

In vitro models of human cardiac fibrotic tissue on 'bioartificial' scaffolds

Original

In vitro models of human cardiac fibrotic tissue on 'bioartificial' scaffolds / Zoso, Alice; Carmagnola, Irene; Ruocco, Gerardina; Spedicati, Mattia; Chiono, Valeria. - In: BIOMEDICAL SCIENCE AND ENGINEERING. - ISSN 2531-9892. - ELETTRONICO. - 3:3s(2020), pp. 35-35. [10.4081/bse.2019.122]

Availability:

This version is available at: 11583/2798415 since: 2020-02-27T11:45:41Z

Publisher:

Page Press

Published

DOI:10.4081/bse.2019.122

Terms of use:

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

Publisher copyright

default_article_editorial [DA NON USARE]

-

(Article begins on next page)

***In vitro* models of human cardiac fibrotic tissue on 'bioartificial' scaffolds**

Alice Zoso,¹⁻³ Irene Carmagnola,¹⁻⁴ Gerardina Ruocco,^{1,2}

Mattia Spedicati,^{1,2} Valeria Chiono¹⁻⁴

¹Department of Mechanical and Aerospace Engineering, Politecnico di Torino, Turin; ²POLITO Biomedlab, Politecnico di Torino, Turin;

³Interuniversity Center for the promotion of the 3Rs principles in teaching and research; ⁴CNR-IPCF, National Research Council – Institute for Chemical and Physical Processes, Pisa, Italy

Abstract

Cardiac infarction is a global burden worldwide that leads to fibrotic and not contractile myocardial tissue. In this work, *in vitro* models of infarcted tissue were developed as tools to test novel therapies for cardiac regeneration in the future. Human cardiac fibroblasts were cultured on scaffolds, with different compositions and architectures, as to mimic structural and chemical features of infarcted cardiac tissue. Early findings from *in vitro* cell tests were reported, showing an enhancement of cell attachment and proliferation in the case of "bioartificial" scaffolds, *i.e.* scaffolds based on a synthetic and a bioactive polymer.

Introduction

Heart failure is a global pathological condition affecting approximately 26 million people worldwide.¹ Myocardial infar-

tion causes the death of billions of cardiomyocytes followed by the progressive formation of a fibrotic scar mainly populated by cardiac fibroblasts. Fibrotic tissue is mechanically stiffer than healthy cardiac tissue and unable to undergo contraction.² *In vitro* models of infarcted tissue represent a key tool to evaluate new therapies for cardiac regeneration. In this work, a model of fibrotic heart was designed and fabricated by culturing human cardiac fibroblasts (HCFs) on bioartificial scaffolds with different morphology, mimicking structural and chemical features of infarcted cardiac tissue.

Materials and Methods

Synthetic polymer scaffolds were prepared by different techniques and, then, functionalised with an adhesive protein. HCFs isolated from human ventricle were cultured onto the scaffolds. Their survival, adhesion, proliferation and morphology were studied by biochemical assays and fluorescence microscopy, as a function of scaffold structure and surface composition.

Results

SEM analysis allowed to demonstrate the correct design of scaffolds. Functionalised scaffolds showed superior cell attachment and proliferation compared to non-functionalized scaffolds.

Conclusions

Bioartificial scaffolds were able to support the viability and proliferation of HCFs. The study will allow the modelling of different degrees of human cardiac fibrosis by

Correspondence: Valeria Chiono, Department of Mechanical and Aerospace Engineering, Politecnico di Torino, Turin, Italy.
E-mail: valeria.chiono@polito.it

Key words: Biomimetic scaffolds; extracellular matrix; *in vitro* human cardiac fibrotic tissue model.

Acknowledgements: BIORECAR project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme grant agreement No 772168.

Conference presentation: this paper was presented at the Second Centro 3R Annual Meeting - 3Rs in Italian Universities, 2019, June 20-21, University of Genoa, Italy.

Received for publication: 28 October 2019.

Accepted for publication: 11 November 2019.

This work is licensed under a Creative Commons Attribution NonCommercial 4.0 License (CC BY-NC 4.0).

©Copyright: the Author(s), 2019

Licensee PAGEPress, Italy

Biomedical Science and Engineering 2019; 3(s3):122
doi:10.4081/bse.2019.122

specific constructs, which will be useful for the *in vitro* testing of advanced therapies.

References

1. Ponikowski P, Anker SD, AlHabib KF, et al. Heart failure: preventing disease and death worldwide. ESC Heart Fail 2014;1:4-25.
2. Porter KE, Turner NA. Cardiac fibroblasts: at the heart of myocardial remodeling. Pharmacol Ther 2009;123:255-78.