Universidad de Navarra
Facultad de Ciencias

MÁSTER EN INVESTIGACIÓN BIOMÉDICA
Research Project Proposal
Academic year 2022-2023

Project Nº 07 ASIGNADO

Title: *3D bioprinting of functional human cardiac*

Department/ Laboratory *Cell Therapy Area (CUN) and 101 lab, Regenerative Medicine Program (Cima)*

Director 1 *Manuel M. Mazo Vega*
Contact: *mmazoveg@unav.es*
Codirector: *Olalla Iglesias García*
Contact: *oiglesias@unav.es*

Summary

Cardiovascular diseases are the number one killer worldwide with, myocardial infarction standing behind almost 1 in 6 total deaths. In this disease, functional myocardial tissue is replaced with a stiff non-contractile scar that progressively burdens the remaining myocardium, deteriorating its pumping capacity. In its final stages as heart failure, the patient will be inevitably faced with the dichotomy of transplantation versus death. Tissue engineering aims at fabricating myocardial substitutes in the lab. The explosive development of areas such as pluripotent stem cells, biomaterials and, crucially, additive manufacturing (3D printing and bioprinting) have make this ambitious aim seem to loop over the next hill.

In the present project, the student will explore 2 strategies of 3D bioprinting for the generation of human cardiac tissue. On the one hand, we will implement 3D bioprinting of hydrogel-embedded-cells (bioink) in combination of a fibrillary reinforcement deposited with melt electrowriting, in order to form a composite tissue. On the other, we will implement chaotic bioprinting to obtain well-ordered layers of tissue formed by the mentioned bioink. In both cases, cells derived from human induced pluripotent stem cells (hiPSCs) will be differentiated to cardiac phenotypes (cardiomyocyte, cardiac fibroblast and vascular cells) and employed as the biological component in these two strategies. The student will apply analysis through metabolic assays, fluorescent live/dead probes, RT-qPCR and confocal microscopy to decipher the adequacy of each fabrication modality.

All in all, this is a highly ambitious and interdisciplinary project that will train the student in cutting edge technology.

yes	
no	x

Does the project include the possibility of supervised animal manipulation to complete the training for animal manipulator?