

A Time and Frequency Dependent Study of Low Intensity Microwave Radiation Induced Endoplasmic Reticulum Stress and Alteration of Autophagy in Rat Brain

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Abstract : With the tremendous increase in exposure to radiofrequency microwaves emitted by mobile phones, globally public awareness has grown with regard to the potential health hazards of microwaves on the nervous system in the brain. India alone has more than one billion mobile users out of 4.3 billion globally. Our studies have suggested that radio frequency able to affect neuronal alterations in the brain, and hence, affecting cognitive behaviour. However, adverse effect of low-intensity microwave exposure with endoplasmic reticulum stress and autophagy has not been evaluated yet. In this study, we explore whether low-intensity microwave induces endoplasmic reticulum stress and autophagy with varying frequency and time duration in Wistar rat. Ninety-six male Wistar rat were divided into 12 groups of 8 rats each. We studied at 900 MHz, 1800 MHz, and 2450 MHz frequency with reference to sham-exposed group. At the end of the exposure, the rats were sacrificed to collect brain tissue and expression of CHOP, ATF-4, XBP-1, Bcl-2, Bax, LC3 and Atg-4 gene was analysed by real-time PCR. Significant fold change ($p < 0.05$) of gene expression was found in all groups of 1800 MHz and 2450 MHz exposure group in comparison to sham exposure group. In conclusion, the microwave exposure able to induce ER stress and modulate autophagy. ER (endoplasmic reticulum) stress and autophagy vary with increasing frequency as well as the duration of exposure. Our results suggested that microwave exposure is harmful to neuronal health as it induces ER stress and hampers autophagy in neuron cells and thereby increasing the neuron degeneration which impairs cognitive behaviour of experimental animals.

Keywords : autophagy, ER stress, microwave, nervous system, rat

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