



NO LYMPHOCYTE VARIATION IN WISTAR RAT ON EXPOSURE TO RADIO FREQUENCY ELECTROMAGNETIC RADIATION

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ABSTRACT

Mobile phones are one of the popular and fastest growing technological advancements. It has become necessary in our modern life. The widespread usage of mobile phones in recent Years have raised concern for potential research activities (*Abdolmaleki A, Sanginabadi F-2013*). Many countries have tried to determine the effect of the emitted electromagnetic radiation from mobile phones from last two decades. Rapid growth has been seen in the number of people using mobile phones (MPHs). Humans are exposed to radiofrequency electromagnetic radiation emitted from mobile phones and this has created a need to investigate its possible ill effects on health of individuals (*Agarwal A, Singh A, Hamada A, Kesari K (2011)*). It has been revealed that exposure to various forms of radiation could lead to reversible or irreversible structural and functional changes at the cellular level. This damage depends on the frequency of the electromagnetic radiation intensity and the duration of exposure. Cell phones low-power transmitters operate on 0.75 to 1 watt of power. Cell phones emit of electromagnetic radiation. It is possible for the radiation to causes harm to the user. The mobile phone emitting 900 MHz radiofrequency electromagnetic radiation (EMR) Exposure to electromagnetic radiation emitted from mobile phones is able to induce hepatic, renal and splenic tissue damage. The degree of damage increased with time of exposure to EMR (*Clark G-1988*). Radiofrequency of electromagnetic radiation from mobile phones also induces oxidative stress in rats and different organs system (*Diechmann WB, Male J et al*). In present investigation we have exposed the wistar rats to the cell phone radiofrequency electromagnetic radiations (RF-EMR) to study Lymphocyte variation wistar rat. Cell phone R-EMR causes no alteration in the mean lymphocyte percentage in comparison to the control animals.

KEYWORDS: RF-EMR, Lymphocyte, Radiation Exposure.

INTRODUCTION

Mobile phones (MP) operate on wireless technology, with communication typically occurring via a 900–1800 MHz signal that is pulsed at 217 Hz. The signal carries essentially no power when the user is not talking or receiving, but when the user communicates the power of this Pulsed electromagnetic Field (EMF) reaches a maximum of 250 mW. There is concern that this pulsed EMF will reach neurons and directly affect membrane function (Adey and Bawin, 1979), and reflects this concern is theme of research testing for MP-related changes in human physiology and pathology. Research has failed to find consistent relations between use of MP and human physiology/pathology, and, coupled with the lack of theoretical framework to explain the inconsistencies, there is little consensus on the issue.

Mobile phones are used in position very close to the human body and require a large number of base station antennas. The resulting health issues have repeatedly been raised by public and scientists. (*Atasoy A, Kaya L et al.*).

Innovations in cell phones may be associated with detrimental effects on various organs, systems and their functions (*Durney CH, Iskander MF, Massoudi H, et al 1984*) EMFs might produce a variety of adverse in vivo effects such as chronic fatigue, headaches, cataracts, heart problems, stress, nausea, chest pain, Forgetfulness, influence the learning and disturbances in memory, immune systems, and sleep. It has been implicated in adversely affecting multiple facets of human health such as brain, lung and breast tumors, leukemia, genotoxicity, and reproduction anomalies, infertility, increased risk of abortion, birth defects, childhood morbidity, depression, neurodegenerative disease, amyotrophic lateral sclerosis, and Alzheimer's disease. (*Ebrahim S, Azab AE, Albasha MO, et.al-2016*).

Previous studies showed that an association between elevated EMFs exposure and mortality of employer in electric utility industry jobs from arrhythmia-related causes and acute myocardial infarction influence heart rate variability by changing autonomic balance. (*Azab AE, Ebrahim SA.-2017*).

Exposure to EMFs induces heart palpitations, pain in the chest area, and an irregular heartbeat. Also, exposure to EMFs causes decreases in total antioxidant capacity and plasma calcium level. Measurements of blood parameters are most important means by which to determine the health status of experimental animals. (*Soud R.-2004*). These measurements are diagnostic for certain diseases such as anaemia, leukaemia and detect the presence of the inflammation. (*Alghamdi MS, El-Ghazaly NA-2012*) Rats exposed to EMF show increases in blood pressure, the whole heart and left Ventricular weights (*Azab AE, Ebrahim SA.-2017*). Movement of haemoglobin in blood vessels is accelerated due to presence of ferric ions. (*Bansal HL-2006*).

EMFs have various chemical effects, including causing deterioration in large molecules in cells and imbalance in ionic equilibrium. Despite being essential for life, oxygen molecules can lead to the generation of hazardous by-products known as reactive oxygen species (ROS) during biological reactions. These ROS can damage cellular components such as lipids, proteins, and DNA. Antioxidant defence systems exist in order to keep free radical formation under control and to prevent their harmful effects on the biological system. Free radical formation can take place in various ways, including ultraviolet light, immunological reactions, radiation, stress, smoking, and biochemical redox reactions. Oxidative stress (OS) occurs if the antioxidant defence system is unable to prevent the harmful effects of free radicals. Exposure to EMF is known to increase free radical concentrations and trace ability and can affect the radical couple recombination. (*Kivrak EG, Yurt KK, Kaplan AA, et al.-2017*).

However, studies using actual cell-phone in a talk and listen mode are lacking. Further, the exact Body weight changes on exposure to the mobile phones EMF in Animals continues to be investigated.

MATERIALS AND METHODS

Animals

Male albino Rats, 6-8 weeks old (b.w. 220-240 g) wistar strain were acquired from Pharmacology Animal House, SVS Medical College. Animals were kept in well ventilated polypropylene cages under standard conditions of temperature and humidity. The animals were provided with standard Rat chow and water ad libitum. All animal experiments in this study were conducted with prior approval of Institutional Animal Ethics Committee (IAEC), strictly adhering to the ethical guidelines laid down by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), constituted by the Animal welfare Division, Government of India and approved by the International Animal Ethics Guidelines. Each Group consists of 10 wistar rats.

Two animal groups are considered control and RF-EMR exposed. Control animals are not exposed to the RF-EMR and kept away from the exposure area.

Cell phone radiofrequency Electromagnetic Radiation (RF-EMR) exposure assembly

The Group of animals were exposed to RF-EMR from an active mobile phone. NOKIA-3310 is used for exposure of RF-EMR. GSM mobile phone operating in the 900 MHz band was used for this purpose. The mobile phone used in this study was a level 4 GSM mobile phone with a permitted power level of 2 W (with SAR specification 1.15 W/kg). When exposed to rats, the phone was kept in silent mode (without ring tone and vibration) and auto answer Mode. Each animal cage had two animals and to prevent the rats from contacting or damaging the device, it was placed at a bottom poly propylene wire mesh cage in the centre of the Animal cage.

Method of RF-EMR Exposure

Animals kept in Polypropylene cages are kept with mobile handset fixed at the bottom of the Cage. Mobile phone is fixed properly at the floor of the cage in such a way that it should hide between the husk animal bedding, so rats cannot interfere with the fixed handset during the study duration of 30 days. Duration of exposure, source to surface distance is determined before radiation exposure. Parameters are discussed in Materials is considered for Irradiation procedure. Animals are irradiated and exposed to RF-EMR (900 MHz) from an activated Global System for Mobile communications (GSM) mobile phone for 2hour/day (in silent mode; “no ring tone” Auto receiver mode and Talk mode) for 30 days.

Haematological Examination

Haematological examinations are carried out at the day 30 post-irradiation to the RF-EMR through automate biochemical analyzer and through manual smear preparation to validate the results.

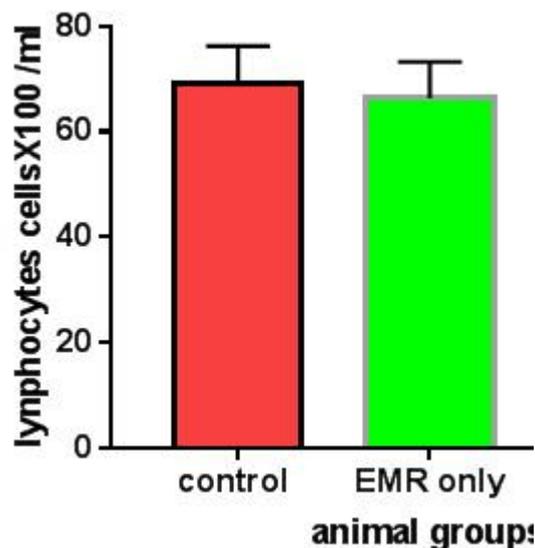
Collection of blood sample from Animals

Blood sample of animals is collected at day 30 through Tail vein puncture after cell phone irradiation from animals, collected from Rats Blood collected in EDTA vacutainer tubes to avoid blood coagulation. Immediately this blood sample is processed for haematological analysis through Biochemical auto analyzer, remaining blood volume is used for Manual methods of haematological examination.

RESULTS

30 days exposure of cell phone EMF radiation to two animal group results in no decline and variation in the Lymphocyte percentage. In comparison with the control animal group EMR alone animal group shown almost similar kind of lymphocyte Percentage.

Mean lymphocyte percentage in control animal were 69.19%, EMR alone group shown mean lymphocyte percentage as 66.36% No statistical significance is observed between the two animal group's viz. control, EMR radiation alone group.



Graph: Effects of the cell phone EMR exposure to Lymphocyte.

DISCUSSION

The effects of radiofrequency electro-magnetic radiation (RFEMR) on the biological functions of living organisms is an emerging field of interest with regard to environmental impacts on human health (Adebayo *et al.*, 2015). It is documented that the radiation produces reactive oxygen species (ROS) or free radicals in biological system (Gracy *et al.*, 1999; Strinivasan *et al.*, 2006; Mansour, 2012). Quite a number studies have also been performed to clarify direct effects exerted by radiations on living systems which involves in vivo and in vitro experiments using different approaches (Stuchly *et al.*, 1991; Dachà *et al.*, 1993, Khayyat and Abou-Zaid, 2009) some of which produced a number of biological effects in Cells and tested whole organisms (Goodman *et al.*, 1995; Kwee and Raskmark, 1998; Velizarov *et al.*, 1999; Adebayo *et al.*, 2015).

Previous reports revealed that range of cell responses to RF-EMR have been observed including gene expression (Piacentini *et al.*, 2008; Goodman *et al.*, 2009), differentiation and proliferation (Schwartz *et al.*, 2008; Foletti *et al.*, 2009), apoptosis, alteration in ion homeostasis (Iorio *et al.*, 2011), modulation of the membrane receptors functionality (De-Matteiet *al.*, 2009), and free radicals generation (Simk, 2007; Di-Loreto *et al.*, 2009), but more careful studies need to be carried out to establish the nature of effect of radiofrequency non-ionizing radiation (RF-EMR) in living systems.

CONCLUSION

In our present investigation we have not observed the significant variation in the Lymphocyte percentage in RF-EMR exposed animal group in comparison with the control group.

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