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P274- Preconditioning with Oxidative Stress Increases the Survival Rate in Bone Marrow-derived Mesenchymal Stem Cells

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Abstract

Introduction: Mesenchymal stem cells are multipotent stem cells having capacity for differentiation to various types of cells such as osteocyte, adipocyte, and chondrocytes. They can be easily isolated from several organs without any prominent invasive procedure. Both differentiation ability and immunomodulatory effects of the bone marrow–derived mesenchymal stem cells (BM-MSCs) make them to be a promising source for tissue repairing and vehicles of cell-based gene therapy. Moreover, the homing properties of BM-MSCs offer them to be a prospective tool for augmenting of the tissue regeneration. Nevertheless, some disadvantages including low survival rate following transplantation will be resulted by a lot of oxidative stress caused by hypoxia/inflammation in damaged tissue. These conditions restrict the broad applications of BM-MSCs for clinical purposes. Therefore, each strategy protecting BM-MSCs from premature death and improving the survival rate will be valuable for their therapeutic aims. Preconditioning denotes the cell exposure to minute rate of oxidative stress for a short period of time, reinforcing the cells against the higher level of stress. **Literature review:** Preconditioning with oxidative stress induced by H_2O_2 is one of the successful strategies to increase the cell viability. Previous studies have demonstrated preconditioning of PC12 cells with H_2O_2 increased their survival rate through reducing the intracellular reaction oxygen species (ROS) and rising the mitochondrial membrane potential (MMP). Moreover, H_2O_2 preconditioned BM-MSCs significantly showed higher survival percentage against the harmful conditions and prevention of apoptosis. Recent studies have also reported that preconditioned–based cell therapy in mice with infracted myocardium enhances the neovascularization in heart and improves its function through overexpression of HGF and IL-6 as well as VEGF upregulation followed by high expression of HIF-1α protein. **Conclusion:** H_2O_2 causes oxidative stress in cells by producing many free radicals such as superoxide (O_2^-) and hydroxyl radical ($OH^\cdot$) that may lead to apoptosis. However, low concentrations of H_2O_2 for a short period of time protect BM-MSCs against oxidative stress and increase their survival rate both *in vivo* and *in vitro*.

Keywords: Mesenchymal Stem Cells, Survival, Oxidative Stress, H_2O_2.