Colloquium of the Cluster of Excellence REBIRTH
(From Regenerative Biology to Reconstructive Therapy)

Guests:

Prof. Dimosthenis Mavrilas, PhD

Laboratory of Biomechanics & Biomedical Engineering, Department of Mechanical Engineering & Aeronautics, University of Patras, Greece

'Decellularised Natural Collagenous Biomaterials for Cardiovascular Tissue Engineering: Biomechanical, Biochemical and Biological characteristics'

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Dr. Sotiris Korossis, PhD

Director of Biomedical Engineering, Lower Saxony Centre for Biomedical Engineering, Implant Research and Development,
Hannover Medical School, Hannover

'Investigation of the Suitability of Decellularised Porcine Pericardium in Mitral Valve Reconstruction'

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Wednesday, 16th of January 2013
5 pm (c.t.)

Lecture Hall M
Hannover Medical School

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Decellularised Natural Collagenous Biomaterials for Cardiovascular Tissue Engineering: Biomechanical, Biochemical and Biological characteristics

Professor Dimosthenis Mavrilas, PhD

Laboratory of Biomechanics & Biomedical Engineering, Department of Mechanical Engineering & Aeronautics, University of Patras, Greece.

Guest Professor, Leibniz Universität Hannover, DE.

Abstract: Scaffolds designed for Cardiovascular Tissue Engineering (CVTE) need to meet specific biomechanical, biochemical and biological characteristics. Special focus has to be directed in their dynamic mechanical behavior and fatigue strength, haemo/cytocompatibility, and balanced cell-tissue growth vs. scaffold degradation. Acellular xenogeneic soft tissues (like heart valves and dermal or pericardial patches) have been used as implants for long time in CV and other surgical applications. They may be important alternatives to polymeric scaffold materials in TE research, due to similarity in structure and composition of their extracellular matrix with tissues to be replaced, availability (animal tissues) and potential biocompatibility. As an example, bovine pericardial tissue was decellularized under different techniques and their effect on the mechanical behavior, structure and composition, as well its cytocompatibility will be presented and compared with commercially available acellular bovine pericardial and porcine dermal tissue derived biomaterials.

Investigation of the Suitability of Decellularised Porcine Pericardium in Mitral Valve Reconstruction

Dr Sotiris Korossis, PhD

Director of Biomedical Engineering, Lower Saxony Centre for Biomedical Engineering, Implant Research and Development, Hannover Medical School

Abstract: Autologous and glutaraldehyde-treated xenogeneic and homogeneic pericardium have been used extensively in mitral valve repair. However, there are a number of limitations associated with its use. These include calcification, limited durability and lack of *in vivo* regeneration with glutaraldehyde-treated xenografts, as well as the sacrifice of the patient's own pericardium in the case of repair with autologous pericardium. The aim of this study was to investigate the suitability of decellularised porcine pericardium for heterotopic repair of the mitral valve leaflets, and its potential to regenerate through endogenous cell repopulation *in vivo*, or *in vitro cell* seeding prior to implantation. Fresh porcine anterior and posterior mitral valve leaflets, together with fresh and decellularised porcine pericardium were tested histologically, biochemically and biomechanically to investigate potential similarities and differences between the different types of tissue. Subsequently, the decellularised pericardial scaffolds were tested both in terms of biocompatibility, using contact and extract cytotoxicity assays, and in terms of regenerative capacity through porcine mesenchymal stem cell (pMSC) seeding. Porcine mitral valve leaflets and porcine fresh/decellularised pericardium shared similar histoarchitectures, but had different biochemical composition and biomechanics. Decellularised pericardium was shown to be an optimum material for cell repopulation, delivering the necessary biological and biomechanical cues to seeded or migrating cells, and representing a plausible scaffold option for the regeneration of the mitral leaflets *in vitro* or *in vivo*, respectively.