BIOIMPLANT ITN

Call for Applicants

This guide is to provide practical information to potential applicants on how to apply, together with a description of the assessment procedure.

For further and up-to-date information, please visit the website www.BioimplantITN.eu

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H2020-MSCA-ITN European Training Network

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1 ABOUT BIOIMPLANT ITN

BioImplant Innovative Training Network (ITN) is a European Industrial Doctorate (EID) programme that will provide world-class multidisciplinary training to a new generation of high-achieving early stage researchers in the area of medical implant development. A well-balanced consortium that spans four EU countries and incorporates academic, industry and clinical sectors to promote international, interdisciplinary and inter-sectoral aspects of ESR skill development.

Applications are now invited for 12 Early Stage Researcher (ESR) positions on the BioImplant ITN.

Successful candidates will undertake 3-year PhD programmes in the area of bioresorbable implant development, co-hosted by academic and industry members of the consortium, with positions preferably starting in July 2018.

The closing date for applications is 27th January is 5pm (CET), on 27th January 2019.

Further details about the research programme, applicant eligibility criteria, ESR projects and application procedure are provided in this document, with up-to-date information available on the BioImplant ITN website at https://bioimplantitn.eu/.

1.1 ABOUT THE RESEARCH PROGRAMME

Bioabsorbable materials are a category of biomaterial that gradually degrade when implanted in the body. These biomaterials have the potential to form the basis for the next-generation of vascular and orthopaedic medical implants as they avoid late-stage complications associated with conventional permanent implants. However, despite the advances made to date, major challenges must be overcome to improve the performance of vascular and orthopaedic bioabsorbable implants to enhance long-term patient outcome. The BioImplant ITN programme will tackle key technological challenges in this area by bringing together EU partners with leading expertise in the areas of polymer- and metal-based bioabsorbable materials for medical implants. The scientific objective of the BioImplant ITN is to develop and implement improved bioabsorbable materials for vascular and orthopaedic implant applications. This next-generation of medical implants will be realised through technological innovation throughout the Supply Value Chain, including novel material development, advanced manufacturing technologies, robust characterisation and predictive capabilities and innovative application design. The Marie Skłodowska-Curie ITN programme provides the ideal vehicle to support this ambitious multi-partner project that brings together the very best European team to ensure delivery of high-impact science.

1.2 PARTICIPATING HOST ORGANISATIONS

All ESR positions will be jointly hosted by an academic and industry member of the consortium, **with all successful candidates hosted for at least 18 months at industry partners.** The multidisciplinary training programme delivered to early-stage researchers during the BioImplant ITN programme will enhance career development and employability, promoting their

development into leading innovators in the European Medical Technology sector. Selected researchers will enroll in one of the 12 ESR positions available across the host organisations of the BioImplant ITN:

1. National University of Ireland Galway (IE)
2. The Queens University of Belfast (UK)
3. RWTH Aachen (DE)
4. IMDEA Materials Institute (ESP)
5. Boston Scientific Ltd (IE)
6. Vascular Flow Technologies Ltd. (UK)
7. Meotec GmbH (DE)
8. ITA TextilTechnologieTransfer GmbH (DE)

2 CALL FOR APPLICANTS

2.1 WHY APPLY?

ITNs are financially supported by the European Commission because they provide excellent research, training and career aspects. The benefits of being a PhD student in an ITN network include:

- You will get the chance to participate in specially developed courses (e.g. on specific techniques, academic soft skills, etc.)
- You can already at a very early stage start building your personal professional network due to the embedding of our PhD projects in an academic/industrial network
- You will be exposed to industry and the challenges in industry already during the PhD, because we also have partners from industry in our network (who also contribute to the training)
- You will get the opportunity to spend some time in the labs of other partners (thereby you will get familiar with other disciplines, techniques, cultures etc.), as the research projects are designed such that they will mostly have interdisciplinary components
- You will be advised by excellent group leaders – they are all outstanding in their research and trainings.

2.2 BENEFITS AND SALARY

The MSCA-ITN programme offers a highly competitive and attractive salary and working conditions. The successful candidates will receive a salary in accordance with the MSCA regulations for early stage researchers. Exact salary will be confirmed upon offer and will be based on a Living Allowance of €3110/month to be paid in currency of country where based and with a correction factor to be applied per country + mobility allowance of €600/month. Additionally, researchers may also qualify for a family allowance of €500/month depending on family situation. Taxation and Social Contribution deductions based on National and Institutional regulations will apply and will be deducted from the gross payment highlighted above. In addition to their

individual scientific projects, all fellows will benefit from further continuing education, which includes the opportunity to register for a PhD degree, scientific skills courses, transferable skills courses, active participation in workshops and conferences, and secondments to partner labs.

2.3 Eligibility Criteria

Applicants need to fully comply with the three eligibility criteria:

Early-stage researchers (ESR) are those who are, at the time of recruitment by the host, in the first four years (full-time equivalent) of their research careers. This is measured from the date when they obtained the degree which formally entitles them to embark on a doctorate, either in the country in which the degree was obtained or in the country in which the research training is provided, irrespective of whether or not a doctorate was envisaged. Please note applicants cannot already hold a PhD.
Conditions of international mobility of researchers: Researchers are required to undertake trans-national mobility (i.e. move from one country to another) when taking up the appointment. At the time of appointment by the host organisation, researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of their host organisation for more than 12 months in the 3 years immediately prior to their recruitment. Short stays, such as holidays, are not taken into account.
English language: ESR candidates must demonstrate that their ability to understand and express themselves in both written and spoken English is sufficiently high for them to derive the full benefit from the network training. Non-native English speakers are required to provide evidence of English language competency before the appointment is made. An IELTS score of 6.5, or equivalent, is the minimum requirement.

2.4 ESR Roles & Responsibilities

All ESRs recruited will be expected to carry out the following roles

- To manage and carry out their research projects within 36 months
- To write a PhD dissertation
- To participate in research and training activities within the BioImplant network
- To write articles for scientific peer reviews
- To participate in meetings of the different BioImplant consortium bodies
- To disseminate their research in the scientific community (international conferences) and non-scientific community, by outreach and public engagement
- To liaise with the other research staff and students working in broad areas of relevance to the research project and partner institutions.
- To write progress reports and prepare results for publication and dissemination via journals, presentations and the web.
- To attend progress and management meetings as required and network with the other research groups.

3 ESR PROJECTS

3.1 ESR INTERNATIONAL & INTERSECTORAL SECONDMENTS

The BioImplant ITN is a European Industrial Doctorate (EID) programme, which promotes intersectoral and international aspects of ESR career development. All ESR positions are carried out jointly by an academic and industry partnership.

A condition of the BioImplant ITN programme is that **all recruited ESRs must spend at least 18 months hosted in an industry partner**.

In general, ESRs will be first recruited to an academic institution and seconded to an industry partner, which will be located in an international location (relative to the host academic institution).

3.2 PROJECT DETAILS

There are 12 PhD Fellowship positions available in the BioImplant Marie Skłodowska-Curie Actions Innovative Training Network:

ESR 1 - Material and process optimisation to develop stiffened polymer bioresorbable vascular stents

Project Description: This project will investigate the effect of processing conditions on the physical and mechanical properties of polymer-based bioabsorbable for vascular stent applications. A range of strategies will be investigated to improve mechanical properties of bulk polymer, such as optimising stretch-blow moulding parameters to enhance directional stiffness and yield properties. Post-processing techniques to improve surface properties will also be investigated to further enhance material properties. Physical, mechanical, and biocompatibility (via cell culture) performance of newly developed bioabsorbable polymer composite materials will be evaluated. Finite element models will be developed of processing conditions and subsequent deployment to evaluate influence of processing on biomechanical performance during implantation. The project will culminate in the fabrication of a prototype bioabsorbable polymer vascular stent and functional testing will be completed.

Host Academic Institution: Queens University Belfast (QUB), Northern Ireland, UK
Host Industry: Boston Scientific Limited (BSL), Galway, Ireland

Lead Supervisors: Dr. Alex Lennon (QUB), Dr. Aiden Flanagan (BSL)

For further details about this project please see https://bioimplantitn.eu/esr-recruitment/esr-project-1/ or contact bioimplant@nuigalway.ie

ESR 2: Design, development and characterisation of novel polymer- and ceramic-based coating technologies to control degradation rates for magnesium alloy stent

Project Description: This project will investigate the potential of processing techniques in reducing the corrosion rate of bare-metal magnesium devices. The potential of a novel coating technology to enhance corrosion properties of magnesium will be investigated. There will be an exploration of the potential of ultra-thin flexible ceramic coatings to enhance corrosion properties of magnesium. Testing of the degradation of magnesium samples to discover optimal coating and coating processes will be completed. Numerical degradation models will be used to inform and optimise implant and coating design for a vascular stent. In the concluding stages of the project a prototype stent will be manufactured and functionally tested.

Host Academic Institution: Queens University Belfast (QUB), Northern Ireland, UK
Host Industry: Boston Scientific Limited (BSL), Galway, Ireland

Lead Supervisors: Dr Savko Malinov (QUB), Dr. Jan Weber (BSL).

For further details about this project please see https://bioimplantitn.eu/esr-recruitment/esr-project-2/ or contact bioimplant@nuigalway.ie

ESR 3: Modelling and design of a polymer bioabsorbable, spiral laminar flow (SLF) stent for peripheral artery applications, to deliver optimal flow and mechanical performance.

Project Description: This project will develop and implement numerical models to accurately simulate the degradation of bioabsorbable polymers. Polymer samples will be manufactured and then experimentally tested to determine degradation and mechanical performance. Numerical models of degradation will be used to predict polymer stent degradation. Clinical imaging data will be used to develop model reconstructions of diseased vessels. Degradation and general performance of a bioabsorbable stent will be assessed using these models in fluid-structure interaction simulations. This project will end with the optimisation of a design of an optimised bioabsorbable stent incorporating spiral laminar flow technology and controlled degradation.

Host Academic: National University of Ireland Galway (NUIG), Galway, Ireland
Host Industry: Vascular Flow Limited Ltd. (VFT), Scotland, UK

Lead Supervisors: Dr. Ted Vaughan (NUIG), Craig Dunlop (VFT).

For further details about this project please contact bioimplant@nuigalway.ie

ESR 4: Multiphysics modelling and experimental validation of degradation of magnesium alloy with different coating technologies for vascular stent and orthopaedic implants

Project Description: This project will involve the development of numerical models to accurately simulate magnesium degradation. Mechanical and degradation characterisation will be undergone for magnesium and polymer-coated magnesium samples. This characterisation will be used to develop a multiphysics framework to provide a predictive capability of hybrid and composite metal-polymer material systems using degradation based models. This project will culminate in the optimisation of implant and coatings for vascular and orthopaedic applications.

Host Academic: National University of Ireland Galway (NUIG), Galway, Ireland
Host Industry: Meotec GmbH, Aachen, Germany

Lead Supervisors: Dr. Ted Vaughan (NUIG), Alex Kopp (Meotec).

For further details about this project please contact bioimplant@nuigalway.ie

ESR 5: Selective laser melting of magnesium powder materials to optimise mechanical performance and degradation rates and development of novel orthopaedic trauma plate

Project Description: This project will develop novel magnesium powder materials for additive manufacturing focussing on controlling degradation and investigate combining with stiff reinforcements to produce novel metal matrix composites. Additive manufacturing processing conditions will be evaluated in order to optimise mechanical performance and investigations into novel coating technologies to control will be carried out. Characterisation of the physical, mechanical and biocompatibility performance of the additive manufactured magnesium materials is required. Numerical models will be developed and a novel orthopaedic trauma plate will be designed and prototyped.

Host Academic: Queens University Belfast (QUB), Northern Ireland, UK
Host Industry: Meotec GmbH, Aachen, Germany

Lead Supervisors: Dr. Savko Malinov (QUB), Alex Kopp (Meotec).

For further details about this project please contact bioimplant@nuigalway.ie

ESR 6: Post-processing effects and prediction of long-term performance for bioresorbable composites for vascular stent and orthopaedic implant applications

Project Description: This project will investigate and quantify the effect of post-processing procedures on the physical properties and long-term performance of bioabsorbable composite devices and that any adverse late-stage cell responses are highlighted. Sterilisation techniques such as irradiation and chemical processes as well as surface-specific and emerging sterilisation techniques will be investigated. Performing comprehensive experimental characterisation of the mechanical performance and assessment of long-term in vitro cell response for composites in the degradation process will be studied. The project will study of the effect of several sterilisation procedures on the properties of the new composite material systems. Performance enhancements opportunities for post-processing via irradiation technologies will be identified as deliverables for this project.

Host Academic: Queens University Belfast (QUB), Northern Ireland, UK
Host Industry: Boston Scientific Limited (BSL), Galway, Ireland

Lead Supervisors: Prof Fraser Buchanan (QUB), Dr. Jan Weber (BSL).

For further details about this project please contact bioimplant@nuigalway.ie

ESR 7: Experimental investigation and testing of a bioabsorbable, spiral laminar flow stent for peripheral artery applications, including materials development, prototype design, manufacture and performance characterisation

Project Description: This project will develop finite element models of polymer stent crimp and deployment phases used to inform design and manufacture a preliminary bioabsorbable peripheral artery spiral laminar flow stent. Experimental flow rig for a spiral laminar flow stent for peripheral artery applications will be developed and tested. Pre-clinical testing using a human cadaveric model to assess implantation and flow performance of the designed stent will be employed. This project will conclude with the use of numerical models and flow models to optimise and manufacture a prototype bioabsorbable peripheral stent with spiral laminar flow technology.

Host Academic: National University of Ireland Galway (NUIG), Galway, Ireland
Host Industry: Vascular Flow Limited Ltd. (VFT), Scotland, UK

Lead Supervisors: Dr. Ted Vaughan (NUIG), Craig Dunlop (VFT).

For further details about this project please contact bioimplant@nuigalway.ie

ESR 8: Patient-customized and load-orientated self-reinforced polymer fibre and textile-reinforced composite structures for bone fixation

Project Description: This project will use fibre spinning techniques to target enhanced strength and stiffness properties in bioabsorbable polymer fibres. There will be the utilization of micro-CT imaging to determine the natural material-structure interaction in sub-mandibular bones and then reconstruct the sub-mandibular bone to characterise biomechanics using finite element models. Micromechanical models of fibre- and textile-based degradable structures will be developed. Micromechanical modelling to inform a biomimetic textile-based design that maximises stiffness and strength within a patient-specific geometry will be performed. This project will culminate in the development of a micron-scale single fibre placement process and fabrication of prototype textile-reinforced bone scaffold

Host Academic: IMDEA Materials Institute (IMDEA), Madrid, Spain
Host Industry: ITA TextilTechnologieTransfer GmbH (ITA), Aachen, Germany

Lead Supervisors: Prof Javier Llorca (IMDEA), Markus Beckmann (ITA).

For further details about this project please contact bioimplant@nuigalway.ie

ESR 9: Development of next-generation bioabsorbable polymer stent with increased strength and stiffness properties, employing polymer textile macrostructures and optimised stent design techniques.

Project Description: This project entails the development of textile macrostructures (braiding, weaving) with tailored structure and composition to produce directional materials that optimise the strength and stiffness in specific directions. The mechanical, physical, degradation, and biocompatibility performance of the newly developed materials will be characterised to identify promising technologies. Finite element models of the deployment of braided/textile stents will be developed to characterise biomechanical performance during implantation and target optimisation of stent design. This project will result in the manufacture of a prototype bioabsorbable braided/textile stent using the textile materials developed.

Host Academic: RWTH Aachen (RWTH), Aachen, Germany
Host Industry: Boston Scientific Limited (BSL), Galway, Ireland

Lead Supervisors: Prof. Thomas Gries (RWTH), Dr. Aiden Flanagan (BSL).

For further details about this project please contact bioimplant@nuigalway.ie

ESR 10: Development of novel bioabsorbable materials for orthopaedic implant applications with optimised properties, using innovative fibre textile structures

Project Description: This project will develop novel textile macrostructures with tailored fibre placement technology to improving strength and stiffness properties in specific directions for orthopaedic implant applications. Coupons of developed materials will be manufactured and characterised to detemine mechanical/biocompatibility. There will be an investigation into the synergistic property enhancement with post-processing techniques. There will be development of a model for tissue healing to predict how biomechanical forces drive tissue in-growth around implants. A fibre-based bone scaffold for critical defects will be designed with optimised structure and fibre placement to maximise vascularisation and in-growth potential. This prototype design will then be manufactured and functional testing will be completed in the conclusion of this project.

Host Academic: National University of Ireland Galway (NUIG), Galway, Ireland
Host Industry: ITA TextilTechnologieTransfer GmbH (ITA), Aachen, Germany

Lead Supervisors: Dr. William Ronan (NUIG), Markus Beckmann (ITA).

For further details about this project please contact bioimplant@nuigalway.ie

ESR 11: Development of magnesium fibre-reinforced polymer composite with optimised mechanical and degradation properties for orthopaedic applications

Project Description: This project will utilise contemporary production techniques to produce a range of magnesium-based filament and fibre reinforcement for orthopaedic devices. During the project laminate-based coupons of magnesium fibre-reinforced polymer composite material will be produced with composite moulding processes. Numerical models of polymer- and metal-based degradation will be used to inform composition and optimise performance of material coupons for both mechanical/degradation behaviour in orthopaedic applications. Physical, mechanical and biocompatibility performance of the coupon specimens will be characterised. The project will investigate the development and design of a magnesium fibre-reinforced polymer composite orthopaedic fixation plate, with optimised mechanical and degradation behaviour that maximise load-bearing potential during tissue healing. The project will culminate in the manufacture and complete functional testing of a prototype.

Host Academic: IMDEA Materials Institute (IMDEA), Madrid, Spain
Host Industry: Meotec GmbH, Aachen, Germany

Lead Supervisors: Prof Javier Llorca (IMDEA), Alex Kopp (Meotec).

For further details about this project please contact bioimplant@nuigalway.ie

ESR 12: Development of a 3D printed bioabsorbable composite materials for orthopaedic applications.

Project Description: This project will demonstrate the potential of 3D printing of orthopaedic implants using composite material systems to produce patient-specific orthopaedic plate and scaffold structures. Extrusion technology will be used to produce develop 3D printing systems to enable printing of biodegradable polymer composites. There will be an investigation into new process methodologies for spool-fed 3D printing. Optimisation of material and structural design of orthopaedic implants produced via the new process methodologies will be carried out by means of multiscale modelling simulations. The project will demonstrate the application potential of 3D printed biodegradable composites through the production of image-based patient-specific orthopaedic fixation plate and small-scale bone scaffold structures.

Host Academic: IMDEA Materials Institute (IMDEA), Madrid, Spain
Host Industry: ITA TextilTechnologieTransfer GmbH (ITA), Aachen, Germany

Lead Supervisors: Dr. Claudio Lopez (IMDEA), Markus Beckmann (ITA).

For further details about this project please contact bioimplant@nuigalway.ie

4 APPLICATION PROCEDURE

4.1 CONTENT AND SUBMISSION OF YOUR APPLICATION

To submit your application, please fill in the requested data in the online application form, upload your application file and submit your application. The online application form is available on the website www.bioimplantITN.eu under 'Application' page

Your application consists of two parts:

1. An online application form: In the online form, you are requested to fill in information that is aimed to facilitate the eligibility check of your application and to identify the ESR position(s) you are applying for.

2. One PDF file containing all a Cover Letter and Curriculum Vitae

Closing date for receipt of applications is 5pm (CET) on 27th January 2019.

All positions are recruited in line with Open, Transparent, Merit (OTM) and Competency based recruitment.

5 SELECTION & EVALUATION CRITERIA

5.1 ELIGIBILITY CHECK

All applications will be checked according to the eligibility criteria. Only eligible applications will be processed to the next phase.

• The applicant is an Early Stage Researcher.
• The applicant complies with the mobility rule for the project(s) to apply for.
• The application is complete, in English and submitted through the online form before the deadline.

5.2 SELECTION PROCEDURE

Remaining candidates will be ranked by the principal supervisors of the ESR according to the following criteria:

- Scientific/Academic background and merits to date
- Professional experience
- Motivation

Candidates who are ranked sufficiently highly for an ESR position will be invited for skype/phone interviews with supervisors.

6 FURTHER INFORMATION

For further and up-to-date information, please visit the website www.bioimplantITN.eu, or contact us at bioimplant@nuigalway.ie

7 FUNDING

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