

## ORIGINAL ARTICLE

# Electromagnetic Fields induces Physiological Construction Abnormalities in Liver of Trout's

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### ABSTRACT

*Electromagnetic field is a subject that all organisms in world are somehow affected with it. This study was designed to evaluate the probably effects of electromagnetic fields on liver tissue of trout's. 20 male trout's weighing averagely 300±38.5 grams were randomly divided in two groups, including control and treatment group. Treatment group was exposed to electromagnetic field (pulsed electromagnetic field with triangular form with a frequency of 900 KHz with power of 10 ml T) 2 hour/day for 7 days. In the final day of experiment, for tissue assessment; the specimens from liver were immersion imprisoned overnight in 10% neutral buffered formalin to be fixed. Then the specimens were mounted to allow 5-µm sections. Sections were stained via hematoxylin and eosin method and photographed directly using a stereo microscope and then they were studied in respect of structural changes. In the exposed fishes to electromagnetic fields the histological changes were consisting of hepatic congestion and hepatocytes necrosis and dilation of sinusoids, increased Kupffer cells and lymphocytes in hepatic parenchyma. In conclusion it is obligated that fishes should be prevented from direct exposing to electromagnetic fields.*

**Key words:** Physiological Construction, Liver, Trout, Electromagnetic

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### INTRODUCTION

So far what has been reported in connection with the damaging and harmful effects of electromagnetic fields in biological tissues since the course consists of static biological tissues associated with electric currents in the frequency range of sinusoidal AC (city electrical flow) power [1]. Electromagnetic radiation is a type of energy that can move in space with the speed of light. The quantum radiation as a stream of energy called photons, each photon energy is considered to depend on the radiation frequency [2, 3]. For the first time, in 1976, the biological effects of electromagnetic fields usage were considered [4]. With the growing development of technology in various fields and waves, organisms and especially the human who has affected today it can be argued the existence of electromagnetic waves in the ocean and float fields [5]. In 1979, the food & drug control organization of the united state of American proved that square and triangular electromagnetic waves have positive therapeutic effects on sum disorders resulting from fractures [6, 7]. Our research aimed at evaluation of probably effects of electromagnetic fields on normal structure of liver in trout's.

### MATERIALS AND METHODS

#### Experimental Animals

All procedures that involved animals were approved by the Veterinary Ethics Committee of the Faculty of para Veterinary Medicine of Ilam University. 20 male trouts weighing averagely 300±38.5 grams were randomly divided in two groups, including control and treatment group. Treatment group was exposed to electromagnetic field (pulsed electromagnetic field with triangular form with a frequency of 900 kHz with power of 10 ml T) 2 hour/day for 7 days. In the final day of experiment, for tissue assessment; the specimens from liver were immersion imprisoned overnight in 10% neutral buffered formalin to be fixed. Then the specimens were mounted to allow 5-µm sections. Sections were stained via hematoxylin and eosin method and photographed directly using a stereo microscope and then they were studied in respect of structural changes.

#### Electromagnetic field

One low-intensity magnetic field exposure apparatus (made in German PHYWE factory) was applied to generate a pulsed electromagnetic field. In pulsed electromagnetic field, in contrast to static

electromagnetic field, the poles of the field are constantly being changed. By the way the pace of this changing is depended on frequency of the field. In this apparatus, one pair of identical Helmholtz coils, each of which contained 600 turns of enameled copper wire with diameters of 0.8 mm, were mounted coaxially at a distance of one coil radius (70 cm) from each other to produce a highly uniform horizontal field between them. The coils were connected to an amplifier driven by a pulse generator. This was set to produce a pulsed triangular form with a frequency of 900 MHz with power of 10mT.



Fig 1: Trout's being exposed to electromagnetic fields in aquarium.



Fig 2: Exhibiting produced electromagnetic field with 900K Hz frequencies.

## RESULTS

In the exposed fishes to electromagnetic fields histological changes were consist of hepatic congestion and hepatocytic necrosis and dilation of sinusoids, increased Kupffer cells and lymphocytes in hepatic parenchyma (Fig 1,2,3 and 4) .

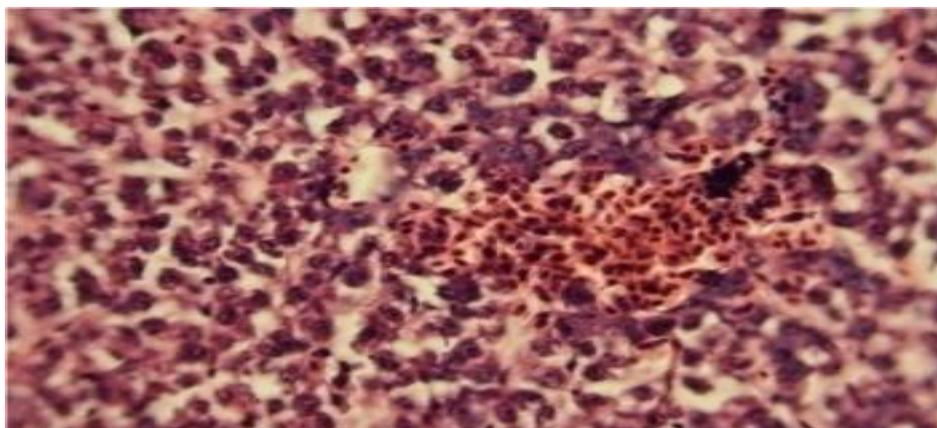


Fig 1: hepatic congestion in liver parenchyma of trout's exposed to electromagnetic fields (hematoxylin and eosin stain×400)

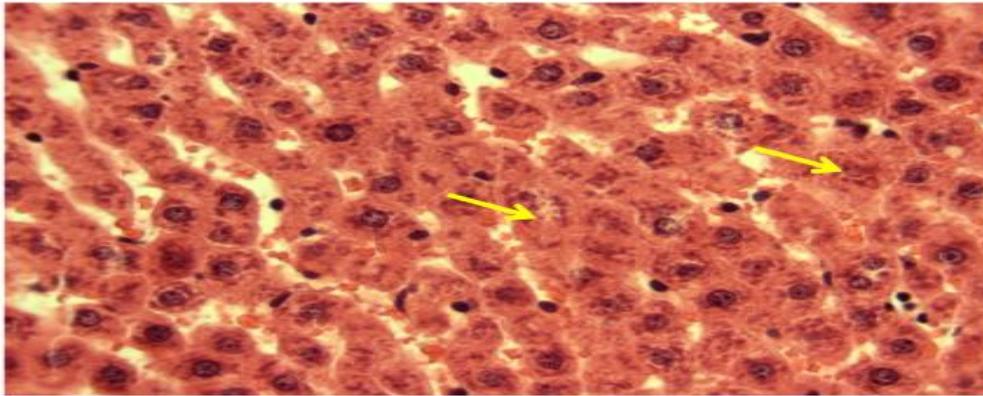


Fig 2: Hepatocytic necrosis of trout's exposed to electromagnetic fields indicated with arrows (hematoxylin and eosin stain×400)

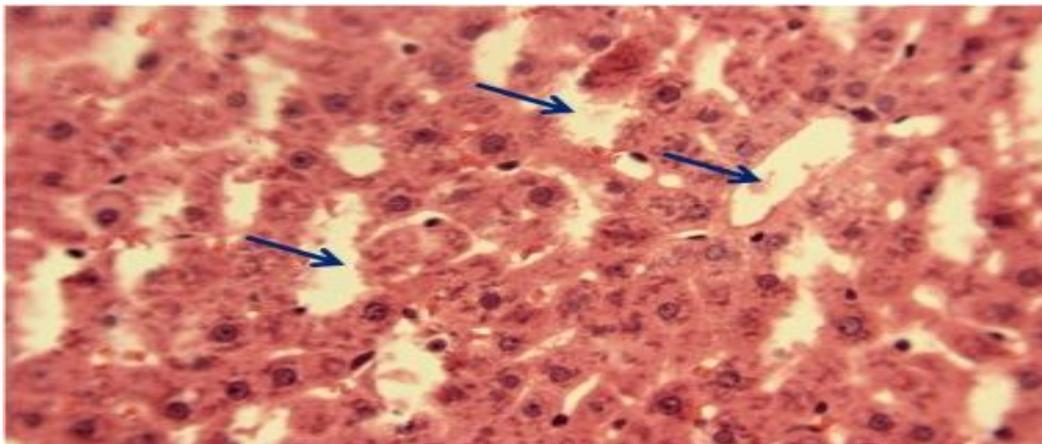


Fig3: Dilation of hepatic sinusoids of trout's exposed to electromagnetic fields indicated with arrows (hematoxylin and eosin stain ×400)

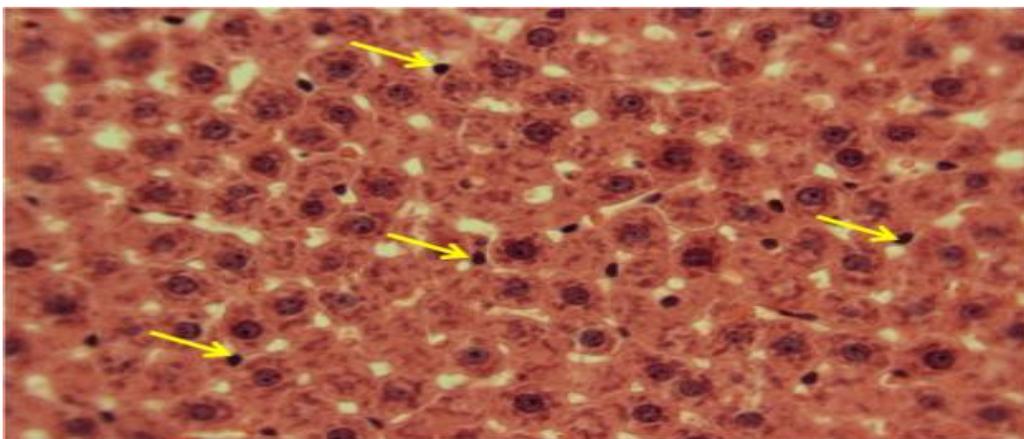


Fig4: increased Kupffer cells and lymphocytes in hepatic parenchyma indicated with arrows (hematoxylin and eosin stain ×400)

## DISCUSSION

In the present study, we observed increased Kupffer cells in hepatic parenchyma. In other study, It was identified that extremely low frequency electromagnetic fields caused considerable increase in number of Kupffer cells in liver but no any disruption and destruction of normal structural tissue was seen in lobular system in liver[7] .However in our study ,the trout's exposed to electromagnetic fields showed hepatic congestion and also hepatocytic necrosis and dilation of hepatic sinusoids. The researches performed to assessment the performance of liver in people encountered daily with electromagnetic fields, have clarified that electromagnetic fields are capable of affecting liver by decreasing serum albumin,serum liver enzymes and increasing total Albumin . In another study, it is

demonstrated that low frequency electromagnetic field have not any harmful effects on liver performance in rats [9]. Also in researches that effects of electromagnetic fields on hepatocytic mitochondria in rats were studied, it was indicated that electromagnetic fields waves was not able to have considerable effects on intra-cellular phosphorylation and liver enzymes levels did not change statistically[10].

## CONCLUSION

On the base of present study electromagnetic fields exposing to trout's was able to pathological changes in liver and it is obligated that fishes should be prevented from direct exposing to electromagnetic fields.

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