

Development of a 3D Cell Culture Model Based on Biocompatible Polymeric Scaffolds Engineered with Human Mesenchymal Stromal Cells (MSCs) for Skin, Cartilage and Bone Regenerative Therapy

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Regenerative medicine aims to restore normal function by repairing or replacing damaged cells and tissues in patients. The efficacy and the success of regenerative medicine depends on many factors including the manner by which the cells are organized in the new tissue that must be able to mimic the structure and function of the original one. Current treatments for articular cartilage damage, bone defects and skin lesions are quite challenging and they show limited repair and regeneration following injury.

This project aims at developing an innovative 3D cell culture model composed of Mesenchymal Stromal Cells (MSCs) and biocompatible, safe, resorbable, polymeric scaffolds for studying the mechanisms involved in tissue repair and treatment of chronic skin conditions, cartilage defects and bone lesions.

For this purpose, hydrogel-forming polymers scaffolds of natural origin were firstly characterized for their mechanical and morphological properties, stability and degradability. Secondly, MSCs were seeded on these scaffolds and optimal culture conditions for MSCs expansion were defined. Preliminary results suggest that hydrogel scaffolds seem to be an optimal model to host MSCs.

Currently, we are exploring the effects of scaffolds on modulating MSCs behaviour, in particular in the matter of how scaffolds can affect MSCs proliferation and differentiation. Moreover, efforts are being made to implement this 3D culture system with autonomous sensors in order to have an objective way to monitor tissue restoration.

This project will provide new useful insights to define novel innovative therapeutic approaches, thus making this research translatable within the clinical scenario.

Biography:

Dr. Federica Re has obtained her Degree in Medical Biotechnology from 2010 to 2015 at the Department of Molecular and Translational Medicine of the University of Brescia, Italy. She is doing a PhD in Technology for Health at the department of Information Engineering at the University of Brescia, Italy. She spent several months at the Department of Biomedical Engineering at the University of Glasgow, Scotland during her PhD. Her main research interest is focused on the study of the human Mesenchymal Stem Cells applications in combination with biocompatible and bioresorbable scaffolds for a cost-effective regenerative therapy translatable into the clinical practice.