Universidad de Navarra
Facultad de Ciencias

MASTER'S DEGREE IN BIOMEDICAL RESEARCH
Research Project Proposal
Academic year 2024-2025

Project Nº 38

Title: Effects of cell isolation techniques in cell viability and expression

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

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Liquid biopsy obtained non-invasively from the patient's peripheral blood can be used in screening tests, offering an alternative to conventional tissue-based biopsy. One of the elements circulating in those patients' blood are intact tumor cells (CTCs) that could be a valuable option for patient diagnosis, stratification, personalized treatments, or cancer relapse detection. We have developed a novel microfluidic system for the enrichment of CTCs. We have verified its capacity to isolate CTCs from different cancer cell lines, a murine model and patients with hepatocellular and pancreatic carcinoma. One of the main advantages of our system is that cells are isolated using physical methods thus allowing downstream analysis. However, no viability assays have been done to define the survival rate of the cells after isolation in our system, which is very important because of the reduced number of CTCs per blood sample. Additionally, we don't know if the isolated cells present some changes in their expression profiles that could affect the downstream analysis.

We propose in this project a viability assay in different cancer cell lines enriched in our microfluidic platform. To achieve this objective, we will use a highly interdisciplinary approach that combines cell culture, microfluidics, multidimensional fluorescence microscopy techniques and flow cytometry. The experiments will consist of the enrichment of different tumor cell lines using our isolation system, followed by a viability assay using fluorescence microscopy (propidium iodide) and flow cytometry (anexin5 and propidium iodide). If the execution time of TFM allows it, changes in the cell expression after cell enrichment will be also studied. Aditionally, we will test the isolated cell capacity to be expanded in vitro. To achieve our scientific objectives, the following tasks are proposed:

1. Fabricate microfluidic devices in PDMS;
2. Enrich samples using the CTCs isolation system and microfluidic devices fabricated in #1;
3. Adapt existing staining and confocal microscopy protocols, and existing image analysis tools to determine cell viability in the enriched cells;
4. Determine cell viability using flow cytometry;
5. Study cell expression changes after cell enrichment;
6. Expand isolated CTCs in vitro

yes	
no	X

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