Immunomodulatory Properties of Mesenchymal Stem Cells for Knee Osteoarthritis Prevention and Treatment

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Knee osteoarthritis (OA) is a degenerative joint disease in which the cartilage within the joint gradually wears away, leading to pain, stiffness, and swelling of the knee. About 10% of men and 13% of women in the United States over the age of 50 have symptomatic OA. Trauma to the joint leads to increased production of substance P and pro-inflammatory cytokines, demonstrating the importance of the inflammatory immune response involved in the pathogenesis of OA. Mesenchymal stem cells (MSCs) are known to exhibit anti-inflammatory properties when exposed to pro-inflammatory cytokines and have been studied for their therapeutic effects due to their abilities to regulate the immune system, enhance proliferation of cells, and their differentiation capacities. The purpose of this study is to investigate the differences in gene expression of MSCs derived from bone marrow and umbilical cord tissues, cultured in different conditions [human platelet lysate or chemically-reinforced media], and induced with pro-inflammatory cytokines in vitro. The results demonstrated differences in gene expression between MSCs derived from different tissue types and grown in different media. Notably, MSC induction with pro-inflammatory cytokines initiates a cascade of gene expression that increases MSCs' responses to inflammation. Future research should further characterize these differences to determine which tissue source of MSCs and induction method in vitro is most efficient for joint injury and OA disease therapeutics. In doing this, more efficient stem cell therapies that regulate immunomodulatory responses during OA progression can be developed, increasing the quality of treatment and prevention for OA, along with various other inflammatory diseases that are difficult to treat.

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