Abbreviations : Electromagnetic fields : EMF , Smooth Muscle cells : SMC, Malignant sarcoma cells : MC, SC, Platelets Reach Plasma : PRP , 3,4-benzopyrene : B[a]P.: DMEM , Fetal Bovine serum : FBS , Radio – frequencies : RF, Electron Paramagnetic Resonance : EPR , Electron Spin Resonance : ESR.

Introduction

There is a lot of data dealing with the effects of electromagnetic fields (EMFs) on cells, experimental animals and humans, some of them referred to application of electromagnetic resonance principles(1, 2). Dealing with malignancy , the following main concepts have been expressed, so far, depending on the intensity, frequency and duration of application of the electromagnetic waves : The EMFs may act as co-carcinogens in combination with the initiating carcinogen , especially in experimental animals and the EMFs can exert anticarcinogenic effects, inhibiting the proliferation of malignant cells in vitro as well as decreasing the size of the experimental tumors in vivo (3,4,5,6). The studies on EMFs pro-carcinogenic effects in experimental animals are however, not numerous and it seems that the described methods have a lot of uncertainty (3,4). In comparison, the studies on EMF anticancer effects are abundant and their methodology is well documented (7). It has been also shown, that the cytostatic effects of the EMFs on cancer cells are not related to their thermal effects but are exerted via temperature-independent actions(8,9,10).

In the present study the effects exerted by low intensity radiofrequency static electromagnetic fields, on a sarcoma cell line , were investigated.

Materials & Methods

Production of malignant (sarcoma) [MC] and smooth muscle cells (SMC). In this study, the malignant cells were isolated from selected sarcoma described tumors of Wistar rats. Fifteen (7 males and 8 females) Wistar rats, belonging to the fifth generation of a certain couple, 60 days old, were subcutaneously injected by 1 ml of 3,4-Benzopyrene solution (B[a]P) in Tricapryline at a final dose of 10,08 mgr/ml in their right scapula. . After 110 days (maximum 135 days), all the animals developed malignant tumors at the site of injection. All the tumors were histologicaly identified as leiomyosarcomas. The tumors were surgically removed and cut under aseptic conditions into pieces of 0.5cm size. Each pieces was placed immediately in cold Ringer's solution, then sliced down again to smaller pieces of 1 mm size and placed into 5 ml DMEM solution which contained small quantities of trypsin. The pieces in the solutions were kept at 37° C for 4 hours, with gentle mixing every15 minutes. Then they were centrifuged at 900 rpm for 10 minutes and the supernatant was rejected. The remained cells were resuspended in DMEM+10%FBS solution and seeded in plastic coated dishes of 52 mm size and subcultures of these cells were made, and were submitted to histological examination.

In order to verify if these cells are able to induce the same type of malignancy in rats, 4 million of these cells suspended in Hanks Salt solution were inoculated into every Wistar rat. The animals were anaesthetized with Midazolame and Ketamine, and surgical opening was made on the backside to their outer skin layer. The tissue underneath was traumatized by lancing with a sharp blade in order to bring fresh blood to the surface. Malignant cells were then aseptically infused into the operated area, closure of the open site was immediately performed. The animals developed