



EFFECT OF RADIO FREQUENCY RADIATION ON ANIMALS

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Abstract: The article present systematic Study based on effect of radio frequency Radiation on animals. From past few decade. There has been a study carried out on what Are the effect of radio frequency on human. With the rapid development of electronic information in the past 30 years, technical achievements based on electromagnetism have been widely used in various fields pertaining to human production and life. Consequently, electromagnetic radiation (EMR) has become a substantial new pollution source in modern civilization. The biological effects of EMR have attracted considerable attention worldwide.

INTRODUCTION

Radio frequency electromagnetic fields exposure assessment in radio frequency radiation on living organism is challenging due to presence of multiple EMF sources with there specific features, affectations and interrelation. However most of the research work is mostly focused on practical approaches rather then theoretical methodology to design system with low SAR values .The introduction summarizes RF effect on major physiological system and provides a detailed literature about threshold specific absorption rate required to produce such effects . technological changes in mankind through the development of electrical and communication technologies have resulted in the exposure to artificial electromagnetic fields (EMF). Technological growth is expected to continue as such the amount of EMF exposure will continue to increase steadily.

LITERATURE REVIEW

Exposure to Sprague- Dawley rats to electromagnetic fields at different frequencies in standing and travelling wave chambers value to SAR for all these experiments were obtained from commercially available FDTD based simulation software based on numerical phantom animals .An experimental radiation system was developed with a standing wave cavity which keeps electromagnetic parameters constant while facilitating stress free exposure of animals and determine whole body mean SAR according to weight .The simple picrotoxin model made allow identifying morphological signs of neurotoxicity in rat brain tissue. In the diathermy model, rat thyroid and thymus exposed to 2. 45GHz radiation showed visible visible morphological and immune effect. The experimental model of controlled exposure of animals to radio frequency allow author in A to know in the short term the mechanism and risks that can affect human health. The modulation of EEG rhythms in epileptics the modification of the immune response and the increase in cellular stress are biological effects that could be caused in humans by radio frequency interaction. In an urban environment that combines the electromagnetic and chemical pollution of environmental particles cortical excitability, inflammatory response and cell injury can be modified.

A comprehensive analysis of electromagnetic field absorption by humans body has been carried out in B using boundary conditions and simulation o f electromagnetic fields . presented analytical methodology and outcomes have significant impact on the research of SAR analysis of electromagnetic field absorption by the human body has been carried out in B using boundary conditions and simulation of electromagnetic field , presented analytical methodology and outcomes have significant impact on the research of SAR reduction and antenna efficacy improvement when a hand held or wearable mobile device is closely placed on human body Electromagnetic power absorption is taken into account with the detailed analysis of boundary conditions and the vector electromagnetic field presented analytical methodology and outcomes have significant impact on the research of SAR .IN order to further validate the mechanism of electromagnetic effect on human body is more important to have more realistic example with a phantom head.

SOME OF THE PREVIOUS LITERATURE REVIEWS ARE AS FOLLOWS

Three investigations examined the impact of 1800 or 2100 MHz on bladder cells of rats (Gurbuz et al. 2010; Gurbuz et al. 2014; Gurbuz et al. 2015). In these experiments, the rats were exposed to RF radiation and the bladder cell micronuclei



were assayed for micronuclei in vitro. Gurbuz, et. al. (2010) exposed 6 female Wistar rats to 1800 MHz GSM-like RF for 20 minutes/day, 5 days/week for a month and assigned 6 others to a control group. Near field exposure was used to simulate cell phone exposure. Field strengths were controlled with a Narda EMR 300 meter and probe. The E-field was 4 V/m. The authors claim that because E-field values are much lower than the 41 V/m of ICNIRP, exposure is assumed to be non-thermal. However, temperature was not monitored, and those statements cannot be confirmed. RFR exposure did not increase the frequency of micronuclei in exposed rats compared with the controls.

Gurbuz et al (2014) examined exfoliated rat bladder cells for micronuclei after whole body exposure (30 min/day, 6 days/week for one and two months) to 1800 MHz and 2100 MHz RF radiation. The animals were free to move in their cages during the RF exposure. The control animals were housed in their home cages during the entire experimental period without being subjected to any experimental manipulation. A vector signal generator was used to create a GSM modulated RF radiation in the experimental setup. The E-field was 17 V/m. The calculated average SAR was estimated to be 0.23 W/kg. No significant increase in micronuclei found in the exfoliated rat bladder cells was detected in cells from RF exposed rats compared to control rats.

Finally in a third study, the same group (Gurbuz et al. 2015) examined the influence of RFR on micronucleus formation in bladder cells of diabetic rats. They postulated that diabetes may accelerate oxidative damage in DNA molecules through glucose auto-oxidation and nonenzymatic glycation. The diabetic rats were exposed to 2100MHz RF for 30 min/day, 5 days/week for 30 days at a low SAR (0.24 W/kg). As in previous experiments, they used a near field exposure and the dosimetry was unclear. Again, this group found no statistically significant difference between the exposed population and the diabetes control or the non-diabetes control. Overall, based on the results presented, the studies indicate that rat bladder cells are not sensitive to RF exposure at low SARs.

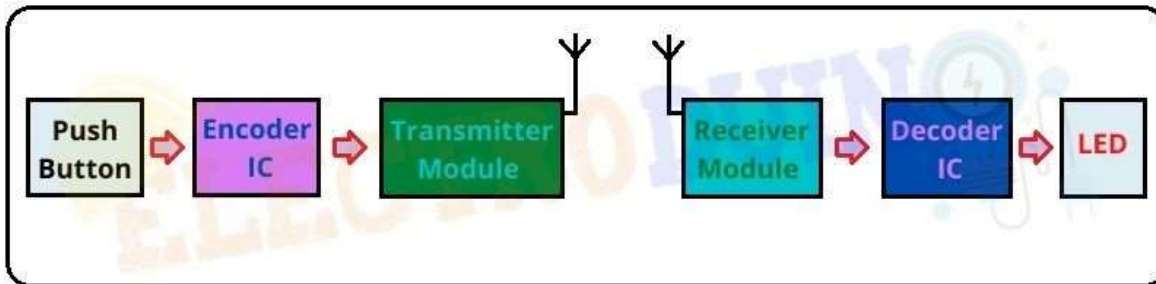
Deshmukh et al. (2013) studied the impact of 900 MHz (SAR= 0.595 mW/kg), 1800 MHz (SAR= 0.58 mW/kg) and 2450 MHz (SAR=0. 67 mW/kg) on the brain of rats. There were 24 rats that were organized into 4 groups (6 rats each). Three groups were exposed, and one group was sham exposed. The restrained rats were exposed for 2 hours/day, 5 days/week for 30 days. There were no statements regarding measurement of the animals' temperatures. Using the results from their modified alkaline comet assay, the authors concluded that low SAR exposures with any of the three frequencies may induce DNA damage.

Pandey et al. (2017) investigated histology and DNA damage in testicular cells in mice after 900 MHz RFR exposure. There were 5 groups of 15 mice each. The animals were exposed for either 4 hours or 8 hours/day for 35 or 70 days and the SAR was calculated to be from 5.4 to 5.16 mW/kg. The animals' temperatures were not measured. There was no blinding of quantitative endpoints. There is no description of a sham exposure for the control group. The authors concluded that oxidative stress caused DNA damage in germ cells of exposed mice without measuring oxidative stress, and the precise link between the apparent oxidative stress and DNA damage remains unclear.

Pandey and Giri (2018) investigated DNA damage with the comet assay and other oxidative stress endpoints in germ cells of male mice exposed to 900 MHz RF radiation. There were 60 animals in 4 groups of 12 animals each. The groups were: controls, mice dosed with melatonin, mice exposed to RFR, and mice dosed with melatonin and exposed to RFR. There was no mention of sham controls. The animals were irradiated for 3 hours/day, twice a day for thirty-five days. The SAR ranged between 0.052 and 0.0054 W/kg. The authors state that the samples and slides were carefully blind coded before analysis; however, blinding is mentioned specifically only in the histology section. The authors found that melatonin administration reduced DNA damage that they attributed to RFR exposure

EFFECTS OF RADIOFREQUENCY ELECTROMAGNETIC FIELD EXPOSURE

Explosive use of various electronics devices in modern society has inevitably led to increase continuously the chances of electromagnetic exposure. The development of wireless communication technologies such as computers and smartphones has become a necessity of modern people. as a consequence all living things on earth are experiencing environmental changes and are being exposed to artificial electromagnetic waves which have not been experienced before .When using electronic devices essentially electromagnetic waves are generated these waves can be absorbed by human or animal bodies the specific absorption rate SAR is a numerical expression of these absorbed waves .SAR refers to the amount of radio wave energy absorbed in units mass of human body thus capable amount of body temperature increase such heat reactions are expressed quantitatively by SAR.

SYSTEM MODELLING

Animals Grouping: Group 1, Group 2: (3 animals each)

Group1: **Test group** Exposure of EMF radiation for 8 hours/day for 30 day

Group2: **Control group** Without exposure of EMF radiation

Behavioural evaluation:

Elevated plus maze- The elevated plus maze consisted of two open arms, 50 x 10 cm, and two enclosed arms, 50 x 10 x 40 cm, with an open roof, arranged such that the two open arms were opposite to each other. The maze was elevated to a height of 50 cm. The measures indicated in the procedure section were taken by two observers, sitting in the same room as the maze.

Animals were placed into maze for 5 min.

- Times spend in center
- Times spend in open and closed arm

Open field test- The Open field test was used to assess anxiety-like behaviour and mood disturbances. The Open field used was a 1 m × 1 m square with sides of 50 cm high. It had demarcated inner and outer zones and the floor was divided into squares of equal size

a. Locomotors activity- Number of squares rat crossed was counted and used as a measure of locomotors activity.

- Number of square crossed

b. Exploratory behaviour- Two parameters were assessed as an indication of exploratory behaviour

- Number of rearing
- Grooming- Time spent grooming was measured Behavioural parameters were measured on 8th, 15th and 30th day of exposure period and then all animals were euthanized, blood were processed for AST, ALT, Urea & Creatinine measurement. Brain tissue were collected and processed for histopathological and oxidative markers evaluation.

Elevated plus maze test result:

1. No significant difference in time spent in center, closed and open arm (sec.) were observed on 8 days exposure of Electromagnetic field radiations.

2. Significant increase in time spent in center and open arm (sec.) were observed on 15 days exposure of Electromagnetic field radiations. Significant decrease in time spent in closed arm (sec.) was observed on 15 days exposure of Electromagnetic field radiations

Open field test result:

1. No significant difference in number of square crossed, rearing and time spent in grooming (sec.) were observed on 8 days exposure of Electromagnetic field radiations.

2. Significant increase in number of square crossed, rearing and time spent in grooming (sec.) were observed on 15 days exposure of Electromagnetic field radiations

CONCLUSION

With the progress of science and technology we have easily been exposed to the create artificial electromagnetic waves in our daily life because of use of many electronic devices therefore it is very difficult to understand the mechanism of electromagnetic field absorption devices therefore it is very difficult to understand the mechanism of electromagnetic field absorption in human body so as to find accurate and effective approaches to deal these consequences .Scientific studies on the mechanism of biological effects are also required .The possible biological effects of RF-EMF are not be



proven due to insufficient data to provide a clear answer to possible health risks. Therefore it is necessary to study biological response to RF-EMF in consideration of the comprehensive regards to the use of various devices by individual.

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