Universidad de Navarra
Facultad de Ciencias

MASTER'S DEGREE IN BIOMEDICAL RESEARCH
Research Project Proposal
Academic year 2023-2024

Project Nº 54

Title: Design and fabrication of an Air-liquid microfluidic device for grown tumoral organoids

Department/ Laboratory *Microphysiological systems and Quantitative Biology / Biomedical Engineering / Advanced Technologies Division / CIMA University of Navarre*

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Organoids, i.e. three-dimensional cell structures grown in hydrogel scaffolds-, are a promising tool to replicate *in vitro* the tumor microenvironment (TME). Organoids are of highly physiological relevance, and overcome the limitations of traditional two-dimensional cell cultures. Concretely TME-cell interactions condition the tumor phenotype and growth, which are closely related to their resistance to therapies. Improved organoids have been generated using air-liquid-interface (ALI) systems, in which the tumor cells are embedded in hydrogels exposed to both air and culture medium. ALI devices endow organoids with a competent immune environment, making them ideal models to study the interplay between the immune system and the tumor, related to the potential response to immune-based therapies. In this project, we propose the design and fabrication of a custom-made ALI device to grow organoids in simplified biomimetic hydrogels. To achieve this we will use a highly interdisciplinary approach that combines cell culture, microfluidics, and multidimensional fluorescence microscopy techniques. The experiments will consist of the generation of murine pancreatic ductal adenocarcinoma (PDAC) organoids in Collagen-I based hydrogels. Concretely, the organoid formation will be monitored in a previously tested multi-well custom-made PDMS device, and a novel custom-made PDMS ALI device. The organoid growth will be imaged and analyzed using multiphoton microscopy. To achieve our scientific objectives, the following tasks are proposed: **i)** Fabricate biomimetic hydrogels with different Collagen concentrations; **ii)** Fabricate microfluidic devices for organoids culture; **iii)** Generate organoids in the ALI and conventional organoids device; **iv)** Adapt existing staining protocols, multiphoton microscopy and existing image analysis tools to characterize the organoids.

yes	
no	X

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