53 Magnetic Phenomena of Cells and Proteins of Blood Coagulation System

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In this paper, we focused on the effects of static magnetic fields on blood coagulation system. Blood coagulation system have the materials that orient parallel and perpendicular to the direction of magnetic fields. So modulation of blood coagulation under magnetic fields of Tesla order is expected. We investigated the effects of intense magnetic fields on blood platelet aggregation by measuring the time course of optical transmittancy of blood plasma during a platelet aggregation process with and without static magnetic fields of up to 14 T. The platelet-rich-plasma was injected into a plastic-type optical cell. After 10 minutes of incubation at 37 °C, collagen was added into the plasma. Then platelets in the plasma were stimulated by collagen and a plasma coagulation started. We observed that the optical transmittancy (600 nm) of plasma under magnetic field exposures increased more rapidly compared to the control. The results show that a 14 T magnetic field enhanced the platelet aggregation in plasma.

54 Effects of Elliptically Polarized Magnetic Fields on Immediately Early Response Gene Expression

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Several epidemiological studies have reported that there is an association between childhood leukemia and the EMF from the power lines. However, these reported that no number of well-performed studies provides strong support evidence for mechanistically plausible effects of EMF. And no study was performed for types of waveform that correspond to the ELF-MFs from the existing power lines. With *in vitro* exposure units that can generation elliptically polarized MFs we examined whether the exposure of pseudo-synchronized culture cells at G_1 phase to flux density below 500μT induce alterations in expression of the immediately early response gene at both the transcriptional and translational levels. The cells were exposed to 60 Hz elliptically polarized MFs (Vertical : Horizontal =4:1) for 30 (for c-fos and c-jun) and 180 (for c-myc) minutes at flux density of 1, 20, 100 and 500 μT both with and without 10 % serum. As an indicator of each gene induction in both the northern- and western-blot hybridization, the exposed sample values were normalized to sham sample value. In all the study data, there was no significant difference in the expression of G_1 dependent genes between MFs exposed and sham exposure culture. From these results, we may conclude that no effect is exerted to enhancement in gene expression by exposure of cultured human cells to linearly polarized ELF-MFs at flux density below 500μT (60 Hz).

55 Development of Multi-Elliptically Exposure System and Reassessment of Effects by Linearly Polarized Magnetic Fields in Immediately Early Response Gene Expression

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Several studies have assessed for the bio-effects of sinusoidal extremely low frequency-magnetic fields (ELF-MFs) past 20 years. There is not reproduction and clearance whether the exposure of *in vitro* to linearly MFs effects alteration of the immediately early response gene expression. In this study, we used newly exposure system for ELF-MF that can generate multiply polarized MFs and reassessed an effect of linearly MFs by measuring the gene expression. The exposure system was constructed with a magnetic field applied to one of the two culture boxes (exposed / sham) and two axis coils (in the vertical and side to side horizontal axes). The chambers were completely surrounded by two annealed mu-metal box. The generated frequency, waveform, flux density of MFs was automatically regulated by personal computer. Human glioblastoma cell line, T98G cells, were pseudo-synchronized at G_1 phase and were exposed to 60 Hz linearly (vertical and horizontal) polarized MFs for 30 and 180 minutes at flux density of $500\mu T_{RMS}$ with and without 10% serum. The c-jun and c-fos (for 30 min) and c-myc (for 180 min) expression were determined by the northern- and western-blotting analysis, respectively. The uniformity within ±5% of the set flux density in the exposure chamber is confirmed. In all the study data, there was no significant difference in the expression of G_1 dependent genes in both transcriptional and translational levels between MFs exposure and sham exposure at $500\mu T_{RMS}$. Since these genes are associate with growth stimulation of cell cycle, we may conclude that no effect is exerted to enhancement in gene expression by exposure of cultured human cells to linearly polarized ELF-MFs (60 Hz, 500μT).