

Stem Cells, Materials and Tissue Engineering - An Emerging Therapeutic Symphony in Regenerative Medicine

09th December to 14th December 2019

Overview

Clinicians are often challenged with conditions without any definitive cure. In such cases, doctors usually have to opt for symptomatic management until replacement of the diseased organ/system is available. Organ transplantation, on the other, hand is fraught with its own challenges. Demanding situations like these have led scientists on a path to develop alternative therapeutic strategies and clinical tools on the benchside that have the potential to replace original organs, tissues or body parts in general. Regenerative medicine, being a branch of translational research, integrates the skills of tissue engineering and molecular biology, and thereby provides opportunities to develop novel therapeutic tools for a wide range of clinical conditions. As stated by Leland Kaiser, regenerative medicine holds promise to “change the course of chronic disease and in many instances will regenerate tired and failing organ system”.

Objectives	<ul style="list-style-type: none"> • Exposing participants to the fundamentals of Regenerative Medicine and its tools • Orienting participants to the latest developments in Regenerative Medicine • Understanding the molecular interactions of stem cells and biomaterials • Providing participants with information on the experimental methods and tools • Learning translational research: Moving towards commercialization
Topics 	<ul style="list-style-type: none"> • Introduction to Regenerative Medicine: Basic concepts, use of materials in tissue modulation. Skeletal tissue engineering as a model to learn RegMed practices. • Biomaterials: Definition; types; tissue-material integration; implant tissue interactions; biocompatibility; blood compatibility; bio-activity/ inertness; bioresorbability and biodegradable implants. 3D printing technology. Visit to Biomaterials and Tissue Engineering labs. Materials, design and applications. Structure-Property relationship, classification, concepts of defects, mechanism of toughening, implants, Ashby diagram for modulus and strength, stress shielding, Wolff's law, porous implants, manufacturing techniques; importance of reverse engineering. • Discovering tools and techniques involved in Regenerative Medicine: Cell culture: tools and techniques; setting up a cell culture facility - considerations, challenges and troubleshooting; molecular biology tools in Regenerative Medicine: flow cytometry, molecular biology techniques; polymerase chain reactions, western blotting, immunohistochemistry etc. Reverse engineering, 3D designing, microCT, microscopic techniques (SEM, TEM, Ultrasonography, OCT), Semi-confocal Apotome imaging, 3D manufacturing by top down and bottom up approach, histology. • Stem cells: Embryonic, adult and iPSCs; importance and uses; ethical concerns; clinical practices; stem cell technology; mesenchymal stem cell (MSC): sources of MSCs, methods to differentiate MSCs & cell analysis techniques, biochemical assays and imaging, quantification etc.; applications, current status and future prospects. • Tissue Engineering for Bone Regeneration. Biomimics - construction strategies, scaffold design and cell sources. Role of biomaterials in skeletal tissue engineering. Osteoconduction, Osteoinduction, Osteogenesis, Concept of Tissue on-growth, Tissue In-growth, Osseo-incorporation. Mesenchymal stem cells in osteoarthritis therapy: current status of theory, technology, and applications, cell differentiating and tracking, non-invasive imaging and follow up.
Who can attend?	<ul style="list-style-type: none"> • Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories. • Students at all levels (BTech/MBBS/MSc/MTech/MD/MS/PhD) or Faculty from reputed academic institutions and technical institutions. • Clinicians and Dental surgeons with interest in Regenerative Medicine
Fees	<p>The participation fees for taking the course is as follows:</p> <ul style="list-style-type: none"> • Participants from abroad: US \$500/- • Industry / Research Organisations: Rs.10,000/- • Faculty members, Post-docs, Research Associates and Assistants: Rs.6000/- • Research Scholars / Students : NIL <p>The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges.</p> <p>The participants will be provided with accommodation on payment basis.</p>

The Faculty

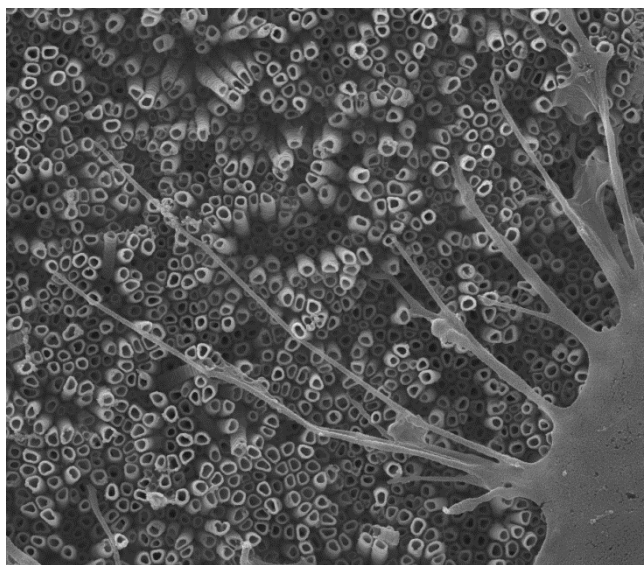
Prof. Yin Xiao is a Professor at Institute of Health and Biomedical Innovation, Queensland University of Technology (QUT), Australia. He is the Director of Australia-China Centre for Tissue Engineering and Regenerative Medicine and a group leader of the bone and clinical research program.



Prof. Santanu Dhara is a Professor at School of Medical Science and Technology, Indian Institute of Technology Kharagpur. The Biomaterials and Tissue Engineering Group headed by Prof. Dhara emphasizes on product development research based on fundamental understanding of cell-material interactions and in vivo response.



Dr. Nishant Chakravorty is an Assistant Professor School of Medical Science and Technology, Indian Institute of Technology Kharagpur. His lab utilizes the concepts of cell and molecular biology, biomaterials and tissue engineering to study human pathophysiological condition and attempts to identify therapeutic tools and targets for clinically important conditions.



A scanning electron microscopy (SEM) image depicting interaction of osteoblastic cells with nanostructured titanium implant

3D printing

Stem cells

Assays

Highlights

Biomaterials

Translational Research

Course Coordinators

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