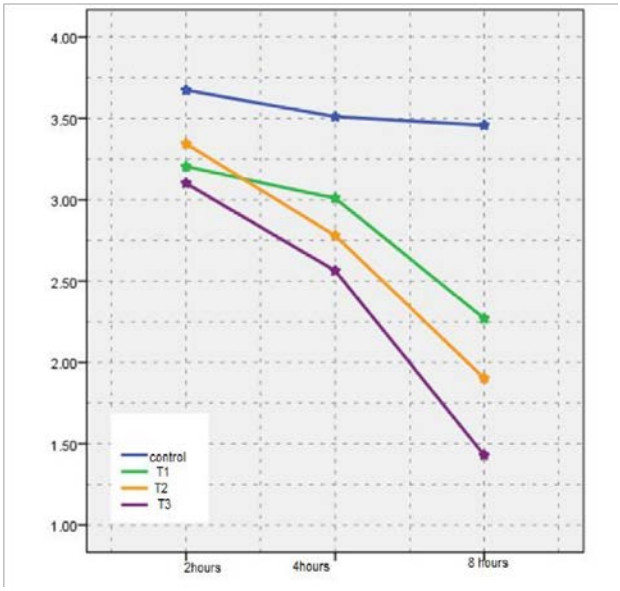

FIGURE4: The effect of mobile phone after treated on the level of CAT in blood serum. Data are showed as mean ± SD (n =5) and are analysed by Revised Least Significant Differences (L.S.D) test. Different letters refer to significant (P<0.05)

The effect of mobile phone radiation on the level of superoxide dismutase SOD in Serum.

The results of the current study showed a significant (5-4) significant decrease (P <0.05) in the serum compared to the control group in the period T1, T2, T3 (2-3-6) months for (2-4-8) Respectively in groups exposed to mobile radiation and had the highest effect in the last group T3 for the period of 6 months and for (2-4-8) hours (0.52) (0.67) (0.83) , respectively

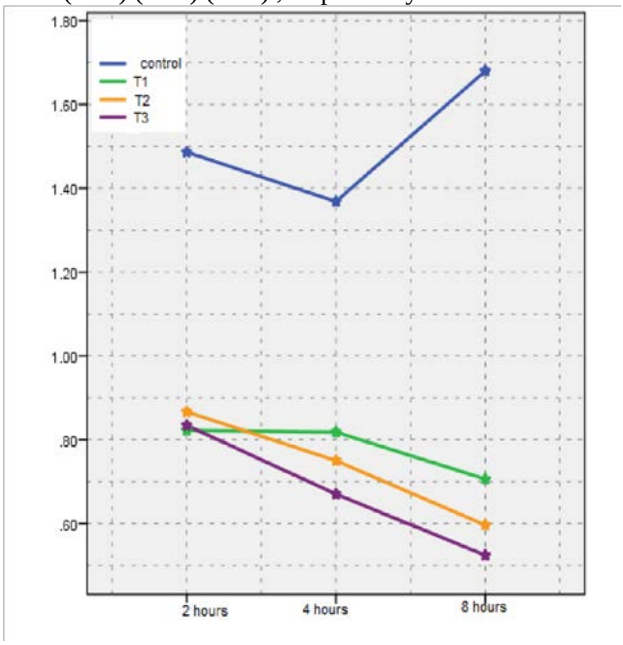

FIGURE 5: The effect of mobile phone after treated on the level of SOD in blood serum. Data are showed as mean ± SD (n =5) and are analysed by Revised Least Significant Differences (L.S.D) test. Different letters refer to significant (P<0.05)

DISCUSSION

The results of the present study in figure (1) showed that exposure to mobile phone radiation resulted in a significant increase in the level of manholdehyde (MDA). This study was consistent with (14) Where an increase in levels of manholdehyde (MDA) was identified, an indicator of fat oxidation Where the long-term exposure to 900 MHz mobile radiation has caused an increase in the active oxygen species ROS causing the generation of free radicals that play an important role in raising the level of oxidants, including MDA This study was supported by other studies mentioned earlier on exposure to radiation from the mobile phone (15,16,17, 18)

The process of peroxidation occurs when the production capacity of free radicals exceeds the antioxidant defense systems to get rid of their products. And in figure (2 The results of the present study showed that the exposure to mobile phone radiation led to a significant increase in the level of nitric oxide NO. This study was consistent with (14)

The rise in nitric oxide is due to the fact that the use of mobile phones operating in the 900 and 1800 MHz bands and very broadly cause some harmful biological effects on human health (19). This increase is due to the formation of free radicals in some tissues (16,20)

It was found that exposure to mobile radiation caused an increase in levels of nitric oxide NO and thus indicates the role of oxidation mechanisms and free radicals in the damage of the heart tissue and nasal cell phone (21)

Where the rapid increase in the level of concentration of nitric oxide Nitric oxide because of the rapid interactions that occur between NO and the positive ion of Superoxid to form Peroxynitrate Peroxynitrate, which in turn is toxic acid gets the ability to analyze pyroxy nitrite easily to give the roots of free hydroxyl and toxic nitrogen nitrogen Nitrogen dioxide (22).

Pyroxy nitrite acts to attack the lipids in cells, proteins and amino acids by breaking down the hydrogen atoms present in them and thus losing their permeability and damage to cells (23).

Figure (3) The results of this study showed that exposure to mobile phone radiation resulted in a significant decrease in the level of GSH and this study was consistent with (14) (24)

Clotathione is one of the most important internal antioxidants in the body by coin as a catalyst for many enzymes responsible for removing the toxicity of oxidizing compounds such as active oxygen (25)

While in figure(4) and (5)The results of the present study showed that exposure to mobile phone radiation resulted in a significant decrease in the level of superoxide and catalase this study was consistent with (14) ,(15)SOD This enzyme also works to resist all free radicals in all cells exposed to active oxygen species. It also decomposes superoxide to hydrogen peroxide and oxygen, but over hydrogen oxide it is used to oxidize many toxins including phenol, formalin, and alcohol. Decreased levels of SOD and increased levels of free radicals (ROS) in the kidneys of 900 MHz-exposed mice for 30 minutes / day for one month (26)where the exposure of rats' brains to electromagnetic radiation drop The level of CAT and SOD. (27) AND Several studies have shown that exposure to radiation has a negative effect on the effectiveness of some antioxidant enzymes such as Superoxide dismutase, Catales, Peroxidase and therefore its negative impact on the processes of the Hoya Electromagnetic fields are known to affect biological systems by increasing ROS, which causes oxidative stress by altering the levels of CAT and SOD in tissues (28,29)

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