



PhD in BIOINGEGNERIA / BIOENGINEERING - 38th cycle

PARTENARIATO PNRR Research Field: MULTIORGANS-ON-CHIP AS ADVANCED TOOLS FOR THE DEVELOPMENT OF INNOVATIVE CANCER-RELATED IMMUNOTHERAPIES

Monthly net income of PhDscholarship (max 36 months)

€ 1250.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

Organ-on-Chip (OoC) technology combines the use of microfluidics, biomaterials, and advanced cell cultures in order to generate and monitor miniaturized replicas of human tissues and organs in vitro.

It is an enabling technology involving interdisciplinary expertise from the fields of engineering, physics, and cell/molecular biology. Application areas include environmental assessment, toxicological evaluation of chemical agents, drug screening and disease modeling, among others.

The aim of the project is to introduce a new multi-organ on-chip platform that can support the development of cancer immunotherapies.

Specifically, the platform will host a tumor organ model targeted by the therapy, connected to models of one or more organs typically susceptible to possible toxicity effects of the therapy (e.g., heart, liver, blood-brain barrier). Obtaining this innovative platform will enable more effective evaluation of therapies, potentially designed specifically for the individual patient.

Methods and techniques that will be developed and used to carry out the research

The design and the development of new advanced microscale in vitro platforms will consider state-of-the-art technologies, micro- and nano-fabrication.

Computational modeling will be used to optimize geometrical parameters.

The main hypothesis behind the project is that the development of effective immunotherapies requires the



	<p>development of effective immunotherapies requires the recapitulation of systemic effects, thus requiring the integration of multiple organs on the body, including on-target and off-target ones. Such hypothesis will be verified by taking advantage of the design and the development of new advanced microscale in vitro platforms, namely Multi Organs-on-Chip (MOoC) devices.</p> <p>To this aim, state-of-the-art technologies, micro- and nano-fabrication approaches will be exploited, starting from individual organ models previously developed by Prof. Rasponi group at Politecnico di Milano.</p> <p>Computational modeling will be used to optimize geometrical parameters.</p> <p>The proposed research plan is divided into 3 Actions.</p> <p>A1: Development of a on-target human organ model</p> <p>A2: Development of a multi organ-on-chip platform, containing 2 organ/tissue models, independently cultured, that may be connected for biological communication processes</p> <p>A3: Definition of a protocol for the evaluation of advanced immunotherapies on chip</p> <p>The research will be implemented at the MiMic Lab, Department of Electronics, Information and Bioengineering of Politecnico di Milano, while secondment periods are envisioned.</p>
Educational objectives	<p>To train the PhD student in organs-on-chip technology, microfluidics, microfabrication, soft-lithography, cell culture applications, micro-bioreactors.</p> <p>http://www.biomech.polimi.it/mimiclab https://www.polifab.polimi.it/</p>
Job opportunities	<p>The research will be carried out in strong cooperation with BiomimX Srl, spinoff of Politecnico di Milano, developing organ-on-chip models. Moreover, a secondment periods are foreseen at the facilities of Natural and Medical Sciences Institute (NMI) at the University of Tübingen (DE) as well as at the University Hospital of Basel (CH). The Consortium involved will thus offer large opportunities for interdisciplinary research careers.</p>
Composition of the research group	<p>1 Full Professors 1 Associated Professors 1 Assistant Professors</p>



	4 PhD Students
Name of the research directors	PROF MARCO RASPONI

Contacts
<p><i>Prof. Marco Rasponi</i> marco.rasponi@polimi.it, +39-02-2399-3377</p>

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	625.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>The research will be carried out by an interdisciplinary consortium, bringing both basic and translational research expertise and long-lasting experience in the drug development process. Politecnico di Milano (IT) - POLIMI unit has access to microfabrication facilities. It has renowned experience in developing and studying biological models within custom-designed microfluidic devices for cell cultures and tissue engineering, with a focus in the field of cartilage tissue engineering. The PhD student will join the MiMic Lab group, lead by Prof. Marco Rasponi (http://www.biomech.polimi.it/mimiclab).</p> <ol style="list-style-type: none"> 1. Educational activity: The student will be encouraged to attend to courses with subjects in tissue engineering, cell and tissue culture, micro and nanofabrication either at POLIMI or abroad in International Schools. 2. Teaching assistantship: There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations. 3. Computer and desk availability: the student will be allowed to access facilities of both CBLab and μBSLab of the DEIB.