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Biologics to enhance mesenchymal stem cell expansion and storage

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Regeneration of human cartilage is inherently inefficient, a key factor for the widespread occurrence of degenerative diseases like Osteoarthritis (OA). Recent reports have provided compelling evidence that juvenile chondrocytes (from donors below 13 years of age) are more efficient at generating articular cartilage as compared to adult chondrocytes. However, the molecular basis for such a superior regenerative capability is not understood. We aimed to identify the cell-intrinsic differences between young and old cartilage and systematically profiled global gene expression changes between a small cohort of human neonatal/juvenile and adult chondrocytes. Our studies identified and validated new factors enriched in juvenile chondrocytes as compared to adult chondrocytes including secreted ECM factors Chordin-like 1 (CHRDL1) and Microfibrillar-associated protein 4 (MFAP4). CHRDL1 was observed to aid the proliferation and survival of human bone-marrow derived mesenchymal stem cells (MSC) providing a mechanism for how young cartilage factors can potentially enhance stem cell function in cartilage repair. Similarly, we observed that soluble Collagen VI (Col VI) enhances the proliferation of adult chondrocytes without any dedifferentiation. These juvenile cartilage factors are therefore useful in maintaining chondrocytes and can be potential biologics with useful applications towards biobanking of mesenchymal stem cells, chondrocytes and cartilage constructs.

Biography

Nidhi Bhutani is an Assistant Professor in the Department of Orthopaedic Surgery at Stanford University and is affiliated with the Cancer Biology Program, the BioX program and the Children Health Research Institute at Stanford. Her research interests broadly encompass the molecular mechanisms regulating regeneration and repair of the musculoskeleton, with a focus on epigenetic regulation by DNA methylation and demethylation. Her group is interested in applying stem cell and reprogramming based approaches towards musculoskeletal tissue engineering.

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