Effect of bioactive glass cotton wool like fibre conditioned medium on bone marrow derived stem cells

Olga Tsigkou

Lecturer in Biomaterials; Biomaterials Subject Lead; Department of Materials, University of Manchester, Oxford Road, Manchester, UK

Abstract

Biomaterials science focuses on engineering smart materials that can direct cellular behaviour. *In vivo* bone tissue resident adult stem cells are encompassed by a 3D microenvironment that presents a repertoire of signals, such as matrix rigidity, soluble factors, cell-cell interactions and extracellular matrix ligands. Ultimately, bone stem cells or bone progenitors respond to these components by initiating signaling pathways, which control and direct cell function and differentiation into osteogenic lineage. Bioactive glasses have shown the ability to form hydroxyapatite through exchange of silicon and calcium ions with interstitial fluids. Silica and calcium have been reported to be highly beneficial for bone and cartilage health and their dietary intake has been implicated with increased bone mineral density. In this talk I will report the development of a bioactive glass electrospun cotton wool like fibres and the effect of their conditioned medium on bone marrow derived mesenchymal stem cells. I will demonstrate that the bioactive glass conditioned medium enhance osteogenic differentiation and ECM deposition and mineralization *in vitro* 3 times faster than conventional osteogenic supplements. Additionally, activation of specific intracellular pathways activated and the effect of the 70S30C bioactive glass conditioned media on bone mass and bone remodeling will be discussed.

Biography

Dr Olga Tsigkou is a Lecturer in Biomaterials (Assistant Professor) and Programme Director for the MSc in Biomaterials at the Department of Materials, School of Natural Sciences, Faculty of Science and Engineering at the University of Manchester, UK. Her research focuses predominantly in the application of stem cells, 3D porous scaffolds and hydrogels on tissue regeneration applications. She has developed robust protocols for 3D cell culture models in static and shear stress (bioreactor) culture conditions. Her research interests include cell-substrate interactions, vascularization strategies, *in vitro* tissue modeling and substrate directed differentiation of stem cells. She has published highly cited papers on these topics in leading international journals (e.g. PNAS, Biomaterials, Advanced Functional Materials and Acta Biomaterialia). Her published work includes more than 30 original research papers in international peer-review journals with over 1200 citations focusing in the fields of bone tissue engineering, bioactive glasses, vascularization, as well as imaging and material characterization. Dr Tsigkou has successfully supervised 18 Master students and is currently involved in the supervision of 6 PhD students and an EPSRC fellow.