6 months internship_ Undergraduate student

Development of a tumor-on-a-chip of pancreatic cancer

Pancreatic cancer is the 4th leading cause of cancer-related death in Europe and North America and shows a median survival of less than 6 months. With the aim to increase the therapeutic efficacy in pancreatic cancer a wide range of nanoscale drug delivery systems (i.e., nanomedicines) has been developed in the last decades. However, despite their potential efficiency, progresses in pancreatic cancer therapy have remained exceedingly slow mainly as consequence of an inefficient drug delivery to cancer cells. The extensive desmoplastic reaction is the hallmark of this tumor and acts as a physical barrier sequestrating nanomedicines, blocking their diffusion and limiting the effectiveness of the treatment. Thus, in vitro models, which reliably mimic the clinical conditions, are highly required for an appropriate preclinical screening of nanomedicines.

In this context, this research project aims to develop **a tumor-on-a-chip as an innovative 3D in vitro model of pancreatic cancer able to recreate the complex physiology of the tumor microenvironment**. Based on a microfabrication protocol well established at C2N, the student will first fabricate PDMS microfluidic-based platforms[1]. These devices will be used at Institut Galien for spatially control a triple co-culture of Panc-1 tumor spheroids, fibroblasts and endothelial cells (HUVECs)[2], embedded in fibrin-collagen hydrogels. The development of a perfusable microvascular network interconnected with a stroma barrier will allow shedding lights on the parameters which play a crucial role in the kinetic, diffusion and efficacy of the anticancer drugs. Attention will focus on chemical composition, size, shape and surface properties of nanomedicines. Information gathered by this complete screening will enable to identify the strategies that would prompt the penetration of the drug delivery systems in the tumor mass in order to make shorter the step for their clinical translation.

References:
1. S. Kim et al., Engineering of functional, perfusable 3D microvascular networks on a chip. Lab on a Chip, 2013. 13(8): p. 1489-1500
2..G. Lazzari, P. Couvreur and S. Mura, "Multicellular spheroid based on a triple co-culture: A novel 3D model to mimic pancreatic tumor complexity." Acta biomaterialia 78 (2018): 296-307

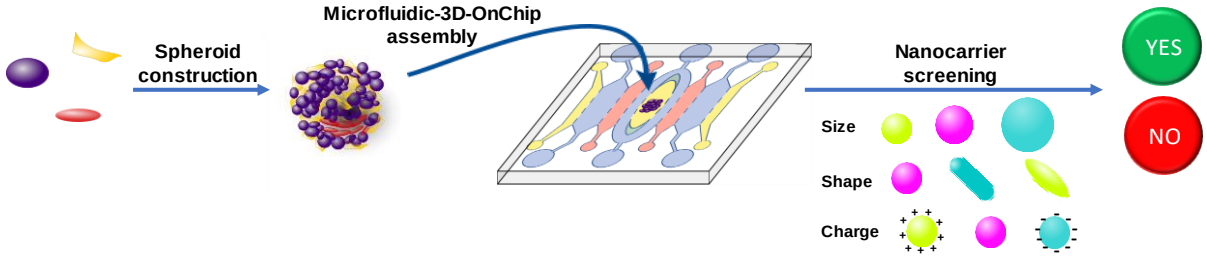

Figure 1. Schematic representation of the proposed project.

Applicant profile

- Undergraduate student with a background in nanomedicine and/or cell biology and/or microfluidics and/or engineering
- Good organizational skills
- Scientific rigor, creativity, perseverance

Applicant must provide a CV, a motivation letter and references of previous supervisors

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Contact persons:

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