

Effect of 3G and 4G mobile phone radiation on brain and sperm cells of Wistar rat

Paulraj Rajamani*, K.V. Singh, R. Gautam, J.P. Nirala, S. Pardhiya and J. Behari

¹School of Environmental Sciences, Jawaharlal Nehru University, New Delhi –110 067, India.

E-mail. paulrajr@hotmail.com

Ever increasing electromagnetic radiation emitted from different gadgets particularly, mobile phone communication system becomes a major concern among the general public concerning potential health hazards. Chronic exposure to these radiations may induce various changes in growth related enzymes, antioxidative enzymes and in DNA. Therefore the present investigation is aimed to study the DNA strand breaks, morphological study, various biochemical assays such as enzymatic activities of catalase, glutathione peroxidase, super oxide dismutase, level of inflammatory cytokines, corticosterone and hippocampus dependent memory etc. in rat exposed to different frequencies of microwave radiation.

Wistar rats (male) were exposed 2 h/day for 30–45 days at different frequencies starting from 1800 MHz, 2100 MHz and 2.45 GHz at low power density. Exposure was carried out in a specially designed anechoic chamber. After the exposure rats were sacrificed and whole brain, hippocampus and testis were dissected out and used for various assays[1,2].

Remarkable changes in the level of pro-inflammatory cytokines, hypothalamic pituitary adrenal axis (HPA) activity and oxidative stress in hippocampus of exposed rats. However there is no significant impairment in hippocampus dependent contextual memory. It is noted that the activity of hippocampus showed a significant decline as compared to hypothalamus and the rest of the brain (fig. 1). In additions a significant alteration in anti-oxidative enzymes, such as catalase, glutathione peroxidase, super oxide dismutase, was observed in rats exposed to above mentioned radiation as compared to control groups. It is clear from the present study that prolonged exposure to these radiation may cause significant alteration in different organs of rat, suggesting a transductive coupling to the cytoplasm. These results indicate a possibility that these type of radiations may also affect DNA damage, induce oxidative stress mediated activity in antioxidative system. It is also observed that an alteration in sperm parameters such as sperm count, viability, morphology, membrane integrity in the head and the tail of sperm [3].

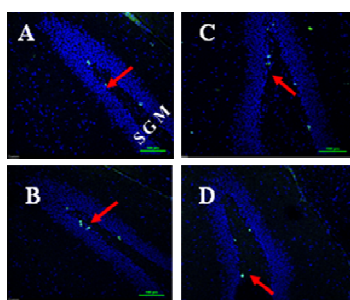


Fig. 1 Effect of 2115MHz (3G) radiation on Hippocampal neurogenic process. Figure shows BrdU positive cells (green flurescent) in Dentate gyrus of exposed and sham group after 2 hours (A&B) and 24hrs (C&D) of injection depicting no of proliferating cell and rate of proliferation respectively. per dentate gyrus. DAPI; caunter stain. Magnification; 20X. Different cell layers of dentate gyrus. M; molecular layer, S; subgranular zone; G; granule cell layer

References

- [1] H. Lai, N.P. Singh, “Single and double strand breaks in rats brain cells after acute exposure to radio frequency electromagnetic radiation”, *Int. J. Radiat. Biol.* **69**, 1996,pp 513–521.
- [2] R. Paulraj, J. Behari, “Single strand DNA breaks in rat brain cells exposed to microwave radiation”, *Mut Res.* **596**,2006 pp 76–80
- [3] R Gautam VS Kumari J Nirala N N Murmu R Meena, R Paulraj, “Oxidative stress-mediated alterations on sperm parameters in male Wistar rats exposed to 3G mobile phone radiation”, *Andrologia*,**51**(3) 2019:e13201.