Australia-China Centre
for Tissue Engineering and
Regenerative Medicine

2021 International Forum for Tissue Engineering and Regenerative Medicine

Friday, November 26th, 2021

VENUE:
QUT E Block Level 5 Function Space,
Kelvin Grove Campus, Australia

ORGANISERS:

Queensland University of Technology (QUT)
Guangzhou Medical University

CHAIRMEN:

Professor Yin Xiao
Professor Zhiyong Zhang

Professor Minghao Zheng MD, PhD, FRCPath

Biography

Professor Minghao Zheng is dedicated to the translation of innovative medical technologies into optimised outcomes for orthopaedic applications and cell therapies in clinical practice.

After studying medicine at Shantou University and Sun Yat-sen University of Medical Sciences in China, Professor Zheng came to The University of Western Australia in 1989, receiving a PhD in 1993 and Doctor of Medicine in 2000.

He is Winthrop Professor of Orthopaedic Research at UWA, heads the Bone-Brain Axis research division at the Perron Institute for Translational and Neurological Science, and is part of numerous national and international collaborative research programs. He is fellow of the Royal College of Pathologists, UK, the Royal College of Pathologists of Australasia, and the Royal Society of Medicine, and serves on the editorial boards of a number of Orthopaedics, Stem Cell and Pathology journals.

Professor Zheng is an expert in the field of regenerative medicine, in particular the translation of novel science into clinical practice, including the regeneration of tendon and cartilage using a patient's own stem cells. He developed Matrix-induced Autologous Implantation (MACI) for cartilage repair of the adult knee; Autologous Tenocyte Implantation therapy (Ortho-ATI™) for chronic tendon injuries; and CelGro™ collagen scaffold for cartilage, tendon, ligament and nerve cell repair and dental applications, which has gained FDA, TGA and CE Mark approval.

Professor Zheng is co-founder of Orthocell Limited (ASX:OCC), a company established to commercialise orthopaedic innovations; co-founder and scientific consultant at Captix Biomedical, an Australian biotech company creating innovative technologies to deliver cell therapies; and recently established Marine Biomedical Pty Ltd to develop PearlBoneTM from pearl nacre into a synthetic bone substitute for the orthopaedic device sector.

He has authored more than 270 scientific publications with over 9,100 citations and H index of 54 and holds 11 patent families in orthopaedics and cellular therapy worldwide. In 2016 he was recipient of the Vice-Chancellor's Senior Research Award, won the Innovation Award at the WA Industry & Export Awards in 2016, and was a finalist in the WA Innovator of the Year Award in 2019.

Professor of Orthopaedic Research

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Collaboration Showcase:

Orthocell and UWA collaboration led to market authorisation of a collagen device in Europe, USA and Australia.

Professor Minghao Zheng, MD, PhD, FRCPath

Medical School, The University of Western Australia

Co-Founder of Orthocell, Chief Medical and Scientific Officer, Orthocell (ASX:OCC), Australia

Abstract

One of key aspects in tissue engineering and regenerative medicine is the development of scaffold materials for restoration of tissue and organ function. A wide variety of synthetic materials have been developed including polyester, polycarbonate/polyurethane, polyglycolic acid, polytetrafluoroethylene and polypropylene. These synthetic materials have shown improved biomechanical strength but their evidence to aid tissue repair and regeneration is still accumulating. In contrast, biological scaffolds, composed of collagens derived from either xenograft or allograft tissue, may have the ability to support tissue growth but generally lack biomechanical strength. A range of sources has been used for processing or manufacture of biological scaffolds including allogenic skin, porcine dermis, porcine small intestinal sub-mucosa, bovine pericardium as well as Achilles tendon. There are significant issues concerning the biocompatibility of biological scaffolds. We previously reported that one of the commercial collagen devices contained significant amounts of foreign residual DNA which have been associated with serious biological reactions resulting in compromising the efficacy and quality of scaffolds for tissue repairs. Learning from mistakes, we developed a patented technology of collagen scaffold manufacture and translated the concept into a clinical product approved in Europe, USA, and Australia within 15 years. This lecture aims to use this showcase to discuss the journey of translation from benchtop and bedside, the essential requirement on how to cross a valley of death in translation and the roles of academic institutions and industry.

Professor Jiang Chang

Biography

Professor Jiang Chang, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Fellow of International Union of Societies for Biomaterials Science and Engineering (FBSE), Fellow of Royal Society of Chemistry (FRSC), and Fellow of American Institute of Medical and Biological Engineering (AIMBE). Professor Chang is the vice president of the Interdisciplinary Research Society for Bone and Joint Injectable Biomaterials. He is also an associate editor of the Journal of Materials Chemistry B, and International Editorial Advisory Board member of Biomaterials.

His research focuses on bioactive materials for tissue regeneration and tissue engineering and the mechanisms of the interaction between biomaterials and cells. Professor Chang has over 400 scientific papers published in international peer-reviewed scientific journals with more than 20000 citations and H-index 82, and 70 patents.

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Regulation of cell fate by bioceramics for tissue engineering

Jiang Chang

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Abstract

The development of new generation biomaterials, which have the activity to activate gene expression of cells, stimulate stem cell differentiation and tissue regeneration, has attracted more and more attention. It is also known that stem cells play a key role in tissue regeneration, and regulation of the stem cell microenvironment is important for the regulation of tissue regeneration. In recent years, many studies have shown that bioactive ions released from biomaterials are able to regulate cell fate and enhance tissue regeneration. Therefore, design of biomaterials with controllable release profile of bioactive ions is critical for tissue engineering applications. In our recent studies, bioactive glasses/ceramics with different chemical composition and structural characteristics have been synthesized using different chemical methods. The interaction of stem cells and tissue specific cells with bioactive ions derived from bioceramics with different chemical composition as well as the in vivo effect of bioactive ceramics on tissue regeneration were investigated. Our results demonstrated that some silicate based bioceramics and composites have the potential to

stimulate stem cell differentiation and angiogenesis of endothelia cells, and this effect is dependent on the type and concentration of ions released from the materials. Furthermore, these materials showed the activity to stimulate tissue regeneration and blood vessel formation in vivo. In addition, the micro/nano-surface structure/topography is known as one of the material characteristics which has been found to affect stem cell differentiation in recent years. Therefore, we have developed techniques to fabricate biomaterials with micro/nano structure and investigated activity of the surface structure on stimulating stem cell behavior in vitro, and the activity to enhance tissue regeneration in vivo. Our study demonstrates that both micro and nano structure have activity to stimulate cell behavior by activating signaling related pathways related to tissue regeneration. The activation mechanisms of micro and nano structures may be different, and the combination of micro and nano structure revealed further enhanced activity as compared to the single structure type. Our results suggest that bioactive ions and micro/nano-structure of bioceramics can enhance tissue regeneration by regulating cell fate in particular stem cell differentiation and should be considered in designing materials for tissue engineering applications.

Professor Krasimir Vasilev

Biography

Since completing his PhD at the Max Plank Institute for Polymer Research 16.5 years ago, Professor Vasilev has built and led at The University of South Australia (UniSA) a highly productive team, currently consisting of more than 20 postdocs and PhD students (size of a Center). His team is well connected having deep collaborative networks within Australia and internationally, and is strongly engaged with industry, end users, government agencies and community. Professor Vasilev has attracted in excess of 20M dollars in research funding from Government competitive grants and Industry, published more than 250 papers and has been awarded several prestigious Research Fellowships from ARC, NHMRC and the Humboldt Foundation, and other awards such as the John A. Brodie Medal for achievements in Chemical Engineering in 2016, and the election of a Fellow of the Royal Society of Chemistry (FRSC) in 2017. His contribution to UniSA has been recognised by several awards including the UniSA Research Excellence Award in the Mid-Career category (2018), and the Division of ITEE Excellence Award for Leadership in Research (2018), and the UniSA Interdisciplinary Award (2019) for his work across disciplines.

Professor Vasilev has established international reputation and leadership in his field evident (in addition to the awards mentioned above) by regular invitations to deliver plenary and keynote lectures at international conferences, and prestigious universities, institutes and companies around the world. The foundation of his research program was his revolutionary approach to the nanoengineering of plasma polymer films, which vastly expanded the opportunities for this technology. His publications have been cited more than 8400 times and his H-index = 52 (M-index ~ 3.

Professor Vasilev's research has a very strong translational focus. He works extensively with industry to translate research findings to tangible commercial products. Key examples for this are 1) recently translated technology (via a $5,000,000 from the CRC-P program, $2.5M industry cash) for bladder cancer diagnostics to the manufacturing facility of Motherson Innovations in South Australia. The device is currently undergoing clinical trials; 2) A $6,000,000 ($3M industry cash) project with Corin Group focussed on translation an antibacterial surface modification to the company's hip and knee implants. His translational work involving the entire spectrum of activities from research discoveries to commercial products was a key strength allowing him to win in 2020 the prestigious and highly competitive NHMRC Investigator Award ($2,738,000 over 5 year).

Professor Vasilev is deeply involved with various research funding bodies, currently being a member (by invitation) of NHMRC GRP (Grant Review Panel), a member of the Advisory Committee of the Australia-India Scientific Research Fund and a member of the College of Assessors of the New Zealand Ministry of Business, Innovation and Employment Science Funding (both are major funding bodies in Australia and New Zealand).

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Nanoengineered surfaces for medical devices

Professor Krasimir Vasilev

UniSA STEM, University of South Australia, Australia

Abstract

In my talk, I will give an overview of recent progress from my lab on development of advanced nanoengineered surfaces capable of controlling infection and inflammation, and are the heart of diagnostic technologies. Over the last few years, we have created the means to control the entire spectrum of surface properties including chemical, physical, mechanical and topographical. We do that by nanoengineering and tailoring traditional plasma polymer films using tools from nanotechnology. By controlling surface properties, we are able to address medical challenges that are often encountered with implantable devices such as infection and inflammation. We have developed four distinct classes of antibacterial surfaces that are suitable for application on various medical devices. These surfaces can be classified based on their mechanism of action as non-stinky, contact killing, antimicrobial compound releasing and stimuli responsive. I will provide examples and describe the strategies used to achieve such surfaces, including such being translated onto commercial devices in collaboration with industry. We have strong interest in understanding the inflammatory responses to surfaces, and particularly, the interplay between surface nanotopography and chemistry in regulating these physiological processes. We found that when these parameters are used in an optimal way, we can achieve surfaces that reduce the expression of pro-inflammatory cytokines but increase the production of pro-healing markers such as arginase. Recently, we have also revealed that the mechanism of surface nanotopography induced modulation of inflammation is the unfolding of adsorbed fibrinogen. This unfolding is surface nanotopography scale dependent and leads to the exposure of (normally hidden) peptide sequences that activate the MAC-1 receptor of macrophages. In my talk, I will also give examples of how we use our surface nanoengineering expertise to create diagnostic devices which are now translated to industry.

Professor Shengmin Zhang

Biography

Prof. Shengmin Zhang is the University Chair Professor of Biomedical Engineering (BME), the Top 1 BME program in China. He is the Founding Director of Innovative Center for Interdisciplinary Advancement on Biomaterials and Regenerative Medicine, and Dean of Institute of Regulatory Science for Medical Devices at Huazhong University of Science and Technology. He is also the Vice President of Chinese Society for Biomaterials (CSBM), and Chair-elect of TERMIS-AP.

Dr. Zhang received his Ph.D. in Materials Science from Wuhan University of Technology, China in 2003. He was promoted to Professor, and then the University Chair Professor at Huazhong University of Science and Technology, China. His previous academic appointments included Professor (2000-2003), Associate Professor (1996-2000), and Assistant Professor (1992-1996) in Materials Science at Wuhan University of Technology.

Prof. Zhang has over 20-years' experience in biomaterials and TERM fields. He has authored more than 100 original journal papers, 5 edited books and delivered more than 100 Plenary, Keynote or Invited speeches in scientific conferences. He is the inventor of more than 40 patents, some of which have been further developed into 5 medical device products authorized by CFDA and FDA. He is one of few key founding members in promoting collaborative researches between Chinese and Korean biomaterials societies. He serves on the editorial boards of several leading international journals, such as Tissue Engineering, Biomedical Materials (IOP, UK), etc. Currently, he is the Chief Scientist of the National Key R & D Project of China. Dr. Zhang was the leader and recipient of the 2017 Distinguished Team Achievement Award from the Chinese Society for Biomaterials, and the recipient of the 2015 Special Contribution Award from the Chinese Society for Biomaterials. He is a Member of the NMPA Advisory Committee for Medical Devices Evaluation and a Member of the NMPA Technical Committee for Medical Devices Classification.

In 2016, Dr. Shengmin Zhang was elected as Fellow of International Union of Societies for Biomaterials Science and Engineering (IUSBSE Fellow, FBSE), and recognized for his distinguished contributions to development and translation of regenerative medical materials, and to public promotion of biomaterials science.

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Director, Advanced Biomaterials and Tissue Engineering Center
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Translational Ways to Medical Devices for Biomaterials and Tissue Engineering*

Shengmin Zhang[1, 2, 3]

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Abstract

In this short talk, we will briefly introduce translational ways to medical devices for biomaterials and tissue engineering in China to guide ambitious researchers from both countries to realize their achievement translations, which includes products R & D procedure, product technical requirement (standard), biocompatibility evaluation, type (version) verification test, animal test, multicenter clinical trial, and product registration, etc.

*supported by NSFC (82130061 and 31870960)

Professor Travis Klein

Biography

Professor Travis Klein is the Director of the Centre for Biomedical Technologies (CBT) and the leader of the Cartilage Regeneration Laboratory (CRL) at Queensland University of Technology (QUT). The CBT aims to deliver better health in our lifetime, by improving how we treat complex medical cases stemming from injuries, infection, and age-related issues. The multi-disciplinary CBT works closely with industry and utilises regenerative approaches, robotics and artificial intelligence, and advanced manufacturing to expand surgical possibilities and reduce complications. The ultimate aim of the CRL is to help develop long-term regenerative therapies for treating cartilage defects, including osteoarthritis. To help understand chondrogenesis and joint pathologies, and engineer functional tissues, Travis' group is developing functionalised biomaterials, 3D cell culture systems, biofabrication approaches, and mechanical stimulation technologies.

Travis is also co-Founder of Gelomics, an Australian company aiming to provide the research community with the highest quality 3D cell culture technology at affordable prices.

Google Scholar link:
http://scholar.google.com.au/citations?user=RYS5blIAAAAJ

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Starting up the Centre for Biomedical Technologies and Gelomics

Abstract

The Centre for Biomedical Technologies was recently established at QUT and has significant capacity in tissue engineering, biomechanics, medical robotics, and advanced manufacturing. The Centre works closely with national and international industry and clinicians to develop new technologies to improve human health through the development of advanced medical technologies. I will first provide an overview of the Centre, giving some more detail about who we are, what we do, and how to work with us. I will then speak from personal experience on translation of research in my group into a company, Gelomics, which produces easy to use 3D cell culture technologies for a range of applications including drug development, bioprinting, and tissue engineering.

Professor Yin Xiao

Biography

Professor Yin Xiao, a dental specialist (BDSc 1986 and MDSc 1991), started his research career in 2000 (Ph.D. from the University of Queensland) and has been the tenured professor at Queensland University of Technology since 2005. He is the Founder, and the Director of the Australia-China Centre for Tissue Engineering and Regenerative Medicine (ACCTERM), established in 2013, and the Joint Research Centre of functional biomaterials for tissue and organ replacement. His work has predominantly focused on bone, biomaterials, stem cells, dentistry, osteoarthritis, and tissue engineering. He initiated the concept of osteoimmunology in bone biomaterial development and introduced the "Materiobiology" in M. Phil's training courses at QUT. He has authored more than 340 journal papers, three books, and 23 book chapters. His H index is 69, and his work has been cited more than 20,000 times. He was named the top 250 researchers in Australia and the field leader in Biomedical Technology in 2019 and 2021 by Australian Research Magzine.

Stem cell-based therapy: Current challenges for future application

Abstract

Traditional clinical intervention heavily relies on synthetic/chemical drugs; however, in most cases, our body can heal and repair itself without external intervention. Understanding the cellular interactions and physiological processes of cell function in tissue repair and regeneration builds the foundation for developing the next generation of medicine: biological therapy. Stem cell-based therapy is not just to regenerate our body parts. The cell-based products will revolutionize how we treat our body, especially in aging, degenerative diseases, autoimmune disorders, and cancer. However, a few bottlenecks currently challenge the stem cell industry and future application of stem cells and stem cell-based products for clinical applications. For example, we are still seeking the cell surface markers for selecting mesenchymal stem cells, cell culture methods for stemness, and standards for maintaining cell phenotype for manufacturing cell-based products. With the current advancements in cell culture technologies and the understanding of stem cell biology, stem cell-based therapy will be a forsee approach for clinical application to benefit human life and improve the quality of living.

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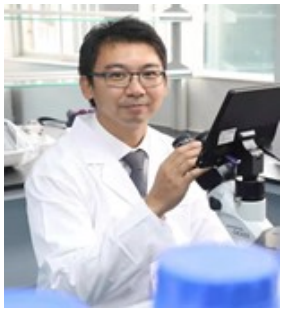
Professor Zhiyong Zhang

Biography

Professor Zhang Zhiyong is the professor of Guangzhou Medical University(GMU) and the founding directors of the Translational Research Centre of Regenerative Medicine and 3D Printing Technologies of GMU, and the Biomedical Engineering Research Center of Guangdong Province. Previously, he was the adjunct professor of Fourth Military Medical University (2010-2012) and Professor /Group Leader of Shanghai Jiao Tong University and National Tissue Engineering Centre of China(2012-2016). He has been granted a number of talent scheme program awards including the National "One Thousand Young Talents" （China's Recruitment Program of Global Experts） Award by the central government of China, "Eastern Scholar" Distinguished Professor award by Shanghai government and the "Outstanding Medical Academic Leader" award by Guangzhou government.

In the past 16 years, Prof. Zhang focused on the translational research of tissue engineering and regenerative medicine (TERM). He is pioneering in the use of allogenic mesenchymal stem cell source for TERM application, which has been approved by the Health Sciences Authority of Singapore for the first-in-man clinical trial. He have developed a TERM technology named Autologous Regenerative Factor Cocktail (ARFC), which has been used to successfully heal hundreds of patients including refractory wound, diabetic ulcer, tracheal stenosis, intrauterine adhesions and so on. He has filed more than 30 patents, published more than 70 academic papers in the international journals such as Advance Science, Bioactive Materials, Small, Biomaterials, and authored five bookchapters. He has given plenary, keynote, invited presentation in more than 40 international conferences and been granted 14 scientific awards including the National Award for Science & Technology Progress of China(the First Prize) , Natural Science Award of Ministry of Education of China (the First Prize, 2014) and so on. His research effort led to the successful commercialization and clinical translation of a couple of TERM technologies, including ARFC technologies, bioreactor, stem cell culture media and so on. He served as committee member of Tissue Engineering Technical Committee in Standardization Administration of China (SAC, the counterpart of ISO) and the technical reviewing committee member for the Class III medical device for China's National Medical Products Administration (NMPA, the counterpart of US FDA). Prof. Zhang has actively served in more than 20 international and national academic societies, including vice chair of Chinese Society of Tissue Engineering and Regenerative Medicine(since 2020), the SYIS Chair of TERMIS-AP (2009-2012).

Translational research of regenerative medicine—our strategic planning and practice



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Associate Professor Michael Doran

Biography

Associate Professor Mike Doran Mike Doran is the Stem Cells and Tissue Engineering Program Leader in the Centre for Biomedical Technologies at QUT. He completed a BSc (Genetics) and BEng (Chemical) at the University of Alberta (Canada), and PhD (Biomedical Engineering) at the University of New South Wales. His research interests include the study of bone, bone marrow, cartilage, cancers that metastasise to the bone, and metaresearch. Mike is also a Consultant Scientist at the National Institutes of Health (NIH, Bethesda, USA), TRI/QUT Wellness Ambassador, and is on the Cure Cancer Australia Research Board.

Since establishing his own laboratory (2010) (www.mikedoranlab.com), Mike has had been a named investigator on ~25 awarded grants, including Principal Investigator (referred to as CIA in Australia) on ~20 awarded grants. These projects have funded research into stem cell biology, cartilage tissue engineering, umbilical cord blood transplantation, prostate cancer, a bone repair clinical trial, diabetic foot ulcer repair, and a science outreach program called “Bitesize Science”. Mike is author on 5 patents and has approximately ~75 publications. Mike is first or senior author on most (~75%) of his publications, and over the past 5 years Mike’s first/senior author publications have described cancer models, cartilage tissue engineering, cord blood stem cell transplanation, a new method for stem cell characterisation, ECR training, use of video in grant applications, and undergraduate teaching.

Mike recently founded two companies: One company produces a microwell cell culture platform developed by his laboratory (www.microwell-mesh.com), and the other company aims to exploit burgeoning video technologies as a tool to better communicate scientific outputs (https://scientific-broadcasts.com).

Some of the steps and missteps we’ve taken studying BMSC chondrogenesis

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Dr. Xiaohu Ge

Biography

Dr. Xiaohu Ge is Senior Engineer, CEO and director of TinGo Regenerative Medicine (Tianjin) Co., Ltd., Vice-president at Jointown Pharmaceutical Group, China.

He received his PhD degree from Hong Kong Polytechnic University (PolyU) in 2009 and conducted postdoctoral research at Stanford University. His research interests focused on stem cell and regenerative medicine. He has published a number of SCI research papers in high-quality journals and received the Melcin Judkins Young Researcher Award from the USA National Institutes of health (NIH).

After returning he still focused on stem cell clinical application and development of novel drugs, searching for reproducible and innovative technological system for stem cell industrialization, in order to solve the remaining problem of 'being hit in the throat' in stem cell industry for clinical application. He has undertaken a number of tasks for establishing National Pilot Platform of Creative Drugs and Province- and Ministry-level Major Industrial Platform.

He was elected to Innovative Leading Talents of Special Support Project by the Organization Department of Guangdong Provincial Party Committee, and the member of Expert Committee for Stem Cell and Clinical Research of Guangdong Province. He is serving as member of Guangdong Provincial Association for Science and Technology, and honored with Outstanding Experts of Guangzhou City, Excellent Talents of Guangzhou Development District as well as Invited Province- and Ministry-level Talents by Binhai New District Government of Tianjin. Since 2014, he has received two National Excellent Patent Awards and Guangzhou Scientific and Technological Innovation Nanshan Award in 2020. He held over 200 licensed patents.

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Exosomes and organoid in regenerative medicine

Abstract

The discovery of intercellular communication and organ homeostasis function of exosomes triggers scientists and industry to explore the potential of exosomes as drug delivery vector or treatments. A spate of pharmaceutical companies are placing big bets on exosomes and other extracellular vesicles as a means to deliver nucleic acid therapeutics, especially in Europe, America and Japan. However, it is still a challenge to identify, isolate and quantify exosomes accurately, efficiently, and selectively. Another important branch of regenerative medicines is

organoid. Organoids can be used to model organ development and disease and have a wide range of applications in basic research, drug discovery and regenerative medicine. In the second part, we offer a careful and considered view of the state of the organoid field and its current limitations, and lay out TinGo's approach on organoid technology.

Dr. Silvio Tiziani

Biography

Silvio Tiziani is Chief Executive Officer of CCRM Australia, an organisation focusing on bridging the regenerative medicine commercialization gap through a network of scientists, entrepreneurs, academic institutions, and industry partners. CCRM Australia is a leader in developing and commercialising regenerative medicine, cell and gene technologies and is taking a pivotal role in supporting Australia's fast developing regenerative medicine sector.

Silvio is also the Director, External Strategy and Engagement of the Australian Regenerative Medicine Institute (ARMI) at Monash University. This role is responsible for the leadership of the Institute's engagement strategy and planning and communications functions. Key elements of this position include the identification, development, and oversight of high priority external engagement projects from inception to delivery.

Guidelines for Stem Cell Research and Translation

Abstract

Stem cell research development continues to progress at a rapid rate. Research using stem cells performed under strict scientific and ethical oversight is ethically permissible in many countries. However, this is only possible due to an agreed community understanding – of the ultimate benefits of such research and that regulations and guidelines in place are consistent with prevailing community ethics and values. Stem cell research guidelines developed by the stem cell research community successfully provide guidance to researchers and inform regulators and add to the general discourse on stem cell research. This presentation will provide an overview of recent guidelines published by the International Society for Stem Cell Research and their impact on stem cell research.

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Professor Sašo Ivanovski

Biography

Sašo Ivanovski is the Dean of the School of Dentistry at the University of Queensland, Professor of Periodontology and director of the Centre for Orofacial Regeneration, Reconstruction and Rehabilitation (COR3). He combines these academic positions with part time specialist practice in periodontics and surgical implant dentistry.

He has published over 200 journal articles in the peer-reviewed literature and leads an internationally recognized research group focusing on regenerative dentistry and tissue engineering, as well as clinical periodontics and implant dentistry.

Additively Manufactured Scaffolds for Large Volume Alveolar Bone Regeneration

Sašo Ivanovski
School of Dentistry, the University of Queensland
Centre for Orofacial Regeneration, Reconstruction and Rehabilitation (COR3).

Abstract
A variety of bioengineering approaches have been proposed for one regeneration, involving a combination of different cell types, bio-scaffolds, and biologically active molecules. This lecture will describe novel techniques using additive manufacturing for the manufacturing of custom scaffolds. The feasibility of combining these approaches with established surgical techniques will be explored, and their potential for clinical utilisation will be critically evaluated.

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Professor Chengtie Wu

Biography

Prof. Chengtie Wu is now working in Shanghai Institute of Ceramics, Chinese Academy of Sciences (SIC, CAS). Prof Wu's research focuses on bioactive inorganic materials for tissue engineering.
He completed his Ph.D in 2006, and then he worked in the University of Sydney, Dresden University of Technology, Germany and Queensland University of Technology where he was awarded Vice-Chancellor Research Fellow and Alexander von Humboldt Fellow. In 2012, Dr Wu has been recruited to work in SIC, CAS, as Leading Talent Program of Chinese Academy of Sciences. Then he was awarded Recruitment Program of Global Young Experts of China, National Ten Thousand Plan Science and Technology Leader, Shanghai Pujiang Talent Program and Shanghai Outstanding Academic Leaders.
Prof Wu's research focuses on bioactive inorganic materials for bone tissue engineering. Up to now, Prof Wu has published more than 250 SCI peer-review journal papers, including Science Advances, Advanced Materials, Materials Today, ACS Nano, Biomaterials and Nano Letters, etc. He is now the Associate editors for "Applied Materials Today", and "Journal of Inorganic Materials" as well as the editorial board member of "Acta Biomaterialia". Prof Wu has been awarded 42 patents, in which 12 of them have been transferred to companies. Prof Wu was awarded the Journal of Materials Chemistry Lectureship in 2015, Young Scientists of Chinese Biomaterials Society in 2016, Outstanding Young Scientists of Chinese Ceramics Society in 2018, and First Prize of Science and Technology of Chinese Biomaterials Society in 2019.

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Clinical Transition Models of biomaterials Research

Abstract

The rapid growth of population, as well the development of aging society, presents great demand for biomedical devices, among which implants for tissue repair and regeneration are highly required. Basic biomaterials research, which provides the innovation both in theory and practice, are essential for the development of biomaterial implants. However, the clinical transition of biomaterials research is frequently hampered by various factors, such as technical difficulty in large-scale fabrication, policy restriction and the lack of innovation forward thinking in enterprise. Since established in 2001, our group has been focused on biomaterials research. Based on the academic achievements, in recent years, our group started to explore the clinical transition of biomaterial researches. Currently, we have launched three types of clinical transition

models. The Model I, namely Entrusted Technical R&D, involves the development of specific biomaterials from the demand of an entrusting enterprise. The Model II, namely Technology Transfer, involves the delivery of technical document to the enterprise, as well as the personnel training. The Model III, namely Joint Venture, presents the tightest incorporation between the research group and the enterprise, which involved the combination of the resources of both the parties. By applying the three models in a parallel manner, we have managed to realize the transition of some research achievements, e.g. 3D printing bioceramic bone implant and bioactive skin would dressing, to the biomedical devices enterprise with a high efficiency. Based on these successful experiences, it is believed that these models would greatly accelerate the clinical transition process of biomaterials research, which ultimately addresses the major challenge of implant development.

Professor Ross Crawford

Biography

Professor Crawford undertakes private clinical practice at St.Vincent's Private Hospital Northside and public practice at the Prince Charles Hospital. He is also currently employed as the Professor of Orthopaedic research at Queensland University of Technology.

As a surgeon who deals only with pathology of the hip and knees much of his practice is dedicated to primary hip and knee replacement with a special interest in complex problems of the hip and knee. These include revision hip and knee surgery, unicompartmental knee replacement, complex hip reconstruction, including congenital hip dysplasia and robotic hip and knee replacement. Robotic surgery is currently an important part of his surgical practice. Professor Crawford is an internationally recognized expert in the field of hip and knee replacement surgery. He performs approximately 150 hip and 150 knee replacements per year, both in public and private practice. He was instrumental in establishing the Medical Engineering Research Facility at QUT and served as Director.

Each year an overseas orthopaedic surgeon is trained by Professor Crawford in complex lower limb joint replacement surgery, including robotic surgery. Surgeons from Canada, India, Malaysia and Singapore represent just some of the countries who have had surgeons selected to be part of this program. Professor Crawford has been an invited lecturer on hip and knee replacement techniques and outcomes at the Malaysian, Thailand, Australian, Japanese and Indian Orthopaedic Association meetings. He teaches robotic surgery both nationally and internationally.

Fellowship training, in primary and revision hip and knee replacement surgery, was undertaken by Professor Crawford at both Oxford and Exeter in England and lasted 4 years. He completed a D.Phil (Oxon.) (PhD equivalent) at Oxford University in 2000. Upon returning to Australia he was appointed as the Chair of Orthopaedic Research at the Queensland University of Technology in 2001. He still continues this role in which he supervises PhD students, a number of post-doctoral researchers and collaborates closely with experts in the field of tissue engineering, cartilage degradation, cartilage mechanics and clinical orthopaedics. The research in the outcomes of surgery performed under Professor Crawford's care is an important part of his practice.

Orthopaedic innovation

Abstract

In spite of millions of hours of research spent on solving orthopedic pathology little has changed in the last 20 years. This talk will look at the most important advances in orthopedics and discuss strategies to improve the translation of laboratory research into making practical changes in orthopedic practice.

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Professor Xinquan Jiang Ph.D., D.D.S

Biography

Professor Jiang is the Chief Scientist of National Key Research Program during the 13th 5-Year Plan. He is the project leader of the Foundation for Innovative Research Groups of the National Natural Science Foundation of China. He was selected in the Changjiang Scholars Program of China and the Program for New Century Excellent Talents in University of Ministry of Education of China. He is the Youth Science and technology innovation leader of the Ministry of Science and Technology of the People's Republic of China. He is currently directing over 20 grants including the National Key Research Program, the National Program on Key Basic Research Project (973 Program). Being the pioneer of National and International (Regional) Key Cooperation Research Projects leaders, he also develops collaborative dental practices in the pattern of multiple disciplinary teams.

Professor Jiang has been working on regenerative medicine for dental and maxillofacial tissue accredited for decades. Now he has 7 national invention patents. As first or communication author, he has 137 publications in peer-reviewed journals with the total impact factor (IF) of 1037. His publications include the cover story paper in JDR and Advanced Science, native work published in "Advanced Materials" and the work selected as "the images of the year" by Biomaterials.

New Strategies for Oral and Maxillofacial Tissue Regeneration and Functional Reconstruction

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Abstract

Cranial-maxillofacial skeleton plays important physiological roles for its structural and functional specificity. Tumor, inflammation, trauma, congenital diseases can lead to the large bone defects of maxillofacial, seriously affecting the physical and mental health of patients. Regenerative medicine provides new ideas for oral functional

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restoration. Our team focuses on bone regeneration and oromaxillofacial functional restoration, combined with regenerative medicine and traditional prosthodontics. In this presentation, we will systematically summarize our research results on optimization and modification of osteo-inductive biomaterial, exploration and application of osteo-inductive factors, optimum selection of jaw seed cells. Furthermore, we actively promoted clinical transformation by integrating stomatology, regenerative medicine, materials and other disciplines. In recent years, our research group actively carried out the clinical trials of CPC/BMP-2 bioactive scaffold for alveolar ridge site preservation, as a basis for the follow-up National key research program during the 13th5-Year Plan and innovative research group project of NSFC. In future, our team will focus on the maxillofacial tissue regeneration and collaboratively promote clinical transformation and application, aiming to achieve individual scaffold design, precise targeted delivery of drugs, together with the enrichment and recruitment of stem cells simultaneously.

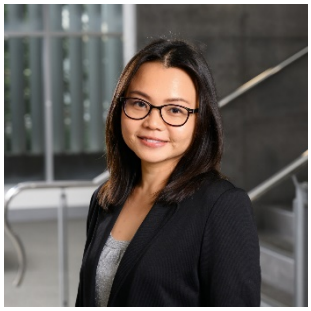
Associate Professor Yi-Chin Toh

Biography

Yi-Chin Toh is a Future Fellow and Associate Professor at the Queensland University of Technology. She obtained her B.Eng in Chemical Engineering and Ph.D in Bioengineering from the National University of Singapore in 2001 and 2008 respectively. She did her post-doctoral training at the Massachusetts Institute of Technology in 2008 under Professor Joel Voldman's guidance. Before joining QUT, she led an independent research group as an Assistant Professor at the Department of Biomedical Engineering, National University of Singapore.

Her research interest is in engineering multi-scale tissue models to mimic complex biological interactions during human development and diseases, as well as translating them into scalable platforms for disease modeling and drug testing applications.

Dr Toh is a recipient of the Australia Research Council (ARC) Future Fellowship, National University of Singapore Research Scholarship, A*STAR Graduate Scholarship and A*STAR International Fellowship.



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