EFFECTS OF LOW INTENSITY RADIOFREQUENCY STATIC ELECTRO-MAGNETIC FIELDS (EMFs), ON SARCOMA CELL LINES.

Spyridon Karkabounas (1), Patra Vezyraki (1), Olga Kostoula (1), Antonios Avdikos (1), Konstantinos Havelas (2), Jayne Binolis (1), Eleni Theodosopoulou (3), George Hatziaivazis (2), Iulia Yioti (4), Apostolos Metsios (1) and Angelos M. Evangelou (1)

(1) Laboratory of Experimental Physiology, Faculty of Medicine , University of Ioannina (Greece).

(2) Center for Energy Frequencies Studies in Physical and Mental Balance (Greece)

(3) Faculty of Nursery. University of Athens (Greece).

(4) Lab of Hormonal Receptors of Oncology Hospital Agios Savas (Greece).

Corresponding author: Spyridon Karkabounas, PhD, Lecturer in Physiology, Laboratory of Physiology, Faculty of Medicine, University of Ioannina, University Campus, 45110 Greece. Tel. +30-26510-97751, +30-26510-97576. Fax +30-26510-97850.

Email : Skarkabou@cc.uoi.gr

Abstract

In this study we investigated the effects of low intensity static electromagnetic field (EMF) causing no thermal effects, on sarcoma cells, isolated from tumors of Wistar rats. The tumors were developed via 3, 4-benzopyrene injection in the rats. The cancer cells were exposed to EMF using frequencies between 10 kHz to 120 kHz of the radiowave spectrum for 45 minutes. During a 24-hours period after cancer cell exposure to EMF, no inhibition of cell proliferation appeared. In contrast, at the end of 48 hours incubation time, the cancer cell proliferation was dramatically decreased in ratio > 95%. Also, the survived sarcoma cells after the exposure to EMF (2% of the total cell population exposed to EMF) showed a significant decrease to proliferate under the same culture conditions. These cells were then exposed once again to EMF for 45 minutes (totally 4 sessions of exposure) and tested using a flow cytometer. It was found that a great percentage (45%) of these cells, double exposed to EMF, was apoptotic and only a small percentage of them was found under mitosis (2 %). Additionally, the cells were counted and tested using an aggregometer for their ability to aggregate the platelets (an indicator of their metastatic potential) and they didn't show any difference in comparison to the sarcoma cells not exposed to EMF (control cells).

Key Words: Sarcoma cells, Static electromagnetic fields, radiofrequency waves , resonance, platelet aggregation, metastasis.