

Research Project Proposal
Academic year 2017-2018

Project Nº 7
Title: Mechanical stimulation of human induced pluripotent stem cell-based engineered cardiac tissues.
Department/ Laboratory 101, Cell Therapy Program, Center for Applied Medical Research (CIMA).
<p>Director: Dr. Manuel M Mazo Vega Contact: mmazoveg@unav.es</p> <p>Codirector: Dr. Felipe Prósper Cardoso Contact: fprosper@unav.es</p>
<p>Summary</p> <p>Being the number one killer worldwide,(1) cardiovascular diseases have been the subject of intense research under novel regenerative therapies. With cell therapy failing to provide the formation of new healthy tissue, material science has gained a pole position to solve the issue. Tissue engineering has already highlighted the importance of the match in physical properties and applied mechanical forces between the tissue to be mimicked and those of the candidate biomaterial.(2) However, in spite of creating a perfect environment, the choice of a proper cell population remains a roadblock, with only human induced pluripotent stem cells (hiPSC) being a reliable source of cardiomyocytes.</p> <p>The present project aims to apply different types of mechanical load to engineered cardiac tissues. For this, the candidate will use state-of-the-art procedures in a highly multidisciplinary project. On the material side, novel myocardium-mimicking albumin-based hydrogels will be employed. On the cell side, a biphasic Wnt-modulation cardiac differentiation using hiPSC will be implemented.(3) The candidate will gain knowledge on how to prepare the albumin substrates, culture and differentiate the cells, generate the engineered tissues and apply different types of mechanical load. For this last end, purpose built devices will be employed, fabricated by our collaborators from TECNUN (San Sebastian). The candidate will obtain practical expertise in hiPSC culture and differentiation, tissue engineering, as well as staining, RNA extraction-real time qPCR, and cardiac function assessment amongst others.</p> <p>We strongly believe this multidisciplinary and appealing project is the basis for the successful recruitment of a potential PhD candidate.</p> <p>References</p> <p>1. X. Jiaquan, L. M. Sherry, D. K. Kenneth, A. B. Brigham, in Deaths: Final Data for 2013,</p>



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2. N. Y. Liaw, W. H. Zimmermann. Adv Drug Del Rev 2016, 15;96:156-60.
3. X. Lian, C. Hsiao, G. Wilson, K. Zhu, L. B. Hazeltine, S. M. Azarin, K. K. Raval, J. Zhang, T. J. Kamp, S. P. Palecek. PNAS 2012, Jul 3;109(27).