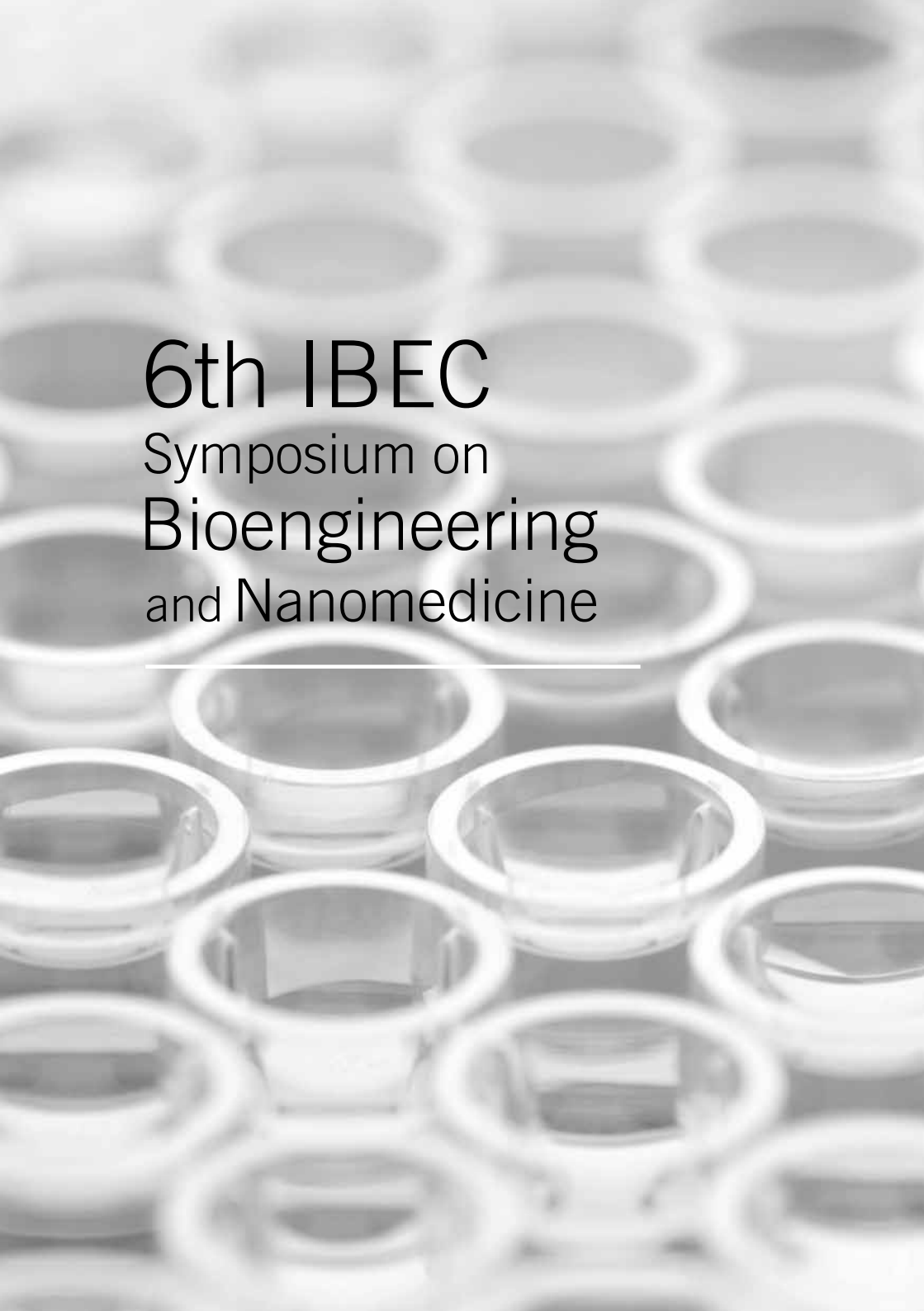
Institute for bioengineering of Catalonia

6th IBEC Symposium on Bioengineering and Nanomedicine

08.05.2013 Barcelona

Escola Tècnica Superior d'Enginyeria Industrial de Barcelona (ETSEIB), UPC
Avda. Diagonal 647, 08028 Barcelona



6th IBEC
Symposium on Bioengineering and Nanomedicine

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6th IBEC Symposium on Bioengineering and Nanomedicine

Welcome to IBEC's sixth annual symposium on Bioengineering and Nanomedicine

The symposium is our yearly opportunity to publicly present our research and showcase some of the achievements of international experts in our main fields of interest.

This year our keynote speakers include the two new members of IBEC's International Scientific Committee, who are specialists in regenerative medicine and biomedical imaging, as well as our former director and current Rector of the Open University of Catalonia. In addition to the speakers' presentations, attendees can enjoy the flash presentations from our young researchers and PhD students, which will cover an even wider range of topics, as well as the poster sessions.

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

Enjoy the symposium!

Josep Samitier
Associate Director of IBEC

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and Nanomedicine

Information for participants

Information Desk

The conference registration and information desk will be located in the main reception hall of the ETSEIB Auditorium. It will be staffed from 08:30 to 16:30 on Wednesday 8th May.

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 Wednesday 8th May. 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 16:30 and 17:00. 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.

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Programme

Wednesday, 8th May	
08:30-09:00	Registration
09:00-09:30	Opening ceremony
09:30-10:05	**Prof. Josep A. Planell**, IBEC Everything you wanted to know about IBEC's history that nobody told you before
10:05-11:00	**Flash poster presentations I**
11:00-11:50	Coffee break & poster session
11:50-12:25	**Prof. George Altankov**, IBEC Type IV collagen at cell-biomaterial interface
12:25-13:15	**Flash poster presentations II**
13:15-14:15	Lunch & poster session
14:15-14:50	**Prof. Jocelyne Troccaz**, CNRS Image and robot-assisted prostate interventions
14:50-15:25	**Prof. Albert van den Berg**, University of Twente Labs, cells and organs on a chip
15:25-16:00	**Prof. Bernat Soria**, CABIMER Cellular medicaments: Changing the paradigm
16:00-16:15	Awards and closing ceremony
16:15-16:30	Final toast

KEYNOTE LECTURES

Wednesday, 8th May 9:30

Everything you wanted to know about IBEC's history that nobody told you before

Josep A. Planell

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

In this talk we will review the history of IBEC, from the creation in 2003 of the Catalan Reference Centre for Bioengineering (CREBEC), aimed at coordinating the multidisciplinary research activities in biomedical engineering carried out in Catalonia. The CREBEC was composed of different divisions from the above mentioned CREB and the Research Centre on Bioelectronics and Nanobioscience (CBEN) of the University of Barcelona (UB). Being Director of CREBEC since its foundation, we succeeded in the implementation of this unique example of multidisciplinary collaboration between two universities until its transformation into the Institute for Bioengineering of Catalonia (IBEC), a non-profit private foundation established at the end of December 2005 by the Generalitat de Catalunya (Autonomous Government of Catalonia), the University of Barcelona and the Technical University of Catalonia.

I was appointed Director of IBEC in 2005 and since then, IBEC's scientific and administrative structure has been set up, and IBEC has started to position itself as an international centre of reference in bioengineering and nanomedicine, developing interdisciplinary multidisciplinary research of excellence in biomedical engineering and becoming the technological counterpart to hospitals, biomedical research centres and companies.

Prof. Josep A. Planell

Professor Josep A. Planell. *Graduate in Physics at the University of Barcelona, Ph.D. (Materials Science) at the University of London. Professor of Materials at the Universitat Politècnica de Catalunya. Fellow, Biomaterials Science and Engineering (FBSE) of the International Union Biomaterials Science and Engineering Societies. President of the Universitat Oberta de Catalunya. Director of the Institute for Bioengineering of Catalonia in Barcelona (2005-2013). Vicepresident of the European Society for Biomaterials (2005-2009). Editor-in-Chief of the Journal of Materials Science: Materials in Medicine (Springer). Chairman of the 17th European Conference in Biomaterials in Barcelona 2002. Member of the Royal Academy of Sciences and Arts of Barcelona, and Member of the Royal Academy of Doctors of Barcelona. Prize "Ciutat de Barcelona" in the area of Technological Research in 2006.*

Notes

Type IV Collagen at Cell-Biomaterial Interface

George Altankov[1], **Nuno M. Coelho**[1]

[1] Institute for Bioengineering of Catalonia (IBEC), Barcelona, Spain
[2] Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain

Initial molecular events that take place at biomaterial interfaces mimic to a certain extent the natural interactions of cells with the extracellular matrix (ECM) components. Here we describe the fate of type IV collagen (Col IV) - the main structural component of the basement membrane (BM) – upon its adsorption onto different model biomaterial interfaces of varying wettability, chemistry and charge, and we demonstrate that it strongly affects their biological performance. Adsorption kinetic of Col IV correlates well with the spontaneous organization of the protein layer on above model surfaces. AFM studies revealed specific substratum–dependent adsorption pattern of Col IV, ranging from single molecular deposition to fine network formations on hydrophilic OH- and positively charged amino-functionalized substrates. Conversely, on hydrophobic CH3 and negatively charged COOH surfaces an augmented network consisting of molecular aggregates was observed. Similar complex structures were also found on families of model substrates with tailored density of OH functions. To characterize the biological response to these nanostructured surfaces human umbilical endothelial cells (HUVEC) and fibroblasts were employed considering their relevance to vascular tissue engineering purposes. We not only found that both cell types attach well to the adsorbed Col IV but also tended to reorganize it in fibril-like patterns. Following the trend of decreased adsorption (NH2 > CH3 > COOH > OH), the reorganization pattern of Col IV improved. However, cells attached better to the two extreme cases (i.e. OH- and NH2-surfaces), and thus independently on the amount of adsorbed protein, as confirmed by the quantitative measurements of cell adhesion and spreading, as well as the expression of p-FAK, $\alpha 1$ and $\alpha 2$ integrins – characterizing the proper functioning of cell adhesion machinery. We further found that cells remodel Col IV in two ways: by mechanical reorganization and by proteolytic degradation, revealing the particular role of fibronectin in the reorganization process, and of MMP2 and MMP9 in the enzymatic degradation of adsorbed Col IV. Another important observation was that in hydrophobic environment the pericellular proteolytic activity override the Col IV reorganization, which corroborates with the altered cell adhesion and morphology. Taken together these results support our view that the ability of cells to remodel surface associated proteins strongly affects the biological properties of a biomaterial. They also show that an appropriate chemical functionalization (NH2, OH), combined with Col IV pre-adsorption, comprises a prospective surface modification that might improve the take of cardiovascular implants.

Prof. George Altankov

Professor George Altankov *received his MD in 1974 from the Medical University of Varna (Bulgaria) where he also started his research career as Assistant Professor of Physiology. After obtaining his PhD he joined a research team at the Institute of Biophysics, Bulgarian Academy of Sciences, advancing to Associate Professor (1995) and Full Professor (2004) as well as Head of the Cell Adhesion Department (2004-2007) and Research Director of the institute (2004-2006).*

In 2003 he obtained a Doctor of Sciences degree in Cell Biology. In 1991-1993 he joined the group of Fred Grinnell in Southwestern Medical Center at Dallas and later visited several leading laboratories in Europe, including Humboldt University, GKSS Research Center (Berlin), Technical University of Barcelona and others, working on joint projects.

He was awarded a Marie Curie senior EU fellowship and a Sabbatical Grant of the Spanish Ministry (2006). He has published more than 100 original papers and filed several patents in the field of cell-biomaterials interaction and tissue engineering. Since April 2007 he has been an ICREA Research Professor at the Institute for Bioengineering of Catalonia (IBEC), continuing his research in the field with emphasis on the organization of extracellular matrix at biomaterials interfaces.

Image and robot-assisted prostate interventions

Jocelyne Troccaz

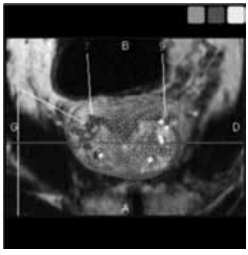
UJF-Grenoble 1 / CNRS / TIMC-IMAG UMR 5525, Grenoble, France

Because prostate cancer has emerged as the most frequent cancer amongst men in Europe and the second most frequent in developed countries, the increase of quality in diagnostic and treatment is potentially very important. In this talk we will show how techniques drawn from the domain of "computer aided medical interventions" can contribute to a progress in the detection and treatment of such cancer. We will focus on image processing, simulation and robotics assistance and we will describe recent progresses obtained in the TIMC-IMAG laboratory in cooperation with its clinical and industrial partners. Contributions include elastic registration of 3D volumes for 3D biopsy mapping, image fusion, simulation of US-guided biopsy and the development of a robot for transperineal needle insertion. The clinical context will be presented before describing the approaches and tools and their evaluation.

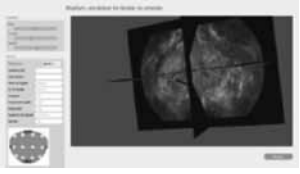
Hungr N, Baumann M, Long JA, Troccaz J. (2012). A 3D Ultrasound Robotic Prostate Brachytherapy System with Prostate Motion Tracking? IEEE Transactions on Robotics, 2012, 28(6): 1382-1397

Baumann M, Mozer P, Daanen V, Troccaz J. (2012). Prostate Biopsy Tracking with Deformation Estimation. Medical Image Analysis, 6(3):562-576

Janssoone T, Chevreau G, Vadcard L, Mozer P, Troccaz J Biopsym : a learning environment for transrectal ultrasound guided prostate biopsies, Proceedings of MMVR'2011 (Medical Meets Virtual Reality), Newport Beach, USA, 8-10 Février 2011, published in Stud Health Technol Inform. 2011;163:242-6



Biopsy mapping after US/MRI fusion



Visualizing the performance of a trainer in the Biopsym simulator

Prosper: a robot for prostate brachytherapy

Prof. Jocelyne Troccaz

Professor Jocelyne Troccaz *was born in 1959. She received her Ph.D. in computer science from the Institut National Polytechnique de Grenoble, France, in 1986. She was a teaching assistant in Grenoble Joseph Fourier University between 1984 and 1988 and was recruited by CNRS in 1988 as research fellow. Since 1998, she has been the Research Director with the Centre National de la Recherche Scientifique.*

Until 1990, her research activity was in the field of automatic robot programming for industrial and spatial robotics. She moved to medical robotics in 1990. Her personal research activity with the TIMC-IMAG Laboratory is about the medical applications of robotics and medical image processing. She is involved in several clinical collaborations. She has more than 180 publications, including international patents. And has been an Invited Speaker at several conferences. She is on the organizing committees of a number of international conferences of her former and current research domains. She has been a Consultant for robotics companies. In 2010, she became a Medical Image Computing and Computer Assisted Intervention Fellow. She has been in charge of the Computer Assisted Medical Interventions team (40 people) in TIMC since 1996 and deputy Director of TIMC since 2006.

Dr. Troccaz is or has been an Associate Editor for the Journal of Computer-Aided Surgery, the IEEE Transactions on Robotics and Autmation and IEEE Transactions on Robotics and the International Journal of Medical Robotics and Computer-Aided Surgery. She is on the Editorial Board of the Medical Image Analysis Journal.

"Cellular Medicaments": Changing the paradigm

Bernat Soria

CABIMER, Andalusian Center for Molecular Biology and Regenerative Medicine, Seville (bernat.soria@cabimer.es)

Advanced Therapy Medicinal Products (ATMP) are a new medicinal product category including: Somatic Cell Therapy Medical Products (CTMP), Gene Therapy Medical Products (GTMP) and Tissue Engineered Products (TEP) [1]. Cells, genes and engineered tissues are regarded as new active substances in the development of medicines. In fact the use of cells as medicaments constitute a new paradigm in pharmacology. From the classical approach of pharma innovation based in small molecule (chemistry) to the most recent biological (biology) we have recently moved into the use of cells. However, all the body of knowledge generated with small molecules and biological seems to be insufficient to warrant safety and efficacy regulations when applied to the use of cells as medicaments. New emerging therapies with stem cells, which are the targets, toxicology, pharmacodynamics or biodistribution? Do stem cells interact with the host? Better autologous or heterologous? Services or products? All these questions pose new problems to surgeons, immunologists, cell therapists and more specially to regulators.

We will discuss examples of stem cell differentiation, clinical trials of cell therapy in humans and cells-host interactions.

[1] Gálvez-Martín, P; Clares-Naveros, B; Hmadcha, A; Ruiz-Martinez, A; Soria, B (2012). Development of a cell-based medicinal product: regulatory structures in the European Union British Med Bull DOI:10.1093/bmb/lds036

Prof. Bernat Soria

Professor Bernat Soria, MD, PhD. *Director of the Stem Cells Department of the Andalusian Centre for Molecular Biology and Regenerative Medicine (CABIMER), Director of the Andalusian Cell Therapy and Regenerative Medicine Program and the Observatory for International R+D Alliances.*

Former Minister of Health and Consumer Affairs of Spain (2007-2009), he was previously Professor of Physiology in Alicante and Elche (1986-2005), Director of CABIMER (Andalusian Center for Molecular Biology and Regenerative Medicine in Seville, Spain) (2005-2007) and is a Professor of Regenerative Medicine at the University Pablo de Olavide in Seville. He graduated from Valencia University (Spain) and completed his postdoctoral studies at the Max Planck Institute for Biophysical Chemistry (Göttingen, Germany) and at the University of East Anglia, School of Biological Sciences (UK). He has been Visiting Prof in the National University of Singapore, Chairman of the European Stem Cell Network and President of the European Association of Biophysical Societies. He has previously held posts including the Presidency of the Spanish Society of Diabetes, the Spanish Society of Biophysics and the Spanish Society of Physiological Sciences. He has published more than 100 papers and edited 4 books. His work has received more than 3000 quotations in the fields of stem cell research, pancreatic islet biophysics and pathophysiology. His publication in Diabetes (2000) still belongs to the Highly Cited Papers group and pioneered the field of stem cell differentiation of stem cells into insulin producing cells. Several of his former students are current Professors in the areas of Physiology, Biophysics, Nutrition, Applied Biology, etc. Among others he has received the Prize and Gold Medal of the Royal Academy of Medicine, the Galien International Prize, the Medal of Andalucia and, more recently, the High Cross of the Carlos III Order from the King of Spain.

Labs, Cells and Organs on a Chip

Albert van den Berg

BIOS/Lab on a Chip group, MESA+ Institute for Nanotechnology, University of Twente, The Netherlands

Contact: a.vandenberg@utwente.nl

The recent rapid developments in microfluidics technologies has enabled the realization of miniaturized laboratories. These Labs-on-a-Chip will play an important role in future medicine, both in point-of-care devices for drug or biomarker monitoring, as well as in early diagnostic devices. We developed a pre-filled ready-to-use capillary electrophoresis platform for measuring ions in blood. It is used to monitor lithium in finger-prick blood of manic-depressive patients, but can also be used for measuring calcium in blood for prevention of milk fever, or for measuring creatinine in blood or sodium in urine for early detection of ESRD. Apart from diagnostic devices, microfluidic devices are increasingly used to realise advance disease and organ-models, as illustrated by the blood-brain barrier chip and a blood vessel on a chip. Finally, a microdroplet platform for encapsulation of single cells in microdroplets, ordering of these microdroplets and 1:1 fusion of these droplets is demonstrated. We believe this is a very powerful new tool that can be used for high-throughput single cell experimentation.

Prof. Albert van den Berg

Professor Albert van den Berg *received his MSc in applied physics in 1983 and his PhD in 1988 both at the University of Twente, the Netherlands. From 1988-1993 he worked in Neuchatel, Switzerland, at the CSEM and the University (IMT) on miniaturized chemical sensors. From 1993 until 1999 he was research director of Micro Total Analysis Systems (μTAS) at MESA, University of Twente. In 1998 he was appointed as part-time professor in "Biochemical Analysis Systems", and later in 2000 as full professor on Miniaturized Systems for (Bio) Chemical Analysis in the faculty of Electrical Engineering. He has received several honors and awards such as Simon Stevin (2002), ERC Advanced (2008) and ERC Proof of Concept (2011) grant, Spinoza prize (2009) and Honorary University Professorship (2010).*

He has co-authored over 225 papers (H=41) and over 10 patents, and has been involved in 6 spin-off companies. In 2011 he became a board member of the Royal Dutch Academy of Sciences (KNAW).

His current research interests focus on microanalysis systems and nanosensors, nanofluidics and single cells and tissues on chips, especially with applications in personalized health care and development of sustainable (nano)technologies.


Ultrathin Thermoresponsive Polymer Nanocoatings for
Encapsulation.
Microfluidic devices for
Neurobiology

POSTERS

Posters

Shading = flash presentation

1	Silvia Albert	Short time RPE and PR cell- regeneration
2	Zaida Alvarez	3D Nanofibres scaffold mimics neural progenitor niches.
3	Luis E. Amigo	Study of interaction forces in robot-aided therapy
4	Andrés Arcentales	Coherence between respiratory flow signal and heart rate variability applied to classify weaning trials patients
5	Milad Avazbeigi	Applying non-negative matrix factorization for bi-clustering receptors/odors of drosophila
6	Elsa Bazellières	Regulation of collective cell migration and intercellular force transmission by cell-cell junction proteins
7	Luis Botaya	Nanocharacterization station with augmented reality user interface for cell biology research
8	Agustí Brugués	Physical forces driving wound healing
9	Annalisa Calò	Nanomechanics of nano-sized yeast membrane vesicles probed by Atomic Force Microscopy
10	Patricia Carulla	PrPC regulates EGFR function and cell shape dynamics in Neuro2a cells
11	Andrea Casallas	Estudio de variables y características físicas - fisiológicas de un sistema de navegación tubular
12	Douglas Clift	Fabrication of a bioactive calcium phosphate glass ceramic for bone regeneration via the sol-gel method
13	Vito Conte	Modelling wound healing in epithelial tissues
14	Anna Crespo	NrdR modulate differentially the expression of Pseudomonas aeruginosa ribonucleotide reductase genes
15	Lorena de Oñate	Transdifferentiation of human fibroblasts to cardiac fate.
16	Manuela Dietrich	Evidences for a regulatory function of the θ subunit of the DNA polymerase III
17	Luis Estrada	Electrical characterization of laplacian surface electromyographic signals in biceps brachii during isometric contraction

Posters

18	Luis Fernández	Calibration transfer in temperature modulation MOX sensor arrays
19	Laura Fumagalli	Label-free identification of single dielectric nanoparticles and viruses with ultraweak polarization forces
20	Albert García	Extended microcontact printing technique for the patterning of soft substrates: application to stem cell differentiation
21	Simón García	Interplay between chemical and mechanical guidance during collective cell migration
22	Elena Garreta	Effect of oxygen tension on the pulmonary differentiation of mouse embryonic stem cells
23	Maria Godoy	Adhesion decrease of streptococcus sanguinis and Lactobacillus salivarius by LF11 antibacterial peptide
24	Laura González	Micro-contact printed antibodies imaging by quartz tuning fork sensors in different working modes
25	Arlyng González	Calcium sensing receptor (CaSR) and extracellular calcium as potential target on bone regeneration
26	Ana Guamán	Ozone exposure effect in humans through analysis of expired breath condensate (EBC) using Gas Chromatography/Mass Spectrometry (GC/MS)
27	Javier Hoyo	Incorporation of ubiquinone in supported lipid bilayers on ITO
28	Mario Hüttener	Role of the Hha protein in the regulation of virulence factors in EAEC 042 strain
29	Senda Jiménez	Studying heart regeneration through the ablation of proliferating cells
30	Anita Joanna Kosmalska	Membrane reservoirs as regulators of plasma membrane tension
31	Anna Lagunas	Dendrimer-based nano-patterning of high local RGD-ligand density patches assist focal adhesion assembly and maturation on unevenly distributed surface
32	Montse López	Electronic properties of electrochemical and bioelectrochemical systems studied by differential conductance ECSTM
33	Andrea Malandrino	Metabolic-transport simulations within the intervertebral disc: a nutritional link to cell death and sustained deformations
34	Joana Marques	Nanovectors for antimalarial targeted drug delivery

Posters

35	Andres Martín-Quirós	Photocontrol of endocytosis through engineered inhibitory peptides
36	Alba J. Mateos	*In vitro* modeling of LGMD2A through patient-specific iPS cells
37	Esther Melo	Decellularized porcine trachea for the reconstruction of a bronchial respiratory model *in vitro*
38	Olga Mur	Multimodal analysis for hand activity recognition
39	Claudia Navarro	The effect of extracellular calcium on dermal fibroblasts with potential applications in skin wound healing
40	Sara Nocentini	PlexinD1/Sema3E modulates migration of hem-derived Cajal-Retzius cells by regulating CXCL12/CXCR4 chemoattraction.
41	Paula N. Nonaka	Effects of freezing/thawing on the mechanical properties of decellularized lungs
42	Fernando Novio	Multifunctional coordination polymer nanoparticles for medical applications
43	Mireia Oliva	Development of polysaccharidic nanocarriers for specific enzyme delivery: the importance of freeze-drying
44	Andy L. Olivares	Vascular tissue engineering through tri-dimensional multiscale modelling
45	Sergio Oller	Preprocessing techniques for GC-MS metabolomics data
46	Jordi Otero	Shear force microscopy with solid metallic tips for simultaneous topographic and electrical measurements at the nanoscale
47	Ioannis Papadopoulos	Generation and characterization of induced pluripotent stem (iPS) cell lines from Hemophilia patients
48	Wilmer Pardo	Study of flattened surfaces for improved the electrochemical signal in DNA hybridization event
49	Vijaykumar Rajasekaran	Control strategies in robotic rehabilitation therapies compatible with FES
50	Isabel Ramos	Role of the extracellular matrix during zebrafish heart regeneration
51	Diego Reginensi	Block the migratory properties of OECs in biomimetic condicions of SCI and analysis of migration on electrospun nanofibers

Posters

52	Alicia Reyes	Electrochemical detection of alkaline phosphatase in differentiated osteoblasts
53	Luis G. Rigat	Human Splenon-on-a-Chip: design and validation of a microfluidic model resembling the interstitial slits and the fast and slow microcirculations
54	Pilar Rodríguez	How do cells behave in 3 dimensions? Measuring forces within scaffolds
55	Adriana Rodríguez-Marí	Zebrafish: swimming towards the genetic mechanisms of heart regeneration
56	Carlos Ruiz	A composition-dependent intervertebral disc model for integrated studies of degenerative changes
57	Aitor Sánchez	Elastin-like recombinamers/citric acid hydrogels for bone tissue engineering
58	Tiziano Serra	RGD-modified Poly(ε-lysine) dendron functionalization of 3D printed scaffolds and human mesenchymal stem cell response
59	Eduardo Soudah	Computational fluid dynamics and medical imaging to study the effects of the mandibular advancement device positioning in the treatment of sleep apnea
60	Isil Tekeli	Using a photo-inducible CreERT2 recombinase system for cell tracing in zebrafish
61	Eduard Torrents	Preparation of ciprofloxacin-encapsulated poly-(lactic-co-glycolic acid) nanoparticles and its antibacterial activity
62	Themis Toumanidou	On the patient-specific calibration of an active constitutive model for the lumbar muscles
63	Oiane Urra	Decoding the spatial characteristics of arm movements from EMG signals
64	Marc van der Hofstadt	Imaging living bacteria cells with the atomic force microscopy (AFM)
65	Cristina Vergara	The protective role of cellular prion protein in Alzheimer's disease
66	Manuel Vinagre	Characterizing human actions from multivariate time series with descriptive statistics and data mining
67	Rosa Letizia Zaffino	LoRET (Long Range Electron Transport) based nano-gap sensor for DNA detection

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