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DIFFERENTIATION OF BONE MARROW-DERIVED MESENCHYMAL STEM CELLS INTO DISC-LIKE CELLS AFTER CO-CULTURE WITH RAT DISC EXPLANTS

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Introduction. Degeneration of the intervertebral disc, commonly affiliated with chronic low pack pain is characterized by a major loss of extracellular matrix (ECM) and disc cells. Recent advance in cell therapy indicates that mesenchymal stem cells (MSCs) can be an alternative source for tissue repair. The aim of this study was to investigate whether co-culture with disc explant tissue could influence stem cells to differentiate towards disc-like cells.
Methods. Rodent MSCs (rMSC) were cultured alone or co-cultured with disc explant by using insert plates. Differentiation potential of rMSC's was evaluated by immunostaining, western blot, ultrastructural analysis, real time RT-PCR, and northern blot respectively up to 30 days. The multi-potential differentiation characteristics assays, proteoglycan synthesis, total collagen synthesis were performed.
Results. The co-culture conditions led to expression of collagen-II, aggrecan and sox-9 in rMSC at both RNA and protein level after 14 days, whereas rMSCs cultured alone did not express these markers. Co-cultured rMSCs showed functional characteristics of disc-chondrocytes, including production of extracellular matrix of proteoglycan and total collagen. In addition, rMSCs underwent morphological changes to form 3D micro-masses upon differentiation with formation of ECM. rMSCs being co-cultured for day 21 still demonstrated ability of osteogenic and adipogenic differentiation but no hemopoietic colony formulation ability. Cells contact between co-cultured rMSC's and disc explants were observed.
Discussion. rMSCs can differentiate into functional disc-like cells in an explant co-culturing environment. In present of the e host tissue is sufficient for this to occur, in which the tissue and or/cells may provide signaling molecules to influence rMSCs to differentiate. This novel explant co-cultured system allows easy separation of differentiated rMSC for subsequent analysis. This study supports MSCs as a promising source for cellular therapy of disc degeneration and highlights that explants along without manipulation (extract cells) is already sufficient to influence MSCs defeneration pathway.