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WEAK ELECTROMAGNETIC FIELDS ANALOG, DIGITAL AND PULSED, AFFECT CELL CYCLE REGULATION AND GENE EXPRESSION IN CULTURED CELLS

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Abstract:

Some epidemiological studies reported an association between exposure to RF EMFs and increased risk of cancer. For mobile telephone both analog and digital signal seems to be effective in induce gene expression and modifications of cell cycle regulation. The purpose of our study was to provide evidence for a carcinogenic potential of EMFs on cultured human CEM-cells by MTT survival test, Western Blot (WB) analysis and COMET assay. In our study the cell cultures were exposed for 2, 3, 4, and 6 hours, using a normal mobile telephone through a TEM cell device from 1.3 milliWatts to 0.6 microWatts in 11 steps of decreasing power density inside a cell culture incubator.

TIME DEPENDENT EFFECTS

Exposures till two hours caused an increment of the number of proliferating surviving cells. While the exposed samples to 3, 4, and 6 hours show a reduction of the survived cells as detected by MTT viability test. Moreover the expression level of the most representative pro-apoptotic and cell cycle regulator genes in CCRF-CEM cell line was evaluated. First, the WB analysis have evidenced an unbalance between pro-apoptotic and pro-survival signals, in particular the exposure time till two hours induced a prevailing pro-apoptotic gene activation (p53, pRb/p110.), while the exposure time of 3, 4, and 6 hours induced prevailing pro-survival gene expression activity (Bcl-2 and Ras). DNA breaks in exposed samples were also visualized by alkaline Comet assay. Inverse correlation between exposure time and power density was also detected.

POWER DENSITY DEPENDENT EFFECTS ON CELL SURVIVAL

The experiments were performed starting from 1.3 mW (milli W) and reducing progressively the power density till to 0.6 uW (micro W) as measured in input of the TEM CELL.

The cells till to 0.6 uW have been affected, as showed by MTT survival test, with a difference between control unexposed cells and exposed cells, statistically significant of a mean of 20%. A difference between the total exposure time 2, 3, 4, and 6 hours was also detected.