pathways leading to apoptic gene activation (5,7,16,22) or inactivation of anti-apoptotic genes(15). The low percentage of the cells found in synthesis and in mitosis (9 and 2% respectively) compared to that of the control cells (38 and 19% respectively) indicates that RF EMFs can act as cell cycle inhibitors , possibly to the effects of magnetic fields on DNA-synthesis (23,24,7). There is also evidence that exposure to electromagnetic fields may reduce immuno reactive p53 expression in tumor bearing mice (19), which has been found increased in BaP-induced sarcomas in Wistar rats (25). The lower sensitivity after the fourth exposure of the sarcoma cells to EMFs compared to their sensitivity after the first exposure indicates that the sarcoma cells may develop some type of resistance .

Our finding that the electromagnetic frequency pattern of the sarcoma cells changed after their exposure to EMF and resembled to that of smooth muscle cells, may possibly indicate that some type of sarcoma cell differentiation could take place.

The above is supported by our, yet unpublished data, indicating that these, EMF – treated, sarcoma cells fail to induce tumor development, when inoculated to Wistar rats in comparison to the unexposed sarcoma cells that induce tumors in 100% of the rats.

Nevertheless, the sarcoma cells exposed to EMF seems to retain their "metastatic potential" as they can still efficiently aggregate the platelets. There is also data that the EMFs, as well as the generalized electromagnetic radiation fields, are able to induce differentiation in cancer cells and other types of undifferentiated cells (26, 27).

It must be emphasized that for the first time a low intensity RFs EMF is used and it is essential this electromagnetic field to be carefully designed on the basis of the emitted electromagnetic frequencies from the target cells, in order to be effective. Also, the intensity of the electric field we used was 75 times lower and the intensity of the magnetic field was more than 1800 times less than the average of the international safety standards according to the International Committee of Atomic Energy (E.K.E.F.E DEMOKRITOS, Athens Greece) (17). Because of that, the use of this device as an electronic instrument in cancer treatment seems safe. Unpublished data of ours, from the follow up of tumor-bearing animals and cancer patients exposed to similar with the present investigation EMFs , are very encouraging.

Future targets

Our data concerning the alterations of radio-frequency pattern of sarcoma cells after repeated exposures to EMFs ,indicate that in order to affect the biological system of these cells, it is crucial to make readjustments of the RF, in order achieve a better electromagnetic resonance of cells , as close as possible as can be to that of the normal cells. If this hypothesis is right, it is expected that the final radio-frequencies of the sarcoma cells would be close to those of the smooth muscle cells. In this case the sarcoma cells should loose their malignant phenotype, so that their inoculation to Wistar rats will not cause malignant disease. Experiments going on , in our lab, seems to confirm this hypothesis.

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