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Histological and Antioxidant Effect of different phone waves on the liver and kidney of male rats

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ABSTRACT

There is tremendous concern about the potential harmful effects of cell phone microwaves. The results are contradictory. However, the effects of these waves on the body have been reported. In this study, the effect of cellular microwaves on sperm parameters and total antioxidant capacity in relation to the duration of exposure and frequency of these waves were studied. This experimental study was conducted on male Sprague Dawley rats (150-200 g). The animals were randomly assigned to three groups (n = 18). Group 1 Natural control rat were fed to standard laboratory feeding Animals for 14 days. Group 2 animals were exposed to cell phone receiver stimulated waves (915 MHz frequency) for 14 days, and Group 3 animals were exposed to simulated waves of a cell phone antenna (950 MHz frequency) for 14 days. The results indicated that the total antioxidant capacity in all exposure groups decreased significantly compared with the control group (P <0.05). Increased exposure time within two weeks caused a statistically significant decrease in sperm motility and mobility (P <0.05).Effect of phone waves on liver and kidney of male Sprague Dawley rat. The study of pathological anatomy revealed a clear and appropriate deviation. These results found blood enzymes such as aminoaspartase transferase (AST), amino amines (ALT), and creatinine levels. The results showed no significant changes in both liver and kidney physiological functions. Malondialdehyde level (MDA) and total antioxidant contents were performed. The level of glutathione (GST), superoxide dismutase (SOD) was in normal ranges. Exposure to cell phone waves can reduce sperm movement and mobility in rats. These waves can also reduce the total antioxidant capacity in rats and lead to oxidative stress.

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INTRODUCTION

Modern technology increases the exposure to radiation by electromagnetic waves (EM). This is a daily lifestyle that is industrial noise, mobile phones, computers, and home ambulances such as a microwave, oven, and electric heater. Hence, so there is great interest in the effects of electromagnetic radiation on the organism (Smagowska and Pawlaczyk-Łuszczyńska, 2013). Non-ionizing radiation has enough energy to excite, rather than forming charged ions when passing through a substance such as ionizing (Yamasaki *et al.*, 1995; Liang *et al.*, 2018). Ultrasound is widely used in lifestyle exposure (ultrasonic washing machines, welding, and

corrosion machines), dog whistles, insect repellents and rodents, humidifiers, and inhalers. These types of American waves have a reduced frequency averaging 20 kHz. While high frequency (more than 0.8 MHz) is used in therapeutic matters and medical diagnosis 1-3. Ultrasound's biological impacts are thermal and non-thermal. Although most biological reactions are the result of the thermal effect, ultrasound's non-thermal effects are at the level of the cell membrane's gas cavities (Haar, 2011). Radiation exposure, especially ionizing, may release reactive oxygen and nitrogen species known as free radicals within (Okunieff *et al.*, 2008). These roots have non-circulating electrons, making them a highly reactive species. In mammals, an advanced system of intrahepatic antioxidants is produced to resist the action of these reactive species. There are many risk factors, including alcohol, drugs, pollutants from the environment, and radiation, which can trigger oxidative stress in the liver, leading to serious liver disease. Unspecified bookmark (Satti *et al.*, 2018). The present illustrative study conducted experimental methods to anticipate the effect of therapeutic ultrasound radiation on the liver and kidneys of male white mice. The study protocol will be conducted at the cellular level.

MATERIALS AND METHODS

Experimental animals

For this research, male Sprague Dawley rats (150-200 g). Detained in the Animal House (National Research Center, Cairo University, Egypt) Because I am the week to adapt properly before the start of the experiment. They lived under laboratory conditions, preserved in a standard pellet diet And Water Advertising Mom throughout the trial period. The experimental study was endorsed by the Faculty of Veterinary Medicine, University of Medicine Cairo, Egypt's Animal Care and Use Committee. Design and build a cylinder of exposure and chamber of radiation.

Experimental design

The mice were divided into three groups consisting of Eighteen animals in each group are as follows: group 1 Natural control mice were fed to standard laboratory feeding Animals for 14 days. Group 2 animals were exposed to cell phone re- ceiver simulated waves (915 MHz frequency) for 14 days, and group 3 animals were exposed to simulated waves of a cell phone antenna (950 MHz frequency) for 14 days.

Exposure cylinder

To expose animals to cell phone simulation waves, a Plexiglass cylinder was constructed consisting of an inner (radius: 20 cm, height: 35 cm) and an interior (radius: 5 cm, height: 30 cm). Animals were placed between inner and outer space during experiments and had free access to all areas of space. The inner cylinder's objective was to prevent objects from entering the near field of the monopoly antenna, which was mounted vertically in the center of the inner cylinder. A unipolar antenna was used as a simulator for the vertical transmission of cell waves to the middle of the internal drum. The animals were, therefore, stopped from entering this region because the measurement of density in the vicinity of the antenna was comparatively incorrect (Ghanbari *et al.*, 2013).

Cell phone simulation waves exposure

Using a mobile system (Holladay, USA), place the vertical (unipolar) antenna of the cell phone simulator generator in the middle of the internal drum. The average density at the above ranges was 1.60 MW / cm^2.

Tissue examination

Smaller units of newly extracted organs (liver and kidneys) from all experimental groups were treated and tested by the hematoxylin and eosin (H&E) method as follows: small pieces of organs were repaired by 10% formaldehyde; Alcohol. Then clean the xylene and then rehydrate in the descending proportion of alcohol. The samples were kept using Haematoxlin and Eosin stain, then washed again by ethylene. Finally, the slides are configured to be examined by an optical microscope.

Determination of LPO enzyme

LPO was estimated by malondialdehyde (MDA) response with thiobarbituric acid (TBA), a product created by membrane lipid peroxidation. Blood samples have been gathered in fresh pipes at 1500 > ' gthen red blood cells (RBCs). In the frozen phosphate buffer (0.1 M, pH 7.4) containing FCCl (1.17% w / v), RBCs were homogenized. Aliquot of 1ml was drawn from the suspension medium After homogeneous centrifugation (10% w / v) at I0,500xg. Approximately 0.5 ml of 30 percent TCA was then added, followed by 0.5 ml of 0.8 percent TBA. The pipes were held at 80* C for 30 minutes in a shaking water bath. After 30 minutes of incubation, pipes were removed and retained for 10 minutes in ice-cold water. They were then centrifuged for 15 minutes at SOQxg. The supernatant absorbance was read in the room at 540 nm. At the emperor's space against a suitable blank. The concentration of MDA was evaluated using tetraethoxypropane from the conventional calibration curve. The technique of estimating protein (Ohkawa *et al.*, 1979) was used.

Table 1: Antioxidant Capacity Simulated waves of an antenna on the cell phone (950,915 MHz frequency) during14 days

Antioxidant Capacity Parameters	G1	G2	G3
GSH concentration(nmolmMg protein)	890.18±0.56A	820.07±0.66B	810.00±0.94B
MDA (nmol/g tissue)	6.71±0.98A	7.64±0.88C	7.14±0.89C
GST (U/mg Hb protein)	0.52±0.61A	0.77±0.74D	0.75±0.73D
GPx (U/g Hb)	15.27±0.87A	13.26±0.83D	12.4±1.35D
GR (μmol/mg protein)	50.61±0.54D	44.55±1.11A	43.16±0.57A
CAT (U/L tissue)	0.049±0.82A	0.015±0.99B	0.017±1.34B
SOD activity (U/L tissue)	5.702±0.95C	4.099±2.98B	3.941±1.88B

Numbers are ± SD mean. Superscript letters depict meanings between organizations ($p < 0.05$)

Table 2: Antioxidant Capacity Simulated waves of an antenna on the cell phone (950,915 MHz frequency) during 14 days

Parameter	Group		
	G1	G2	G3
ALT concentration (IU/L)	2 4 .30± 2 .92C	24.62± 3 .77c	25.35± 4 .52c
AST concentration (IU/L)	42 .44± 4 .92A	4 0 .55± 4 .38A	43.41±1 2 .94A

Numbers are ± SD mean. Superscript letters depict meanings between organizations ($p < 0.05$)

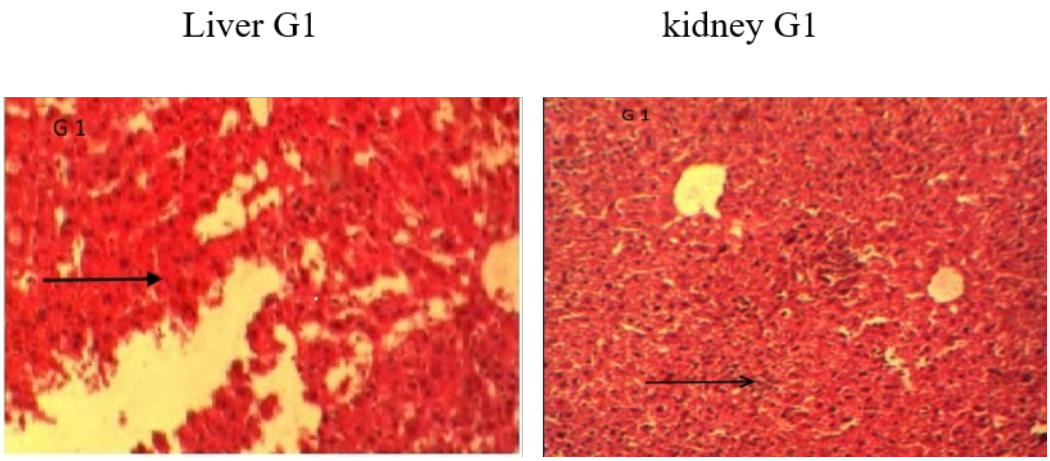

Figure 1: Microscopic photographs illustrating morphological information of study groups for samples of liver and kidney tissue

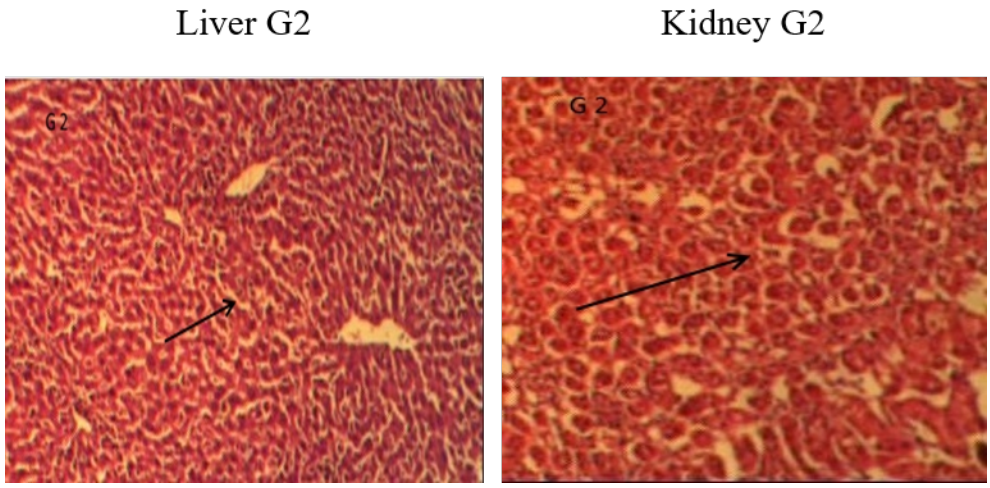

Figure 2: Microscopic photos showing a morphological detail of study group 2 for liver and kidney tissue samples were exposed to cell phone re-ceiver simulated waves (915 MHz frequency) for 14 days and group

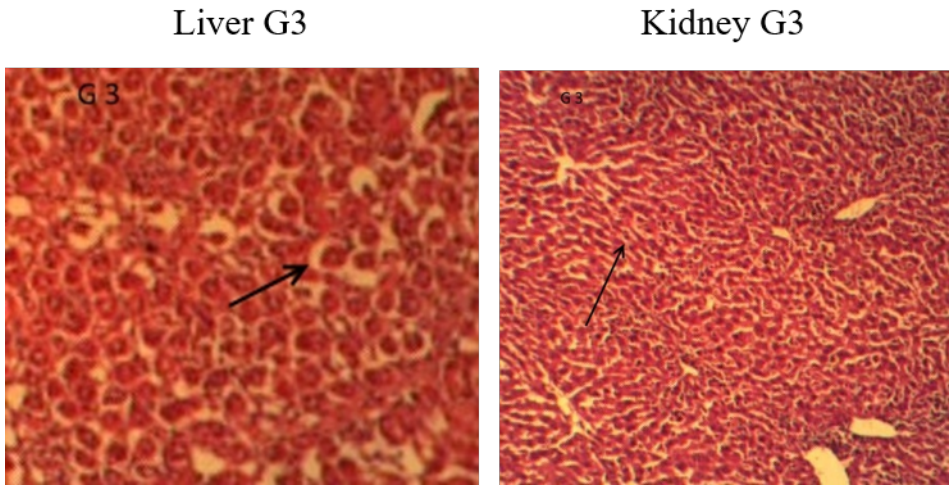

Figure 3: Microscopic photos showing morphological details of study group 2 for liver and kidney tissue samples were exposed to simulated waves of a cell phone antenna (950 MHz frequency) for 14 days

Lipid peroxidation per milligram of protein was presented as nmol of MDA (Ohkawa *et al.*, 1979).

Determination of GSH enzyme

Method of estimating GSH content. In 0.02 M EDTA, the red blood cell fraction was homogenized. Aliquots of 5ml of the homogenates were mixed with 4ml of cold distilled water and 1ml of 50 percent TCA in the test tube. Using vortex mixer, the pipes were shaken for 10 min and the centrifuged for 15 min at 1200xg. 2ml of supernatant was mixed with 4ml after cenlriftigation Tris-buffer of 0.4 M (pH 8.9). Mixed the entire solution and added 0.1 ml of 0.01 M DTNB^5, 5'-dilhiobis (2-nitrobenzoic acid)^. Within 5 minutes of adding DTNB at 412 nm, the absorbance was read using UV-spectrophotometer against a blank reagent without homogeneity (Sedlak and Lindsay, 1968).

Determination of SOD activity

SOD activity was evaluated by technique. The activity of the enzyme was described as mg ' protein units, and 1 enzyme unit is described as the activity of the enzyme that inhibits 50 percent of pyrogallol's autoxidation (Marklund and Marklund, 1974).

Determination of CAT activity

The technique of estimating CAT activity was used. In a final quantity of 3 ml, the response mixture consisted of 1.95 ml phosphate buffer (0.1 M, pH 7.4), 1.0 ml hydrogen peroxide (0.019 M) and 0.05 ml PMS (10% w / v). Absorbance changes were registered at 240 nm. The activity of the enzyme was calculated as min' mg' protein eaten by nmol of H2O2 (Nei *et al.*, 1985).

Determination of GPx activity

Activity of GPx was evaluated by technique. The response mixture consisted of 1.49 ml phosphate buffer (0.1 M, pH 7.4), 0.1 ml EDTA (1 mM), 0.05 ml glutathione reductase (1 lU / ml), 0.05 ml decreased glutathione (1 mM). 0.1 ml NADPH (0.2 mM), 0.01 ml H202 (0.25 mM) and 0.1 ml PMS (10% w / v) of 2 ml complete quantity. NADPH's 340 nm disappearance was recorded at 25 ° C. The enzyme activity was calculated using a molar extinction coefficient of 6.22^ 103 M * cm ' as nmol NADPH xidized / min / mg protein (Mohandas *et al.*, 1984).

Determination of GR activity

According to the technique of GR operation (Mohandas *et al.*, 1984). The reaction mixture consisted of 1.65 ml of phosphate buffer (0.1 M, pH 7.4), 0.1 ml of EDTA (0.5 mM), 0.05 ml of oxidized glutathione (1mM), 0.1 ml of NADPH (0.I mM) and 0.1 mlPMS (10% w / v) in a complete quantity of 2 ml. NADPH's 340 nm disappearance was reported at 25 "C The enzyme activity was calculated using a coefficient of molar extinction of 6.22>:10^M ' cm as nmol NADPH oxidized /min/mg protein (Mohandas *et al.*, 1984).

Estimation of Serum AspartateTransaminase (AST/GOT) and AlanineTransaminase (ALT/POT)10

ALT enzyme is highly concentrated in the liver and lower extent in the kidney and heart muscles, pancreas, and lungs. It can be elevated in a case like Hepatitis, cirrhosis, obstructive jaundice, liver carcinoma,.MeanwhileAST enzyme concentrates mainly in heart, heart, liver, muscles, and kidney. Although both enzymes are elevated whenever liver cell affected, ALT is the liver-specific one. The assay principle of both enzymes is the same. ALT activity is monitored by the concentration of pyruvate hydrazone, formed with 2,4- dinitrophenylhydrazine. While in AST by concentration oxaloacetatehydrazone (Reitman and Frankel, 1957).

Statistical analysis

The mean value of all values is ± SD. Experiment data were evaluated using one-way variance analysis (ANOVA I) using F-test. The least important difference (LSD) was made to assess the difference between.

Result and discussion

Histological statement

Microscopic images in Figures 1, 2 and 3 and all three groups, respectively, 1,2,3 show no abnormal change in cellular integrity for both liver and kidney samples compared with a control group in rats.

Antioxidants and oxidation markers

The activity of lipid peroxide and malalaldehyde levels are shown in Table 1. According to our study, compared with the control group. With regard to antioxidant capacity, all study groups showed reduced antioxidant activities (SOD, CAT, GR, GSH, GST, GPx) compared to normal animals (P> 0.05). As shown in Table 1.

ANOVA test, a: large with the normal group: Statistically significant at $p \leq 0.05$ Data, was expressed using mean ± SD.

Evaluate ALT and AST activity

Liver enzymes are represented (ALT, AST). There was no significant change in the study groups compared with the control group. As shown in Table 2.

Upgrading technology makes our present world as a pool of electromagnetic waves irradiation. Our daily lifestyle aids in increasing the rate of exposure, including industrial noising, working environment, cell phones, Home-aid tools, microwave, oven, and electric heater, and computers. The impact of cell phone waves on the liver and kidney function of Sprague Dawley male rats has been explored in the present research (Agarwal *et al.*, 2009). The outcome results showed a significant no alteration at the histological and biochemical levels (liver enzymes) in comparing with the non-irradiated control group. Histopathological studies revealed no obvious change in cellular ultrastructure of mice liver and kidney cells in comparing with control groups. Monitoring the oxidative stress parameters, lipid peroxidation indication was evaluated by MDA level, irradiated groups with (Erogul *et al.*, 2006). They exhibited significantly high levels of MDA, as compared with the control group. This finding was coincident with the work of (Valtonen, 1967). The antioxidant capacity was estimated as a preventive line for liver and kidney injury. Enzymatic (like SOD) and non-enzymatic antioxidants (such as GST) showed decreased activities in comparison with the control group.

CONCLUSION

In summary, from our finding on irradiated male rats Sprague Dawley, we can occlude that using cell phone waves irradiation Phone waves, especially high-waves such as telephone towers should be avoided close to or near direct contact.

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