

# BIOENGINEERING AND MEDICAL-SURGICAL SCIENCES

## Ateneo - Design and preclinical validation of targeted drug delivery systems for the treatment age-related diseases

<b>Funded By</b>	Politecnico di TORINO [P:iva/CF:00518460019]
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<b>Contact</b>	
<b>Context of the research activity</b>	<p>Progressive aging of world population increases the demand for new advanced therapies against age-related diseases, such as cardiovascular disorders and cancer. In such context, RNA therapies have attracted high interest for their potential ability to fight different health diseases. However, their successful exploitation requires the design of effective and safe RNA-delivery systems, by a multidisciplinary research, including bioengineering tools (nanoparticles, hydrogels, tissue models).</p>
<b>Objectives</b>	<p>The PhD student will develop new technologies for RNA-based therapies to counteract age-related diseases, particularly cardiac diseases, by nanomedicine, biomaterial design and scalable additive manufacturing approaches, for improved therapeutic outcomes, such as release kinetics, efficacy and accessibility. The (co)release of small molecules, already applied in the clinics, will be also exploited: research will be aimed at improving drug efficacy and safety by suitable drug-delivery vehicles and tools.</p> <p>Nanomedicine, hydrogels and additive manufacturing approaches will be combined to achieve the following aims:</p> <ol style="list-style-type: none"> <li>(1) Design of drug-loaded nanocarriers to target cardiac cells such as cardiomyocytes (Polito)</li> <li>(2) Design of hydrogels, able to preserve drug bioactivity, regulate their release kinetics, ensure a precision therapeutic effect, through a simple, non-laborious, non-expensive (i.e., easily accessible), reproducible and mini-invasive approach (Polito with possible collaboration with expert clinicians);</li> <li>(3) Study of regulatory requirements and sterilization methods;</li> <li>(4) Study of scale-up (Polito with possible collaboration with a foreign research center or company);</li> <li>(5) Proof-of-concept preclinical validation in models of the target human disease (Polito with possible collaboration with a foreign research center or company).</li> </ol> <p>The aim is to develop effective and accessible therapies to counteract age-related diseases, particularly cardiac diseases, by accurate design of new</p>

effective and simple drug delivery approaches. Other patients' need will be considered such as the need for improved administration routes, by designing hydrogels for single implantation (through mini-invasive application).

The research activity will cover 2 of the missions of the National Recovery and Resilience Plan (PNRR): 4. Education and research, supporting the formation in STEM disciplines, and 6. Healthcare, as the research will be focussed on the design of new advanced and effective treatments accessible for all patients and able to address a plethora of diseases.

The activity also complies with PNR - HEALTH Theme:

- General themes: Section 3 "Implementation of diagnosis, therapy and follow-up systems for non-communicable and / or aging-related diseases; Section 6 "Development of strategies for the replacement of function of damaged organs and tissues".

- Pharmaceutical and pharmacological technologies: Section 6 - "Implementation of the drug discovery process";

- Biotechnology: Section 2 - "Regenerative medicine, organ transplants and tissue engineering"; Section 6 - "Gene therapy and personalized medicine";

- Technologies for health: Section 7. Medical devices, artificial organs and neuromorphic technologies for medicine

- bionics and regenerative; Section 9 - "Nanotechnologies for nanomedicine".

**Skills and competencies for the development of the activity**

We are looking for talented and motivated candidates, preferably with skills/experience in:

- Nanomedicine
- Tissue engineering
- In vitro cell tests

And interested in collaborating to in vivo trials in the analysis of explanted tissues.

Excellent communication skills and good knowledge of written English and spoken English are required.

The PhD student will work in a multidisciplinary team: team-working and willingness to learn new techniques/methods are required.