EFFECT ON DNA REPAIR IN CULTURED HUMAN CELLS OF EXPOSURE TO ELECTROMAGNETIC IRRADIATION OF 1800 MHZ FREQUENCY.

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OBJECTIVE : Unlike ionising radiation, microwaves do not break chemical bonds within molecules. Although, there is no clear hypothesis for a possible mechanism by which microwaves may affect biological function, nevertheless, an indirect effect of microwaves during an intermediary step of the complex sequence of events involved in carcinogenesis cannot as yet be excluded.
The phosporylated histone γH2AX is implicated in DNA repair process. Recently, it has been shown that foci of γH2AX, detected by immuno-fluorescence, are quantitatively related to DNA repair and may be used as a sensitive biomarker.
The aim of the study is to investigate, *in vitro,* the effect, of a combination 1800 MHz (modulated) electromagnetic field exposure and a known mutagenic agent, on DNA repair. This is a new approach to investigate possible genotoxic effect of electromagnetic fields.
Primary human fibroblasts from the lung presenting a very low basal level of DNA repair (MRC5 cell line) were used for the experiment in combination with the mutagenic agent 4-nitroquinoline-N-oxide (4-NQO).
As might be expected, the effects are weak. Care was taken to increase the reproducibility of the experiments and to avoid false positive or misinterpretation of the results. The presence or the absence of the electromagnetic field was the only difference between the sham and exposed assays.
METHOD : The carrier frequency was 1800 MHz, 217 Hz amplitude-modulated (PW). The power density allowed an average SAR compatible with the ICNIRP exposure limits in the biological samples. For each experiment, four non exposed (sham) and four exposed culture petri dishes were incubated simultaneously in two identical incubators in the presence of 4-NQO, under shaking, at 10°C for 2 hours. After treatments, the cells were incubated at 37°C for 30 min before being fixed and labelled with antibodies for immunofluorescence measurements. The specially designed cell culture incubators were integrated in two identical anechoic chambers both equipped with a horn-antenna. Each experiment was reproducibly repeated 4 times. The electromagnetic field was applied alternatively above one incubator and then the other.
The temperature inside the cell plates was measured with an optic fiber probe (Luxtron) and numerical dosimetry was calculated using the Finite Difference Time Domain method. The SAR was obtained from the electric-field value using the formula $SAR=\sigma E^2/(2\rho)$ en W/kg, where σ is the conductivity in S/m, E is the electric field in V/m and ρ the density in kg/m^3. A time-scaled form of the heat transfer equation allowed to calculate the temperature distribution inside the petri dishes.
CONCLUSION : The exposure power level did not induce increases in temperature in the cell culture medium. Interactions between the incubator and the electromagnetic fields are important and have been examined in a first step. The SAR and the temperature distribution in the petri dishes will be shown. Biological experiments are still in progress and complete analysis of the data will be available at the time of the meeting.
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