

Accepted Manuscript

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PII: S0168-3659(15)00099-1
DOI: doi: [10.1016/j.jconrel.2015.02.009](https://doi.org/10.1016/j.jconrel.2015.02.009)
Reference: COREL 7558

To appear in: *Journal of Controlled Release*

Received date: 3 November 2014
Revised date: 3 February 2015
Accepted date: 4 February 2015



Please cite this article as: S. Pascual-Gil, E. Garbayo, P. Díaz-Herráez, F. Prosper, M.J. Blanco-Prieto, Heart regeneration after myocardial infarction using synthetic biomaterials, *Journal of Controlled Release* (2015), doi: [10.1016/j.jconrel.2015.02.009](https://doi.org/10.1016/j.jconrel.2015.02.009)

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HEART REGENERATION AFTER MIOCARDIAL INFARCTION USING SYNTHETIC BIOMATERIALS

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Abstract:

Myocardial infarction causes almost 7.3 million deaths each year worldwide. However, current treatments are more palliative than curative. Presently, cell and protein therapies are considered the most promising alternative treatments. Clinical trials performed until now have demonstrated that these therapies are limited by protein short half-life and by low transplanted cell survival rate, prompting the development of novel cell and protein delivery systems able to overcome such limitations. In this review we discuss the advances made in the last 10 years in the emerging field of cardiac repair using biomaterial-based delivery systems with focus on the progress made on preclinical *in vivo* studies. Then, we focus in cardiac tissue engineering approaches, and how the incorporation of both cells and proteins together into biomaterials has opened new horizons in the myocardial infarction treatment. Finally, the ongoing challenges and the perspectives for future work in cardiac tissue engineering will also be discussed.

Key words: myocardial infarction, cell therapy, protein therapy, clinical trials, synthetic biomaterials, delivery systems, tissue engineering.

1. INTRODUCTION

1.1. Myocardial infarction and current treatments

Myocardial infarction (MI) remains a leading cause of morbidity and mortality worldwide, being responsible for nearly 7.3 million deaths each year. Moreover, as the World Health Organization highlighted in the last "Global Atlas on cardiovascular disease prevention and control" report [1], the number of deaths is expected to increase within the next decades due to the rising prevalence of the key risk factors for this pathology, such as behavioral and metabolic factors.

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