

**Effect of High-Field Magnetic Resonance on Morphology
of Human Peripheral Blood Lymphocytes**

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Purpose: Numerous studies have been performed about the various safety consideration of magnetic resonance (MR). Multiple investigators have failed to reveal any deleterious defects of MR. On the other hand, several studies have demonstrated detectable biologic effects of MR, particularly high magnetic fields. The purpose of this study was to determine whether high-field MR produces any morphologic changes on the cell membrane and intracellular ultrastructures in human peripheral blood lymphocytes in vitro.

Materials and Method: Lymphocytes were isolated from peripheral blood of normal human adults by Ficoll-Hypaque density centrifugation. Exposure to MR was performed with 4.69 T and 11.74 T MR spectrometer with a radio frequency (RF) pulse of 200 MHz and 500 MHz. Exposure times varied from 30 minutes to 3 hours. The cells were fixed immediately, 1, 3, 7 days after MR exposure. Morphologic evaluation was examined by transmission electron microscopy (TEM).

Results: Under TEM there was cell transformation including cellular membrane, nucleus and intracellular microorganelles on lymphocytes exposed to MR. The percentage of transformed lymphocytes was not significantly increased after 4.69 T MR exposure, whereas the percentage of transformed lymphocytes was significantly increased after 11.74 T MR exposure ($P < 0.05$) compared with that of control. The percentage of transformed lymphocytes was significantly increased at the long incubation period in control and MR exposure group ($P < 0.05$). No change according to MR exposure time and RF pulse sequence was noted.

Conclusion: Exposure to high-field MR induces morphologic transformations of lymphocytes in vitro. Additional studies have to be performed before definitive conclusions can be reached about the safety of high-field MR.