

DC5: Development of a Multifunctional Nanoparticle-Loaded Scaffold for Enhanced Antimicrobial Activity

Host institution: Royal College of Surgeons in Ireland (RCSI), Dublin, Ireland

Supervisor: [Prof. Marco Monopoli](#)

Co-supervisors: Prof. Marc Devocelle (RCSI), Prof. Fergal O'Brien (RCSI), Prof. Maurizio Prato, (CIC biomaGUNE)

Project description: Chronic wound infections remain difficult to treat due to the persistence of bacterial biofilms and the limited efficacy of conventional antimicrobial therapies, particularly in the context of antimicrobial resistance. There is a need for advanced biomaterials that combine structural support with enhanced antimicrobial functionality.

This PhD project focuses on the development of multifunctional scaffolds incorporating antimicrobial peptides and nanomaterials to improve infection control and support wound healing. The work will explore the synthesis of antimicrobial peptides and their conjugation onto metallic nanoparticles, such as silver and zinc oxide, to achieve synergistic antimicrobial effects. These nanoparticle-peptide systems will then be integrated into biocompatible, multilayered scaffolds based on collagen and chitosan.

A key objective is to design scaffold systems that combine antimicrobial activity with suitable structural and biological properties, enabling controlled release of active agents while maintaining biocompatibility. The project will also evaluate antimicrobial efficacy against clinically relevant pathogens and assess cytotoxicity and wound healing performance in vitro.

The doctoral candidate will be trained in nanomaterial synthesis, peptide functionalisation, biomaterials fabrication, and biological evaluation. The outcomes will contribute to the development of advanced scaffold-based strategies for infection management within the broader HEAL-4WARD programme.

Host laboratory: The BioNano Lab is a multidisciplinary research laboratory located in the Chemistry Department of the Royal College of Surgeons in Ireland (RCSI) in the city centre of Dublin. The group focuses on different aspects of the bionano interactions, where we study the nanomaterial evolution after exposure to biological fluids of different origin, to help synthesising safer and more effective nanomaterial for healthcare applications and develop new platforms for precision medicine and early warning disease detection.

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. Maurizio Prato](#), Centro de Investigación Cooperativa en Biomateriales CIC (biomaGUNE), Donostia-San Sebastián, Spain
- [Prof. Bengt Fadeel](#), Karolinska Institutet, Stockholm, Sweden

Eligibility conditions:

- Master's degree in Chemistry, Pharmaceutical Chemistry, Pharmacy, Materials Science, Nanoscience, Biomedical Engineering 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 nanoparticle synthesis and characterisation (e.g. metallic nanoparticles, DLS, TEM, spectroscopy), ideally demonstrated through Master's thesis work or research internships.
- Familiarity with peptide synthesis or biomolecule functionalisation, as well as biomaterials or scaffold fabrication (e.g. hydrogels, collagen-based systems), would be beneficial.
- Prior exposure to microbiology or antimicrobial testing is 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 annual salary of approximately EUR 61,000 in accordance with the MSCA Doctoral Networks programme, including a living allowance and a mobility allowance. The net salary will depend on local taxation, social security and employment regulations which might change on an annual basis.

Enquiries:

For general information about the HEAL-4WARD Doctoral Network visit the project website (www.heal-4ward.eu) or send an email to heal4ward@gmail.com. For additional information on this project please contact Prof. Marco Monopoli (marcomonopoli@rcsi.com).

How to apply

To learn more about the application process, visit the HEAL-4WARD recruitment web page (www.heal-4ward.eu/open-positions).

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 **30 June 2026**.