



# Histological and histochemical study of the protective role of rosemary extract against harmful effect of cell phone electromagnetic radiation on the parotid glands



Fatma M. Ghoneim<sup>a</sup>, Eetmad A. Arafat<sup>a,b,\*</sup>

<sup>a</sup> Department of Histology and Cell Biology, Faculty of Medicine, Mansoura University, Egypt

<sup>b</sup> Department of Anatomy, Taif University, Saudi Arabia

## ARTICLE INFO

### Article history:

Received 16 January 2016

Received in revised form 28 April 2016

Accepted 29 April 2016

### Keywords:

Parotid gland

Mobile phone

Histological examination

Oxidative stress

Rosemary

## ABSTRACT

Electromagnetic fields (EMFs) are a class of non-ionizing radiation (NIR) that is emitted from mobile phone. It may have hazardous effects on parotid glands. So, we aimed to investigate the histological and histochemical changes of the parotid glands of rats exposed to mobile phone and study the possible protective role of rosemary against its harmful effect. Forty adult male albino rats were used in this study. They were classified into 4 equal groups. Group I (control), group II (control receiving rosemary), group III (mobile phone exposed group) and group IV (mobile exposed, rosemary treated group). Parotid glands were dissected out for histological and histochemical study. Moreover, measurement of oxidative stress markers; malondialdehyde (MDA) and total antioxidant capacity (TAC) was done. The results of this study revealed that rosemary has protective effect through improving the histological and histochemical picture of the parotid gland in addition of its antioxidant effect. It could be concluded from the current study, that exposure of parotid gland of rat models to electromagnetic radiation of mobile phone resulted in structural changes at the level of light and electron microscopic examination which could be explained by oxidative stress effect of mobile phone. Rosemary could play a protective role against this harmful effect through its antioxidant activity.

© 2016 Elsevier GmbH. All rights reserved.

## 1. Introduction

Mobile phone (cellular phone) technology is an integral part of everyday life, and its use will continue to grow as their providers proceed to offer more advanced services and better products. The associations between human health and exposure to radiofrequency field (RF-EMF) have been settled in several previous studies (Augner et al., 2010; Shum et al., 2011; Arbabi-Kalati et al., 2014). Electromagnetic fields (EMFs) are a class of non-ionizing radiation (NIR) that is become widespread in human environment. There are many natural and man-made sources of electromagnetic radiation. Natural sources include earth's magnetic field and the man-made sources include radio stations, mobile phone base stations, TV antennas, microwaves, radars and other electrical appliances (WHO, 2014). Mobile phones and cell towers are

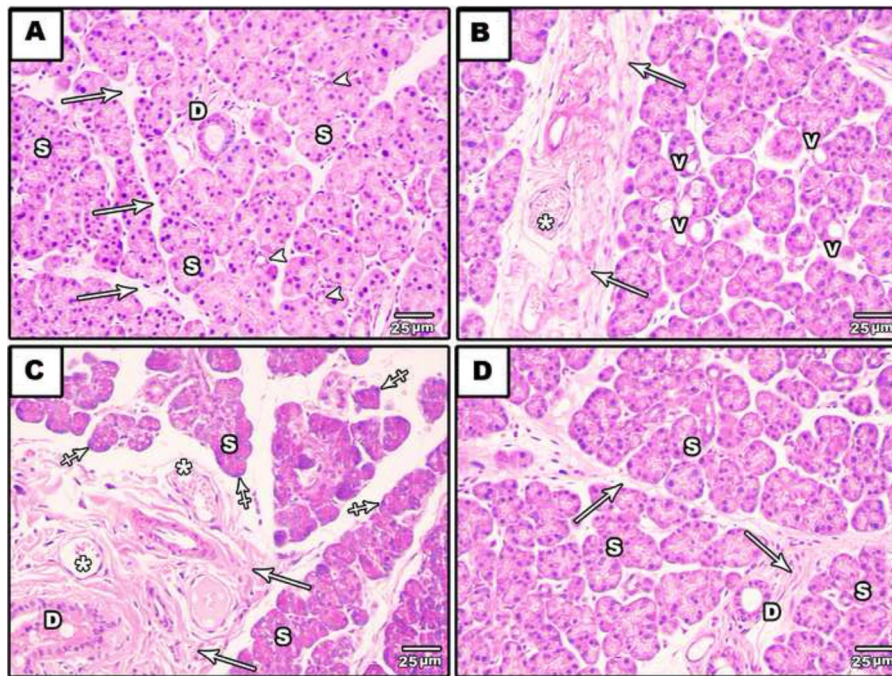
the most frequent sources of NIR that emit micro-wave radiation (MWR) (Djindjic et al., 2003).

The Global System for Mobile Communications (GSM) mostly operates on either the 900 Mega Hertz (MHz) or the 1800 MHz band 9 (SCENIHR, 2009). These levels are far below the high frequency electromagnetic waves (EMW) of X-rays and gamma rays ionizing radiation. It cannot break the covalent bonds in biological molecules. The human body is able to receive and induce electrical fields and currents inside the tissues as human tissues possess electrical properties such as the permittivity and conductivity (Sysoev et al., 2013).

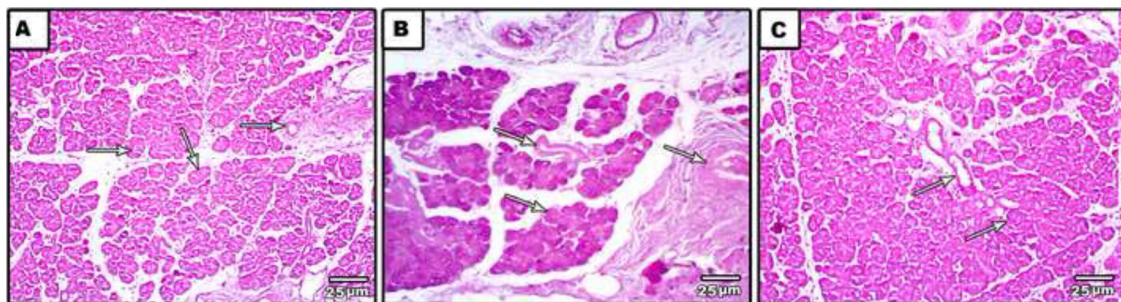
Reactive oxygen species (ROS) are continuously neutralized by antioxidants present in body tissues. Oxidative stress results when the production of ROS exceeds the scavenging capacity of antioxidants (Desai et al., 2009). It is reported that electromagnetic radiation of cellular mobile phones may affect biological systems by increasing the production of ROS and changing the antioxidant defense systems of human tissues causing oxidative stress (Ozguner et al., 2005; Sage and Carpenter, 2009; Arbabi-Kalati et al., 2014).

\* Corresponding author at: Department of Histology and Cell Biology, Faculty of Medicine, Mansoura University, Egypt.

E-mail addresses: [Fatmaghoneim@mans.edu.eg](mailto:Fatmaghoneim@mans.edu.eg) (F.M. Ghoneim), [eetmadarafat@yahoo.com](mailto:eetmadarafat@yahoo.com), [eetmadarafat@mans.edu.eg](mailto:eetmadarafat@mans.edu.eg), [eetmad.a@tu.edu.sa](mailto:eetmad.a@tu.edu.sa) (E.A. Arafat).



**Fig. 1.** Photomicrographs of H&E stained sections in rat parotid glands. (A) (group I) shows normal architecture of parotid gland with pure serous acini (S) and intercalated ducts (arrow head) in between. Thin connective tissue septa (arrow) with interlobular duct (D) are seen. (B) (group II) shows cytoplasmic vacuoles in the acini (V), thick CT septa (arrow) with dilated congested blood vessels (\*). (C) (group II) shows most of the acini (S) with irregular outlines and darkly stained nuclei (crossed arrow). Thick CT septa (arrow) with dilated congested blood vessel (\*) and dilated interlobular duct (D) are seen. Notice the presence of vacuolated secretion and exfoliated cells in the lumen of interlobular duct (D). (D) (group III) shows apparent normal acini (S), ducts (D) and thin C.T. septa (arrow).



**Fig. 2.** Photomicrographs of PAS reaction in rat parotid glands. (A) (group I) shows a positive reaction in the acini, duct system and their basement membranes (arrow). (B) (group II) shows a strong positive reaction (arrow). (C) (group III) shows decrease in reaction density toward normal (arrow).

Histological and physiological studies had been conducted to evaluate the effects of electromagnetic fields on human health (Khaki et al., 2008; Wang et al., 2008). Researchers have reported that extremely low frequency (ELF) electromagnetic field causes tissue damage in different organs of the experimental animals (Zare et al., 2007; Khayyat and AbouZaid, 2009). Radiation effects on salivary glands are of particular interest, where the altered composition of saliva causes distress and often irreversible complications such as oral dryness, nocturnal oral discomfort as well as susceptibility to oral infections and dental caries (Chitra and Shyamala Devi, 2008).

The parotid glands are located in front of the ear, just under the skin of the face. They are directly in contact with handheld mobile phones during its utilization. So, parotid glands are mostly liable to the mobile phone heat and radiation harmful effects (Bhargava et al., 2012).

Rosemary (*Rosmarinus Officinalis*) (RO) is an herb commonly used as spice and flavoring agent in food processing. It has antioxidant property as it is found to contain several

antioxidant compounds (Amin and Hamza 2005) and it has also, anti-inflammatory action (Altinier et al., 2007).

The protective role of rosemary against EMFs induced oxidative stress was not previously reported. Therefore, the present study was undertaken to investigate the subsequent effects of non-ionizing electromagnetic fields on histological and histochemical structure of the parotid glands of albino rats. Moreover, to study the possible protective role of rosemary in prevention of hazards of exposure.

## 2. Materials and methods

### 2.1. Chemicals

Rosemary was purchased as dried rosemary leaves from a herbal store in Mansoura city, Egypt. Aqueous rosemary extract was prepared according to the method of Amin and Hamza (2005). Briefly, 10 gm of dried plants' leaves were boiled in 100 ml of distilled water and heated for 30 min then the extracts were filtered. This yields

Download English Version:

<https://daneshyari.com/en/article/1923342>

Download Persian Version:

<https://daneshyari.com/article/1923342>

[Daneshyari.com](https://daneshyari.com)