Transplantation of Magnetic Nano Particle-Incorporated Human Bone Marrow Derived Mesenchymal Stem Cells by Pulsed Electromagnetic Fields on Injured Rat Spinal Cord

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Adult stem cells are considered to be multipotent and human bone marrow-derived mesenchymal stem cells (hBM-MSCs) have the potential to differentiate into nerve type cells. Mechanical signals have great potential to regulate biochemical signal transduction pathways induced by soluble factors for the control of stem cell differentiation. Spinal Cord Injury (SCI) is damage to the spinal cord that results in a loss of function such as mobility or feeling. Several reports to explain about MSC therapeutic benefits have been suggested, including neuroprotective effects from release of growth factors and cytokines, the induction of axonal sprouting, and the replacement of damaged cells. In this study, the effects of pulsed electromagnetic fields (PEMFs) on injured rat spinal cord were investigated in Magnetic Nano Particle (MNP) incorporated human bone marrow derived mesenchymal stem cells (hBM-MSCs). In histological analysis revealed significant differences in MNP incorporated cell distribution near injured site under the PEMF in comparison to control groups. We confirmed that the MNP incorporated cells are widely distributed in this lesion under PEMFs. The results of our study suggest that MNPs incorporated hBM-MSCs were guided by PEMFs near the injured site, that PEMFs exposure promotes recovery of behavior in spinal cord. The results showed that MNPs incorporated hBM-MSCs with PEMF groups are more effective to BBB behavioral testing, and suggested that PEMFs enhances the action of transplanted cells for recovering injured lesion.