The 52nd iCeMS
SEMINAR

Wed 30 June 2010
11:00-12:00

Venue: 2nd floor Seminar Room (#A207)
Main Building iCeMS Complex 1
Kyoto University

<Part1- 11:10-11:25>

"Biomedical Engineering for Applications in Regenerative Medicine"

Prof. Dr. Konrad Kohler

Center for Regenerative Biology and Medicine (zrm)
University of Tübingen

<Part2- 11:25-11:40>

"Cell Biological Strategies to Study Regeneration in the Nervous and Musculo-sceletal System"

Prof. Dr. Elke Guenther

Head of Department Cell Biology
National and Medical Sciences Institute at University of Tübingen

<Part3- 11:40-11:55>

"Bioreactors for Tissue Engineering"

Dr. Cornelia Kasper

Institute of Technical Chemistry
Leibniz University of Hannover

Contact: iCeMS Innovation Management Group (IMG) at sengoku-g@icems.kyoto-u.ac.jp
Hosted by: iCeMS (Institute for Integrated Cell-Material Sciences), Kyoto University
CiRA (Center for iPS Cell Research and Application), Kyoto University

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Abstracts for June 30th iCeMS Seminar

Prof. Dr. Konrad Kohler

Research at the interface between the life sciences and the material sciences and the translation of insights gained in basic research into clinical therapies require close interdisciplinary cooperation between natural scientists, physicians and engineers. New forms of cell based therapies and biomedical techniques not only offer the possibility of cutting treatment and healthcare costs dramatically, but can also improve patients' long-term quality of life. Similar benefits are offered by the trend towards miniaturization of implants. Increasing use is being made of equipment and instruments with biocompatible or organic coatings. Surfaces are being developed that can be populated with cells – to cover wounds or replace vessels, for example. New and specially adapted technological solutions for cell detection and tissue engineering are developed for in situ application and analysis of implanted cells.

Prof. Dr. Elke Guenther

The NMI is an applied R&D institute at the interface between life and material sciences. One of our core competences is the development of innovative approaches in the field of regenerative biology and medicine. The present talk will give a survey on our current activities 1) to improve the therapeutic performance of resorbable nerve tube implants as alternative to autologous nerve transplants after injuries in the peripheral nervous system, 2) to develop novel strategies that allow the treatment of degenerative cartilage and spine defects using biological reconstruction, and 3) to test the efficiency of putative regeneration-promoting factors in the central nervous systems by means of a microelectrode array (MEA) -based biosensor approach in vitro.

Dr. Cornelia Kasper

The engineering of functional tissue constructs ex vivo is a rapidly growing branch in the field of tissue engineering. Generally a scaffold provides a supportive framework for the seeded cells and the construct is inserted into a specially designed bioreactor system for the production of tissue under controlled conditions. Furthermore, mechanical stimulation has become a substantial tool in functional tissue engineering.

Static cultures are insufficient to mimic the in vivo conditions, thus the cultivation should be performed in a bioreactor where oxygen, pH and the transport of nutrients and metabolic waste in the tissue microenvironment can easily be controlled. The most commonly used bioreactors for tissue engineering are spinner flasks, perfusion chambers and the Rotating Wall Vessel Reactor (RWVR). In spinner flasks the cells can be cultured either on scaffolds fixed on needles or on microcarriers. Perfusion culture systems are frequently applied for the cultivation of cartilage and bone tissues. This allows a removal of metabolic waste and supplementing essential nutrients as well as a mechanical stimulation. Using the RWVR, the scaffolds are cultured in a free fall manner. The RWVR has already been used successfully for the cultivation of bone and cartilage cells. A novel designed rotating bed bioreactor (ZRP ®) for the production of bone tissue like 3 D structures will also be presented as well as a dynamic cultivation system for the application of mechanical strain (by repeated cyclic elongation) to trigger differentiation of mesenchymal stem cells into functional bone tissue.

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