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Mobile phone radiation alters proliferation of hepatocarcinoma cells

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ABSTRACT

This study investigated the effects of intermittent exposure (15 min on, 15 min off for 1, 2, 3 or 4 hrs) to Enhanced Data rates for Global System for Mobile Communication Evolution (GSM-EDGE) modulated radiofrequency radiation (RFR) at 900 MHz and 1800 MHz frequencies on the viability of the hepatocarcinoma cells (Hep G2). Hep G2 cell proliferation was measured by a colorimetric assay based on the cleavage of the tetrazolium salt [2-(4-Iodophenyl)-3-(4-nitrophenyl)-5-(2,4-disulfophenyl)-2H-tetrazolium] (WST-1) by mitochondrial dehydrogenases in viable cells. Cell injury was evaluated by analyzing the levels of lactate dehydrogenase (LDH) and glucose released from lysed cells into the culture medium. Morphological observation of the nuclei was carried out by 4,6-diamidino-2-phenylindole (DAPI) staining using fluorescence microscopy. In addition, terminal deoxynucleotidyl transferase deoxyuridine triphosphate (dUTP) nick end labeling (TUNEL) assay was performed to confirm apoptotic cell death. It was observed that cell viability, correlated with the LDH and glucose levels, changed according to the frequency and duration of RFR exposure. Four-hour-exposure produced more pronounced effects than the other exposure durations. 1800-MHz RFR had more impact on cell viability and injury of Hep G2 than the RFR at 900 MHz. Morphological observations also supported the biochemical results that most of the cells showed irregular nuclei pattern as a marker of late stage apoptosis using the DAPI staining, as well as TUNEL assay which shows DNA damage especially in the cells after 4 hrs of exposure to 1800-MHz RFR. The results showed that proliferation of Hep G2 cells increased after 1 hour of exposure whereas a decrease was observed after four hours of-exposure to the 1800-MHz radiation. The 900-MHz radiation had no significant effect on cell proliferation after 1 hour of exposure, but a decrease was observed after 4 hrs of exposure. Further studies will involve other frequency bands of RFR and longer duration of exposure.

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