

Effects of Mobile Phone Radiation on the Liver of Immature Rats**¹Shahrbanoo Ghaedi, ²Kargar Jahromi Hossein, ³Farzam Mohammad, ³Azhdari Sara, ⁴Mahmoudi Teimourabad Saeid, ⁵Bathae Hamid**¹MSc, Animal Physiology, Islamic Azad University of Jahrom Branch, Jahrom, Iran.²PhD, Comparative Histology, Young Researchers Club, Jahrom Branch, Islamic Azad University, Jahrom, Iran.³PhD, The Department of Anatomy and Embryology, International branch, Shiraz University, Shiraz, Iran .⁴MSc, Department of Histology, International branch, Shiraz University, Shiraz, Iran.⁵MSc, Physiology, Institution of Supreme Education and Industry of Maragheh Author responsible for

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ABSTRACT

Introduction: In recent years, the increasing use of microwaves generator, especially a lot of concern about possible effects of mobile phone radiation on human health has created. The increasing use of technology is immature. Therefore, this study on the effects of mobile phone radiation on rat liver is immature. **Methods:** 40 adult male Wistar rats weighing 60 ± 10 g were prepared and divided into 4 groups, 10 groups: control, experimental 1, experimental 2, respectively. Control group received no radiation exposure controls, but no conversations on mobile phones and similar devices used in the experimental group (with the same conditions) were used. Experimental groups 1 to 5 times per day for 1 month, and every 10 minutes on the phone calls were exposed and experimental groups 2 to 5 times per day for 1 month, and 20 min were exposed to mobile calls. Then at the end of a period of months, rat in all groups, and describe the changes in hepatocytes, cell necrosis, lymphocyte influx, changes in chromatin and hydropic swelling of the lining cells of the various groups were examined by light microscopy. **Results:** A significant increase in liver weight in the experimental group than the control group is 2. Changes indicative of liver fatty change, cell necrosis, grainy liver cells, and lymphocytes invade the core wall changes in groups of 20-minute experimental liver cell necrosis was observed in only 10 minutes ($P < 0.05$). **Discussion:** The results show that mobile radiation may have damaging effects on the liver. Thus, the use of mobile phones at an early age to get more done with caution. The call duration is effective in severe damage. Potentially damaging effects of free radical production and heat production are mobile.

Key words: Wave Mobile, Liver tissue, Rats.**Introduction**

With the increase of mobile phone users from exposure to electromagnetic fields from mobile phone antennas and receiver / transmitter mobile phone is increasing. So according to the above effect of microwave radiation and the risk of liver mobile as an essential organ in the body that is most important in the study of this issue [1]. Results from epidemiological studies indicate that cell phone radiation power density even below the standard can cause symptoms such as headache, heat sensation are in the ears, memory loss and fatigue and significant relationship between duration of call / call of the day there are signs [2-7]. Cell phone system GSM 900 or 1800 MHz with a pulse frequency of 217 Hz. 900 MHz frequency band, which is used in most European and Asian countries. Range 890-915 (frequency, cell phone) [8]. Many studies that weak

electromagnetic fields can also lead to changes in the hippocampus and cortical cholinergic function is [9]. Also Roosli conducted a study on 342 people living near cell phone antennas, stating that 78% of people believe their symptoms associated with the antenna. Symptoms reported include: sleep disturbance (59%), headache (43%), impaired concentration (18%) and fatigue (16%). The symptoms of exposure appeared and gradually decrease [10]. Halevy Lavalee in 2001 and 1998, the effect of EMF on proliferation in fibroblast cells, especially in the expression of IGF-1 and other releases, and prolonged duration of action of IGF-1 occurs both of these factors play an important role in stimulating cell division and are therefore likely to play a role in cancer and tissue injury [11,12]. Baharara in 2008, with the effect of electromagnetic fields on cells of the liver and spleen mononuclear cell mouse embryo significant effects on community and liver cells

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Kopfer and lymphocytes of the spleen is Megakariost white polyps. Also, the total number of dividing cells in a significant increase has been observed [13]. Imadia in 1998, to investigate the frequency of 929. 2 Hz on liver cancer and also found that these frequencies have significant effects on the initiation of liver carcinogenesis [14]. Also in 2004, Lin stated that electromagnetic waves could be electromagnetic radiation on biological systems affect iron homeostasis. The result is an increase in cytoplasmic and nuclear free iron may increase the hydroxyl free radical production and damage to DNA [15]. Agarwal et al in 2008 stated that long-term exposure to cell phone radiation affects epididymal Berznom mitochondrial and nuclear beta-globin locus [16]. So according to the above and the different effects of electromagnetic waves emitted by mobile phones on tissues and body parts and not enough on the waves of the liver in this study was carried out on minors is necessary and that is why the main goal.

Methods:

In all of the research ethics of working with laboratory animals have been observed. 40 adult male Wistar rats weighing 60 ± 10 g and 30 to 35 days were provided. Before starting the experiment, the animals are given a week to get used to the new circumstances after the test period begun. Animals in laboratory conditions include a temperature of 22 ± 2 ° C and 12 h light and 12 h dark cycle was used. Rodents used in food animals and food and water were free. How to create waves was that the three mobile a face cage attached was used. Rats were kept in cages inside the aluminum box and a 5 means it was not put back to keep out radiation. Conversation mode set to make waves in the mobile phone and to ensure the radiation on the aluminum sheet was

placed over the cages. The rats were randomly divided into 4 groups of 10.

Conditions imposed on the five groups as follows:

- No more than the control group did not receive radio waves, and were kept under normal conditions.
- A control group exposed to light, but without a call phones and similar devices used in the experimental group (with the same conditions) were used.
- Experimental groups: per day for 1 month and 5 times, each time for 10 minutes of phone calls was exposed.
- Experimental group two to five times per day for 1 month, and 20 min were exposed to mobile calls.

After all groups of rat after injection of anesthetic were into the anatomy and physiology of normal liver tissue after washing with 10% formalin solution (fixator) And next steps for the preparation of slides of tissue sections stained with hematoxylin and eosin were used. Then the tissues taken from different sections of liver cell necrosis of hepatocytes, lymphocytes invade, Hydrotropic swelling, granular liver cells, the nucleus of the cell wall changes and changes in fat cells and hepatocytes liver examined by light microscopy and magnifying it by 4, 10 and 40 were performed.

Results:

Results of measurement of liver weight in the experimental group showed that the immature 20-minute experimental group increased significantly compared to controls has been observed in liver weight and immature 10-minute change in the experimental group was not significant ($P < 0.05$) diagram (1).

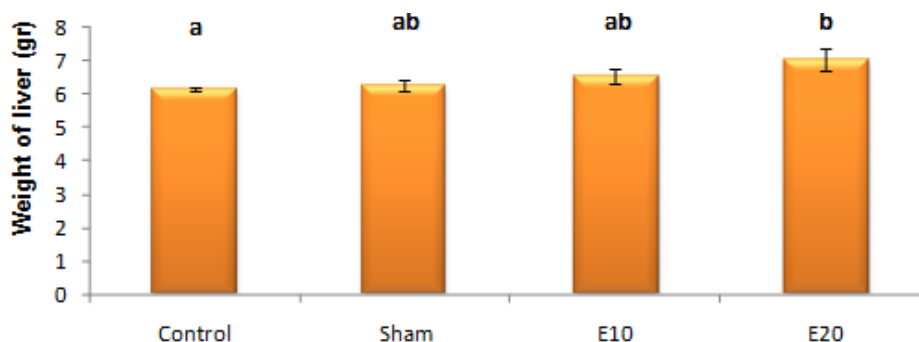


Diagram 1: Compares the average live rweight afterwave of mobile in immature...

The liver histopathological changes in various parameters such as cell necrosis, lymphocytic invasion in port areas, swelling of hepatocytes, fatty changes, the granular cytoplasm and nucleus-wall changes were scored in the measurement method was used in the tables below are the results: In the

following tables, n is equal to 6 rats in each group shows. And the degree of tissue damage is zero to 4 represent the minimum and maximum damage. Zero means there is no harm. Level 1 of the degree of injury is very low, grade 2 moderate degree of injury, grade 3 and grade 4 large degree of injury is too

high. What is certain is that the well appears to photomicrograph [2] cell necrosis and Photomicrograph [3] Changes in nuclear and chromatin wall. According to Table (2 and 3) changes in fat cell necrosis, lymphocyte influx,

changes in nuclei and granular layer cells of the experimental group 1 and experimental group 2 was observed. In group 1, the experimental radiation necrosis of the immature rat hepatocytes occurred.

Table 1: Changes in liver tissue of the control and test groups of rats

| Changes in the core wall | | Granular cells | | Cell necrosis | | Changes in fat | | Hydropic swelling | | Lymphocytic invasion | |
|--------------------------|------------------|----------------|------------------|---------------|------------------|----------------|------------------|-------------------|------------------|----------------------|------------------|
| Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage |
| 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 | 6 | 0 |
| | 1 | | 1 | | 1 | | 1 | | 1 | | 1 |
| | 2 | | 2 | | 2 | | 2 | | 2 | | 2 |
| | 3 | | 3 | | 3 | | 3 | | 3 | | 3 |
| | 4 | | 4 | | 4 | | 4 | | 4 | | 4 |

Table 2: Changes in the liver in the experimental group after the first test in rats

| Changes in the core wall | | Granular cells | | Cell necrosis | | Changes in fat | | Hydropic swelling | | Lymphocytic invasion | |
|--------------------------|------------------|----------------|------------------|---------------|------------------|----------------|------------------|-------------------|------------------|----------------------|------------------|
| Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage |
| 6 | 0 | 6 | 0 | 2 | 0 | 6 | 0 | 6 | 0 | 6 | 0 |
| | 1 | | 1 | 4 | 1 | | 1 | | 1 | | 1 |
| | 2 | | 2 | | 2 | | 2 | | 2 | | 2 |
| | 3 | | 3 | | 3 | | 3 | | 3 | | 3 |
| | 4 | | 4 | | 4 | | 4 | | 4 | | 4 |

Table 3: Changes in the liver of rats in experimental group 2 after the test

| Changes in the core wall | | Granular cells | | Cell necrosis | | Changes in fat | | Hydropic swelling | | Lymphocytic invasion | |
|--------------------------|------------------|----------------|------------------|---------------|------------------|----------------|------------------|-------------------|------------------|----------------------|------------------|
| Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage | Rat number | Degree of damage |
| 5 | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 6 | 0 | 5 | 0 |
| 0 | 1 | 2 | 1 | 3 | 1 | 0 | 1 | | 1 | 1 | 1 |
| 1 | 2 | | 2 | 3 | 2 | 5 | 2 | | 2 | | 2 |
| | 3 | | 3 | | 3 | | 3 | | 3 | | 3 |
| | 4 | | 4 | | 4 | | 4 | | 4 | | 4 |

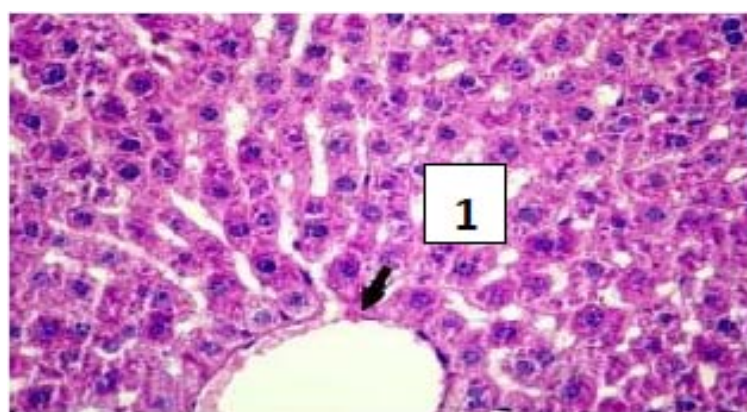


Fig. 1: Optical Photomicrograph the central vein of the liver in the control group (1) is normal (H & E staining, magnification $\times 400$)

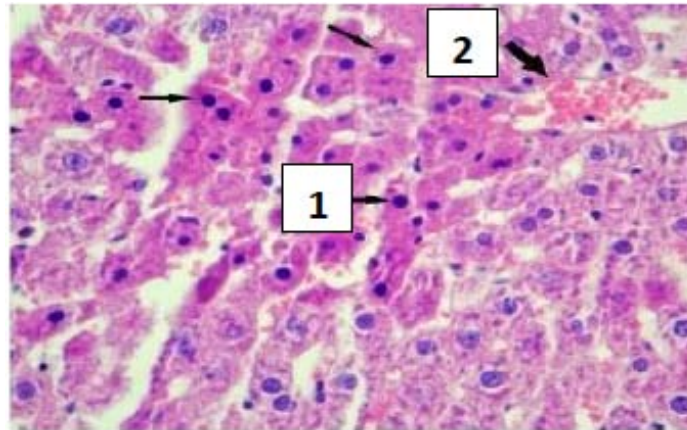


Fig. 2: photomicrograph light of the liver, liver cell necrosis (1) around a small central vein; hyperemia (2) can be seen (H & E staining, magnification $\times 400$)

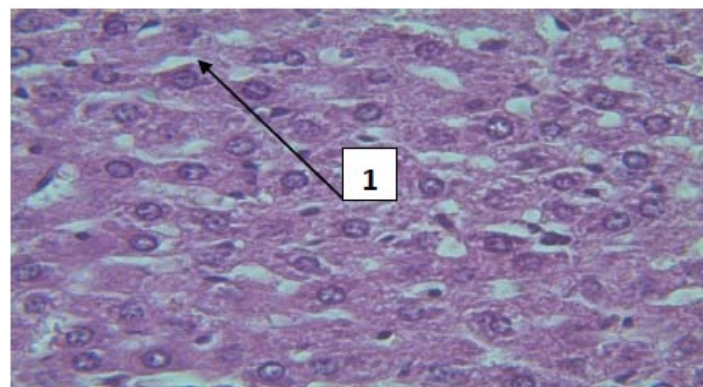


Fig. 3: photomicrograph light, liver, and skin changes in nuclear chromatin (1) (H & E staining, magnification $\times 400$)

Discussion:

In a lot of research into the effectiveness of mobile malware raging through the various organs examined, including adverse effects on kidney tissue. That impairs blood flow in the renal hemodynamic abnormalities of the face, edema, stromal dystrophy, renal tubular, interstitial inflammation, glomerular sclerosis surrounding the show itself [17]. The effect of radiation on the ovary and female sex hormones have also been reported to be detrimental [18]. The results show that the immature group of 10 minutes compared to 20 minutes of minor damage to the liver becomes less, so in the experimental group, 20-minute cell necrosis, lymphocyte influx, changes in the core layer, and granular cells of fat changes seen in the experimental group cell necrosis was observed only in 10 minutes. However, studies show that over 24 mobile antennas, that, although the intensity of the electric field of the antenna is within the standard, however, this is time dependent and can change throughout the day based on traffic antenna. Although exposure levels in areas near the antenna in some of these studies is less than the limit set by ICNIRP, but due to the intensity and duration of exposure seems to be a factor for the onset of tissue damage [19]. It is likely that mobile effects on liver

tissue in immature rat is dependent on the duration of this study are consistent with the results. Create free radicals in cells and in combination with polyunsaturated fatty acids of cell membranes and lipid radicals with molecular oxygen to produce and endoplasmic reticulum, resulting in the breakdown of phospholipids and the release of enzymes and reactions ultimately leading to cell death and cell necrosis is [20,21]. As stated in previous reports, the electromagnetic waves are produced free radicals [22,23] Thus the observed necrosis and cell wall changes in hepatocyte nuclei in rats, possibly due to the production of free radicals and changes in cell membrane and induce cell death in them. It appears that changes in liver tissue after waves emitted by mobile phones is higher in immature and that's one reason they are recommended to be very close, do not watch TV because of the direct effect of light on the eye is not but because of the harmful effects of the magnetic field produced by the body leaving the TV on [17]. Stated that although non-ionizing radio waves and do not damage the chemical structure of DNA, the proteins involved in replication and transcription of DNA damage has been occurred and indirectly alters the DNA [24]. In the present study the changes in the transcription of DNA, cell necrosis in the experimental group, 10-minute and 20-minute

chromatin modification, wall, nucleus, granular cells and hydropic swelling of the experimental group occurred 20 minutes. Histopathological findings in the past stated that in rat Balb / C rat to 30 minutes every day continuously for 2 months and at different times of exposure to cell phone radiation (900 MHz) were placed. Slight increase in the number of micronuclei and lipid changes were observed around small veins in the liver [25]. In studies it has been found that electromagnetic radiation can lead to heat is then absorbed by the material. Thermal radiation of charged particles in matter consists of random motion and the energy can be synthesized in the matter. The radiation can be absorbed simultaneously by the other components of energy balance and is warming the material [26]. Elebetieha in 2004 with the creation of an electromagnetic field male and female rat were pulsed for 90 days and then be seen as a significant increase in ovarian weight [27]. The study also found a significant increase in liver weight in the experimental group received 20 minutes of that show damage to the liver is dependent on the length and duration of the radiation beam. It is likely that the increase in body temperature due to exposure to electromagnetic fields caused induce chromosomal damage in hepatocytes in the present study and resulting in damage to the liver and increased liver weight and resulting in an increase in liver enzymes are listed in experimental groups.

Conclusions:

The investigation will be concluded that the mobile radiation is harmful effects on liver. However, the duration and intensity of the radiation emitted waves are also considered and the sounds of waves found in minor effects on liver tissue are more destructive.

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