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Isolation and characterization of human nasoseptal cartilage derived stem/progenitor cells (CSPCs) for cartilage biofabrication

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Contemporary cartilage tissue engineered implants, many using unrelated adult stem cell sources do not produce stable, physiologically relevant cartilage. Although lacking intrinsic reparative ability, cartilage has been shown to contain a population of stem cells or progenitor cells, similar to other adult tissues, that are thought to be involved in maintenance of tissue homeostasis. Since they were first identified in articular cartilage, these so-called cartilage-derived stem/progenitor cells (CSPCs) have become the latest addition to the potential cell repertoire for cartilage tissue engineering. Unlike articular CSPCs, nasoseptal CSPCs have not been well studied, with definitive markers and molecular identity remaining obscure to date. We isolated human nasoseptal CSPCs using differential adhesion to fibronectin and undertook functional, genetic and immunophenotypic characterization using a combination of RT-PCR, PCR array, Immunocytochemistry, Western blotting and Flow Cytometry. Fibronectin adhesive human nasoseptal CSPCs are a self-renewing subpopulation, positive for recognized stem cell markers CD24, CD44, CD73, CD90 and CD105 as well as integrins CD29 (beta1) and CD49e (alpha 5). Unlike previous reports for articular CSPCs, they are negative for STRO-1. Nasoseptal CSPCs are clonogenic with increased expression of neuroectodermal cell adhesion molecules and multilineage potential. Nasoseptal CSPCs are distinct from nasoseptal chondrocytes demonstrated by reduced expression of collagen type 1, collagen type 2 and aggrecan in monolayer culture. In addition, CSPCs can regain chondrogenic potential in 3D culture. This cell population may benefit future cell-based cartilage tissue engineering strategies due to its ability to maintain chondrogenicity and chromosomal stability following cell expansion.

Biography

Zita M Jessop is an Academic Clinical Lecturer in the Reconstructive Surgery and Regenerative Medicine Research Group at Swansea University and Registrar at the Welsh Centre for Burns and Plastic Surgery. After completion of Medicine at Cambridge University, she undertook surgical training in London Deanery before joining the Welsh Clinical Academic Training Pathway. Her Doctoral research is focusing on cartilage 3D bioprinting, has won significant awards from the Royal College of Surgeons of England, the British Association of Plastic, Reconstructive and Aesthetic Surgeons and the Medical Research Council. She is currently a Fulbright Scholar at the Wyss Institute, Harvard University.

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