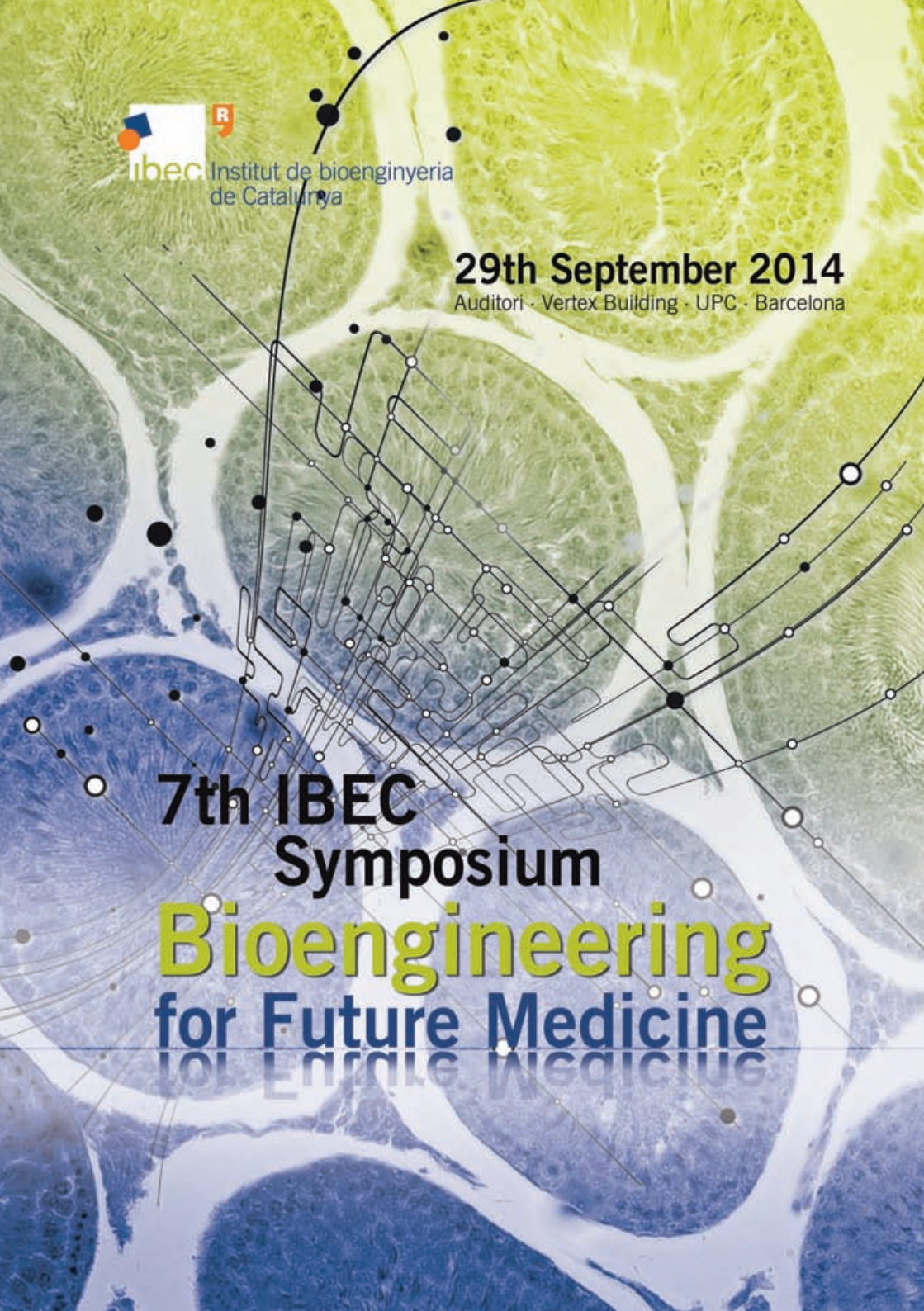
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29th September 2014
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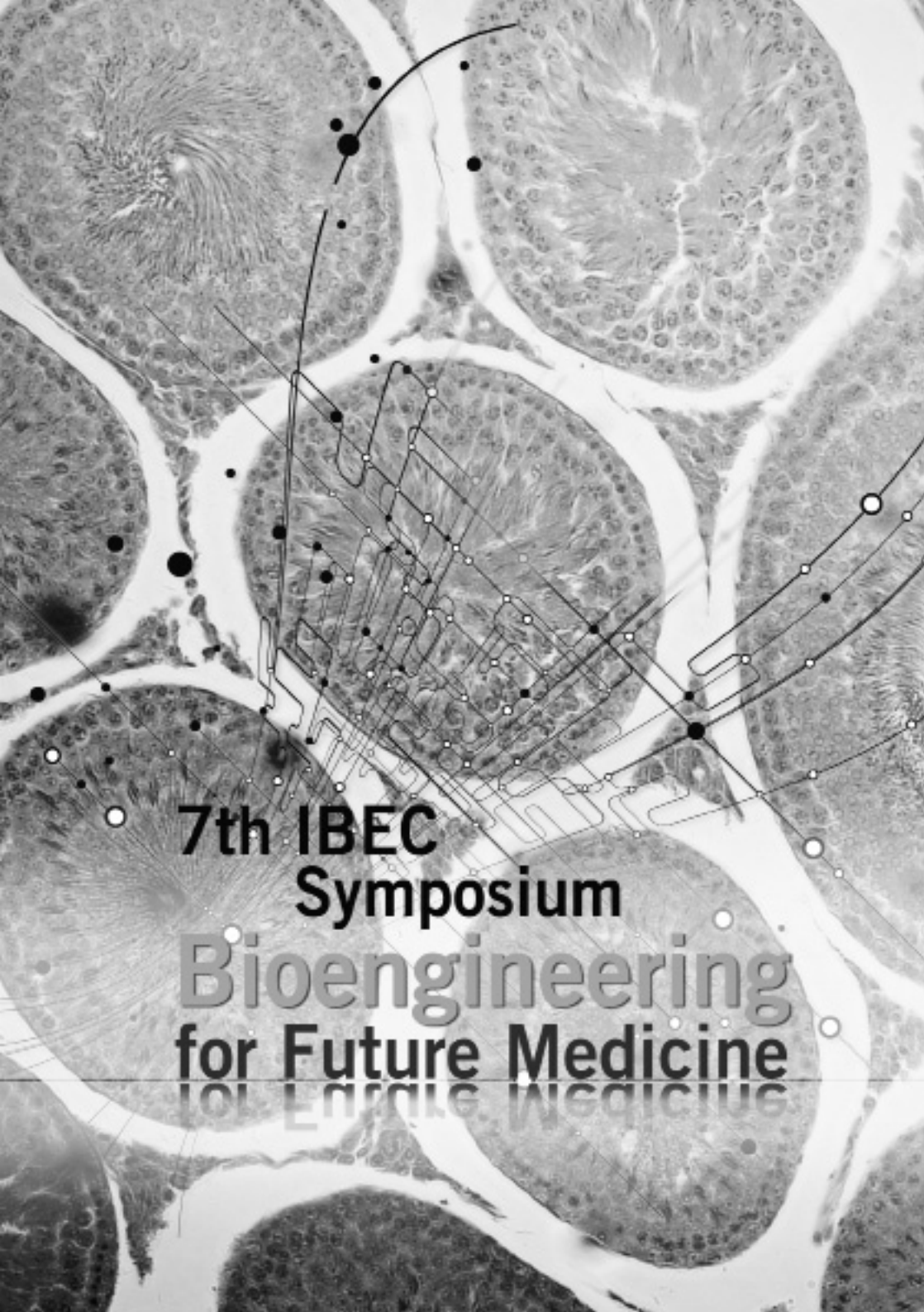
7th IBEC
Symposium
Bioengineering
for Future Medicine


7th IBEC
Symposium
Bioengineering
for Future Medicine

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7th IBEC Symposium
Bioengineering for Future Medicine

Welcome to IBEC's seventh annual symposium

This year the theme will be one of IBEC's three areas of application, 'Bioengineering for Future Medicine'. The future of medicine will mean personalized medicine, hand-held diagnostic platforms, wearable monitoring devices, and other technological advances to make healthcare more effective, cheaper and more convenient.

The symposium is our yearly opportunity to publicly present our research and showcase some of the achievements of the international experts in our main fields of interest. In addition to the main talks, attendees can enjoy the flash presentations from our young researchers and PhD students, as well as the poster sessions.

Along with the networking opportunities offered by the coffee and lunch breaks, the symposium promises an unrivaled opportunity to review the state-of-the-art in bioengineering and nanomedicine and promote multidisciplinary discussions.

Enjoy the symposium!

Josep Samitier
Director of IBEC

7th IBEC Symposium
Bioengineering for Future Medicine

Information for participants

Information Desk

The conference registration and information desk will be located in the main reception hall of the VERTEX building Auditorium. It will be staffed from 08:30 to 17:30 on Monday 29th September.

Badges

Each registered participant will receive a name badge. For security reasons, the badge must be clearly exhibited in order to access the congress area during all scientific and social events. Replacements for lost badges will be available from the registration desk.

Speakers/Flash presentations

Speakers and those participants giving flash presentations should take their presentation(s) to the reception desk during the coffee or lunch break before their session. Those who are speaking in the first session in the morning should go to the desk at least 15 minutes before the start of the day's programme.

Poster sessions

Posters should be hung during registration between 08:30 and 09:00 on Monday 29th September. Please refer to the information board in the registration area or this book to check which board number has been allocated to you.

Posters can remain on display throughout the conference and should be removed between 17:30 and 18:00. Any posters remaining after the indicated time will be removed by the organizers, who accept no responsibility for loss or damage.

Poster sessions will take place during the coffee and lunch breaks.

Certificate of attendance

If you wish to have a Certificate of Attendance, you can request one from the Secretariat at symposium@ibecbarcelona.eu.

7th IBEC Symposium
Bioengineering for Future Medicine

Programme

Monday, 29th September	
08:30 - 09:00	Registration
09:00 - 09:30	Opening ceremony
09:30 - 10:05	**Prof. Josep Samitier**. *Institute for Bioengineering of Catalonia (IBEC), Spain* IBEC Evolution and Scientific highlights
10:05 - 10:30	IBEC Innovation and clinical translation
10:30 - 11:00	Flash poster presentations I. Nanomedicine Session
11:00 - 11:50	Coffee break & poster session
11:50 - 12:25	**Prof. Chwee Teck Lim**. *Faculty of Engineering, National University of Singapore* Microfluidics for cancer detection & diagnosis. From bench to bedside
12:25 - 13:00	Flash poster presentations II. Cell Engineering Session
13:00 - 14:15	Lunch & poster session
14:15 - 14:50	**Dr. Pere Roca-Cusachs**. *Institute for Bioengineering of Catalonia (IBEC), Spain* Exploring the mechanical link between cells and the extracellular matrix
14:50 - 15:20	Flash poster presentations III. ICT for Health Session
15:20 - 16:00	Coffee break & poster session
16:00 - 16:35	**Dra. Elisabeth Engel**. *Institute for Bioengineering of Catalonia (IBEC), Spain* Instructive Biomaterials as Signal releasing Platforms
16:35 - 17:10	**Dr. Roger D. Kamm**. *Massachusetts Institute of Technology, USA* Tumor cell dynamics in metastatic disease
17:10 - 17:25	Awards and closing ceremony

Keynote Lectures

IBEC Evolution and Scientific highlights

Josep Samitier

Institute for Bioengineering of Catalonia (IBEC), Barcelona, Spain
Technical University of Catalonia (UPC), Barcelona, Spain

The outstanding results obtained by our researchers, as well as the efforts, enthusiasm and involvement of our support staff, made what could have been a very difficult year into a resounding success. The continuing political and economic challenges faced by the whole country barely made a mark on IBEC's spirit, as scientists and staff alike stepped up with an even greater level of involvement and dedication to achieve excellent results.

In 2013 we celebrated four Nature group papers, including a Nature Materials cover; 76 papers, 68% of the in the first quartile; 4 new patents; 11 PhD theses, another ERC grant in the shape of a Proof of Concept award for one group leader, who was already the holder of a Starting Grant.

Some of the scientific highlights of 2013 and the beginning of 2014 have included a pioneering breakthrough in the design of drugs controlled by light, when a collaboration with our neighbours the IRB resulted in the first photo-switchable molecules to control protein-protein interactions in a remote and non-invasive manner

The new strategic plan by IBEC was drawn up within the organisation on the basis of a clear overview of what our stakeholders (scientists, business, authorities and society as a whole) need and expect. It sets out to be a tool for the development and consolidation of IBEC as a top-class research centre. To achieve this goal we must focus and orient our efforts in the areas in which we believe we can improve and which will enable us to achieve sustained growth for our research centre.

I would like to end on an optimistic note, in the confidence that despite the restrictive budget environment IBEC has the capacity to take a role within some of these trends: to write many success stories on healthcare technology, nanomedicine and regenerative medicine, in the spheres of science, technology and innovation.

Prof. Josep Samitier

Prof. Josep Samitier *is Director of IBEC and Full Professor in the Physics Faculty (Electronic Dep.) University of Barcelona. From March 2001 to June 2005 Prof. Samitier was Deputy Head of the Barcelona Science Park (PCB). From February 1984 to June 1985 he was visiting research fellow at the Philips Electronic Laboratory, Paris, France. Prof. Samitier is the coordinator of the Spanish Platform on Nanomedicine. He received the Barcelona city Prize for the 2003 of the Barcelona Council in the area of technology.*

Microfluidics for Cancer Detection & Diagnosis – From Bench to Bedside

Chwee Teck Lim

Department of Biomedical Engineering, Mechanobiology Institute, National University of Singapore, Singapore

The presence and number of Circulating Tumor Cells (CTCs) in bloodstream of patients with epithelial cancers is an important intermediate step in cancer metastasis and is often associated with disease stage. As compared to obtaining tissue biopsy which is often challenging and invasive, "liquid biopsy" for CTCs detection can be carried out in patients due to accessibility and ease of collection during a routine blood draw. These CTCs in peripheral blood are showing their potential uses for early detection, diagnosis, prognosis and personalized treatment. Here, we demonstrate several effective methods of isolating CTCs by utilizing the unique differences in size and deformability of cancer cells from that of blood cells. By exploiting the fluid dynamics in specially designed microfiltration and spiral inertial microfluidics chips, CTCs which are generally stiffer and larger are physically separated from the more deformable and smaller blood constituents. Using this approach, we are able to retrieve intact and viable CTCs. With blood specimens from cancer patients, we demonstrated successful detection, isolation and retrieval of viable CTCs. These CTCs will aid in detecting the malignancy as well as determining their genotypic expressions and mutations. The microfluidic biochips have been commercialized and are undergoing tests around the world.

Prof. Chwee Teck Lim

Prof. Chwee Teck Lim *is Provost's Chair Professor, Department of Biomedical Engineering & Department of Mechanical Engineering, National University of Singapore.*

Professor Lim is currently a Provost's Chair Professor at the National University of Singapore. He is also a Principal Investigator at the Mechanobiology Institute as well as a Faculty Fellow of the Singapore-MIT Alliance for Research & Technology. He is founding member of the Department of Biomedical Engineering and the university's Nanoscience and Nanotechnology Initiative. Prof Lim's research interests include cell and molecular biomechanics, mechanobiology of human diseases as well as development of microfluidic diagnostics.

Prof Lim has authored more than 235 peer-reviewed journal articles (including 35 invited/review articles and 15 ISI highly cited papers), 24 book chapters and delivered more than 230 invited talks. He has also won several research awards and honors including the University's Outstanding Researcher Award, the Credit Suisse Technopreneur of the Year Award 2012, Wall Street Journal Asian Innovation Award 2012 (Gold), TechVenture Most Disruptive Innovation Award 2012, Asian Entrepreneurship Award 2012 (First Prize), TechVenture Rising Star Innovator Award 2011, President's Technology Award 2011 and the IES Prestigious Engineering Achievement Award 2010. He is currently editorial board member of 12 international journals. He has co-founded 4 start-up companies that exploit inventions that he has developed in his lab. His research was cited by MIT Technology Review as one of the top ten emerging technologies of 2006 that will "have a significant impact on business, medicine or culture".

Exploring the mechanical link between cells and the extracellular matrix

Pere Roca-Cusachs

Institute for Bioengineering of Catalonia (IBEC), Barcelona, Spain
University of Barcelona, Barcelona, Spain

Cell proliferation and differentiation, as well as key processes in development, tumorigenesis, and wound healing, are determined by mechanical stimuli transmitted between cells and their environment. However, how those stimuli are detected and regulated by cells remains largely unknown. One of the main types of structures transmitting mechanical forces to cells is that of integrin-based cell adhesions, which connect extracellular matrix proteins to the cell cytoskeleton through the transmembrane molecules integrins and different adaptor proteins. To study this system, we combine molecular biology techniques to target specific proteins, biophysical techniques to exert and measure forces in adhesion sites, and theoretical modelling. We employ this approach to dissect the molecular mechanisms by which cells withstand, detect, and transmit forces, and respond to tissue rigidity. In this talk, I will explain our findings showing that different integrins are adapted to sensing versus resisting forces, and that the adaptor molecules talin and α-actinin respectively detect and transmit forces through different mechanisms. Further, I will explain how cells use the binding dynamics between integrins and the extracellular matrix to detect matrix rigidity, and the implications that this has in cancer. Finally, I will show recent findings explaining how mechanical signals are integrated by an often forgotten player – the plasma membrane.

Dr. Pere Roca-Cusachs

Dr. Pere Roca-Cusachs *obtained his PhD in cellular biophysics in 2007 from the Medical School at the university of Barcelona. He then worked in the lab of Prof. Michael Sheetz (Department of Biological Sciences, Columbia University) as a post-doctoral researcher until 2011. In 2011, He joined the University of Barcelona as a tenure-track lecturer. In 2012, he obtained a position as junior group leader at IBEC. His research focuses on unraveling the physical and molecular mechanisms by which cells detect and respond to mechanical force.*

Instructive Biomaterials as Signal releasing Platforms

Elisabeth Engel

Biomaterials for regenerative therapies group, Institute for Bioengineering of Catalonia (IBEC), Barcelona, Spain
CIBER en Biomateriales, Bioingeniería y Nanomedicina (CIBER-BBN), Spain
Department of Materials Science and Metallurgy, Technical University of Catalonia, Barcelona, Spain

The field of tissue engineering has made steady progress in translating various tissue applications. Although the classical tissue engineering strategy - which involves the use of culture-expanded cells and scaffolds to produce a tissue construct for implantation - has been validated, this approach involves extensive cell expansion steps, requiring a lot of time and laborious effort before implantation. To bypass this ex vivo process, a new approach has been introduced: in situ tissue regeneration uses the body's own regenerating capacity by mobilizing host endogenous stem cells or tissue-specific progenitor cells to the site of the injury. This approach relies on development of a target-specific biomaterial scaffolding system that can effectively control the host microenvironment and mobilize host stem/progenitor cells to target tissues. An appropriate microenvironment provided by implanted scaffolds would facilitate recruitment of host cells that can be guided to regenerating structural and functional tissues.

Nowadays there is a wide range of biomaterials and processing techniques that have allowed the fabrication of scaffolds available for numerous applications in regenerative medicine. However, in general, available synthetic materials lack of appropriate signals for stimulating cells events such as adhesion, migration and differentiation into the desired cell lineage. This limitation is currently overcome by the incorporation of various morphogens and growth factors into the scaffolds in order to activate a specific cell behavior. The addition of biological molecules, which its clinical effect is still under discussion is another factor the hampers the arrival of these treatments to the patients.

Despite considerable advances in the understanding of physical and chemical material properties, only few so-called smart biomaterials have found their way into clinical application so far.

Nanostructured biomaterials have been developed in our lab to be instructive in order to effectively combine two features that in our experience actively participate in the regeneration of the damaged tissue and respond and react to stimuli from its environment: bioactivity and biodegradability. Bioactive materials are required in order to recruit cells and to stimulate their migration, growth and differentiation towards each specific tissue. Biodegradable materials are crucial to provide the structural support and the chemical cues to activate the regeneration process, while combining their gradual biodegradation into non-toxic products with the progressive release of the signals needed to guide the tissue repair. These bioactive and biodegradable materials should end up totally replaced by the natural regenerated tissue.

Dr. Elisabeth Engel

Dr. Elisabeth Engel *completed her doctorate in 2003, at the Institut Municipal d'Investigació Mèdica (IMIM) in the field of Medicine. During her postdoctoral stage in the UPC (since 2002) she set up the biology lab for tissue engineering and regenerative medicine. In 2007 she became Lecturer of the Universitat Politècnica de Catalunya (UPC), in the group of Dr. Josep A. Planell, where she worked as a senior researcher in the development and evaluation of new biomaterials to promote angiogenesis, and in 2010 she became associate professor.*

On May of 2012 she became Junior Group Leader of the 'Biomaterials for regenerative therapies group' at the Institute for Bioengineering of Catalonia (IBEC). Currently, its dual linkage to UPC and IBEC (defined in the framework of a cooperation agreement) allows her to perform both research and education/training activities.

The 'Biomaterials for regenerative therapies' group is a multidisciplinary research group focussing its research activities on the development and application of new biomaterials that will stimulate cell colonization and differentiation to promote tissue repair and regeneration. The areas of application are skin, nervous tissue, bone, tendons and vascularization.

Tumor Cell Dynamics in Metastatic Disease

Roger D. Kamm[1,2], Michelle B. Chen[1], Jessie Jeon[1], Simone Bersini[3,4], Matteo Moretti[4], Joseph Charest[5], Ran Li[2]

[1] *Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA, USA*

[2] *Department of Biological Engineering, Massachusetts Institute of Technology, Cambridge, MA, USA*

[3] *Department of Electronics, Information and Bioengineering, Politecnico di Milano, Milano, Italy*

[4] *Cell and Tissue Engineering Lab, IRCCS Istituto Ortopedico Galeazzi, Milano, Italy*

[5] *Charles Stark Draper Laboratory, Cambridge, MA, USA*

Microfluidics are increasingly utilized to model in vivo processes in a variety of pathological conditions. Several applications in connection with various stages of metastatic cancer will be addressed.

Role of macrophages on tumor cell migration. We have quantitatively analyzed the effects on tumor cell migration of macrophages polarized into the various subtypes. We found that, while all activated macrophages enhance tumor cell migration, different sub-types (M1 vs. M2) influence migration in distinctly different ways, one affecting the speed and the other the directedness of migration. Current studies are examining the molecular basis for this response. Other experiments are investigating the role of interstitial flow on macrophage migration. We had found earlier that tumor cells migrate upstream against the flow, either when cell density is high, or the CCR7 receptor is blocked. Our new results demonstrate that macrophages show the same tendencies, although the effect is even more pronounced.

Extravasation experiments under flow or static conditions. In order to explore the role of integrins in the extravasation process, we developed an shRNA knock-down of the b-1 integrin in the MDA-MB-231 breast cancer cell line. Comparing the extravasation potential of control cells to the b-1 knock-downs, we find that 1) tumor cell adhesion to the endothelium is reduced, 2) transmigration is greatly impaired, and the tumor cells remain rounded and often become incorporated into the endothelial monolayer for extended periods, and 3) their ability to traverse the basement membrane is impaired, and 4) in the rare cases in which they escape from the vessel, they tend to remain close to the endothelium. Parallel studies are being conducted in mice (a collaboration with the Richard Hynes lab) to compare the results.

Bone and muscle organ models. Using previously developed models with a microvascular network that permeates through the 3D matrix and our system with an endothelial monolayer on the side (channel-facing surface) of an ECM analog, we have taken initial steps to model the organ-specificity of certain types of cancer to particular tissues. In these experiments, we introduced MSC-derived osteoblast-like cells into a collagen gel, and compared extravasation rates with those into a cell-free gel. We found that intravasation rates were considerably elevated, as was the permeability of the vascular wall. For comparison, we seeded the gel with C2C12 myoblasts, to see if the reduced extravasation potential could be observed. Extravasation rates into the model muscle were slightly reduced compared to the cell free gel, despite the permeability being higher. Adenosine was identified as an important factor.

Prof. Roger D Kamm

Prof. Roger Kamm is the Cecil and Ida Green Distinguished Professor of Biological and Mechanical Engineering and former Associate Head of the Department of Mechanical Engineering at MIT

A primary objective of Kamm's research group has been the application of fundamental concepts in fluid and solid mechanics to better understand essential biological and physiological phenomena. Spanning a wide range, research in the Kamm lab has addressed issues in the respiratory, ocular and cardiovascular systems. More recently, his attention has focused on two areas, the molecular mechanisms of cellular force sensation, and the development of new microfluidic technologies for vascularized engineered tissues. Kamm has a long-standing interest in biomechanics education, and has played key roles in developing both graduate and undergraduate bioengineering programs at MIT.

He is the 2010 recipient of the Lissner Award from the American Society of Mechanical Engineers and a member of the Institute of Medicine. He is the former chair of the US National Committee on Biomechanics and of the World Council on Biomechanics. Kamm currently directs a new NSF Science and Technology Center on Emergent Behaviors of Integrated Cellular Systems and is Chair of the International Academy of Medical and Biological Engineering.

Posters and Flash presentations

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NANOMEDICINE - Posters with Flash presentation

Poster	Name	Title
1	Aida Baelo	Methyl-hydroxylamine specifically inhibits ribonucleotide reductase activity in pathogenic bacteria
2	Noelia Campillo	A simple PDMS chip to subject cultured cells to fast gas composition changes and stretch
3	Víctor González	Unveiling the mechanical interaction between tight junction protein ZO-1 and integrin α5β1 in cell adhesion and migration
4	Luis G. Rigat	Towards Lab-on-a-Chip approaches for the functional study of the spleen in hematological disorders
5	Marc Van Der Hofstadt	New approach to image single bacterial division on gelatine coated substrates with the Atomic Force Microscope.
6	Ziqiu Tong	Lab-on-a-chip platform for neurobiological applications

NANOMEDICINE - Posters

Poster	Name	Title
7	Joana Azevedo Elisabet Marti	Nanovectors for antimalarial targeted drug delivery
8	Maria Chiara Biagi	Nanoscale electrical characterization of biological samples at microwave frequencies
9	Luis Botaya Turón	AFM-SCM system based on quartz tuning fork nano-sensors equipped with glue-free solid metallic tips.

10	Anna Crespo	NrdR modulates transcriptionally the expression of ribonucleotidil reductase genes and topA gene in Pseudomonas aeruginosa
11	Manuela Dietrich	Evidence for moonlighting functions of the θ subunit of Escherichia coli DNA polymerase III
12	Rene Fabregas	A 3D finite element model for atomic force microscopy: quantitative assessment of the effects of apex, cone and cantilever.
13	Berta Gumí	"The effect of galactosylceramides on the nanomechanical stability of model lipid membranes"
14	Javier Hoyo	Electron transfer processes in biomimetic membranes incorporating prenylquinones
15	Mário Hüttener	Role of nucleoid-associated protein Hha in virulence and infection in EAEC strain 042
16	Antonio Juárez	Application of dielectrophoresis to improve PCR detection of a food spoiling yeast in a real sample
17	Antonio Juárez	Antibiotic resistance plasmids interacting with their bacterial hosts: IncHI1 R27 plasmid and Salmonella as a model
18	Anita J. Kosmalska	Passive cell membrane regulation in response to mechanical stimuli
19	Jose Muñoz	Non-homogenised Finite Element Analysis for 3D Traction Force Microscopy
20	Lucas Pedraz	Key genes involved in DNA synthesis are specifically regulated by quorum sensing in Pseudomonas aeruginosa.
21	Carlos Pérez	"Dissecting the mechanical role of E- and P-cadherin in breast cancer"
22	Marta Pozuelo	MAPPING ELECTRONIC PATHWAYS IN REDOX PROTEINS BY SINGLE MOLECULE JUNCTION MEASUREMENTS
23	Torrents	Deciphering the involvement of ribonucleotide reductase in adherent-invasive Escherichia coli LF82 infection
24	Torrents	Identification of new antibacterial molecules targeting bacterial DNA synthesis
25	Zalvidea	"Development of a multi-photon microscopy system for measuring traction forces during in vivo angiogenesis"

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CELL ENGINEERING - Posters with Flash presentation

Poster	Name	Titel
26	Agustí Brugués	Forces driving epithelial wound healing
27	Laura Casares	Hydraulic fracture during epithelial stretching
28	Vanessa Gil	Sema3E/PlexinD1 regulates the migration of hem-derived Cajal-Retzius cells in developing cerebral cortex
29	Maria Valls	Optimization of cell seeding in 3D scaffolds and fabrication of an electrically stimulated perfusion bioreactor for cardiac patch generation
30	Cristina Vergara	"Cellular Prion Protein: A Key Modulator in the Evolution of Alzheimer's Disease"

CELL ENGINEERING - Posters

Poster	Name	Title
31	Judith Buxadera	Antifouling coatings on titanium: deposition methods for poly(ethylene glycol)
32	Irene Cano	"In vitro development of cell-derived extracellular matrix scaffolds using PLA microparticles for bone regeneration"
33	Vito Conte	Force fluctuations and topology in epithelial tissue dynamics
34	José A. del Rio	Increased migration of geneticaly engineered olfactory ensheathing cells (OECs) on inhibitory substrates and lesioned spinal cord.
35	Claudia Di Guglielmo	Reporter transgenic cell lines to study the differentiation of Human Induced Pluripotent Stem cells to cardiomyocytes.
36	Roberta Fraioli	Integrin-Selective Titanium Surfaces to Improve the Osteointegration of Implant Materials
37	Albert Garcia	Microstructuring of PEGDA hydrogels to develop epithelial tissue analogs
38	Anna Garcia	The role of extracellular matrix proteins in zebrafish heart regeneration
39	Riccardo Levato	Biofabrication of osteochondral grafts via 3D printing of cell-laden microcarriers in a gelatin methacrylamide/gellan gum bioink
40	Joan Martí	Glass coated PLA fiber scaffolds: a new approach for bone regeneration
41	Ágata Mata	Impairment of Reelin-mediated neuronal plasticity in rapid progressive dementia (sCJD)
42	Andy Olivares	Ex-vivo Biomechanical Characterization of Rabbit artery
43	Clara Sanjurjo	Induced Pluripotent Stem cells and biofunctionalized Scaffolds for Cartilage Engineering
44	Isil Tekeli	In vivo three-photon activation for irreversible cell labeling in zebrafish
45	Isil Tekeli	Studying the migration of zebrafish epicardial cells by particle image velocimetry and traction microscopy

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ICT FOR HEALTH - Posters with Flash presentation

Poster	Name	Titel
46	Eduard Bergés	Endowing surgical robots with cognitive capabilities
47	Manuel Lozano García	Multichannel Analysis of Respiratory Sounds for the Assessment of Pulmonary Diseases
48	Leonardo Sarlabous	Non-invasive Method to Monitor the Respiratory Muscle Function in Patients with COPD during Tidal Volume at Rest
49	Themis Toumanidou	The effect of disc degeneration in combination with muscle activity on the intradiscal pressures: a continuum approach using a L1-S1 patient-specific FE model for simulated standing

ICT FOR HEALTH - Posters

Poster	Name	Titel
50	Ion Carrera	Stabilization of a Schatzker I tibial plateau fracture through proximal tibial locked plating system or cannulated screws: a comparative numerical study"
51	Luis Carlos Estrada	The use of Concentric Ring Electrodes for Recording of Diaphragm Electromyographic Signals during Respiration
52	Juan Manuel Jiménez	Fast determination of the toasting degree in wine oak barrels by Ion Mobility Spectrometry
53	Jérôme Noailly	Multiscale analysis of the hip joint: translate mechanical information from inverse analyses of body motion into boundary loads for finite element calculations of organ/tissue biomechanics"
54	Raquel Obregon	Mimicking olfactory receptors with molecular imprinted polymers
55	Andy Olivares	Agent-based modeling to explore the early stage of Atherosclerosis
56	Raquel Pruna	Odor information segregation in the olfactory bulb
57	Vijaykumar Rajasekaran	Adaptive walking using a wearable exoskeleton
58	Raquel Rodríguez	Methodology for gas chromatography - mass spectrometry data analysis: application to breath based diagnostics of pulmonary diseases
59	Carlos Ruiz	Intervertebral disc degeneration: How does proteoglycan loss affect the cell viability?
60	Carlos Ruiz	Effect of the cartilage endplate gradient of composition on the fluid exchange at the intervertebral disc - vertebra interface
61	Oiane Urra	Synergies as a Tool to Design and Assess an Effective Stroke Rehabilitation

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