

## International Training Network Towards Tissue Engineering Solutions for Cardiovascular Surgery (TECAS)

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### Forschungsprofil

#### TECAS - Towards Tissue Engineered Solutions in Cardiovascular Surgery Marie Curie Initial Training Network

##### Overview

The TECAS-ITN is a Marie Curie Initial Training Network, which is coordinated by Dr Sotiris Korossis (MHH-HTTG) and was funded in 2013 with €3.5 million by the People Programme (Marie Curie Actions) of the European Union's 7th Framework Programme FP7/2007-2013/ under REA grant agreement n°317512. The TECAS-ITN comprises 5 academic full partners, including Hannover Medical School, RWTH Aachen University, Eindhoven University of Technology, University of Padua and University of Patras, as well as a private company (Corlife oHG, Germany). In addition to the full partners, the TECA-ITN collaborates with a number of associated partners, including the British Standards Institute, Regener8 and the private companies 3T GmbH and ROWIAK GmbH.

The TECAS-ITN European Doctoral Academy in Regenerative Engineering integrates the major European contributors in the field of cardiovascular tissue engineering (TE) and regenerative medicine (RM), generating a coherent framework of expertise that facilitates the training and career development of 13 early stage researchers (ESRs). In particular, the TECAS- ITN focuses on the clinical needs of cardiac valve replacement/repair, myocardium reconstruction and patch graft angioplasty of the great blood vessels, with a view to developing the underpinning expertise and technology that will be required to manufacture functional TE cardiovascular implants for clinical use in the near future. The projects of the TECAS-ITN span over the intersectorial innovation pipeline of a number of TE products and technologies from basic science to translational research and beyond. The strategy of the TECAS ITN involves the use of functionalised 3D scaffolds, which have been seeded with either differentiated stromal cells or adult mesenchymal stem cells derived from the intended recipient, and either physically conditioned in the laboratory in bioreactors, with a view to producing biological and biomechanical functionality of the graft prior to implantation, or used unseeded with a view to attracting endogenous cell colonisation after implantation.

The strategic priority of the TECAS-ITN is to enable its Fellows to develop their research performance, multidisciplinary, intersectorial skills, employability, professionalism and engagement with society. In addition to training-through-research, the Fellows are trained in complementary skills, and industrial and clinical methodologies used in the area of cardiovascular TE and beyond, giving them an all-round training to prepare them equally for employment in the industry (cardiovascular implant, stem cell, TE companies), academia, clinical sector, transplant services, and regulatory and standardisation agencies.

##### Recent Developments

During the first year of the project, the activities of the Participating Institutions were focused on establishing the Network. Along these lines, the website of the TECAS-ITN was constructed (<http://doctoralacademy.mh-hannover.de>).

de/), and 2 non-research personnel, the Research Manager and the Industrial Liaison Officer, were recruited for the administrative support of the TECAS-ITN.

The recruitment of the ESRs was implemented in two cohorts and the response exceeded expectations as 508 applications from 68 countries were received. Following the implementation of a central processing strategy, 13 students (7 females and 6 males) representing 8 nationalities were recruited by November 2013.

The Kick-Off Meeting of the Network was held in December 2013, at MHH while the 1st Focused Symposium was organized in August 2013 in the 19th Congress of the European Society of Biomechanics (Patras, Greece).

## **Forschungsprojekte Jahrgang 2013**

### **Molecular biomechanics of $\alpha$ -actin remodelling (ESR1)**

■ Projektleiter: Baaijens, F. (Prof.), Eindhoven University of Technology; Betreuer: Bouten, C. (Prof.), Eindhoven University of Technology, Jockenhövel, S. (Prof.), RWTH Aachen University, Gerosa, G. (Prof.), University of Padua, Mavrilas, D. (Prof.), University of Patras

### **Experimental investigation of $\alpha$ -actin remodelling (ESR2)**

■ Projektleiter: Baaijens, F. (Prof.), Eindhoven University of Technology; Betreuer: Korossis, S. (Dr.), Hannover Medical School, Bouten, C. (Prof.), Eindhoven University of Technology, Jockenhövel, S. (Prof.), RWTH Aachen University, Gerosa, G. (Prof.), University of Padua

### **Evaluation of non-destructive online markers for tissue development (ESR3)**

■ Projektleiter: Jockenhövel, S. (Prof.), RWTH Aachen University; Betreuer: Korossis, S. (Dr.), Hannover Medical School; Petra, M. (Dr.), RWTH Aachen University; Harder, M. (Dr.), Corlife oHG; Gerosa, G. (Prof.), University of Padua

### **In vitro calcification models for cardiovascular scaffolds (ESR4)**

■ Projektleiter: Mavrilas, D. (Prof.), University of Patras; Betreuer: Korossis, S. (Dr.), Hannover Medical School, Missirlis, Y. (Prof.), University of Patras, Jockenhövel, S. (Prof.), RWTH Aachen University, Gerosa, G. (Prof.), University of Padua

### **Anticalcification treatments for TE scaffolds (ESR5)**

■ Projektleiter: Mavrilas, D. (Prof.), University of Patras; Betreuer: Korossis, S. (Dr.), Hannover Medical School, Koutsoukos, P. (Prof.), University of Patras, Jockenhövel, S. (Prof.), RWTH Aachen University, Harder, M. (Dr.), Corlife oHG

### **Development of cell-seeded TE valves using decellularised valvular scaffolds (ESR6)**

■ Projektleiter: Korossis, S. (Dr.), Hannover Medical School; Betreuer: Hilfiker, A. (Dr.), Hannover Medical School, Harder, M. (Dr.), Corlife oHG, Baaijens, F. (Prof.), Eindhoven University of Technology, Mavrilas, D. (Prof.), University of Patras

### **Development of a decellularised pericardium percutaneous heart valve (ESR7)**

■ Projektleiter: Gerosa, G. (Prof.), University of Padua; Betreuer: Korossis, S. (Dr.), Hannover Medical School, Iop, L. (Dr.) University of Padua, Jockenhövel, S. (Prof.), RWTH Aachen University, Baaijens, F. (Prof.), Eindhoven University of Technology

### **Investigation of the growth and calcification potential of fibrin gel-based TE valves in vivo (ESR8)**

■ Projektleiter: Jockenhövel, S. (Prof.), RWTH Aachen University; Betreuer: Mela, P. (Dr.), RWTH Aachen University, Baaijens, F. (Prof.), Eindhoven University of Technology, Gerosa, G. (Prof.), University of Padua, Mavrilas, D. (Prof.), University of Patras

### **Development of a vascularised TE myocardial patch (ESR9)**

■ Projektleiter: Korossis, S. (Dr.), Hannover Medical School; Betreuer: Hilfiker, A. (Dr.), Hannover Medical School, Jockenhövel, S. (Prof.), RWTH Aachen University, Gerosa, G. (Prof.), University of Padua, Baaijens, F. (Prof.),

Eindhoven University of Technology

**Development of a pattern recognition method for quality testing of TE scaffolds and constructs (ESR10)**

■ Projektleiter: Harder, M. (Dr.), Corlife oHG; Betreuer: Korossis, S. (Dr.), Hannover Medical School, Jockenhövel, S. (Prof.), RWTH Aachen University, Gerosa, G. (Prof.), University of Padua, Baaijens, F. (Prof.), Eindhoven University of Technology

**Preservation methods for cell-seeded TE cardiovascular grafts (ESR11)**

■ Projektleiter: Gerosa, G. (Prof.), University of Padua; Betreuer: Korossis, S. (Dr.), Hannover Medical School, Aguiari, P. (Dr.), University of Padua, Jockenhövel, S. (Prof.), RWTH Aachen University, Harder, M. (Dr.), Corlife oHG

**Preservation and sterilisation of decellularised TE scaffolds (ESR12)**

■ Projektleiter: Gerosa, G. (Prof.), University of Padua; Betreuer: Korossis, S. (Dr.), Hannover Medical School, Iop, L. (Dr.) University of Padua, Harder, M. (Dr.), Corlife oHG, Mavrilas, D. (Prof.), University of Patras

**Assessment of the durability of valvular scaffolds for clinical use (ESR13)**

■ Projektleiter: Mavrilas, D. (Prof.), University of Patras; Betreuer: Korossis, S. (Dr.), Hannover Medical School, Dougenis, D. (Prof.), Baaijens, F. (Prof.), Eindhoven University of Technology, Gerosa, G. (Prof.), University of Padua