TERMIS Newsletter

April—June 2011

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Inside this issue:

Letter from the Editor

Dear TERMIS Members,

We will have our third world congress next year in Europe namely Vienna. Today in many articles, Europe is termed the old World or economy. Interestingly a recent Time Magazine article was titled "Old World Tiger: How Germany Became the China of Europe" – (TIME: http://www.time.com/time/magazine/article.)

I have decided to give you a brief summary of the activities in the different countries in Europe, so you have a better idea what is happening in the old world. It feels natural that I will start in this newsletter with Germany my home country. With approximately 27,000 employees working on biotechnology related issues across over 700 research institutions, Germany can enjoy a strong international reputation in the field. These facilities are equipped with a combined budget of 2.8 billion Euros, of which around 1.1 billion is third party funding. The scientific publications from many of these research institutions are rated extremely highly abroad, and Germany's researchers in the area have attained a high degree of international recognition, including being awarded with the Nobel Prize (Harald zur Hausen, Christiane Nüsslein-Volhard, Er- win Neher). Aided by government funding initiatives, the significance of regenerative medicine and tissue engineering research within German bio- technological research has risen steadily in recent decades. Researchers are working on important issues in regenerative medicine in many of the over 100 universities and 180 universities of applied sciences in Germany. Moreover, non-academic research institutions belonging to research organizations (the Max Planck Society, the Gottfried Wilhelm Leibniz Scientific Association, the Helmholtz Association of German Research Centers, and the Fraunhofer Society) provide an important institutional foundation for German research in regenerative medicine.

Yours sincerely,

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

2011 TERMIS Conferences

TERMIS-AP: Singapore

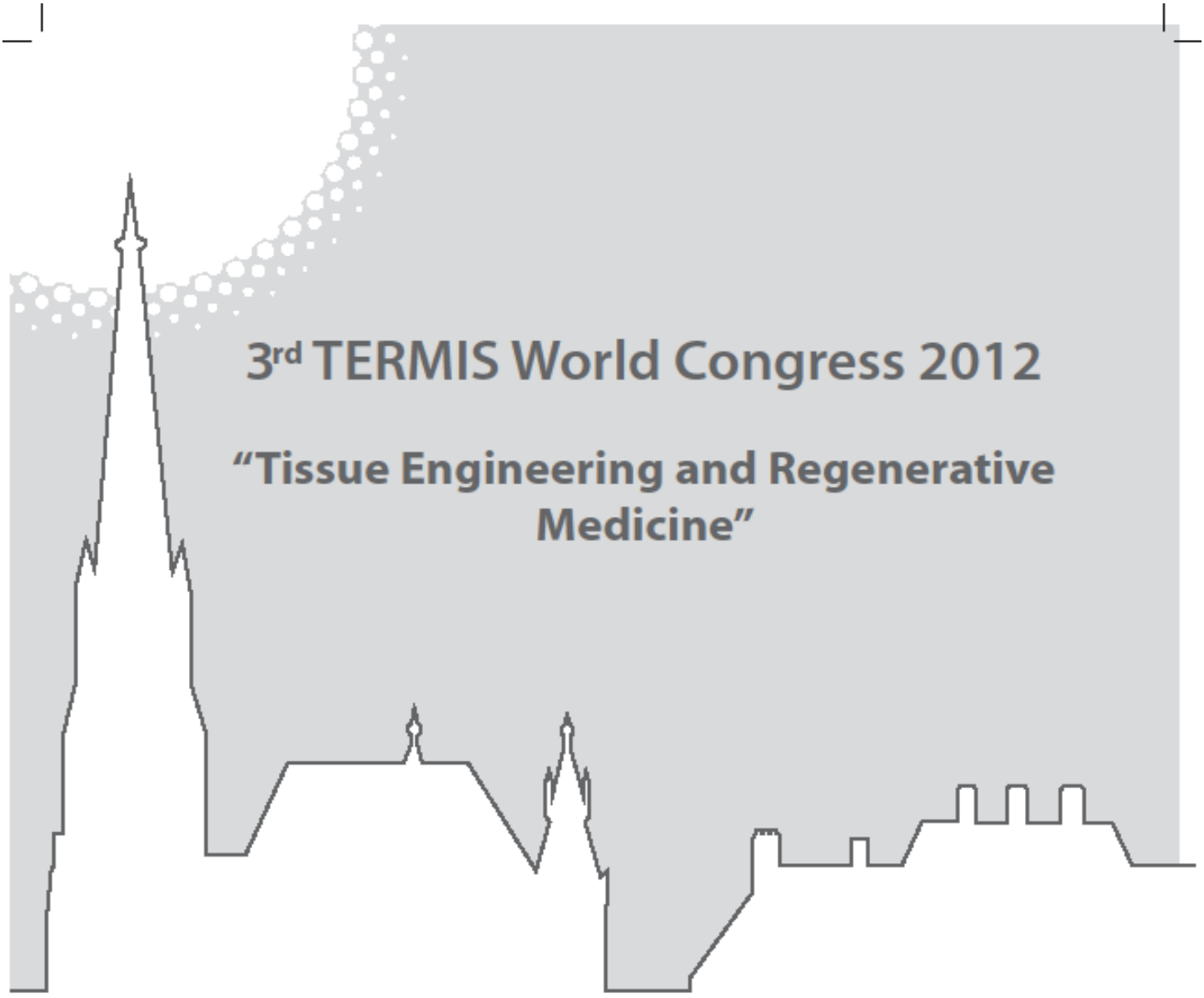
3-5 August 2011

www.termis.org

TERMIS-NA: Houston

December 11-14, 2011

Submit Your Abstract!



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

Latest Developments from the Asian-Pacific Chapter

A Dedication to Prof. Tae Gwan Park

Professor Tae Gwan Park (1957 - 2011) was a talented biomaterial scientist. His profound intellectual curiosity and strong desire for excellence in research have inspired a number of colleagues, students, and post-docs. He obtained his B.Sc. degree from Department of Chemical Technology at Seoul National University in 1980 and did his Ph.D. degree from Department of Bioengineering at University of Washington in 1990 (advisor: Professor Allan Hoffman). After his post-doctoral training at MIT Langer Lab, he started his professional carrier at Temple University, School of Pharmacy (1992 - 1995). In 1996, he joined Department of Biological Sciences at Korea Advanced Institute of Science and Technology (KAIST) where he spent the rest of his life. He published total 252 peer review papers (including 18 papers during his training), and the papers have been cited more than 7,000 times. He received a number of awards including Clemson award (Society for Biomaterials, 2009). He was also selected as one of the six highly cited Korean scientists for the past ten years by the Korean Ministry of Education and Science and Technology (Creative Knowledge Award, 2009).

His research interests were in the area of protein, peptide, and gene delivery systems, tissue engineering, and intelligent polymers. In early days of his research, he suggested novel methods to prepare porous scaffolds for tissue engineering, utilizing gas forming reagents and thermally induced phase separation (TIPS). He also dedicated himself to the development of polymeric micelles for anti-cancer drug delivery, microspheres for peptide/protein delivery, protein PEGylation techniques, and non-viral gene delivery systems. His recent research interests include molecular imaging and tissue adhesives.

He is resting in peace in heaven. However, it will be unambiguously true that his academic achievement will last forever, and our remaining task is to pursue his spirit of innovative research.

Lab Feature

Tissue Regeneration Materials Unit, International Center for Materials Nanoarchitectonics, National Institute for Materials Science, Japan

Dr. Guoping Chen

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Tissue Regeneration Materials Unit, International Center for Materials Nanoarchitectonics was founded in April, 2011 as one of the research units in National Institute for Materials Science. The unit aims to create novel functional materials and innovative advanced technologies to meet the scaffold, drug delivery and cell function manipulation requirements for tissue engineering and regenerative medicine. Methods including chemical synthesis, hybridization, micro-patterning and biomimetics are used as key technologies to conduct basic and application research on biomaterials and scaffolds that can induce efficient tissue regeneration. There are four main research topics in the unit.

1. The first research topic is design and preparation of hybrid porous scaffolds. Biodegradable synthetic polymer such as poly (glycolic acid) (PGA), poly(L-lactic acid) (PLLA), poly(lactic-co-glycolic acid) (PLGA) and poly(*e*-caprolactone) (PCL); and naturally derived polymers such as collagen have their respective advantages and drawbacks when used to prepared porous scaffolds for tissue engineering and regenerative medicine. Generally, the biodegradable synthetic polymers are easily formed into desired shapes with relatively good mechanical strength. Their periods of degradation can also be manipulated by controlling the crystallinity, molecular weight, and copolymer ratio. However, the scaffolds derived from synthetic polymers lack cell-recognition signals, and their hydrophobic property hinders smooth cell seeding. In contrast, naturally derived polymers such as collagen have the advantages of specific cell interactions and hydrophilicity, but scaffolds constructed entirely of collagen have poor mechanical strength. Therefore, these two kinds of biodegradable polymers have been hybridized by introducing collagen sponge or micro-

Lab Feature Continued...

sponge in the openings of skeletons of synthetic polymers to combine the advantageous properties of both constitutes and to overcome the drawbacks. The mechanically strong synthetic polymers serve as mechanical skeletons to support the hybrid porous scaffolds, whereas collagen sponge and microsponge provide high porosity and a favorable microenvironment for cell proliferation and new tissue formation. The hybrid porous scaffolds have been used for tissue engineering of bone, cartilage, skin, ligament, trachea and bladder.

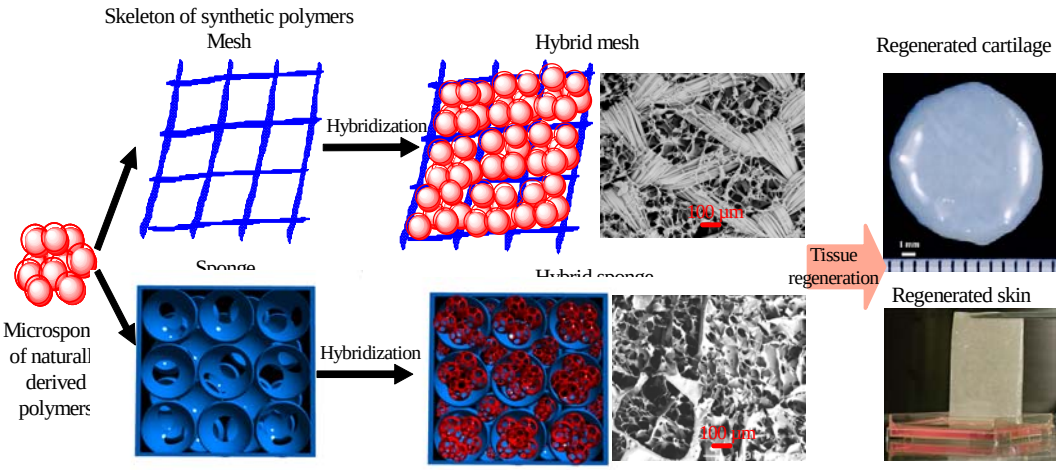

Figure 1. *Hybridization scheme for hybrid scaffolds, SEM images of two hybrid scaffolds and gross view of tissue engineered cartilage and skin.*

2. The second research topic is development of porous scaffolds with controlled pore structure and interconnectivity. Optimization of porous structure is one important aspect of scaffold design and fabrication, and various methods have been developed to introduce porosity into biodegradable polymers. We have developed a method by using pre-prepared ice particulates and embossing ice particulates as the porogen materials and templates to prepare porous scaffolds having open surface pore structures and high interconnectivity. Pre-prepared ice particulates are mixed with polymer solution and then removed by freeze-drying to form bulk pore structures. The pore size and density can be controlled by altering the dimension and number of ice particulates. Additionally, ice particulates embossed on a film surface are used as templates to prepare funnel-like porous scaffolds. The funnel-like porous scaffolds have a hierarchical structure of large open pores on the top surface and interconnected smaller pores within the construct. The shape, size, and density of the large surface pores are determined by the physical properties of the ice particulates, while the small bulk pores are influenced by the freezing temperature. Funnel-like collagen, chitosan, hyaluronic acid, and collagen-glycosaminoglycan sponges have been prepared by this method. Such funnel-like porous structures facilitate cell adhesion to, penetration into, and distribution throughout the scaffold, and promote tissue generation. The funnel-like porous scaffolds have been used for tissue engineering of cartilage and skin.

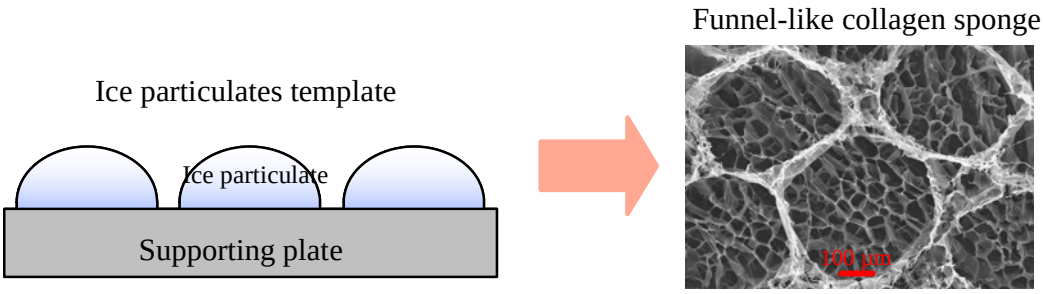

Figure 2. *Schematic illustration of embossing ice particulates and SEM image of funnel-like collagen*

3. The third research topic is creation of biomimetic ECM scaffolds and cell culture substrate using cultured cells. Biomimetic scaffolds and substrates of extracellular matrices (ECM) play an important role in the regulation of cell function and in the guidance of new tissue regeneration, as ECM have the intrinsic cues necessary to communicate with and dictate to cells. Similarity in the composition, microstructure and biomechanical properties of the scaffolds and substrates to those of the native tissues and organs will maximize the promotion effect in the regeneration of both structural and functional tissues and organs. We have developed a method to prepare matrices mimicking ECM remodelling during stem cell differentiation, referred to as stepwise tissue-development mimicking matrices. Osteogenesis-mimicking matrices and adipogenesis-mimicking matrices have been prepaed by this method. The stepwise tissue-development mimicking matrices can be applied to tissue engineering and basic biological research. We have also developed a method to prepare autologous extracellular matrices (aECM) scaffolds by combining culture of autologous cells in a three-dimensional template, decellularization, and template removal. By using autologous ECM scaffolds for the culture of autologous cells, “full autologous tissue engineering” can be realized to make the tissue engineered construct more biocompatible with the host.

Lab Feature Continued...

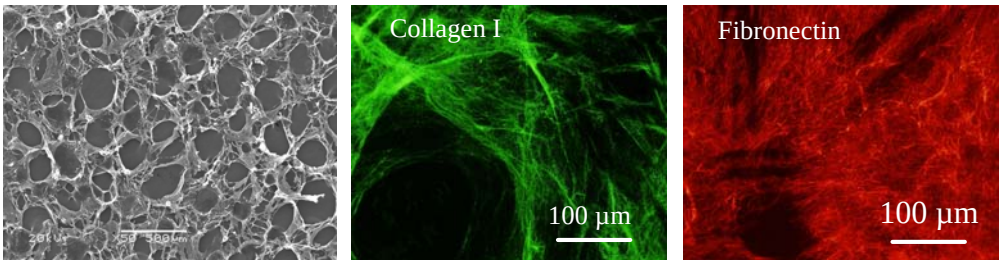

Figure 3. *SEM image of autologous ECM scaffold and immunofluorescence images of collagen I and fibronectin composing the aECM scaffold.*

4. The fourth research topic is manipulation of stem cell functions by micro-patterned surfaces of functional polymers and bioactive molecules. Photo-reactive polymers are synthesized and used for preparation of micropatterns of functional polymers and bioactive molecules by photolithography. Micro-patterns with different geometries and areas are constructed and used to manipulate stem cell functions.

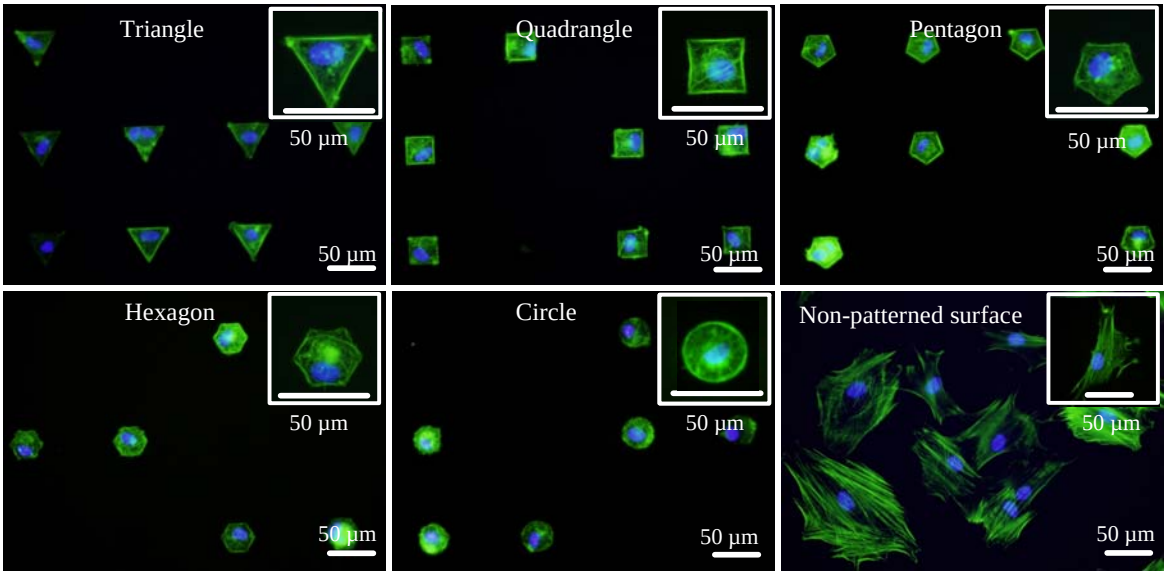

Figure 4. *Manipulation of cell shape of single mesenchymal stem cell by micro-patterned surface (green: cytoskeleton, blue: nucleus).*

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Submit Your Abstract!

termis 2011 NorthAmerica Annual Conference and Exposition

December 11-14, 2011, Hilton Americas-Houston - Houston, Texas

TERMIS-NA is proud to announce the 2011 conference committee is now accepting abstracts for review. Click here for more information.

Deadline date for submissions is August 2nd.

Experts from academia and commerce are invited to present timely information ranging from cutting edge research to successful implementation of tissue engineering technologies in all areas of tissue engineering/regenerative medicine including:

Biomaterials and Scaffolds
- Synthesis, Functionalization and Fabrication of Biomaterials
- Microfabrication, Printing, and Patterning Technologies
- Nanobiotechnology for Regenerative Medicine

Extracellular Matrix Biology
- Impact of ECM Composition on Cell Fate and Tissue Formation
- ECM and Mechanotransduction
- Decellularized Tissue Matrices

Stem Cells and Regenerative Medicine
- Stem Cell Sources, Culture and Characterization
- Developmental Biology and Tissue Morphogenesis
- Endogenous Stem Cell Homing
- Artificial Stem Cell Niches

Cell Tracking and Tissue Imaging
- Reporters and Imaging for Cell Tracking
- Assessing Engineered Tissues In Vitro and In Vivo

Biological and Design Considerations in Tissue Engineering and Regenerative Medicine
- Bioreactor Technologies
- Cell Sourcing, Preservation and Manipulation
- Gene Therapy
- Vascularization of Engineered Tissues
- Immunology and Tissue Responses

Translation to Clinical Application
- Manufacturing, Scale-up and Automation
- Regulatory and Commercialization Issues
- Pre-clinical Studies
- Clinical Trials

Applications of Tissue Engineering and Regenerative Medicine
- Cancer
- Cardiac and Cardiovascular
- Disease Models and Drug Testing Platforms
- In Situ Repair
- Liver and Endocrine
- Musculoskeletal, Craniofacial and Dental
- Neural
- Pediatric, Fetal, or Neonatal Applications
- Skin and Wound Healing
- Soft Tissue Repair
- Urologic
- Veterinary and Agricultural

TERMIS-EU News

2014 TERMIS-EU Conference Location Announcement

The 2014 TERMIS-EU Conference will be held in Genoa, Italy from 10-13 June. The conference co-chairs are Dr. Ranieri Cancedda and Dr. Claudio Migliaresi.

The TERMIS-EU Council would like to inform you of two summer schools that will be held in 2011. The TERMIS-EU Council has provided the organizers of each of the schools funds to support student scholarships.

TERMIS-EU 2011 Summer Schools

1st Advanced Summer School - Interrogations at the BiointerfaceSummer School Dates: 20-24 June 2011Theme: "Cancer/ Regeneration Interface"Location: INEB/IPATIMUP/IBEC, Porto, Portugal

Summer School on Biomaterials & Regenerative Medicine
Summer School Location: Riva del Garda, Trentino Region, Italy
Summer School Dates: September 19-23, 2011
Summer School Theme: Biomaterials and Regenerative Medicine: from molecular and cell biology to tissues and organ repair

Formation of Thematic Groups

The Governing Board of TERMIS has approved a recommendation that Thematic Groups of the Society should be created. According to its mission, TERMIS brings together the international community of person engaged in the fields of tissue engineering and regenerative medicine and promotes education and research within these fields, serving as an international forum to promote the informed discussion of challenges and therapeutic benefits of the application of these technologies of regenerative medicine.

These aims are mainly achieved through the annual meetings of the three Continental Chapters, the TERMIS World Congress Meeting held every three years and the endorsement of the journal Tissue Engineering. TERMIS is well advanced in the integration of regenerative medicine at the geographical level and now intends to address this integration at the thematic level. Tissue engineering and regenerative medicine involve a wide variety of basic scientific and engineering disciplines that have to be combined with clinical disciplines and the practical aspects of translational medicine. Thematic Groups will now be introduced, in a phased manner, which are globally based rather than geographically oriented. The incorporation of Thematic Groups into the general structure of TERMIS will be permissive and not mandatory and will be based on the submission of proposals to the Governing Board and their approval by the Board.

List of Potential Themes:

- *Developmental Biology*
- *Scaffolds & Matrix Biomaterials*
- *Bioprinting/Biofabrication/ Bioreactors/Bioprocessing*
- *Inflammation & Immunity*
- *Imaging*
- *Cell Sourcing & Manipulation*
- *Pre-clinical Protocols*
- *Clinical Trials*
- *Infrastructure—regulatory, health economics, ethics*

Procedures for Establishing Thematic Groups

Outline Submissions: An outline proposal should be made to TERMIS which will include the title of the theme, the names of the three proposers, all of whom are members of TERMIS, and one of whom will be the Chair of the Group, and a single paragraph statement of the rationale for the theme and its inclusions as a TERMIS Thematic Group. The outline submission should be communicated to the TERMIS administrator and will be reviewed by the TERMIS President and President-Elect. If it is agreed that the proposal represents a theme that is relevant to TERMIS, the proposed Thematic Group Chair would be encouraged to submit a full proposal.

Next Steps Upon Approval of Outline Submission

Full Proposal: The full proposal should contain a two-page statement of the scientific and clinical rationale for the theme and an indication of the proposed activities. It should include the names of proposed office holders, specifically Chair, Vice Chair and Secretary, and a list of ten additional scientists and/or clinicians, who need not be current members of TERMIS, who endorse the formation of the Group. These should have a broad geographical spread and preferably involve all three Continental areas.

The full proposal, which have to be submitted within three months of receiving the decision to proceed, should be communicated to the TERMIS administrator, who will distribute this to members of the Governing Board.

The process of submissions may take place at any time after March 1st, 2011; there will be no submission closure dates and each proposal will be dealt with as they are received. If two or more proposals dealing with the same or similar themes, are received, the individual proposers may be invited to discuss possible collaboration/consolidation.

David Williams

President-Elect, TERMIS

Tissue Engineering, published by Mary Ann Liebert, Inc. is the official journal of TERMIS

Tissue Engineering, Part A
Co-Editors: Antonios G. Mikos and Peter C. Johnson

The flagship journal provides a fundamental understanding of structure-function relationships in normal and pathologic tissues with the ultimate goal of developing biological substitutes. The Journal brings together scientific and medical experts in the fields of biomedical engineering, biomaterials science, molecular and cell biology, genetic engineering, and surgery to present and discuss advances in this emerging field.

Tissue Engineering, Part B, Reviews
Co-Editors: John P. Fisher, Antonios G. Mikos, and Peter C. Johnson

This journal meets the urgent need for high-quality review papers due to the rapid expansion of the field. The Journal presents critical discussions, analyses, and concise summaries of research in different aspects of the field to assess where we are now and future directions.

Tissue Engineering, Part C, Methods
Co-Editors: John A. Jansen, Antonios G. Mikos, and Peter C. Johnson

This journal presents procedures and protocols that will be adopted by the tissue engineering community as the research is translated into clinical applications. Authoritative papers will bring consistency to the research methods employed and help the field grow and mature.

Upcoming Meetings Endorsed by TERMIS

July 2011

4th Annual Business Education Course Course Dates: July 11-14, 2011 Course Organizers: Dr. Arnold I Caplan Course Location: Cleveland, OH BEC 2011 Brochure

Stem Cells Europe Conference Dates: 20-21 July 2011 Conference Location: Edinburgh, Scotland

Gordon Research Conference Conference Theme: Biomaterials & Tissue Engineering: The Path from Basic Science and Engineering to Translational Medicine Conference Dates: July 31-August 5, 2011 Conference Location: The Holderness School, Plymouth, NH

August 2011

TERMIS-AP 2011: Singapore Conference Dates: 3 - 5 August 2011 Conference Location: Corpthorne Waterfront Convention Centre Conference Theme: "Rescuing the Patients" Meeting Chair: Prof. James Goh Scientific Chair: Prof. Michael Raghunath

Rice University Short Course 2011 Short Course Dates: August 10-13, 2011 Short Course Location: Rice University BioScience Research Collaborative Short Course Director: Dr. Antonios G. Mikos

September 2011

ESB 2011 Conference Dates: 4th-9th September 2011 Conference Location: Dublin, Ireland Dr. Abhay Pandit, Conference Chair

Stem Cells USA & Regenerative Medicine Congress Conference Dates: September 12-15, 2011 Conference Location: Boston, MA

Summer School on Biomaterials & Regenerative Medicine Summer School Location: Riva del Garda, Trentino Region, Italy Summer School Dates: September 19-23, 2011 Summer School Theme: Biomaterials and Regenerative Medicine: from molecular and cell biology to tissues and organ repair Registration Deadline: before June 15, 2011

Phacilitate Cell & Gene Therapy Forum 2011 Forum Dates: 19-21 September 2011 Forum 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

4th Joint ESAO-IFAO Congress 2011 Congress Dates: 9-12 October 2011 Congress Location: Porto, Portugal at the Porto Congress Centre - Alfândega

bone-tec 2011 Congress Dates: 12-15 October 2011 Congress Location: Hannover, Germany Congress Chair: Dr. Karl-Heinz Schuckert, Head of Institute Indente

December 2011

TERMIS-NA 2011: Houston, Texas Conference Dates: December 11-14, 2011 Conference Location: Hilton Americas-Houston Conference 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 Engineering Conference Location: Ho Chi Minh City, Vietnam Conference Dates: January 8-12, 2012 Conference Organizers: International University of Vietnam National Universities in HCM City, University of Houston, University of Michigan, and University of Southern California

April 2012

7th Symposium on Biologic Scaffolds for Regenerative Medicine Symposium Dates: April 26-28, 2012 Symposium Location: The Silverado Resort, Napa Valley, CA Symposium Organizer: Stephen F. Badylak, DVM, PhD, MD Keynote Speaker: Mina J. Bissell

For more information, please contact:
Jocelyn L. Runyon
Phone: +1 (412) 624-5253

September 2012

2012 3rd TERMIS World Congress: Vienna, Austria Conference Dates: September 5-8, 2012 Conference Location: Hofburg Congress Center in Vienna, Austria Conference Chair: Heinz Redl, PhD

To request further information, please contact:
Dr. Heinz Redl

June 2013

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

October 2013

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

December 2013

2013 TERMIS-NA: Atlanta, GA Conference Location: Atlanta, Georgia Conference Chair: Robert E. Guldberg, PhD Conference Program Chair: Todd C. McDevitt, PhD More details to follow.

June 2014

2014 TERMIS-EU: Genoa, Italy Conference Dates: 10-13 June 2014 Conference Co-Chairs: Ranieri Cancedda and Claudio Migliaresi More details to follow.

Would you like to have your meeting listed here? To learn more, contact Sarah Wilburn.