Volume VI, Issue III
Summer '11

July—September 2011

interLink

Linking the international community of TERMIS

Highlights

- 2011 TERMIS Election
- News from SYIS Chapters
- 2011 TERMIS-NA Award Recipients
- 2012 TERMIS World Congress

Inside this issue:

Letter from the President

Dear Members of TERMIS,

As 2011 draws to a close, I would like to share with you some highlights of the past year.

I am pleased to report that membership in TERMIS is at an all-time high. Following the North American chapter meeting in Houston this December, TERMIS will have almost 4,000 members. Importantly, this membership is divided almost equally among the 3 TERMIS Chapters. This growth in membership is representative of the strength of our organization and the appeal of Regenerative Medicine to the scientific community at-large. Amount of activity is also indicative of the global interest in Regenerative Medicine. I am also particularly excited by the fact that more than 700 of these members are young investigators through membership in the Student Chapter.

I would also like to share with you the accomplishments of the Asia Pacific Chapter. Approximately 15 months ago, I appointed a President's Committee led by Wei Liu (Shanghai Jiao Tong University School of Medicine). This Committee was charged with the task of drafting a formal charter for the AP Chapter. I am pleased to report that this charter has now been approved by the TERMIS Governing Board and subsequently ratified by the AP Chapter which is chaired by Professor Teruo Okano (Tokyo Women's Medical University). This accomplishment represents a major step forward and I'd like to express my gratitude for the hard work and time put forth by Wei Liu and the rest of the Committee. Other members of the Committee include: James Goh (National University of Singapore), Mime Egami (Tokyo Women's Medical University), and Il-Woo Lee (The Catholic University of Korea).

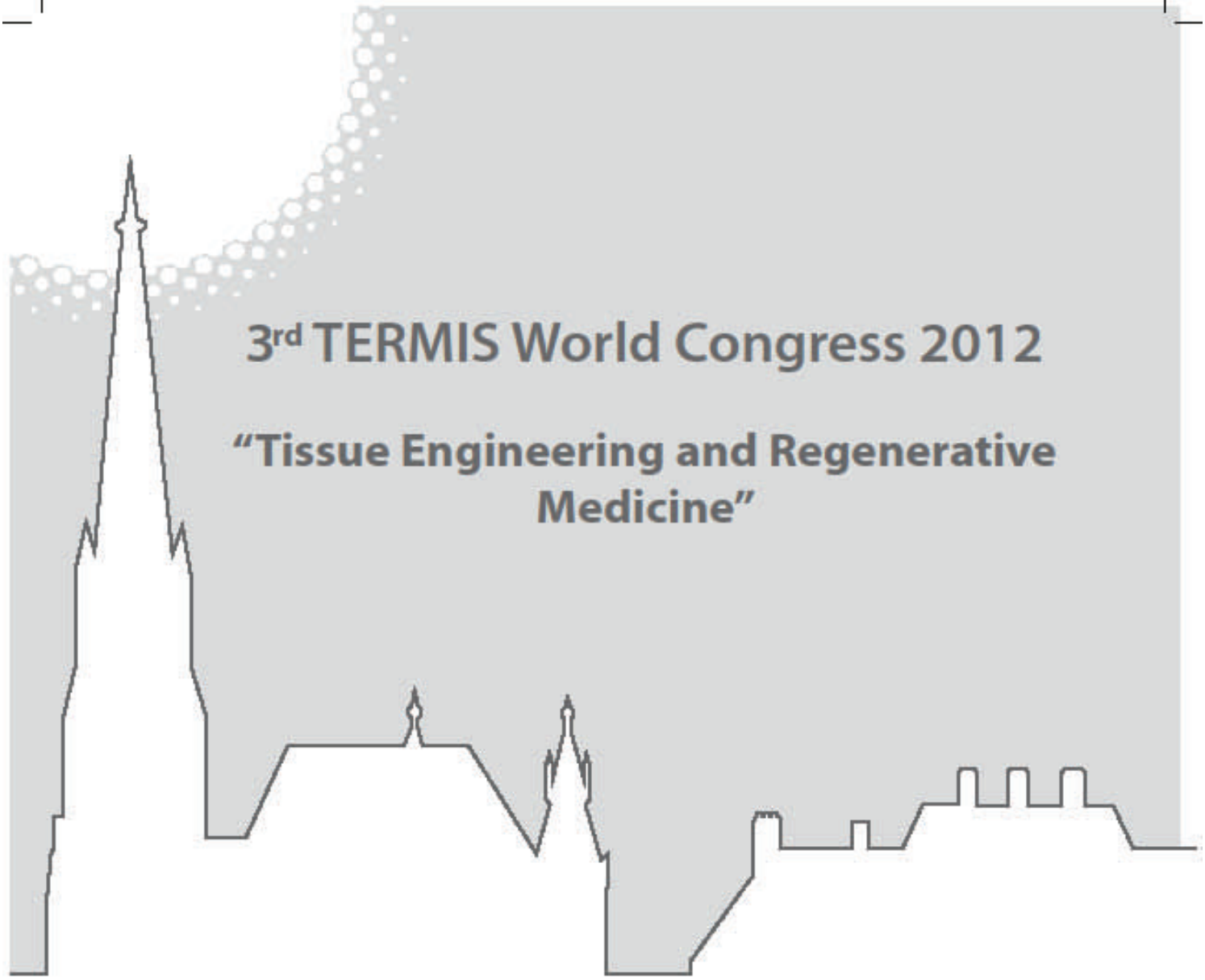
As you know from the previous newsletter, the concept of thematic groups within TERMIS has been initiated. Under the leadership of President-Elect David Williams, this initiative provides the opportunity for individuals interested in particular topics to organize workshops, sponsor sessions at the various chapter meetings, and in general, communicate and collaborate at an effective manner under the umbrella of TERMIS. There are currently two thematic group proposals that have been granted full approval by the TERMIS Governing Board: 1) Bioreactor Technologies (Chair: Athanasios Mantalaris) and 2) Musculoskeletal Tissue Engineering (Chair: Karl-Heinz Schuckert). Additional thematic groups will be considered in future years.

TERMIS has renewed its formal agreement with Mary Ann Liebert, Inc. *Tissue Engineering* remains the official journal of the society. The support provided by Mary Ann Liebert and Vicki Cohn has been nothing short of sensational. The access to the contents of the journal that each of us enjoys as a benefit of membership in TERMIS is a direct result of their commitment to the success of our society.

Finally, I want to acknowledge the organizational work being conducted by Professor Heinz Redl (Austrian Cluster for Tissue Regeneration) and his colleagues in preparation of the World Congress in Vienna, September 5-8, 2012. More than 90 symposia have been submitted for consideration. The social events and scientific content of this meeting promise to set a new standard for excellence. I look forward to seeing you in Vienna.

Best wishes,

Stephen F. Badylak, DVM, PhD, MD
President of TERMIS



3rd TERMIS World Congress 2012

"Tissue Engineering and Regenerative Medicine"

September 5 - 8, 2012 Vienna, Austria

www.termis.org/wc2012

LBI Trauma

termis.

Society of the Advancement of Research in Shock and Tissue Engineering

EXPERTISSUES

ADVA

Letter from the Editor

Dear Colleagues and Friends,

Based on my previous letter I will continue to highlight the TE&RM activities of the different European countries. Today, I will give a short inside into the tissue engineering & regenerative medicine activities in the United Kingdom.

In 2008/09, MRC established two full MRC Centre's focused on stem cell research and regenerative medicine. The Centre awards in Edinburgh (5 year) Cambridge (3 year) represent an investment of £3.4m. Imaginative policy making and visionary statecraft of the UK government has allowed several other universities; just to name a few University of Southampton, University of Nottingham, National University of Ireland, Imperial College, University College London, University of Manchester to profit from the programmes described below to develop strong TE&RM teaching and research programmes.

The Technology Strategy Board is running a £21.5m "RegenMed" programme of investment to support key areas of commercial R&D and the development of R&D partnerships. The programme is being developed in partnership with the Medical Research Council (MRC), Engineering and Physical Sciences Research Council (EPSRC) and Biotechnology and Biological Sciences Research Council (BBSRC) who have committed up to £4m to the programme. The goals of the Technology Strategy Board/Research Council Regenerative Medicine programme are to:

"underpin and enable the most competitive regenerative medicine businesses to flourish in the UK and to build a connected regenerative medicine community through the formation of well-linked programmes of work and activities to develop medicines and technology platforms creating critical mass which is an important element in developing emerging industries."

The 2011 Budget announced a competition to form a Cell Therapy Technology and Innovation Centre. The Centre, with a focus on cell therapies and advanced therapeutics, will help support development and commercialisation of therapeutics, as well as the underpinning technologies for manufacturing, quality control and addressing safety/efficacy challenges for these new treatments.

The Innovative Medicines Initiative Fourth Call for Proposals was also launched in June 2011. Research into human induced pluripotent stem cells has been announced as a "Think Big" topic for this call, with an approximate budget of up to €50m.

In summary, the United Kingdom is in a strong position to continue to play a leading role in Europe in the area of TE&RM based on world-class research activities, comprehensive infrastructure in form of universities and institutes, an active commercial sector, and not to forget from a health economics point of view a single payer healthcare regime in the form of the National Health Service.

Yours sincerely,

Professor Dietmar W. Hutmacher PhD (NUS), MBA (Henley)

2011 TERMIS Election

The call for nominations for the various open positions within the TERMIS Board and the three TERMIS Chapters is now closed. We would like to thank you for providing your nominations for the 2011 TERMIS Election.

In mid-November, you will be receiving notification of the start of the 2011 TERMIS election process by being provided with the final slate of nominees, biographical information for each of the nominees, and the online voting instructions.

We encourage all of our members to take a brief moment to cast your vote. Voting is simple. To enter the online voting system, you will be asked to enter the email address you provided upon applying for membership. The voting system will automatically direct you to the candidates for your designated region. Make your selection and submit. More information will be distributed to the members in the coming months.

Students & Young Investigators (SYIS): European Chapter

TERMIS-EU 2011 Granada

SYIS-EU Activities Wrap-Up

One more TERMIS-EU Chapter Meeting is concluded. As usual, there were SYIS activities to promote interaction among younger researchers and between older, established scientists. All of the organized activities were pretty much oversubscribed, like last year, which confirms the growing awareness and recognition among the delegates with regard to SYIS activities. We have received a lot of positive feedback both during and after the meeting. For this, the SYIS EU council wishes to acknowledge this year's SYIS Meeting and Fundraising Committee chair Miguel González-Andrades for his outstanding work before and during the meeting.

Of course nothing is perfect and we strive at continuously improving SYIS activities. As you are all central to these activities, we invite your suggestions as to how they can be enhanced and even suggest new activities for next chapter meetings. You can send your suggestions to us using our contacts below.

We would like to thank all our SYIS co-chairs for taking part in chairing the general sessions and symposia. We hope it was a fruitful experience for you. We would also like to thank the mentors that were available for the student-meet-mentor lunch. Furthermore, to the Professors and professionals that made the Career Session so interesting, a big thank you.

As you might be aware, SYIS EU has a facebook page (http://www.facebook.com/group.php?gid=264370673210). In the page, some pictures of the activities in Granada have been posted, so please check them out. If you have any pictures or videos featuring Granada SYIS activities you would like to add to this collection please go ahead.

We also wish to congratulate the recipients of the SYIS awards for Best Oral and Poster communication. We hope such distinction can help you to excel in the TERM field!

Finally, the next TERMIS meeting in Europe will be the TERMIS world meeting in Vienna next year. It will be chaired by Professor Heinz Redl and for sure it will be an engaging event, scientifically, professionally and socially and, as usual, you can check the meeting details, including SYIS activities, at the TERMIS website as the meeting date gets near. See you all next year!

Best regards,

Rogério Pirraco, Chair TERMIS-SYIS EU (rpirraco@dep.uminho.pt)

Paul Geutjes, Vice Chair TERMIS-SYIS EU (p.geutjes@uro.umcn.nl)

Dennis Link, Treasurer TERMIS-SYIS EU (dlink@dep.uminho.pt)

Lise de Jonge, Secretary TERMIS-SYIS EU (l.dejonge@imperial.ac.uk)

Students & Young Investigators (SYIS): Asian-Pacific Chapter

Riding on the resounding success of TERMIS-AP 2011 Singapore Conference, the SYIS-AP had the wonderful opportunity to organize several activities to promote interaction and networking amongst students and young investigators. Our activities started from the first day of conference (3 August 2011), where we spent an unforgettable night getting to know more than 30 SYIS members from different countries of the Asia-Pacific Rim. This year, participants were treated to dinner and games in a rustic shophouse located in the historic quarter of Singapore. In line with the mission of the SYIS, through playing games, this ice-breaking social event helped SYI get acquainted with each other and fostered interaction in the subsequent days of the conference. The second day saw a Student-Mentor interaction session, which featured a town hall style discussion on "Career prospects and the future of tissue engineering". SYIS members had the opportunity to interact with leading experts from both academia and industry, including Profs Catherine LE VISAGE, Dietmar HUTMACHER, Evelyn YIM, Michael RAGHUNATH, and Nicolas These mentors shared their insightful views on the differences between an academic and industrial career and how to prepare ourselves best for these two different career paths. On the final day of the conference, we had the annual SYIS scientific competitions. This year, in order to encourage the participation of SYI, two categories of competition were set: "Best oral presentation competition" and "Best poster presentation competition". Based on the submitted extended abstracts, a local scientific committee led by Prof Michael Raghunath shortlisted 8 candidates for oral competition and 7 candidates for poster competition, and the finalists were invited to present their work in a head-to-head competition. The intense presentation sessions were graced by the participation of recognized gurus in tissue engineering and regenerative medicine research field, including Profs. David Williams, Robert Nerem, Masanori Kikuchi , Ng Kee Woei, Tatsuya Shimizu, Katja Schenke-Layland and Dietmar Hutmacher, who served as esteemed judges. This brought a fitting conclusion to the conference, and we look forward to the next opportunity to renew the bonds forged at this meeting.

SYIS-AP Committee

Zhiyong Zhang (Chair)

Mark Chong (Vice-chair)

Erin Teo (Treasurer)

Winners of the best oral and poster competitions

(5 Aug 2011)

Listening to the mentors in the student-mentor section (4 Aug 2011)

Playing games in the social event (3 Aug 2011)

Students & Young Investigators (SYIS): North American Chapter

2011 TERMIS-NA Houston

SYIS-NA Activities

Be up-to-date on the latest SYIS-NA news. Join the SYIS-NA Facebook page.

Tentative SYIS-NA events are as follows:

SCIENTIFIC SESSION CO-CHAIRS

Open for all SYIS members

TERMIS-NA SYIS is pleased to announce the opportunity for students and young investigators to serve as co-chairs for the scientific sessions at the TERMIS-NA Houston Meeting in December. All applicants for these positions must meet the criteria below:

Criteria:

- Must be a TERMIS-SYIS member
- Must have submitted an abstract and have it accepted for either an oral or poster presentation
- All sessions will be held in English

Applications must include:

- Short Bibliographic Sketch (100 words)
- Your research details: institution, advisor, and research topic
- A list of the 3 top sessions for which you would like to be co-chair (in order of preference)

The online submission form will go live once the notification for the acceptance of abstracts (Set for September 27, 2011). Sign ups to be a scientific session co-chair will be available until **Tuesday, November 1, 2011.**

Career Panel Discussion

More details to be posted soon.

SYIS Reception and Rice University Lab Tours

More details to follow.

5K Fun Run

Enjoy a brisk morning jog with fellow colleagues. The 5K route will tour downtown Houston. Runners/walkers of all speeds are welcome. Complimentary breakfast will be served for all participants.

Student Meet Mentor Lunch

The Student Meet Mentor Lunch gives SYIS members the opportunity to enjoy a plated lunch with a mentor, with seating arranged by student preference. Mentors include Session Chairs, members of the Scientific Advisory Committee, and local industry leaders. Advanced sign-ups required.

SYIS-NA Business Meeting

The annual TERMIS SYIS-NA business meeting is open to all students and young investigators. Attend this meeting to learn more how to get involved in SYIS.

SYIS-NA Representatives:

Sayed-Hadi Mirmalek-Sani - Chair TERMIS-SYIS NA
Maxime Guillemette - Previous Chair TERMIS-SYIS NA
Patrick Spicer - Meeting and Fundraising Committee Chair
Chris Bashur - Secretary TERMIS-SYIS NA
Rebecca Dahlin - Treasurer TERMIS-SYIS NA
Robert Gauvin - Chair of the Scientific and Professional Development Committee

2011 TERMIS-AP Singapore Conference Overview

The Tissue Engineering Regenerative Medicine International Society Asia-Pacific (TERMIS-AP) 2011 meeting was hold from August 3-5 in Singapore with great success. The 340 attendees from the Asia-Pacific region and other countries around the world were impressed by the inspiring scientific programme and the rich opportunities in interacting with students, colleagues and scientists with interests in tissue engineering. Plenary speakers included **Sir Roy Calne**, a pioneering transplant surgeon who performed several first transplant operations in the world; **Professor David Williams**, Editor-in-chief of Biomaterials, President-Elect of TERMIS and Professor and Director of International Affairs of Wake Forest Institute of Regenerative Medicine; **Dr. Silviu Itescu**, Chief Executive and CEO of Mesoblast Limited, Australia; **Professor Richard Boyd**, Director of Monash Immunology and Stem Cell Laboratories in Monash University, Australia; **Professor Yilin Cao** from Department of Plastic and Reconstructive Surgery in Shanghai 9th People's Hospital who is known for his expertise in tissue engineering and its applications to repair defects; **Professor James Hui**, Director of Cartilage Repair in Department of Orthopedic Surgery at the National University of Singapore, Singapore; **Professor Robert Nerem**, Institute Professor and Director of the Georgia Technology Institute and Emory University Center for Regenerative Medicine and Distinguished Visiting Professor of Chunbuk National University, Korea; **Dr. Alan Colman**, Executive Director of Singapore Stem Cell Consortium, Institute of Medical Biology Singapore, who is the first in the world to clone a sheep.

The theme of the meeting, *Rescuing the Patient*, covered a range of topics and was attended by academics, clinicians and industry representatives. The conference, held for the first time in Singapore, was jointly hosted by the National University of Singapore and Biomedical Engineering Society Singapore (BES), and chaired by Professor James Goh. In total, there were almost 200 podium presentations and over 120 poster presentations from leading international research laboratories, industry and clinical institutes.

Singapore is a dynamic city with a rich blend of Asian and Western cultures, located 1 degree north of the Equator offering an all-year-round summer weather. During the conference, social events including the conference banquet and the TERMIS-Student and Young Investigator Section (SYIS)-AP social event were organized to offer the delegates, not only opportunities for scientific exchange and networking, but also a taste of Singaporean cuisine and an experience of the metropolitan Singapore.

As part of the TERMIS-AP, Professor David Williams, President-Elect of TERMIS had compiled a crossword competition. This challenging crossword was featured on the TERMIS-AP website, when the delegates submitted their solution during the three days conference. The award was announced during the closing ceremony and the winner was a group of students from the National University of Singapore, with the best answered crossword puzzle.

The TERMIS SYIS-AP organized several activities including a fun-filled networking evening event, the student-mentor session and the Young Investigator Awards. This year, the student-meet-mentor session featured five mentors: Dr. Catherine Le Visage, Institut National de La Santé et de la Researche Médicale (INSERM), Professor Dietmar Hutmacher, Queensland University of Technology, Dr. Evelyn Yim, National University of Singapore, Professor Michael Raghunath, National University of Singapore and Dr. Nicolas L'Heureux, Cytograft Tissue Engineering, Inc. The young scientists and students had the opportunity to interact and discuss with the researchers from both industry and academia in the field.

The TERMIS SYIS-AP Young Investigator Awards were presented to the three oral presentations and three poster presentations.

Best Poster Presentation Awards:

First prize: Y. Kawakami "Local delivery of ex-vivo expanded bone marrow cd34 positive progenitor cells using bioscaffold for treatment of unhealing bone fracture"

Second prize: A. Tan "TGFβ1 pulses in fibroblasts- a comparative study"

Third prize: B. Mandal "Hierarchical silk scaffolds for intervertebral disc engineering"

"Yum Sing!"--"Cheers" in Chinese dilate. Delegates giving a Singaporean-style toast for the success of the conference.

Singapore Conference Continued

Best Oral Presentation Awards:

First prize: Kiryu K. Yap "Implantation of oval cells as multi-cellular spheroids in a murine in vivo vascularised chamber: A model for liver tissue engineering"

Second prize: Y. Liang "Tuning cancer malignancy through 3-dimensional control of stiffness"

Third prize: J. Kasuya "Spatio-temporal control of hepatic stellate cell-endothelial cell interactions for reconstruction of vascularized liver constructs in vitro"

The organizing committee was delighted to take the opportunity to organize the TERMIS-AP 2011 meeting and introduce the delegates to Singapore. The Local Organising Committee of the TERMIS-AP Meeting would also like to thank all the conference delegates, speakers, presenters and volunteers, all were the key components to the success of this meeting.

One of the Opening Plenary Presentation by Professor David Williams

The conference banquet offering a taste of delicious Singapore cuisine and the get-together of colleagues and scientists.

termis 2011
NorthAmerica
Annual Conference and Exposition

Join us in Houston, TX for

TERMIS-North America 2011
CONFERENCE AND EXPOSITION

Scaffolds in Tissue Engineering: Bridging Matrix Biology and Biomaterials Science

December 11-14, 2011

Hilton Americas-Houston
Houston, Texas

Hosted by:
Conference Co-Chairs:

Antonios G. Mikos, Ph.D. and Jennifer L. West, Ph.D.

Scientific Program Co-Chairs:
Jennifer L. West, Ph.D. and

K. Jane Grande-Allen, Ph.D.

Local Arrangements Chair:

F. Kurtis Kasper, Ph.D.

Featured Keynote Speakers:

Kristi S. Anseth, Ph.D., University of Colorado

Christopher S. Chen, M.D., Ph.D., University of Pennsylvania

Molly S. Shoichet, Ph.D., University of Toronto

We look forward to hosting you in Houston!

2011 TERMIS-NA Awards Program Recipients

The TERMIS-NA Awards Committee would like to announce the awardees of the 2011 awards program. Each of the awardees will be acknowledged during the upcoming TERMIS-NA conference in Houston, TX. Congratulations!

Lifetime Achievement Award:

Robert S. Langer

David H. Koch Institute Professor
Massachusetts Institute of Technology

Senior Scientist Award:

David J. Mooney

Robert P. Pinkas Family Professor of Bioengineering
Core Faculty Member, Wyss Institute for Biologically Inspired Engineering
Harvard University

Young Investigator Award:

F. Kurtis Kasper

Faculty Fellow
Department of Bioengineering
Rice University

Mary Ann Liebert Inc. Outstanding Student Award:

Jessica A. DeQuach

Department of Bioengineering
Christman Lab
University of California at San Diego

The Committee would also like to thank all of the individuals, who submitted a nomination package for consideration. A complete list of awards established by the TERMIS-NA Awards Committee is posted online for viewing. We look forward to receiving nomination packages in 2012!

Interested in Hosting a TERMIS-AP Conference?

Solicitation of Proposals for the 2014 TERMIS-AP Chapter Meeting

The TERMIS-AP Chapter Council would like to announce the solicitation of proposals for hosting the 2014 TERMIS-AP Chapter meeting. If you are interested in hosting the 2014 TERMIS-AP Chapter meeting, please submit your request to Sarah Wilburn at swilburn@termis.org. You will be provided with a meeting host form that asks detailed questions about the meeting organizers, location/venue, program, and meeting financials. When proposals are submitted, they are reviewed by the respective chapter council and an official vote is conducted. Click here to view details about hosting a TERMIS meeting.

The deadline for submitting proposals for the 2014 TERMIS-AP Chapter Meeting is Saturday, December 31, 2011.

Laboratory Feature: Kyung Hee University of Korea

Professor Il Keun Kwon
Director of Maxillofacial Biomedical Engineering
School of Dentistry, the Kyung Hee University of Korea
Hoegi-dong, Dongdaemun-gu, Seoul 137 - 701, Korea
Tel: +82 - 2 - 961 - 0350
E - mail: kwoni@khu.ac.kr
Web page: mbe.khu.ac.kr

The Department of Maxillofacial Biomedical Engineering (MBE) in Kyung Hee University is the first school of dentistry in Korea established as an engineering-based, interdisciplinary department that performs research in the fields of biomaterials, tissue engineering, drug delivery, stem cell engineering, and stem cell biology. The primary goal of this department is to develop and establish a new field based on the convergence of medical and dental science through interdisciplinary academic and research collaboration. MBE has 4 divisions dedicated to research in the various technologies such as scaffold fabrication and surface modification for tissue regeneration (professor Il Keun Kwon), drug delivery systems (professor Sang Cheon Lee), stem cell engineering (professor Yu-Shik Hwang), and stem cell biology (professor Jung Sun Heo),

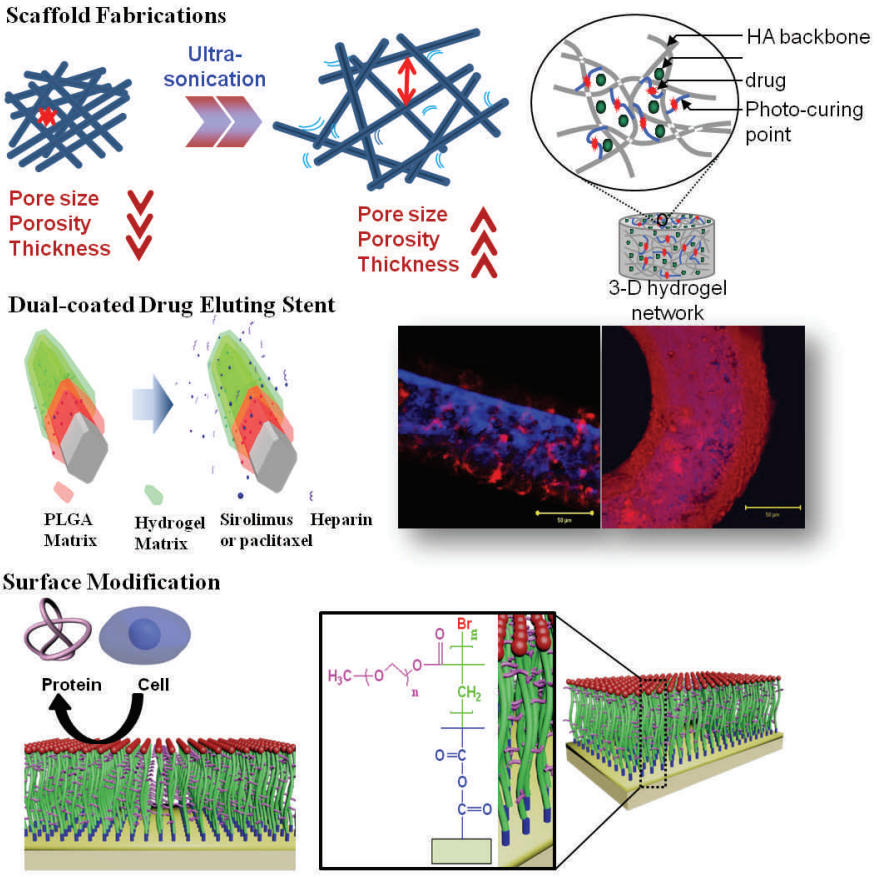
The first research group: Tissue engineering technology

Researchers in professor Kwon's group are mainly focused on scaffold fabrication, development of bioactive medical/dental implants, and surface modification for improving biocompatibility of implants.

One of the primary techniques for scaffold fabrication is electrospinning which is a relatively simple and versatile method for forming non-woven fibers that mimic the structure of natural extracellular matrix (ECM). We are developing various nanofiber scaffolds using both natural and synthetic polymers such as collagen, gelatin, chitosan, poly(lactic-*co*-glycolic acid) (PLGA), poly(*L*-lactic acid) (PLLA), and polyurethane for applications to tissue engineering. We developed a three-dimensional (3D) structural nanofiber scaffold which had highly enlarged porosity using an ultra-sonication technique. In order to produce a highly macroporous nanofibrous structure, we developed PLLA nanocylinders by aminolysis and ultra-sonication. These were then blended with natural polymers such as gelatin and utilized as an ECM mimetic structure to create a 3D nanofibrous and macroporous construct for tissue engineering applications.

Hydrogel systems have attracted increasing attention as tissue engineering scaffolds for use in cell therapeutics, wound healing, cartilage/bone regeneration, and the sustained release of drugs due to its similar physical properties to natural tissue. We are developing a series of photo-curable hydrogels which can play an important role as a scaffold for tissue regeneration.
We have developed a dual-coated drug-eluting stent (DES) in order to resolve DES problems resultant from poor biocompatibility and bioavailability. This was comprised of two layers including a hydrophilic natural polymer hydrogel and a hydrophobic synthetic polymer carrier layer dual-coated onto cobalt chromium stents. The dual coating stent can have a broad selection area of drug because
of the hydrophilic and hydrophobic drug carrier matrix.

Figure 1. Schematic of scaffold fabrication technique, development of drug eluting stent, and surface modification for improving biocompatibility of medical implants



Second research group: Drug delivery systems

Researchers in Professor Lee's group are mainly focused on development of nanoparticles for delivery of anti-cancer drugs and various surface treatment approaches for dental implants.

We are developing smart nano-carriers based on calcium phosphate (CaP) coatings on organic or inorganic nanoparticles. The CaP mineral coatings can hold the encapsulated anti-cancer drugs in extracellular conditions, whereas they can be dissolved within intracellular endosomes as non-toxic ions to initiate the drug release within tumor cells. Mineral-coated nano-carriers can satisfy the major requirements for cancer chemotherapy with high delivery efficiency, high structural stability in blood, minimalized premature drug release, and specific release of drugs within tumor cells. The mineralized nanoparticles might serve as promising specific intracellular carriers for many drugs, proteins, and imaging agents.

Laboratory Feature Continued...

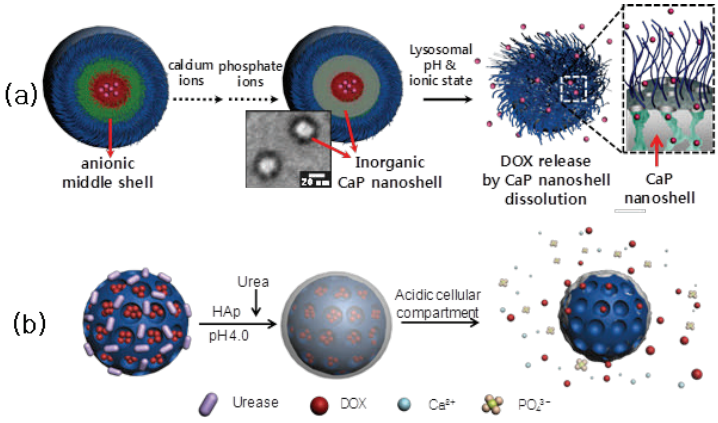


Figure 2. CaP mineralization on organic (a) and inorganic (b) nanocarriers and intracellular triggered release of drugs.

We are also developing a novel gold nanoparticle (AuNP) based carrier for tumor-targeted delivery of anti-cancer agents. The surface of the AuNP was functionalized with β-cyclodextrin (β-CD) as a drug pocket, biotin as a tumor-specific targeting ligand, and poly(ethylene glycol) (PEG) as a solvated anti-fouling shell. The anticancer agent was efficiently encapsulated into the hydrophobic cavity of β-CD on the surface of the AuNP carriers.

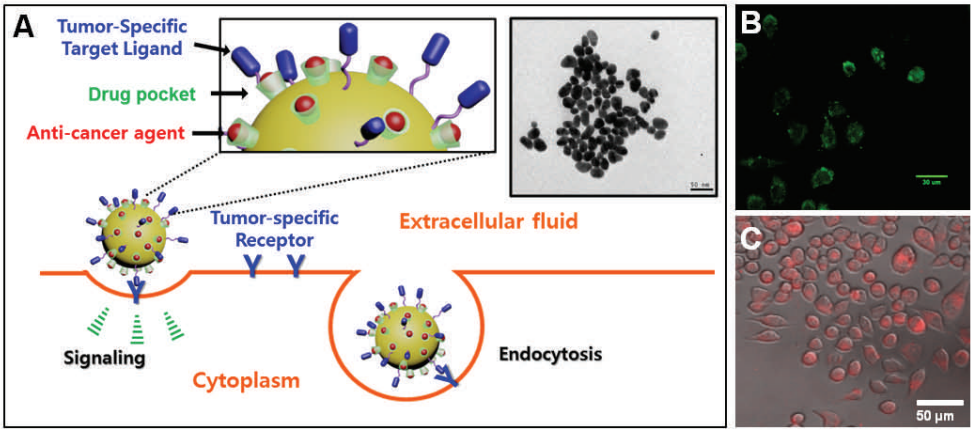


Figure 3. a) The internalization of the Functionalized gold nanoparticle through receptor-mediated endocytosis, b) self-fluoresced gold nanoparticle, and c) Annexin-V/FITC treated apoptotic HeLa cells

Third research group: Stem cell engineering

Researchers in professor Hwang's group are mainly focused on two fields. Stem cell research and integrated bioprocess research for stem cell's applications to tissue engineering and regenerative medicine.

Dental tissue stem cells were developed by the following process. Neural crest-derived ectomesenchyme tissue and the neural differentiation activity of dental stem cells may reside in immature soft dental tissue such as papilla tissue. In stem cell research, the presence of neural stem cells was determined by histological sectioning of the human third molar teeth. Neural stem cells were isolated from papilla tissues and expanded. The dental papilla-derived neural stem cells (DP-NSC) were characterized by immuno-cytochemical staining, DNA microarray analysis, flow cytometric analysis and real-time PCR. Then the neural differentiation of the isolated neural stem cells was studied. These isolated DP-NSCs were applied to develop in vitro nerve tissue formation using an encapsulation technique and a dynamic bioreactor culture system. These cells were applied to direct in vivo nerve tissue formation by implantation into an animal model, and to develop optogenetic stem cells which are sensitive to a blue ray irradiation via optrode (developed by companion in KIST) which will stimulate optogenetic stem cells to produce neural signals. This may be applied to cure Parkinson's Disease.

Inside Story Headline

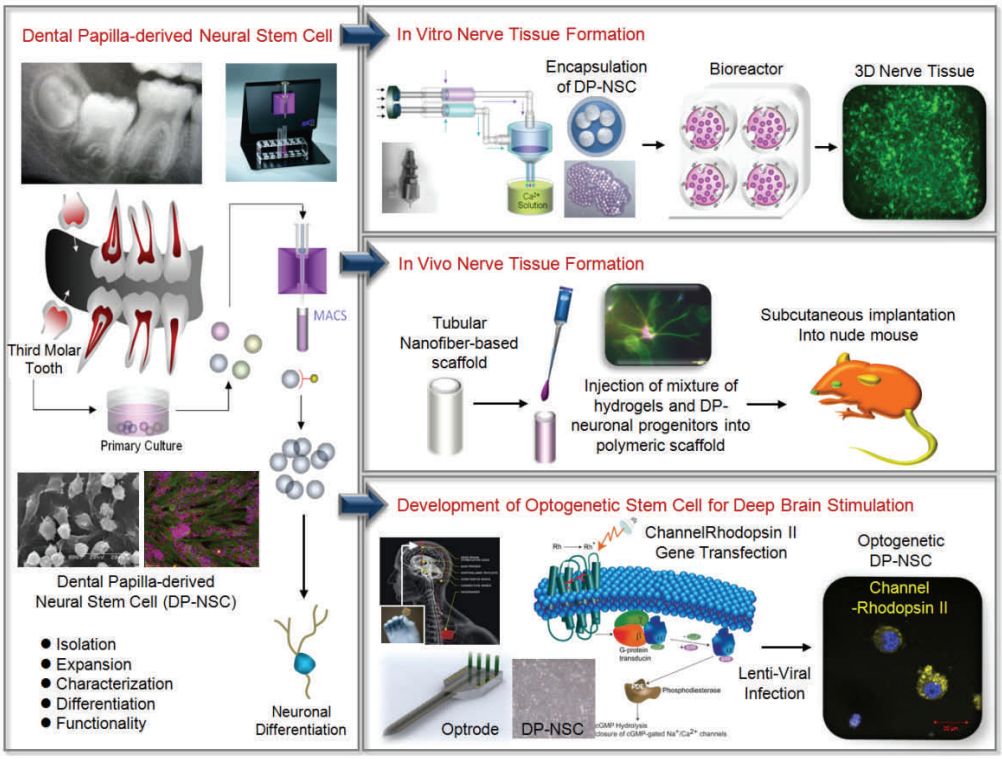


Figure 4. Neural stem cell from dental papilla tissue and its application to tissue regeneration

Fourth research group: Stem cell biology

Currently, our research team is focusing on research in dental and periodontal tissue regeneration with a focus on the interface of stem cell biology and biomolecular engineering.

We are now developing several novel paradigms of 1) endogenous regenerative approaches to restore function of periodontal ligament stem cells (PDLSCs) at periodontal defect sites in patients, 2) selection of biochemical and biomechanical candidates for embryonic stem cell (ESC) regulation, and 3) creating well-defined stem cell niches (microenvironments) for stem cell transplantation into destroyed dental tissues. In order to achieve the third aspect, we are collaborating with experts in biomaterial science with respect to the use of biomimetic material niches. The orchestration of molecular signals and structural tools can offer new strategies that are able to control and guide tissue regeneration. Our research will generate insights into the dynamic changes of stem cell fate in response to extrinsic and intrinsic factors and signals for endogenous repair of dental structures. This may propagate new platforms for the design of appropriate components for artificial stem cell niches and implantable devices, which can guide the desired cell response and generate effective therapeutic outcomes.

Laboratory Feature Continued...

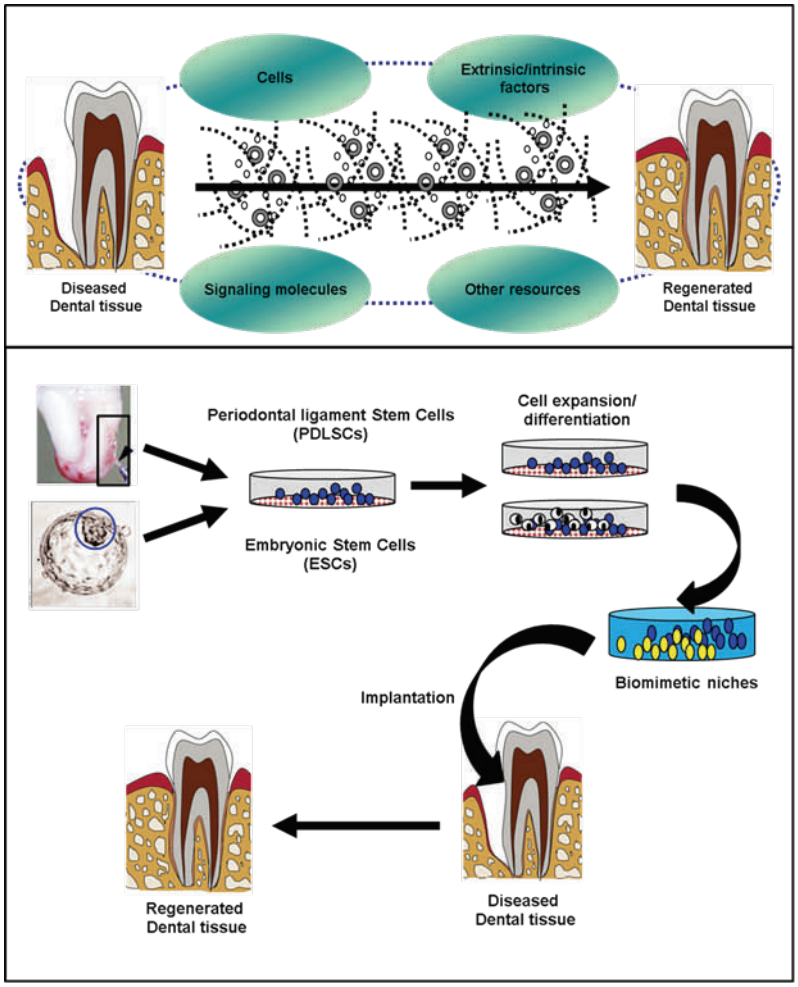


Figure 5. Schematic diagram of key components for endogenous dental tissue regeneration and Strategy of stem cell transplantation into tissue defect site of patients

Recent Representative Publications

HP Rim, KH Min, HJ Lee, SY Jeong, SC Lee*, pH-Tunable calcium phosphate covered mesoporous silica nanocontainers for controlled intracellular release of guest drugs, *Angew. Chem. Int. Ed.* (in press).JB Lee, SI Jeong, MS Bae, DH Yang, DN Heo, CH Kim, Alsberg E, IK Kwon*, Highly porous electrospun nanofibers enhanced by ultra-sonication for improved cellular infiltration, *Tissue Eng.* (in press)

MS Bae, DH Yang, JB Lee, DN Heo, YD Kwon, IC Yoon, K Choi, JH Hong, GT Kim, YS Choi, EH Hwang, IK Kwon*, Photo-cured hyaluronic acid-based hydrogels containing simvastatin as a bone tissue regeneration scaffold, *Biomaterials* (in press)

HJ Moon, YP Yun, CW Han, MS Kim, SE Kim, MS Bae, GT Kim, YS Choi, EH Hwang, JW Lee, JM Lee, CH Lee, YM Park, IK Kwon*, Effect of Heparin and Alendronate coating on Titanium Surfaces on Inhibition of Osteoclast and Enhancement of Osteoblast Function, *Biochem. Biophysic. Res. Comm.* (in press)

HJ Moon, SE Kim, YP Yun, YS Hwang, JH Park, IK Kwon*, The Inhibitory Effect of Simvastatin on Osteoclast Differentiation by Scavenging Reactive Oxygen Species, *Exp. Mol. Med*. (in press)

DN Heo, JB Lee, MS Bae, YS Hwang, KH Kwon, IK Kwon*, Development of Nanofiber Coated Indomethacin-Eluting Stent for Tracheal Regeneration, *J. Nanosci. Nanotech.* 11(7), 5711-5736 (2011)

Laboratory Feature Continued...

HJ Moon, SE Kim, YP Yun, YS Hwang, JH Park, IK Kwon*, The Inhibitory Effect of Simvastatin on Osteoclast Differentiation by Scavenging Reactive Oxygen Species, *Exp. Mol. Med*. (in press)

DN Heo, JB Lee, MS Bae, YS Hwang, KH Kwon, IK Kwon*, Development of Nanofiber Coated Indomethacin-Eluting Stent for Tracheal Regeneration, *J. Nanosci. Nanotech.* 11(7), 5711-5736 (2011)

JB Lee, SI Jeong, MS Bae, DN Heo, JS Heo, YS Hwang, HY Lee, IK Kwon*, "Poly(L-lactic acid) Nanocylinders as Nanofibrous Structures for Macroporous Gelatin Scaffolds", *J. Nanosci. Nanotech.* 11(7), 6371-6376 (2011)

SJ Kim, JG Park, JH Kim, JS Heo, JW Choi, YS Jang, JH Yoon, SJ Lee, IK Kwon*, Development of a Biodegradable Sirolimus-Eluting Stent Coated by Ultrasonic Atomizing Spray, *J. Nanosci. Nanotech.* 11(7), 5689-5697 (2011)

SE Kim, SH Song, YP Yun, BJ Choi, IK. Kwon, MS Bae, HJ Moon, YD Kwon*, The effect of immobilization of heparin and bone morphogenic protein-2 (BMP-2) to titanium surfaces on inflammation and osteoblast function, *Biomaterials* 32, 366-373 (2011)

SJ Lee, KH Min, HJ Lee, AN Koo, HP Rim, BJ Jeon, SY Jeong, JS Heo, SC Lee*, Ketal Cross-Linked Poly(ethylene glycol)-Poly(amino acid)s Copolymer Micelles for Efficient Intracellular Delivery of Doxorubicin, *Biomacromolecules* 12, 1224-1233(2011)

JS Heo*, JC Lee, β-catenin mediates cyclic strain-stimulated cardiomyogenesis in mouse embryonic stem cells through ROS-dependent and integrin-mediated PI3K/Akt pathways, *J. Cell. Biochem.* 112(7),1880-1889(2011)

JS Heo*, SY Lee, JC Lee, Wnt/β-catenin signaling enhances osteoblastogenic differentiation from human periodontal ligament fibroblasts, *Mol. Cells.* 30(5), 449-454(2010)

CW Kim, YP Yun, HJ Lee, HW Choi, YS Hwang, IK Kwon, SC Lee*, In situ fabrication of alendronate-loaded calcium phosphate microspheres: controlled release for inhibition of osteoclastogenesis, *J. Controll. Rel.* 147, 45-53(2010)

HJ Lee, SE Kim, IK Kwon, C Park, C Kim, J Yang, SC Lee*, Spatially mineralized self-assembled polymeric nano-carriers with enhanced robustness and controlled drug-releasing property, *Chem. Commun*.(Cover Feature), 46, 377-379(2010)

HS Park, CW Kim, HJ Lee, JH Choi, SG Lee, YP Yun, IC Kwon, SJ Lee, SY Jeong, SC Lee*, A mesoporous silica nanoparticle with charge-convertible pore walls for efficient intracellular protein delivery, *Nanotechnology*, 21, 225101(2010)

YS. Hwang, BG Chung, D. Ortmann, N. Hattori, H-C. Moeller, A. Khademhossini*. Microwell-mediated control of embryoid body size regulates embryonic stem cell fate via differential expression of WNT5a and WNT11, *Proc Natl. Acad. Sci. USA* 6(40),16978-16983(2010)

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All conferences listed have been reviewed and approved for endorsement by the TERMIS Endorsement Committee

Upcoming Conferences

September 2011

- Summer School on Biomaterials & Regenerative MedicineSummer School Location: Riva del Garda, Trentino Region, Italy-Summer School Dates: September 19-23, 2011Summer School Theme: Biomaterials and Regenerative Medicine: from molecular and cell biology to tissues and organ
- Phacilitate Cell & Gene Therapy Forum 2011Forum Dates: 19-21 September 2011Forum Location: The Marina Bay Sands Hotel, Singapore
- Phacilitate Vaccine Forum 2011
  Forum Dates: 19-21 September 2011
  Forum Location: The Marina Bay Sands Hotel, Singapore

October 2011

- 2011 World Stem Cell SummitSummit Dates: October 3-5, 2011Summit Location: Pasadena Convention Center, Pasadena, CA
- 4th Joint ESAO-IFAO Congress 2011Congress Dates: 9-12 October 2011Congress Location: Porto, Portugal at the Porto Congress Centre - Alfândega
- Regenerative Medicine and Barriers to Commercialisation Online Summit 2011Online Summit Dates: October 11-25, 2011
  15 Modules, 3 weeks, 0 travel, 0 time out of the office = flexible learning for your whole team
- bone-tec 2011Congress Dates: 12-15 October 2011Congress Location: Hannover, GermanyCongress Chair: Dr. Karl-Heinz Schuckert, Head of Institute Indente
- Translational Strategies for Tissue EngineeringConference Theme: "Achieving Commercial Success with Tissue Engineered Products"Conference Dates: 31st October - 2nd November 2011Conference Location: Boston, MA

November 2011

- 2011 IFATS-9th Annual Symposium on Adipose Stem Cells and Clinical Applications of Adipose TissueConference Dates: November 4-6, 2011Conference Location: Eden Roc Renaissance Hotel, Miami, FLConference Chair: Stuart K. Williams, PhD
- 9th Annual Commercial Translation of Regenerative Medicine Conference Theme: "Building the international cell therapy industry"Conference Dates: 14-16 November 2011Conference Location: London, UK
- Cambridge Healthtech Institute's 6th Annual 3D Tissue ModelsConference Dates: November 17-18, 2011Conference Location: Omni Parker House, Boston, MA

December 2011

- TERMIS-NA 2011: Houston, TexasConference Dates: December 11-14, 2011Conference Location: Hilton Americas-HoustonConference Co-Chairs: Antonios G. Mikos, Ph.D. and Jennifer L. West, Ph.D.Scientific Program Chair: Jennifer L. West, Ph.D.Local Arrangements Chair: F. Kurtis Kasper, Ph.D.Conference Theme: Scaffolds in Tissue Engineering: Bridging Matrix Biology and Biomaterials Science

January 2012

- BME4 - 4th International Conference on The Development of Biomedical EngineeringConference Theme: Regenerative Medicine Conference, "Building A Face" Using A Regenerative Medicine Approach Conference Location: Ho Chi Minh City, VietnamConference Dates: January 8-10, 2012Conference Organizers: Vo Van Toi, PhD: International University of Vietnam National Universities in HCM City, VietnamStephen E. Feinberg, DDS, PhD, University of Michigan, Ann Arbor, MI, USA Anh Le, DDS, PhD: University of Southern California, Los Angeles, CA, USA

April 2012

- 7th Symposium on Biologic Scaffolds for Regenerative MedicineSymposium Dates: April 26-28, 2012Symposium Location: The Silverado Resort, Napa Valley, CASymposium Organizer: Stephen F. Badylak, DVM, PhD, MDKeynote Speaker: Mina J. Bissell-
  For more information, please contact:
  - *Jocelyn L. Runyon*

  Phone: +1 (412) 624-5253

Upcoming Conferences

September 2012

- 2012 3rd TERMIS World Congress: Vienna, AustriaConference Dates: September 5-8, 2012Conference Location: Hofburg Congress Center in Vienna, AustriaConference Chair: Heinz Redl, PhD*To request further information, please contact:*

  Dr. Heinz Redl

June 2013

- 2013 TERMIS-EU: Istanbul, TurkeyConference Dates: June 12-15, 2013Conference Location: Istanbul, TurkeyConference Chair: Erhan Pişkin, PhD

October 2013

- 2013 TERMIS-AP: P. R. ChinaConference Dates: October 2013Conference Chair: Yilin Cao, MD, PhD

December 2013

- 2013 TERMIS-NA: Atlanta, GAConference Location: Atlanta, GeorgiaConference Chair: Robert E. Guldberg, PhD Conference Program Chair: Todd C. McDevitt, PhDMore details to follow.

June 2014

- 2014 TERMIS-EU: Genoa, ItalyConference Dates: 10-13 June 2014Conference Co-Chairs: Ranieri Cancedda and Claudio .

Current Employment Opportunities

TERMIS members still have the benefit of posting current job openings on the TERMIS website free for 30 days.

Regenerative Medicine Jobs

RegenerativeMedicineJobs.com is a specialized online job board focused on recruiting for positions in the rapidly growing field of regenerative medicine. The site is simple to use and focused in scope but this is more than just another website. RMJ has developed a sophisticated system designed to leverage our extensive network in RM to ensure every post gets maximum attention and attracts the best candidates.

Traffic is pulled to the site and job postings are pushed to a targeted audience by focused social media and marketing campaigns. This is the latest way to recruit for any position in a regenerative medicine department, division, or company. This is regenerative medicine recruiting with a focus.

All TERMIS members are entitled to a 25% discount for posting positions on RegenerativeMedicineJobs.com

TERMIS Members Receive a Registration Discount!

Keynote Presentation:

Translational Therapeutics Development at NIH
Christopher P. Austin, M.D.
Scientific Director
NIH Center for Translational Therapeutics, National Institutes of Health

TERMIS Member Discount is Available to Attend CHI's Upcoming Event!

Sessions:

- Moving into the Third Dimension
- Surrogate Model Systems: How Complex Do They Need to Be?
- Tissue Models for Drug Discovery & Development: Ready for Prime Time?

PreConference Short Course

- Scaffolds Bridging the Gap between 2D and 3D

Register On-line and check-off the box indicating you are a TERMIS member to save $200 off your commercial conference registration/ $100 off an academic registration. For questions or to register by telephone, call 781-972-5400.

www.healthtech.com/3DTissueModels

Stem Cells USA & Regenerative Congress 2011

Stem Cells USA & Regenerative Medicine Congress is a three day conference with exhibition for pharmaceutical companies, biotechs, government, academics and investors focused on the commercialization of stem cells and regenerative medicine. It is where science and business unite.

TERMIS members save 15%! Register here: https://secure.terrapinn.com/V5/rCalc.aspx?E=4185&C=1261YLLK

Linking the international community of TERMIS

TERMIS
223 Park Place
San Ramon, CA 94583
United States

Phone: +1 (925) 362-0998
Fax: +1 (925) 362-0808
E-mail: swilburn@termis.org

termis®

www.termis.org

Edited and Compiled by:
Dietmar W. Hutmacher, PhD, MBA
Queensland University of Technology

Sarah Wilburn
TERMIS Administrator

Interested in contributing to the TERMIS Newsletter?
CONTACT SARAH WILBURN

ABOUT TERMIS

TERMIS brings together the international community of persons engaged or interested in the field of tissue engineering and regenerative medicine and promotes education and research within the field of tissue engineering and regenerative medicine through regular meetings, publications and other forms of communication. The TERMIS newsletter, *inter*Link, is published quarterly. If you are interested in submitting content, please contact Sarah Wilburn, swilburn@termis.org. For further details about TERMIS, please visit the Society's website at www.termis.org.