



MASTER'S DEGREE IN BIOMEDICAL RESEARCH

Research Project Proposal

Academic year 2024-2025

Project Nº 09					
Title: Mimetic periosteum: Functionalization strategies for efficient bone regeneration					
Department/ Laboratory <i>Laboratory where the project will be carried out indicating Department, Area, Faculty, CUN, CIMA etc.</i> Experimental Orthopedics, Regenerative Medicine, CIMA					
Director 1 <i>Froilán Granero Moltó</i> Contact: <i>fgranero@unav.es</i>					
Summary <i>Short summary of the project with a maximum extension of 250 words, including the goals and the methodology that will be used</i>					
<p>The regenerative properties of bone tissue can be challenged resulting in delayed fracture healing and nonunion, a major cause of chronic pain and disability. These difficulties may occur up to 10% of the fractures worldwide. Autografts are the most important therapeutic option, although its availability is limited and associated to different comorbidities. Using tissue engineering strategies, we are developing a mimetic periosteum as alternative to autografts by combining 3D printed (MEW, FDM) poly caprolactone scaffolds (PCL) functionalized with progenitor cells (MSCs), morphogens (rhBMP-2), chemo-attractants (i.e., CXCL12) or other treatments as antibiotics, key to treat open fractures. We will use different functionalization approaches to deliver morphogens (surface exposed rhBMP-2), antibiotics (microparticles loaded with vancomycin) and mesenchymal progenitor cells (collagen hydrogels) from the mimetic periosteum to enhance bone regeneration. Efficacy of bone regeneration of treatments is evaluated using a bone critical size defect of the femur in rats (SD, immunocompetent; RNU, immunodeficient) and analyzed by micro computed tomography, histology, immunohistochemistry, as well as transcriptomics.</p> <p>This project is highly interdisciplinary combining tissue engineering t (3D printing) with pharmacological (microparticle synthesis, antibiotics encapsulation), cell biology (MSCs isolation, characterization, and expansion) and molecular biology techniques to enhance bone regeneration.</p>					
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yes	X				
no					
Does the project include the possibility of supervised animal manipulation to complete the training for animal manipulator?					