Comparing the Therapeutic Efficacy of Human Amniotic Membrane and Adipose Derived Mesenchymal Stem Cells to Mitigate Osteoarthritis

Osteoarthritis (OA) is a leading cause of disability and pain to patients worldwide, and is characterized by abnormal subchondral bone remodeling, synovial tissue inflammation, and the destruction of articular cartilage, with limited capacity for intrinsic repair. Currently, only palliative options are available to help address the debilitating effects of the disease and there are no therapies that halt or mitigate the progression of OA. Thus, there is an urgent need to develop novel therapies to combat OA.

Stem cell-based regenerative strategies hold promise as a therapeutic due to their reported ability to regulate inflammation and promote tissue regeneration in vitro. Our lab has previously shown, in an in vitro explant co-culture study, that human amniotic membrane-derived stem cells (hAMSCs) provide an enhanced chondro-protective effect compared to human adipose-derived stem cells (hADSCs). To further our previous findings, the overall purpose of the research herein was to investigate and compare the therapeutic efficacy of these two stem cell sources to mitigate OA in vivo following intra-articular injection into a spontaneous model of OA; the Dunkin Hartley Guinea Pig (DHGP). This was achieved by directly comparing the therapeutic effect of hAMSCs and hADSCs via multiple histological and biochemical outcome measures as well as longitudinal fluorescent cell tracking following intraarticular administration.

Our results indicate that the DHGP serves as a validated spontaneous OA model while histological trends demonstrated that use of stem cell treatments mitigated cartilage degradation in comparison to non-stem cell treated groups. However, it was observed that both stem cell sources did not provide a significant therapeutic effect in vivo as results revealed a limited residence time and lack of tissue engraftment of hAMSCs and hADSCs following injection. Altogether, these findings highlight the current limitations of stem cell-based therapy once introduced into a complex, pathological environment. Therefore, further investigations are warranted to evaluate the therapeutic capabilities of stem cells in in vivo models of OA.

November 14th, 2018
9:30 AM
Rhodes 310, Clemson, SC

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