FIU Engineering & Computing
FLORIDA INTERNATIONAL UNIVERSITY

Biomedical Engineering
Wallace H. Coulter Foundation
Seminar Series

Bioceramics for life science applications

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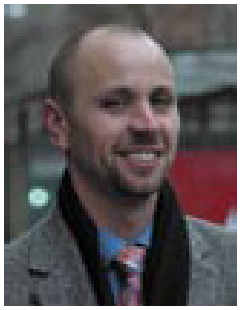

Tuesday, Feb 05, 2013
Lecture: 10:00 AM-11:00 AM
FIU Engineering Center
EC 2300

Abstract: The demographic shift in the world is rapidly increasing the need for new health care solutions. Technologies that enables faster, better and cheaper healing of will be needed to aid the silver economy. This has become an important research field at the Department of Engineering Sciences of Uppsala University where the development and analysis of new materials for life science applications. In recent years, nano and biomaterials have gained enormous attention in particular in the field of life science and especially in drug delivery, biomaterials and diagnostics. Projects aiming for new diagnostic tools, materials for regenerative medicine, technologies to prolong the lifetime of prostheses, new drug delivery systems and new dental materials are currently running.

The problem of surgery related infections during bone implant surgery are an increasing problem world-wide. Deep infections in the bone are very difficult to treat and require intravenous antibiotics to be solved or even costly revision surgery. We are attacking this problem by tailoring new implant surfaces that can either be loaded with a drug of choice by the surgeon in the operating theatre or be sterilized on demand by UV light as a preventive action or as a treatment of already infected sites. The latter is directed towards skin penetrating implants like dental screws and fixation instruments used in trauma surgery. Examples of drugs to be loaded into implant surfaces are antibiotics to treat or prevent infections, growth factors like bone morphogenetic proteins and bisphosphonates to ensure optimal bone in-growth in, forexample, osteoporosis patients. When developing nanustructured surfaces for fast loading in the operating theatre one of the key challenges is to make sure that the fast loaded drug is realesed in aslow and controlled manner in vivo. This is where the tailoring of the implant surface nanostructure play an important role. We are developing both the implant surfaces as well as the tools needed for on-demand sterilization of the surfaces with the overall goal to bring forward safer bone implant surgery.

The incidence of bone-cancer, osteoporosis and trauma is currently one of the fastest increasing health care burdens. New materials that can help in restoring the original musculoskeletal function are of high clinical interest. The aim with the research is to provide materials that provide a faster and cheaper bone healing in critical size bone defects. Two main routes are being followed; A first minimal invasive route where injectable biomaterials are being developed for spinal and cranial application but with a future use also in extremities. The materials are resorbable and sets and harden in vivo and provide a mechanical strength in the same order of magnitude as cancellous bone. And a second route focusing more on targeted ion delivery for optimal bone regeneration where e.g. Sr is delivered locally from resorbable biomaterials in order to aid in bone formation in osteoporosis patients.

Biography: Dr. Håkan Engqvist is Professor, Division Head in Applied Materials Science, and Dean of external relationships for the faculty of science and engineering at Uppsalar University, Sweden. His research is focused towards implantable biomaterials and drug delivery vehicles, mainly for bone replacement. The main competence is connected to synthesis and characterisation of ceramic bulk materials and coatings for biological applications. He has supervised more than 41 postdoctoral researchers, Ph.D. and master students. He is the President of the Scandinavian Society of Biomaterials Society and chairman of the board. He is also the founder and member of the board of Bactinact AB, Oss-Q AB and Ascilion AB, and board member in several academic and industrial positions. He has received awards from Alde Nilssons ABB Foundation (1999): Scholarship for scientific research and development in production technique, Commended in EPMA Powder Metallurgy Thesis Competition (2000), and Göran Gustafsson Award (2005) for Young Researchers, Million price winner at Uppsala University.

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