

Fondo Sociale Europeo Plus 2021/2027

FSE+

Sportello 2025 P.S. 20/24

Sostegno alla realizzazione di dottorati di ricerca

With Decree No. 9526/GRFVG of February 28, 2025, the Friuli Venezia Giulia Region published the Notice regarding the submission of operations for Specific Program No. 20/24, which aims to support higher education through the realization of PhD programs.

Specific Programme 20/24, through the funding of doctoral scholarships, contributes to the achievement of the objectives of the Sustainable Smart Specialisation Strategy (S4). It supports the development or strengthening of integration with the regional production system and/or research organisations, through coordination and collaboration mechanisms with regional enterprises or research bodies, or by leveraging the potential for technology transfer of processes, products, applications, or, more broadly, research outcomes.

- Sportello 2025
- Ciclo 41
- CUP J93C25000640008
- Progetto 2025/6525/8

Dottorato in Nanotechnology

"Development and optimization of a cell surface-mimicking model system by integrating artificial membranes, DNA-based nanostructures and microfabrication techniques, to study molecular signatures that enhance disease diagnostics and targeted therapies"

The goal of the project is to develop a platform based on DNA nanotechnologies to analyze the nano-environments of membrane receptors within lipid rafts, ordered microdomains involved in numerous cellular functions. The intent is to understand how spatial molecular interactions influence different cellular phenotypes, drug response, and the onset of resistance. This approach will allow for more precise prediction of the functional state of membrane receptors, guide personalized therapeutic choices, and contribute to the development of new targeted treatments. The method will be based on an innovative technology (RepliSeq) that uses polygonal DNA nanostructures to read the spatial organization of proteins through sequencing, with nanometric resolution. The nanostructures will be made to interact with artificial membranes (SLBs), which mimic the cellular membrane while maintaining the mobility and functionality of the incorporated proteins. The SLBs will be enriched with lipid rafts and used to reconstitute target proteins of interest. The project will focus on the Her2 membrane receptor, a key protein in breast cancer, as a proof of concept to demonstrate the platform's feasibility. Recent evidence shows that the simple overexpression of Her2 is not sufficient to explain therapeutic responses: the different composition and spatial organization of the proteins surrounding Her2, particularly within the rafts, plays a fundamental role. The project therefore aims to investigate the influence of lipid rafts on the activation and oligomerization of Her2. Functionalized surfaces will be designed to immobilize the DNA nanostructures, positioned on micro-patterned substrates for the formation of artificial membranes. The nanostructures will allow for the controlled arrangement of single proteins, the modulation of lipid domains, and the simultaneous analysis of their spatial organization.