

Effect of ELF-EMF on antioxidant status and micronuclei in K562 cells and normal lymphocytes

Research Article

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Abstract: The effect of ELF-EMF on DNA through changes in antioxidative enzyme activities has not been sufficiently explored yet. The aim of this study was to determine ELF-EMF effect on antioxidative enzymes in cancer cell line and genotoxic potential on normal human lymphocytes. K562 cells were exposed to 50 Hz ELF-EMF (40 μ T, 100 μ T; 3 h, 24 h) and spectrophotometric determination of lipid peroxidation and antioxidative enzyme activities was conducted. Genotoxicity of ELF-EMF (50 Hz, 100 μ T) was investigated by cytokinesis-block micronucleus assay in a normal human lymphocytes (exposure 24 h and 48 h). Results demonstrated that ELF-EMF did not alter the process of lipid peroxidation and superoxide dismutase activity. Catalase activity was increased only after application of 100 μ T EMF for 24 h. Glutathione-S-transferase and -reductase activities were increased. Treatment with 100 μ T ELF-EMF (24 h, 48 h) significantly reduced micronuclei incidence, while cell proliferation was significantly increased. Results indicate that 50 Hz ELF-EMF (40 μ T, 100 μ T) are weak stressors which alone cannot generate enough ROS to induce process of lipid peroxidation in cancer cell line but strong enough to induce response of antioxidative system. Furthermore, 100 μ T ELF-EMF in human lymphocytes did not exhibit genotoxic potential during 24 h and 48 h treatment, but stimulated cell proliferation.

Keywords: ELF-EMF • Human leukemia cell line • Oxidative stress • Lymphocytes • Micronuclei • Genotoxicity

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1. Introduction

Electromagnetic fields (EMF) of all frequencies represent one of the most common and fastest growing environmental influences, about which anxiety and speculations are spreading. All populations are now exposed to varying degrees of EMF, and the levels will continue to increase as technology advances. There is no doubt that short-term exposure to very high levels of electromagnetic fields can be harmful to health. Current public concern focuses on possible

long-term health effects caused by exposure to electromagnetic fields at levels below those required to trigger acute biological response [1]. The potential effects of extremely low frequency electromagnetic fields (ELF-EMF) on human health is a matter of public concern, due to the increasing use of electric power for domestic and industrial appliances in the last few years. ELF fields generally have frequencies up to 300 Hz. In the IARC (International Agency for Research on Cancer) evaluation, ELF magnetic fields were classified into group "2B" ("possibly carcinogenic to humans").

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