

Design of in vitro model of fibrotic cardiac tissue

Original

Design of in vitro model of fibrotic cardiac tissue / Spedicati, Mattia; Ruocco, Gerardina; Zoso, Alice; Carmagnola, Irene; Chiono, Valeria. - ELETTRONICO. - (2020). ((Intervento presentato al convegno Trainee Symposium for Organoids & Organs-on-a-chip tenutosi a Online Webinar nel 11/08/2020.

Availability:

This version is available at: 11583/2872044 since: 2021-02-19T21:57:14Z

Publisher:

Columbia University - Columbia stem cell initiative

Published

DOI:

Terms of use:

openAccess

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

Fibrotic cardiac tissue *in vitro* models based on bioartificial scaffolds

Mattia Spedicati^{1,2}, Gerardina Ruocco^{1,2}, Alice Zoso^{1,2,3}, Irene Carmagnola^{1,2,3}, Valeria Chiono^{1,2,3}

Myocardial infarction causes massive cardiomyocytes loss, and the remodelling of local extracellular matrix. This in turn leads to the progressive formation of a stiff fibrotic tissue, mainly populated by cardiac fibroblasts. *In vitro* models of human pathological cardiac tissue able to precisely reproduce post-infarct microenvironment could greatly improve preclinical experimentation, helping in the selection of potential therapies for human heart regeneration.

In this work, adult human cardiac fibroblasts (AHCfs) were cultured on bioartificial 2D and 3D scaffolds designed to mimic different extensions of early stage cardiac fibrosis.

2D and 3D polycaprolactone (PCL)-based scaffolds were prepared by electrospinning and fused deposition modelling, respectively. Type A Gelatin was grafted on scaffolds. Physicochemical, morphological, and mechanical characterisations were performed at each functionalisation step. AHCfs isolated from ventricle (PromoCell) were seeded on scaffolds, and their adhesion, proliferation and extracellular matrix (ECM) deposition were analysed after long culture times (up to 21 days).

Random electrospun nanofibrous 2D scaffolds and grid interconnected 3D scaffolds with different pore size (150 and 350 μm) were prepared. Efficient gelatin grafting was demonstrated by QCM-D, ATR-FTIR, contact angle analyses and colorimetric assay. Gelatin coating improved attachment and proliferation of AHCfs. Fibroblast markers expression (α -SMA) and cardiac ECM proteins (Fibronectin, Laminin, Tenascin and Collagen IV) secretion were confirmed by immunofluorescence analysis.

2D and 3D bioartificial scaffolds sustained long-term AHCfs culture. Analysis of deposited ECM as a function of scaffold geometry and infarction extension is in progress.