Enzymatic, genetic and Morphological alteration in different organelles of rat exposed to low level microwave radiation

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There has been a major concern among the public regarding the potential human health hazards due to microwave radiation exposure. These radiations may induce changes in growth related enzymes, antioxidative enzymes and DNA. Hence the present investigation is aimed to study the DNA strand breaks, various enzymes such as catalase, glutathione peroxidase, super oxide dismutase, protein kinase C (PKC) ornithine decarboxylase (ODC) etc in rat exposed to different frequencies of microwave radiation.

Thirty days old male Wistar rats were exposed 2 h/day for 30-35 days at different frequencies, 1800 MHz, 2100 MHz, 2.45 GHz, 9.9 GHz etc. at low power density. Exposure was carried out in a specially designed anechoic chamber. After the exposure various organs such as whole brain, liver, spleen and testis etc. were dissected out and used for estimation of DNA strand breaks, calcium ion efflux, PKC, ODC and antioxidative enzyme activity. Radio labeled P32 ATP and C14 Ornithine were used for estimation of PKC and ODC activity respectively. DNA damage was performed by single cell gel electrophoresis[1,2].

A significant decrease in PKC activity was observed in exposed group as compared to their control counterpart. It is noted that activity of hippocampus showed a significant decline as compared to hypothalamus and the rest of the brain. On the other hand, a statistically significant increase in the ODC activity was observed. In additions a significant alteration in catalase, glutathione peroxidase, super oxide dismutase, was observed in the rat exposed to above mentioned radiation as compared to control groups. It is inferred that prolonged exposure to these radiation causes 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, antioxidative system as well as growth related enzymes such as PKC and ODC, which are associated with the cell proliferation and differentiation [3,4]. 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. An increase in ROS level was observed which leads to increase in lipid peroxidation and damaging sperm plasma membrane, significant changes in number of active mitochondria. It may be concluded from the present that the alteration in these enzymes may affect normal functions and development in rat.

References