



PhD in INGEGNERIA DEI MATERIALI / MATERIALS ENGINEERING - 39th cycle

PNRR 118 PNRR Research Field: EDIBLE POLYMERS FOR THE DEVELOPMENT OF LAB-GROWN FOOD INGREDIENTS

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

Natural polymers possess favorable properties such as affordability, widespread availability, and renewable sources. Vegetables represent a valuable source of 3D structured materials made of biopolymers, which can be employed in a wide range of applications. In particular, these properties have sparked increasing interest in the context of the green economy and sustainability, offering potential benefits for both the economy and the environment. Given that animal agriculture is a significant contributor to the climate crisis, alternatives to animal proteins, such as cellular agriculture, have gained traction. This field, particularly in the production of cultured meat and lab-grown ingredients, has garnered increasing attention in recent years. However, progresses in these fields is hindered by the lack of appropriate, eco-friendly and inexpensive 3D scaffolds able to support the growing demand.

This project aims to investigate the development of edible 3D structures using natural polymers, decellularized vegetable structures and combinations of them, with the purpose of culturing animal cells for muscle and fat tissue. By incorporating a 3D structure, the resulting tissue will resemble natural marbling meat and organoleptic behaviours.

Additionally, the co-culture environment will be optimized to create a media that doesn't require animal products.

Methods and techniques that will be

Decellularization techniques will be exploited to produce



developed and used to carry out the research	<p>Decellularization techniques will be exploited to produce plant-derived structures and achieve 3D biopolymeric-based materials employable as scaffolds. The materials used in the project will be fully characterized in terms of rheological, mechanical and chemical-physical properties to understand the structure-properties relationships. If needed, the properties of the developed materials will be tuned by means of the addition of appropriate biopolymers.</p> <p>Then, state-of-the-art cell culture techniques and analysis will be implemented to enhance cell growth on the developed 3D scaffold and reduce reliance on animal-derived ingredients.</p> <p>Expertise in tissue engineering will be applied across different fields, including food engineering, to enhance the production of cultured meat and other food ingredients.</p>
Educational objectives	<p>The PhD student will improve her/his skills, working group interactions, know-how in materials science, especially natural derived polymers and their possible application for food technology and lab-grown food ingredients, exploiting tissue engineering techniques, advanced technological processing, chemical-physical investigation techniques.</p>
Job opportunities	<p><i>Post-doc in high-level universities (Italian and European)</i></p> <p><i>Researchers in start-up or spin-off developing new ideas in the food engineering field</i></p> <p><i>Consultancy in engineering industries</i></p>
Composition of the research group	<p>3 Full Professors</p> <p>3 Associated Professors</p> <p>4 Assistant Professors</p> <p>5 PhD Students</p>
Name of the research directors	Prof.Lina Altomare, Prof Andrea Fiorati

Contacts

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<https://www.cmic.polimi.it/ricerca/elenco-gruppi-di-ricerca/before/>

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	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	
By number of months at the company	0
Institution or company where the candidate will spend the period abroad (name and brief description)	da definire
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Individual budget for research (5.700 euro): 1st year: 1.900 euro; 2nd year: 1.900 euro; 3rd year: 1.900 euro</p> <p>Teaching assistantship (availability of funding in recognition of supporting teaching activities by the PhD student): there are various forms of financial 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 regulation.</p>