Abstracts from the 18th Annual Meeting, Bioelectromagnetics Society
Victoria, British Columbia, Canada
June 1996

EFFECT OF 60-Hz MAGNETIC FIELDS ON LYMPHOID PHENOTYPE

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Correlations have been reported between exposure to electromagnetic fields (EMFs) in the environment and human disease, particularly cancer, but links between exposure and disease have not been established in animal models despite many reports of EMF-induced physiological changes in exposed animals. Our long-term objective is to determine whether the relationship between EMF exposure and human disease can ultimately be explained on the basis of post-translational (with respect to the EMF-detecting cell) processes in which fields are detected by a neural membrane-bound protein, resulting in a sub-threshold electrophysiological change that serves as an afferent signal to the thalamus. In this view, resulting efferent signals mediate a nonspecific adaptive response to the EMF and chronic activation of the adaptive system adversely affects immunosurveillance by natural killer (NK) cells, thereby making the occurrence of clinical disease more likely than would have been the case in the absence of EMF exposure.

The aim of this study is to determine whether 60-Hz magnetic fields can induce an immunodeficient state in a mouse model, as assessed on the basis of phenotypic and quantitative changes in various lymphoid compartments. Considering the important role NK cells play in host resistance to tumor growth and metastasis, particular focus will be placed on determining whether chronic field exposure results in alterations in the number or function of these important effector cells. It is expected that immunosuppression will be observed at higher magnetic-field doses (magnetic field strength x exposure time). Separate groups of male and female mice will be exposed to 5, 50, 500 mG, and 5 gauss for periods ranging from 1 day to 25 weeks, and the number of NK cells, T cells, and B cells in the spleen, blood, lymph nodes and bone marrow will be determined as a function of intensity and duration of field exposure, and compared with values measured in sham-exposed animals. ^{51}Cr-release assays will be used to measure the effect of field exposure on the lytic function of constitutive and inducible (with polyinosinic:polycytidyllic) NK cells, and cytotoxic T lymphocytes generated in mixed lymphocyte cultures from the spleen. In addition, an *in vitro* assay involving IL-2 activation of splenic NK cells to lyse tumor targets will be used to characterize the inducibility of lymphocytes from exposed animals. Homogeneous fields (±5%) will be generated using a series-resonant arrangement of coils; a computer-based system will monitor temperature, field, coil current, environmental conditions, and provide documentation of the absence of transients and distortion in the coil current. The mice will be housed in a non-metallic environment using micro-isolation cages. The exposed and sham-exposed animals will be maintained in the same room; the fringing field at the location of the sham-exposed mice will be ≤0.5 mG. All tissues and cells will be coded after collection to ensure that the personnel making the measurements and performing the assays are blinded regarding whether the samples were obtained from exposed or control animals.

This work was supported by a grant from the National Institute of Environmental Health Sciences.