



PhD in BIOINGEGNERIA / BIOENGINEERING - 40th cycle

INTERDISCIPLINARY Research Field: UNDERSTANDING THE MECHANISM OF NANOPARTICLE DELIVERY TO TUMOUR USING A TUMOR-ON-A-CHIP MODEL

Monthly net income of PhDscholarship (max 36 months)

€ 1400.0

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

Despite extensive research on nanoparticles (NPs) for cancer treatment, clinical translation remains limited due to poor understanding of NP delivery mechanisms into solid tumors. Traditionally, the enhanced permeability and retention (EPR) effect guided NP design, emphasizing smaller size and prolonged circulation. However, recent findings highlight an active transport and retention (ATR) principle, where NPs are actively internalized by endothelial cells and interact with the tumor microenvironment. To address this, we aim to develop tailored lipid NPs for cholangiocarcinoma treatment using a 3D platform that mimics in vivo tumor features.

Interdisciplinary PhD Grant

The PhD research will be carried out in collaboration with research groups of the PhD programme in "**INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING**". See <https://www.dottorato.polimi.it/?id=422&L=1> for further information.

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

This interdisciplinary project calls for a synergic interaction of experts with diverse competences: from



	<p>of experts with diverse competences: from nanotechnology, physical chemistry, soft matter (from synthesis and characterization of NP to the study of their bio-nano interactions) to bioengineering (from the development of microbioreactors to the generation of advanced microphysiological systems); from biology (for their interaction with the environment at cellular and tissue levels) to medicine (access to clinical study and tissues). The project implementation (36 months) will be carried out through three main Work Packages (WPs) The first two will be run in parallel aiming at:</p> <ol style="list-style-type: none"> 1) Development of targeted NPs (WP1); 2) Setting and optimization of tumor-on-a-chip platform for the detection of NPs in cells and tissues (WP2). <p>In the second half of the project the different developed NPs will be tested to evaluate NP extravasation, NP tumor cell internalization, NP interaction with TME components and the best performing will be selected for a preliminary experiment in vivo in collaboration with clinical partners (WP3). For each task, the experimental supervisors will be reported in parenthesis.</p>
<p>Educational objectives</p>	<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>
<p>Job opportunities</p>	<p>In this PhD program, the candidate will receive soft skills training, solid hard science competences, cell biology and chemistry lab training constituting the foundations for brilliant career prospects, not only in academia, but also in industry or the public sector.</p>
<p>Composition of the research group</p>	<p>0 Full Professors 2 Associated Professors 4 Assistant Professors 10 PhD Students</p>
<p>Name of the research directors</p>	<p>Marco Rasponi - Francesca Baldelli Bombelli</p>



Contacts

Prof. Marco Rasponi

Prof. Francesca Baldelli Bombelli

marco.rasponi@polimi.it

francesca.baldelli@polimi.it

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

Scholarship Increase for a period abroad	
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Amount monthly	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

The research will be carried out by a multidisciplinary research team, 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 organ on chip. The PhD student will join the MiMic Lab research group (<http://www.biomech.polimi.it/mimiclab>), coordinated by Prof. Marco Rasponi, as well as the SupraBioNano Lab (under the supervision of Prof. Francesca Baldelli Bombelli)

The PhD student will be involved in educational activities along with teaching assistantship. A shared desk and computer will be given to the student for the time needed to carry out the research.

Educational activity: The student will be encouraged to attend to courses at POLIMI or abroad 2 /3 in International Schools. 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. Computer and desk availability: the student will be allowed to access facilities of the DEIB.