



PhD in BIOINGEGNERIA / BIOENGINEERING - 37th cycle

**THEMATIC Research Field: BANDO INPS -SVILUPPO E VALIDAZIONE DI SISTEMI BICOMPARTIMENTALI IN VITRO PER IL CONDIZIONAMENTO DI CELLULE E TESSUTI
DEVELOPMENT AND VALIDATION OF IN VITRO BICOMPARTMENTAL SYSTEMS FOR
CONDITIONING OF CELLS AND BIOLOGICAL TISSUES**

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

In the need of physiologically relevant technologies for a better understanding of disease mechanisms, the new frontier of bioengineering is the development of in vitro 3D models based on human cells and/or tissues/organs. This poses the challenge of conceiving and realizing standardized, reliable technology enabling the use of human cells or bioptic samples for a new generation of predictive, personalized disease/treatment models. Biological Labs are traditionally accustomed to the use of commercially available systems, still considered a gold standard in the coculture field. Indeed, such solutions offer widely accepted, reproducible, often validated solutions suited for the most common problems. However, their ability to recapitulate the complexity of the pathological alterations due infections or inflammatory responses, leading to disease is rather scarce. The research team has been working on a new tape-based bi-compartmental fluidic culture system hosting membranes, suitable for co-cultures and in perspective for scaffolds and bioptic samples. The novel culture system allows compartmentalized conditioning of cells cultured on both sides of a porous membrane allowing communication/exchanges between two cell layers, one of them mimicking a tissue barrier. The system is empowered by additional features as live imaging and cell



	<p>retrieval for molecular mechanism studies.</p> <p>The research activity will be aimed at the development of new in vitro microphysiological system (MPS) for cell and tissue culture and to their validation in relevant biological scenarios.</p> <p>In particular, the research activities will be devoted to the development of dynamic culture systems enabling new cell/tissue stimulation features and to their integration in a multichamber actuated and sensorized platform.</p> <p>In parallel, the research efforts will be also devoted to the validation of such systems in a physiologically relevant scenario, with the aim of proving their capability of supporting in vitro cellular co-cultures and tissue models, thus recapitulating the complexity of a tissue barrier.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<ul style="list-style-type: none"> - study of the state of the art of bicomparmental microphysiological systems (MPS) - development and production of new versions of dynamic bicompartmental culture system with specific physical stimulation features - engineering and integration of the culture system in a multichamber platform with controlled actuation and sensing - experimental biological validation of the developed system in Lab - training focused of bioassays on biopharma products under good laboratory practice (GLP) and good and manufacturing practice (GMP) in collaboration with a specialized biotech lab. - engineering and optimization of the membranes and materials supporting the cell and tissue cultures within the MPS - collaboration to the development of an in vitro vascular tissue model within the developed culture systems - evaluation of possible repercussions in terms of intellectual property - scientific dissemination activities
<p>Educational objectives</p>	<p>Owing to the intrinsic multidisciplinary nature of this project, bioengineering studies on this topic require the candidate to be prepared to a strong educational</p>



	commitment on design and realization of microphysiological systems, their use, their biological characterization and their assessment in different validation experimental settings.
Job opportunities	The candidate will have the opportunity to cooperate with a company (Eurofins Biolab Srl) working in the field of in vitro bioassays for biopharma products in GMP and GLP environment, boosting his/her teamwork experience with personnel from the biotech industrial world, thus developing his/her attractiveness as a professional bioengineer also in the job market.
Composition of the research group	0 Full Professors 1 Associated Professors 0 Assistant Professors 0 PhD Students
Name of the research directors	MONICA SONCINI

Contacts	
Monica Soncini monica.soncini@polimi.it	

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	566.36 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>The candidate will work within the biomechanics research group of the DEIB department at PoliMI, especially at the ATTIC Lab www.biomech.polimi.it. Part of the candidate activities will be supported by the collaboration with Eurofins Biolab Srl and will be also boosted by a period abroad at the University of Glasgow</p> <p>A shared desk and computer will be given to the student for the time needed to carry out research. Short periods of teaching assistantship are foreseen during the program.</p>



Increase in the scholarship for stays abroad ? 566,36 per month, for up to 6 months

Bando di Concorso Inps ? Dottorati di ricerca in materia di

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