

## DC3: Integrating 3D printing and SERS to investigate host tissue effects on biofilm development

**Host institution:** [Centro de Investigación Cooperativa en Biomateriales CIC \(biomaGUNE\)](#), Donostia-San Sebastián, Spain

**Supervisor:** [Dr. Natalia Baranova](#)

**Co-supervisors:** Prof. Luis Liz-Marzán (CIC biomaGUNE), Prof. Gustavo Bodelon (University of Vigo)

**Project description:** Biofilm formation in wound environments is a major barrier to effective healing, as microbial communities interact with host tissue properties that are still poorly understood. In particular, the role of tissue mechanics in regulating biofilm development and bacterial communication remains largely unexplored, limiting the development of targeted intervention strategies.

This PhD project focuses on integrating 3D printing and Surface-Enhanced Raman Spectroscopy (SERS) to investigate how the physical and biochemical properties of wound-like environments influence biofilm progression. The project will develop extracellular matrix models with controlled rheological properties that mimic relevant wound conditions, enabling systematic study of mono- and multispecies biofilms. In parallel, plasmonic nanostructures will be incorporated to enable non-invasive, label-free monitoring of bacterial quorum sensing and biofilm dynamics using SERS.

A key objective is to establish a platform that links tissue mechanics, biofilm behaviour, and real-time molecular detection, providing new insights into infection progression and potential intervention points. The approach combines bioengineered 3D models, nanomaterials, and optical sensing to capture biofilm dynamics in physiologically relevant conditions

The doctoral candidate will receive interdisciplinary training in biofabrication, nanomaterials, spectroscopy, and microbiology. The project will contribute to the development of advanced diagnostic platforms for infection monitoring within the HEAL-4WARD programme.

The degree-awarding institution is the University of the Basque Country (UPV/EHU).

**Host laboratory:** The Bottom-up Cell Biology and Bioengineering Lab aims to reverse-engineer molecular assemblies to understand how they function and to search for clinically relevant strategies to control peptidoglycan synthesis, biofilm matrix remodelling, and host-pathogen interactions. Our general goal is to advance our mechanistic understanding of the key processes in bacterial physiology, potentially exposing new bacterial targets and consequently aiding the development of new strategies to fight bacterial pathogens. More information at [www.baranovalab.com/](http://www.baranovalab.com/).

The project will be developed in a tight collaboration with the world-leading expert on SERS Prof. Luis Liz-Marzán. More information at [www.bionanoplasmonics.com/index.php](http://www.bionanoplasmonics.com/index.php).

**Secondments:** This project is carried out in collaboration with the following groups, and visits to their laboratories are expected during the project. A willingness to travel and spend time abroad is therefore essential:

- [Prof. Gustavo Bodelon](#), University of Vigo, Spain
- [Prof. Benoit Couturaud](#), CNRS-ICMPE, Paris, France
- [Prof. Iolanda Francolini](#), Sapienza University of Rome, Italy

**Eligibility conditions:**

- Master's degree in Molecular biology or biochemistry, Biomedical Engineering, Materials Science, Chemistry or related fields.
- Applicants must be doctoral candidates, i.e., not already in possession of a doctoral degree.
- Mobility rule: researchers must not have resided or carried out their main activity in the country of the recruiting beneficiary for more than 12 months in the 36 months immediately before their recruitment date.

**Required skills:**

- Experience in molecular biology, biochemistry, microbiology, ideally extracellular matrix models, demonstrated through a Master's thesis work or research internships.
- Familiarity with biofilm-related research and physicochemical or analytical techniques (e.g. microscopy, spectroscopy or SERS) would be an advantage.
- Proficiency in the English language is required, as well as good communication skills, both oral and written. Successful candidates will need to provide an English test (e.g. IELTS, TOEFL, Cambridge English). You may be exempt if you are a national of a majority native-English speaking country, or have qualifications / degree that has been taught and assessed in English. The supervisor may also confirm that a candidate has the required level of English.

**Remuneration:**

The Doctoral Candidate will receive a gross monthly salary of EUR 3,407 in accordance with the MSCA Doctoral Networks programme, including a living allowance and a mobility allowance. This amount corresponds to the contractual gross salary and is indicated before deduction of employer costs, employee taxes and social security contributions. An additional family allowance (if applicable) is foreseen. The net salary will depend on local taxation, social security and employment regulations.

**Enquiries:**

For general information about the HEAL-4WARD Doctoral Network visit the project website ([www.heal-4ward.eu](http://www.heal-4ward.eu)).

For additional information on this project please contact Dr. Natalia Baranova ([nbaranova@cicbiomagune.es](mailto:nbaranova@cicbiomagune.es)).

**How to apply**

For this position, apply directly through the institutional website at [www.cicbiomagune.es/job-offer-detail?id=43403](http://www.cicbiomagune.es/job-offer-detail?id=43403)

**Required documents:**

- Statement of interest (limit of 2,500 characters) explaining why you wish to be considered for the fellowship and which qualities and experience you will bring to the role.
- Curriculum vitae et studiorum.
- A certificate of University examinations taken (with marks).
- A final degree certificate translated in English. If, at the time of application, candidates should not be yet in possession of a degree certificate, they can submit it at the time of the examination.

A limited number of applicants will be invited for an interview and will be required to provide contact information of up to two contact person for reference letters.

**Application deadline:** The closing date for applications is **28 May 2026**.