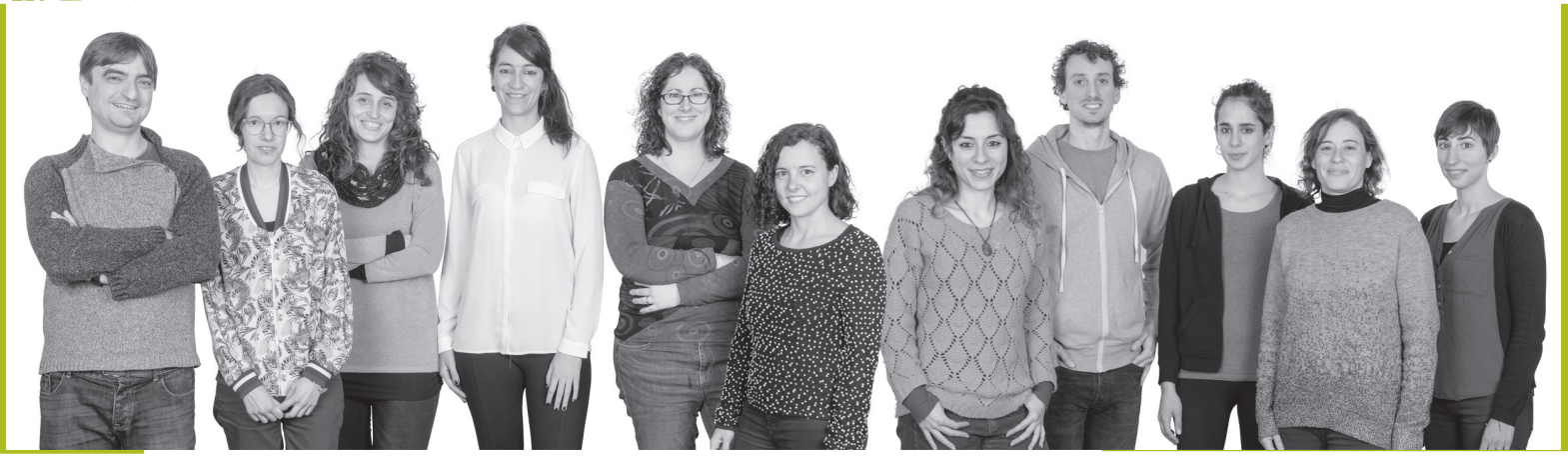
INPhINIT
"la Caixa" Fellowship Programme

IBEC
Institute for Bioengineering of Catalonia

EXCELENCIA SEVERO OCHOA

IBEC participates in INPhINIT, "la Caixa" Doctoral Fellowship Programme with a set of stimulating PhD projects and excellent research groups to host the fellows



Biosensors for bioengineering

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Engineering of a 3D Organotypic model of Intestinal Mucosa for Cancer Research

Up to now cancer research has mainly focused on the cell intrinsic factors that govern the tumorigenic process. However, recently the focus has switched into understanding the cell extrinsic factors of the tumor microenvironment, which appear critical for the progression of cancer and affect treatment strategies. Although some effort has been invested into creating in vitro models that are more representative of the in vivo tumor complexity, the use of rather reductionist culture systems based on immortalized tumor cell lines still represents the backbone of basic cancer research. The goal of this interdisciplinary project is to engineer a novel 3D organotypic in vitro colorectal cancer model in which not only the tumorous tissue but also the tumor microenvironment is represented. We envision to take advantage of a technology we are currently developing in our lab, which combines advanced microfabrication techniques and tissue-engineering components to establish 3D intestinal epithelial tissue models that mimic biochemical, mechanical and structural characteristics found in vivo. The experimental setup will be adapted to incorporate important elements of the tumor microenvironment such as the tumor associated immune system and fibroblasts, which have been demonstrated to play an important role in both preventing and promoting the development of cancer. A better understanding of the tumor microenvironment function including different immune cells types and fibroblasts as well as their related signaling pathways involved in the tumorigenic process will be crucial for the identification of new biomarkers and the development of new therapeutics.

Our approach will lead to an up-to-date non-existent multicellular organotypic model of the intestinal mucosa, which we believe will have a wide-ranging potential as a tool for basic research as well as health and disease modelling. This work will be carried out at the "Biomimetic systems for cell engineering group" of IBEC. Our ultimate goal is to produce new organotypic tissue models that can be used as tools to improve in vitro testing of drug compounds, toxicology, disease modeling, and regenerative and personalized medicines. This work will be developed in the frame of an ERC-Consolidator research project, currently on-going.

Job position description

The experimental work associated to this multidisciplinary project will include both materials engineering and cell biology technologies. On the one hand, the PhD student will employ basic microfabrication technics for the 3D-scaffolds generation and tumor stromal cell encapsulation within the material, and on the other hand basic cellular biology methods such as cell tissue culture, immunostainings, live-microscopy, confocal microscopy and basic biochemistry technics will be necessary to evaluate the performance of the co-cultures on the scaffolds.