MicroTAS 2021 Workshop 1 Information

WORKSHOP TITLE: Tissue and Organ-on-chip Microsystems

PRESENTER AFFILIATION:

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WORKSHOP DESCRIPTION:

The development of new *in vitro* models is now considered as crucial in order to address both, biological and clinical issues. In this context, microfluidics and in particular organ-on-chip technology provide powerful tools to interact with cells at their own scale, tailoring the artificial model on experimental needs.

Organs-on-chip aim at recapitulating the main features of an organ (or combination of organs). This organ-on-chip technology is expected to be pivotal in particular for the life sciences, e.g. to decipher physiological and patho-physiological mechanisms, as well as in pharmaceutical industry, e.g. to drastically improve drug screening process. In this workshop, fundamental and cutting edge aspects related to this field will be presented and discussed, as described below.

OVERVIEW OF MATERIAL TO BE COVERED AND WHAT ATTENDEES CAN EXPECT TO TAKE AWAY FROM THE WORKSHOP:

The workshop will contain four lectures, covering the following topics:

- **Organ on chip monitoring**: Organ on chip models go a step further towards mimicking biological complexity. However, when you have a complex biological model that may take weeks to set up, how do you monitor the cells through the process, without damaging

them? The integration of electrical monitoring into organ on chip platforms can be a minimally invasive continuous method for measuring cell health and disease. However, many challenges still exist in the implementation of electrical monitoring of 2D and 3D cultures. Conducting polymers will be presented as a promising class of material that can be integrated into microfluidic organ on chip platforms for monitoring tissue integrity.

- **Hydrogels in organ models:** Hydrogels can be used to mimic the tissue extracellular matrix, for promoting the interactions of cells with their microenvironment. When combined with microfluidic devices, hydrogels can create more physiological systems to control cell growth conditions, including fluid flow, control of local stiffness and biomolecular gradients. This approach requires the proper hydrogel materials and microfabrication techniques and can be used to study tissue function in physiological and pathological conditions in organ-on-chip devices.
- To exemplify the potential of organ on chip, two specific cases will be presented:
    - **Cardiac and skeletal muscle tissues "on a chip"**: Engineering strategies and quantifying their functional properties, including propagation velocity and contractility.
    - **Tumor on chip**: How can the tumor microenvironment be recapitulated on chip? What could we learn from tumor-on-chip models?

WHO SHOULD ATTEND:

This workshop will provide an overview on organ-on-chip and microfluidic-based approaches for tissue engineering. It will be of interest for a broad audience, including:

- graduate students and post-docs working in microfluidics for cell-based applications.
- Academic researchers.
- Representatives from the industry

PARTICIPANTS WILL NEED THE FOLLOWING:

Laptop or iPad or phone combined with scientific curiosity will be perfectly suited for the OOC workshop.

For those attending in-person, a laptop or iPad with headphones are required.