THE AUSTRALASIAN SOCIETY FOR BIOMATERIALS & TISSUE ENGINEERING

ASBTE *NEWS*

NOVEMBER 2013

Announcing the annual ASBTE Conference 2014 on the Great Ocean Road

Key Dates:

22 October	***Call for abstracts***
4 November	***Registration opens***
29 November	***Call for papers deadline***
16 December	***Notification of abstract acceptance***
15 February 2014	***Early bird registration deadline***
22 April 2014	***Conference opens***
24 April 2014	***Conference closes***

Please check the website for all of the updated information and details:
www.asbte2014.org

New Membership and Renewals Starting 1 November 2013:

Membership Rates: Full Member (Calendar Year) $80; Student Member (Calendar Year) $40. Membership forms are available at www.biomaterials.org.au

ASBTE Website (www.biomaterials.org.au**)**
Any member wishing to supply news items, links, PhD scholarships, job listings, or other relevant information to the ***website*** should submit these to Michael Mucalo (m.mucalo@waikato.ac.nz)

ASBTE NEWS is a biannual newsletter that covers news from The Australasian Society for Biomaterials & Tissue Engineering. If you have a news item that you wish to be included please contact the editor:

Bryan Coad (Bryan.Coad@unisa.edu.au)

INSIDE THIS ISSUE:

Student Column

Upcoming ASBTE Student Nights

New South Wales:

An event is being planned for **November 2013**. Further information to be circulated by email, on the website, and on social media. Contact Khoon (khoon.lim@unsw.edu.au)

Queensland:

Event tentatively planned for **February 2014**. Further information to be circulated by email, on the website, and on social media. Contact Robyn (robyn.aston@uqconnect.edu.au) and Nishant n.chakravorty@qut.edu.au

Victoria:

Event tentatively planned for **February 2014**. Further information to be circulated by email, on the website, and on social media. Contact Peter (Peter.Koegler@csiro.au)

Funding Opportunities

2014 ASBTE Lab Travel Grants - Now Open. Apply by 15th November.

ASBTE provides Lab Travel Grants in 2014

- Up to $5,000 for international travel to collaborating laboratories
- Grants of up to $1,000 for local travel

for postgraduate research students and early-career researchers. Please visit the ASBTE webpage for further information, guidelines, application forms and updates: www.biomaterials.org.au

Completed application forms and a copy of a CV must be submitted to Prof. Tony Weiss via e-mail (tony.weiss@sydney.edu.au) with the subject heading "ASBTE Lab Travel Grant Application" **by 5 pm (AEST) Friday 15 November**

2014 ASBTE Conference Travel Awards - to be announced

Announcement for 2014 to be made soon via email, social media, and on the website

Social Media

ASBTE now on LinkedIn

The ASBTE group on LinkedIn provides the latest news and discussions for society members.

If you are a LinkedIn member, search for "ASBTE - The Australasian Society for Biomaterials and Tissue Engineering" in groups and request to join the group. Or type in the following web address:

www.linkedin.com/groups?home=&gid=6512061

If you are not a member of LinkedIn, start by registering today. It's free!

au.linkedin.com

Lab visit report: Peter Levett, Queensland University of Technology

Introduction

Despite decades of research and clinical testing, cartilage repair remains a huge challenge in healthcare. The Cartilage Regeneration Laboratory, led by Assoc. Prof. Travis Klein at the Queensland University of Technology, uses hydrogels to study disease pathology, chondrocyte biology, and cartilage repair. The focus of Peter's PhD project has been to evaluate functionalised hydrogels for application in cartilage repair. Assoc. Prof. Jos Malda's group at the University Medical Centre (UMC), Utrecht, The Netherlands, is also investigating hydrogels for cartilage repair, with a particular focus on bioprinting and zonal organisation.

From September 2012 to July 2013, Peter visited the UMC under the supervision of Asoc. Prof. Jos Malda.

Peter's Report

Soon after arriving, I was fortunate to attend the TERMIS 3rd world congress in Vienna, from the 5th to 8th September 2012. At this meeting I presented a poster on my research from QUT, and acknowledged the funding obtained from the ASBTE. In December 2012 I attended the Dutch National Biomaterials conference (NBTE) and gave an oral presentation of my research, in which I also acknowledged the funding received from the ASBTE.

Experimental studies at the UMC followed on from the hydrogels that were being used previously at QUT. The first step was to functionalise the hydrogel precursors to form photocrosslinkable versions of gelatin, hyaluronic acid (HA) and heparin (Gel-MA, HA-MA and Hep-MA, respectively). These were analysed using ^{1}H NMR, and we are grateful to Kristel Boere for running NMR samples. Both photocrosslinkable heparin and hyaluronic acid were retained in gel-MA hydrogels, whereas their unmodified counterparts diffused out. Chondrocytes were encapsulated in Gel-MA/HA-MA hybrid hydrogels. Matrix production and collagen type II production by chondrocytes varied with the concentration of HA-MA, with low and high HA-MA concentrations resulting in weak immunostaining for collagen type II, whereas constructs with an intermediate HA-MA concentration stained strongly for collagen type II. Incorporation of both HA-MA and hep-MA did not compromise cell viability. Cell encapsulation studies will be completed using human chondrocytes, to evaluate whether heparin can facilitate the retention of growth factors such as TGF-β within the gel.

Mixtures of Gel-MA and HA-MA were printed using the BioScaffolder, with reasonable fidelity, and printability increased dramatically with concentration of both gel-MA and HA-MA. For the studies with pepsin digests, we harvested tissue from euthanized horses, and following a lengthy protocol, produced photocrosslinkable polymers from the different tissues. Successful incorporation of vinyl groups was confirmed using NMR, and solutions of the modified tissue digests were able to be photocrosslinked into stable hydrogels. In line with our previous studies, we incorporated these components of the tissue digests into gel-MA hydrogels. The effect on these matrix components on equine chondrocytes and MSCs is being investigated.

The research group of the Department of Orthopaedics is situated within the UMC hospital. Many of the research PhD students in the group are medical graduates and the clinicians are actively involved in a broad range of medical research. The Department of Orthopaedics also works closely with the Faculty of Veterinary Medicine and the Department of Equine Sciences, which, together with the hospital setting, combine to give the research group a strong clinical focus. Coming from a background in engineering and laboratory-based experience; this was invaluable for me, as I was able get a different perspective of the broader goals of regenerative medicine, and the challenges of applying research in a clinical therapy. The Department was in the process of establishing a clinical trial for single stage cartilage repair, which was of particular interest, and I learned a great deal from attending research presentations, and being present during group discussions. I also believe the visit was useful to several research students at the UMC, particularly those aiming to establish hydrogel models for cell culture, where I was able to lend some experience and suggestions. In particular, at QUT we have developed a mold system for producing large numbers of photocrosslinked hydrogels, and we were able to introduce this system to researchers working with HA-MA and other hydrogels at the UMC.

The UMC and QUT have now established a joint PhD program in recognition of the strength of the existing collaboration, and to continue the relationship in the future. Under the requirements established by both institutions, it is hoped that the visit will enable me to be eligible for consideration under this program.

Peter is sincerely grateful to the ASBTE for providing the financial support to make this visit possible, and for the support of Travis, Jos and Prof. Dietmar W. Hutmacher.

Peter's lab visit was supported by an ASBTE Lab Travel Grant

Please visit the ASBTE webpage for further information, guidelines, application forms and updates: www.biomaterials.org.au

ASBTE Lab Travel Grant Applications for the coming year are due **by 5 pm (AEST) Friday 15 Nov.**

Travel report: George Wang, Swinburne University of Technology

Dr. Peng-Yuan (George) Wang, a postdoctoral fellow working at Swinburne University of Technology, Melbourne, was the recipient of two ASBTE travel grants this year. George received his ASBTE Conference Travel Grant to attend the 2013 ASBTE conference at Barossa Valley, South Australia in early April this year as well as an ASBTE Lab Travel Grant to visit Prof. Nicolas Voelcker's group at the Mawson Institute, University of South Australia, Adelaide in June this year.

George's research interests centre on cell-biomaterial interactions, and especially on mesenchymal stem cells interacting with surface topography and chemistry, which has applications in tissue engineering. George holds a SIEF funded "John Stocker" Postdoctoral Fellowship in the area of colloid science and biomedical engineering and works with both Prof. Peter Kingshott at Swinburne University of Technology, Melbourne and Dr. Helmut Thissen at CSIRO, Melbourne.

George has previously been the recipient of a travel scholarship under the Graduate Program for Studying (GPS) in Australia/New Zealand Scheme of the National Science Council, Taiwan in 2010 during his Ph.D. At that time he was working closely with Prof. Nicolas Voelcker and focusing on the fabrication of stable porous silicon (pSi) gradients for studying the behaviours of mesenchymal stem cells. George was keen to continue collaborating with his former advisor after coming back to Australia. Since the surface properties of pSi can easily be tuned in regard to topography and chemistry, George was interested in utilising pSi as a substrate for colloidal self-assembly because the substrate properties are crucial for self-assembly.

There were three main aims during this Lab Travel:

1) to deliver the fabrication of binary colloidal self-assembly technique using evaporation induced confined area assembly (EICAA) to them,
2) to learn different methodologies such as dip coating and spin coating techniques for single colloidal crystal formation, and
3) to study binary colloidal crystals on pSi. Preliminary results showed that nanopores may disturb the self-assembly depending on the pore size. George is now continuing the study of binary colloidal self-assembly using pSi as a substrate.

He would like to thank ASBTE for funding his travels, as well as Prof. Nicolas Voelcker and the entire group including students and postdocs for hosting him.

George's lab visit and conference travel were supported by ASBTE grants

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Spotlight on Reviews from ASBTE Members

Mario Salwiczek, CSIRO Materials Science and Engineering

Review Article:

Emerging rules for effective antimicrobial coatings

Mario Salwiczek, Yue Que, James Gardiner, Richard A. Strugnell, Trevor Lithgow, Keith M. McLean, Helmut Thissen

Trends in Biotechnology

DOI: 10.1016/j.tibtech.2013.09.008

How did this review come about?

Lead author: Dr. Mario Salwiczek

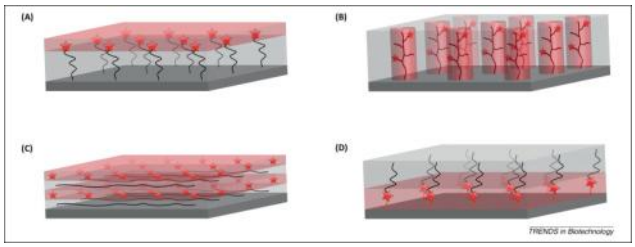
When I joined the Biomedical Materials Theme at CSIRO, the field of biomedical surface coatings and biofilms was new to me and I had to read a lot of papers to familiarise myself with these topics and the most recent developments. The combination of low-fouling polymer coatings with antimicrobial peptides holds great promise as a design principle for effective coatings but is still a rather new approach - so we asked the question "How good is this approach?"

Can you describe how this work will impact your field?

Literature with this specific focus is available but actually hard to find. Biomaterials scientists with an interest in this area will certainly appreciate that somebody has provided an overview. The review may help to develop new ideas and to overcome bottlenecks in this particular field.

Who is your target audience?

This review is targeted at a broad audience ranging from biomaterials scientists chemists, biologists and clinicians interested in the latest developments. We think that especially students entering the field will find this paper useful as a guide and introduction to the topic.



Possible coating architectures that combine low-fouling with antibacterial properties: (A) icing; (B) bottle brush; (C) multilayer; and (D) castle.

Dr. Mikael Larsson, University of South Australia

Review Article:

Biomedical applications and colloidal properties of amphiphilically modified chitosan hybrids

Mikael Larsson, Wei-Chen Huang, Meng-Hsuan Hsiao, Yen-Jen Wang, Magnus Nydén, Shih-Hwa Chiou, Dean-Mo Liu

Progress in Polymer Science

Volume 38, Issue 9, September 2013, Pages 1307 - 1328

How did this review come about?

Basically, we had been working in the field of the review for some time and felt that there was an existing gap in the literature between the material science and the more clinically focused science. We saw that to bridge this gap, a review focusing on the colloidal properties of amphiphilic chitosan derivatives in relation to biomedical performance, was much needed.

Lead author: Dr. Mikael Larsson

Can you describe how this work will impact your field?

We hope that this comprehensive work will enable material scientists and scientist working closer to the clinical application to see and understand the other end of the "pipeline". Hopefully some scientist will get great ideas on how to design materials to overcome clinically relevant problems highlighted in the article, while other scientists will realize that there may already be materials out there that are suitable to address some clinical problem they are already aware of.

Who is your target audience?

At first our intended audience was material scientists working with amphiphilic chitosan, as well as any scientist that works close to the clinical setting and has an interest in nanomedicine. However, as the work progressed we realized that even if the focus was on amphiphilic chitosan there is much information in the article that will benefit scientists with a general interest in the use and potential of colloids in biomedical applications.

If you have a recently published an exciting article of interest to ASBTE members please contact the editor - Bryan Coad (bryan.coad@unisa.edu.au)

Dr Wojciech Chrzanowski takes nanomedicine research global

University of Sydney's Dr Wojciech Chrzanowski (Faculty of Pharmacy) has gained international attention for his cutting-edge work on biomaterial technologies that seeks to enhance the integration between human cells and surgical implants.

Dr Chrzanowski's research into this microscopic biochemical 'braille' concept netted him first prize in the poster presentation category at the inaugural International Translational Nanomedicine Conference at Northeastern University in Boston, USA in July this year.

More recently, Dr Chrzanowski was named a recipient of the Japan Society for the Promotion of Science (JSPS) Invitational Fellowships for Foreign Researchers 2013 – an extremely competitive and prestigious appointment promoting international scientific cooperation.

He will travel to Japan in November to collaborate with world-leading biomaterial scientists Professor Tadashi Kokubo (Chubu University) and Professor BJ Kim (Tokyo University).

The project will focus on understanding and improving the way cells interact with the biomaterials of implant surfaces, and enable the development of novel biomaterials, nanotherapeutics and technologies for studying these interactions.

In a sense, the research will seek to develop its own 'Braille' system to make implants surfaces more 'readable' for cells and therefore improve their integration and function in the body.

"I am honoured and very excited to receive this level of recognition, with the award from the Translational Nanomedicine conference and also the prestigious fellowship," said Dr Chrzanowski.

"I'm looking forward to continuing my research in collaboration with one of the most recognised biomaterials scientists and engage in new research at Tokyo University."

Conference Success

Nanomedicine, a relatively young scientific field (little more than a decade old), has so far yielded promising outcomes, but few commercial products.

However, there is still an exciting surge of activity in nanomedicine, with new exciting avenues of research revealing great future potential applications, such as Dr Chrzanowski's 'braille' surfaces.

Translational aspects of nanomedicine were the major subject of discussion during the first annual International Translational Nanomedicine Conference hosted by Northeastern University in Boston, and sponsored by the International Journal of Nanomedicine.

"The conference reinforced the fact that nanomedicine research is still incredibly active and ripe for forming products," said conference chair Professor Thomas Webster.

Professor Webster highlighted fundamental role of research and the need for integrated efforts in this area, "if we don't even understand the mechanism of how things are working, how are we going to convince the Federal Drug Administration (FDA) to insert our materials," he said.

The Conference was an opportunity for researchers from around the world to present and share their work with colleagues and push closer towards understanding how to translate the incredible potential opportunities into real-life, beneficial products and solutions.

The Faculty of Pharmacy's Dr Chrzanowski attracted particular attention for his work, which focused on guiding cellular responses using biochemical signals incorporated into surface of devices, winning an award for his poster presentation and generating much discussion amongst the attendees.

"I feel very humbled to receive the first prize for my work and I was delighted to discuss my work with researchers who came for the conference from around the world," said Dr Chrzanowski.

"In fact attending this meeting on its own was an award and privilege. This conference has been instrumental to conceive new research ideas and collaborations, which will advance the field of nanomedicine." he said.

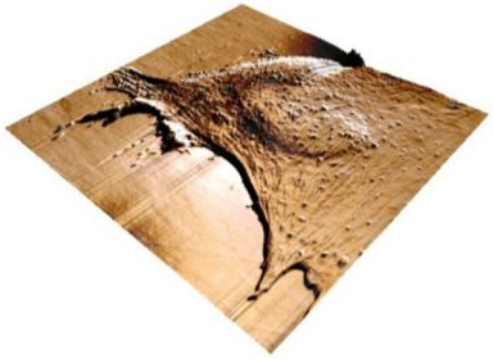


Image of a single cell grown on bio-chemically modified implant surface obtained using Molecular Force Probe (MFP-3D-Bio, part of the state-of-art nano-bio-characterisation facility established at the Faculty of Pharmacy). Real-time 3D imaging at nano-scale allows detailed investigations of cell responses to materials and environ-

It's what's on the surface that counts

Behind Dr Chrzanowski's award-winning research is the simple, but brilliant concept of braille - the physical language of bumps developed to help visually-impaired people 'read'.

Dr Chrzanowski's prestigious JPRS Fellowship will allow him and collaborative researchers to better understand how this braille-like concept could be exploited on the smallest possible level, for the smallest possible audiences – cells.

Applying this idea to optimise surgical implants could prove to be incredibly beneficial to patients' lives and the national health system.

Continued on next page...

Nonomedicine News: Dr Chrzanowski. Continued from previous page

"There is an urgent need for a technology that is capable of improving implant integration, particularly countries with rapidly aging populations, such as Australia," said Dr Chrzanowski.

For example, a large number of trauma incidents results in millions of fractures needing treatment. There are over six million fractures a year in the US alone, which is roughly nine fractures every minute that require an implantable fixation device.

"The implantation of metal devices into tissues carries a high risk of post-operative complications, which are caused by poor integration of the implant and biofilm formation, Dr Chrzanowski explained.

"These are regarded as the most dreaded complications in orthopedics that result in repeat surgeries, patient distress and disability, and increased cost and utilisation of medical resources - recent data shows the number of revision operations in Australia is steadily increasing at a rate of around 6 percent per annum," he said

One solution is to examine the effect of modifications to implant surface characteristics, such as its topography (patterns, rough surfaces), chemistry (eg. oxidations, hydroxyapatite coatings) and functionalisation with bioactive molecules like antibiotics and proteins that are tethered to the surface.

Dr Chrzanowski's JPRS Fellowship will see him team up with Professor Tadashi Kokubo from Chubu University to seek to create innovative, multifunctional (as opposed to current single modulation) surfaces which simultaneously control, regulate, prevent or trigger specific biological reactions, such as cell adhesion or differentiation and prevention of bacteria colonisation.

A new metallic biomaterial developed in Japan, which outperforms currently-used alloys, will be used in the project.

"This fellowship builds on our preliminary results and utilizes the unique expertise of both Chubu University and the University of Sydney in fabricating the next generation of advanced healthcare materials with many prospects for immediate clinical translation," said Dr Chrzanowski.

"It will also open possibility to take this collaboration to the next level and allow the intensive research and the extension of our collaborative network," he said.

"We intend to conceive collaboration with experts from Kyoto University, Tokyo University, Toyota and James Cook University to design novel multifunctional surfaces."

Dr Chrzanowski begins his Fellowship in November.

2014 Membership renewal reminder

Applications for membership renewal are now accepted for 2014.

Renew your membership or become a member: www.biomaterials.org.au