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Differentiation of rat bone marrow mesenchymal stem cells into cardiomyocytes using various preconditioning strategies

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Cardiovascular Diseases (CVDs) are the number one cause of death globally. According to WHO, an estimated 17.7 million people die annually from CVDs, representing 31% of all global deaths. One of the major cardiovascular disorders is Myocardial Infarction (MI), during which cardiomyocytes have limited self-renewal capacity and therefore, their functional ability is compensated. Conventional therapies offer limited improvement in terms of cardiac function. Cell based therapeutics with the potential of cardiac regeneration, hold significant promise as an alternative therapeutic approach. Mesenchymal Stem Cells (MSCs) are considered as one of the best candidates for cellular therapy because of their immense potential in the regenerative medicine and tissue engineering. However, large number of transplanted MSCs does not survive in the ischemic environment of the infracted heart with inadequate blood supply and increased inflammation. To ensure the survival of engrafted stem cells, a number of preconditioning strategies have been adopted including hypoxic shock and genetic modifications using growth factors. We used 2, 4, Dinitrophenol (DNP) for hypoxia and a number of cell survival, angiogenic and cardiomyogenic growth factors for genetic modification of MSCs. These preconditioned MSCs were transplanted in the rat model of myocardial infarction. Cardiac function was assessed by echocardiography while histological analysis was performed to analyze reduction in the fibrotic region. Promising results were obtained in case of these modifications and significant improvement in the cardiac function was observed. In this talk, potential role of preconditioned MSCs on cardiac differentiation will be highlighted.

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