magnus Group

2ND EDITION OF
INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

SEPT 16-17

VIRTUAL EVENT

Contact us:
Ph: +1 (702) 988-2320
Email: tissue-engineering@magnusconference.com
Website: https://magnusconferences.com/tissue-engineering/

magnus Group

BOOK OF ABSTRACTS

2ND EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

16-17 SEPT

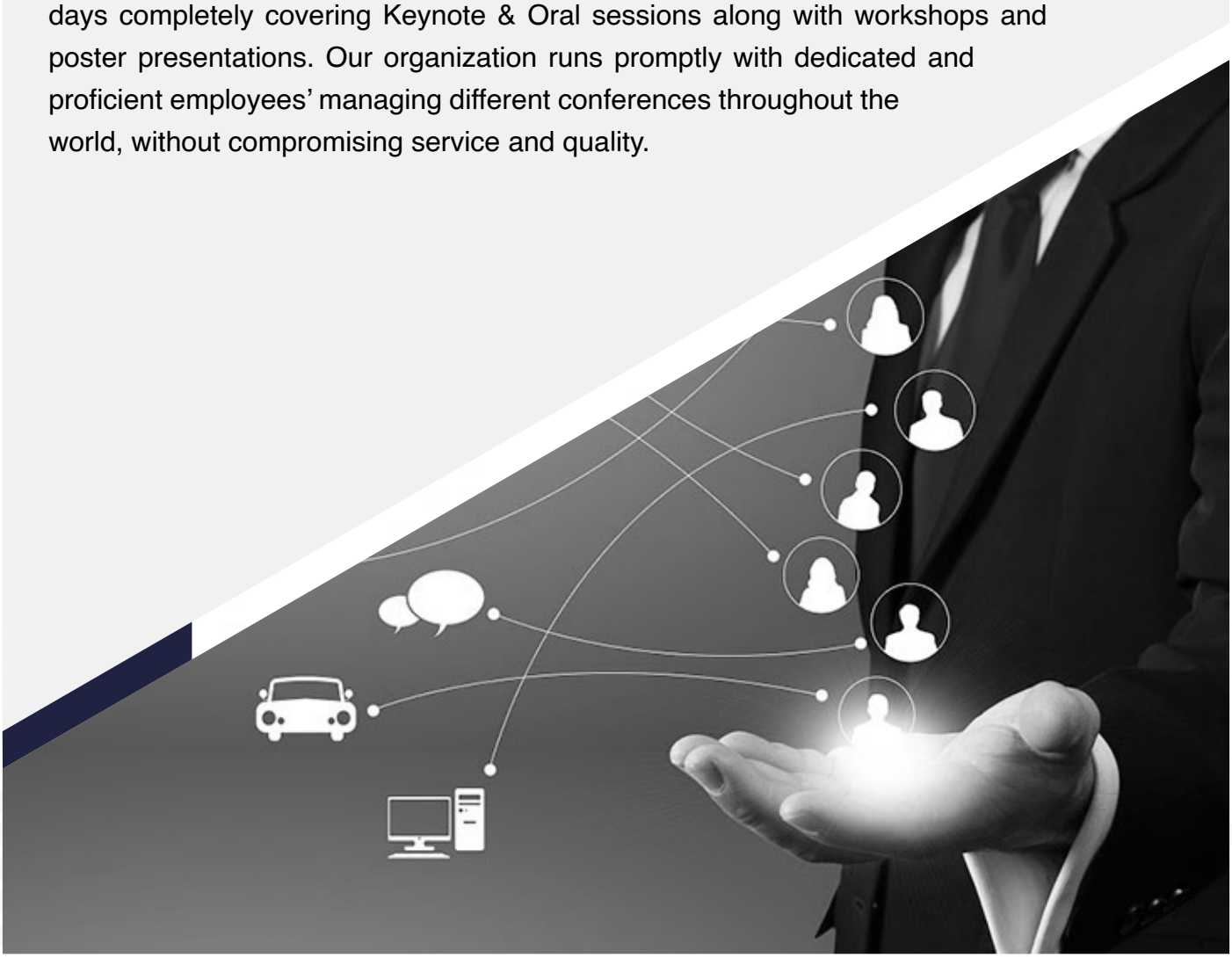
INDEX

Contents

ABOUT MAGNUS GROUP

Magnus Group (MG) is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Magnus group is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conference and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Participation from 90 different countries and 1090 different Universities have contributed to the success of our conferences. Our first International Conference was organized on Oncology and Radiology (ICOR) in Dubai, UAE. Our conferences usually run for 2-3 days completely covering Keynote & Oral sessions along with workshops and poster presentations. Our organization runs promptly with dedicated and proficient employees' managing different conferences throughout the world, without compromising service and quality.



ABOUT TERMC 2022

After getting tremendous success in the Second edition of tissue engineering and regenerative medicine conference, Magnus Group is ecstatic to welcome you to "**2nd Edition of International Conference on Tissue Engineering and Regenerative Medicine**" which is slated during **September 16-17, 2022** as Online Event. The theme chosen for this year's summit is "*Panoramic Perspective for Repairing and Regenerating Tissues.*"

This conference will bring together renowned international scientists and other professionals to discuss the critical issues to be addressed in order to advance tissue science and its applications. This global summit focuses on reporting data and provides pivotal contemplations among researchers, scientists, academicians, cell science experts, tissue engineers, healthcare professionals, regenerative medicine professionals, biomaterial scientists, biotechnologists, molecular biologists, industrialists and policymakers and will provide terrific opportunity to network, learn, and engage with Tissue Engineering and Biomaterials Science experts.

We are confident that our conference will provide you with an incredible chance to explore new horizons in your field.

KEYNOTE FORUM

DAY 01

2ND EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

16-17 SEPT

Federico Carpi

Department of Industrial Engineering, University of Florence, Italy

Electroactive polymer-based smart scaffolds for tissue engineering and regenerative medicine

Cellular scaffolds are a critical component of any system for tissue engineering and regenerative medicine. So far, poor attention has been focused on scaffolds that can mimic the extracellular matrix not only statically, but also dynamically, especially for tissues that have to experience large variable deformations (e.g. muscular, cardiac and lung tissues). This talk will introduce ElectroActive Polymers (EAPs) as a promising technology in order to provide cellular scaffolds with intrinsic actuation capabilities. EAPs consist of synthetic materials capable of changing dimensions and/or shape in response to an electrical stimulus. They show useful actuation properties, such as sizable active strains and/or stresses, large compliance, low density, low power consumption and ease of processing. Ongoing research in our group will be described, showing soft and electromechanically activated bioreactors with inherent cell stretching functions. They are investigated to deliver controllable mechanical stimuli to cell cultures, in order to regulate their developmental processes. The talk will show how the greatest promise of the proposed technology relies on its high versatility, compact size, low weight and scalability, as well as low cost.

Audience Take Away

- Basic aspects of electroactive polymers.
- New opportunities offered by electroactive polymers for tissue engineering.
- Ongoing studies on electromechanically activated soft bioreactors.

Biography

Federico Carpi is an Associate Professor in Biomedical Engineering at the University of Florence, Department of Industrial Engineering, Florence, Italy. He received from the University of Pisa the Laurea degree in Electronic Engineering in 2001, the Ph.D. degree in Bioengineering in 2005 and a second Laurea degree in Biomedical Engineering in 2008. From 2012 to 2016 he has been an Associate Professor (Reader) in Biomedical Engineering and Biomaterials at Queen Mary University of London, School of Engineering and Materials Science, UK. Since 2016, he is with the University of Florence, where he leads the 'SMART – Soft Matter ARtificial muscles and Transducers' research group (www.smart.unifi.it). His research interests include smart material-based biomedical and bioinspired mechatronic devices, and polymer artificial muscles. His publications include some 70 articles in international journals, 3 edited books and several contributions to books and conferences.

Orestis Ioannidis

4th Department of Surgery, Medical School, Aristotle University of Thessaloniki, General Hospital "George Papanikolaou", Thessaloniki, Greece

Open abdomen and negative pressure wound therapy for acute peritonitis especially in the presence of anastomoses and ostomies

Acute peritonitis is a relatively common intra-abdominal infection that a general surgeon will have to manage many times in his surgical carrier. Usually it is a secondary peritonitis caused either by direct peritoneal invasion from an inflamed infected viscera or by gastrointestinal tract integrity loss. The mainstay of treatment is source control of the infection which is in most cases surgical. In the physiologically deranged patient there is indication for source control surgery in order to restore the patient's physiology and not the patient anatomy utilizing a step approach and allowing the patient to resuscitate in the intensive care unit. In such cases there is a clear indication for relaparotomy and the most common strategy applied is open abdomen. In the open abdomen technique the fascial edges are not approximated and a temporarily closure technique is used. In such cases the negative pressure wound therapy seems to be the most favourable technique, as especially in combination with fascial traction either by sutures or by mesh gives the best results regarding delayed definite fascial closure, and morbidity and mortality. In our surgical practice we utilize in most cases the use of negative pressure wound therapy with a temporary mesh placement. In the initial laparotomy the mesh is placed to approximate the fascial edges as much as possible without whoever causing abdominal hypertension and in every relaparotomy the mesh is divided in the middle and, after the end of the relaparotomy and dressing change, is approximated as much as possible in order for the fascial edges to be further approximated. In every relaparotomy the mesh is further reduced to finally allow definite closure of the aponeurosis. In the presence of ostomies the negative pressure wound therapy can be applied as usual taking care just to place the dressing around the stoma and the negative pressure can be the standard of -125 mmHg. However, in the presence of anastomosis the available date are scarce and the possible strategies are to differ the anastomosis for the relaparotomy with definitive closure and no further need of negative pressure wound therapy, to low the pressure to -25 mmHg in order to protect the anastomosis and to place the anastomosis with omentum in order to avoid direct contact to the dressing. The objective should be early closure, within 7 days, of the open abdomen to reduce mortality and complications.

Audience Take Away

- Open abdomen should be carefully tailored to each single patient taking care to not overuse this effective tool.
- Every effort should be exerted to attempt abdominal closure as soon as the patient can physiologically tolerate it.
- All the precautions should be considered to minimize the complication rate.
- Negative pressure wound therapy in peritonitis seems to improve results in terms of morbidity and mortality and definitive abdominal closure.
- When an ostomy is present there are only subtle differences in management.
- When an anastomosis is present consider:
    - Placing the anastomosis remotely to visceral protective layer and thus the negative pressure.
    - Place the omentum over the anastomosis.
    - Decrease the negative pressure to even as low as -25 mmHg.
    - Perform a sutured anastomosis rather than a stapled one.

Biography

Dr. Ioannidis studied medicine in the Aristotle University of Thessaloniki and graduated at 2005. He received his MSC in "Medical Research Methodology" in 2008 from Aristotle University of Thessaloniki and in "Surgery of Liver, Biliary Tree and Pancreas" from the Democritus University of Thrace in 2016. He received his PhD degree in 2014 from the Aristotle University of Thessaloniki for his thesis "The effect of combined administration of omega-3 and omega-6 fatty acids in ulcerative colitis. Experimental study in rats." He is a General Surgeon with special interest in laparoscopic surgery and surgical oncology and also in surgical infections, acute care surgery, nutrition and ERAS. He has received fellowships for EAES, ESSO, EPC, ESCP and ACS and has published more than 130 articles with more than 3000 citations and an H-index of 28

Ruben F. Pereira

ICBAS – Abel Salazar Institute of Biomedical Sciences, University of Porto, Porto, Portugali3S – Institute of Research and Innovation in Health, University of Porto, Porto, Portugal
INEB – Institute of Biomedical Engineering, University of Porto, Porto, Portugal

Mechanical modulation of cell response in 3D bioprinted hydrogels

The fabrication of human tissues and organs exhibiting structural, mechanical and biological function remains a major challenge due to their structural complexity, multicellular composition, spatial heterogeneity of the ECM and, in most cases, the presence of a vascular network. The unique ability of bioprinting technologies to deposit cells, biomaterials and bioactive molecules into precise locations in 3Dhas provided new opportunities in the fabrication of grafts for tissue repair and *in vitro* modelswith high degree of accuracy, automation and reproducibility. The success of bioprinting is intimately linked to the design of biomimetic materials as they aim to recapitulate the ECM properties and support essential cellular functions, such as adhesion, migration, proliferation and *de novo* tissue synthesis. This talk will discuss the rational design of biomaterials for 3D bioprinting, providing examples of strategies that can be used to control the printability and shape fidelity of 3D hydrogels. The regulatory role of biophysical and biochemical properties of biomaterials on cell response will be also discussed, along with key research findings demonstrating the importance of mechanical properties of the cell microenvironment on the biological function of bioprinted constructs.

Audience Take Away

- Rational design of biomaterials for 3D bioprinting.
- How to modulate cell responses within 3D bioprinted hydrogels.
- Impact of material cues on the biological function of bioprinted constructs.

Biography

Rúben Pereira is an Assistant Professor at Instituto de CiênciasBiomédicas Abel Salazar (ICBAS, University of Porto) and Assistant Researcher at the Biofabrication Group (i3S, Instituto de Investigação e InovaçãoemSaúde). He holds a PhD in Biomedical Sciences with specialization in 3D bioprinting and has been collaborating with the pharmaceutical industry in the design of biomaterials for skin repair. He has also been involved in research projects in the fields of bioengineering, 3D bioprinting and tissue engineering. His research interests focus on the development of dynamic hydrogels for the bioprinting of biomimetic cell microenvironments for tissue engineering and regenerative medicine applications.

SPEAKERS

DAY 01

2ND EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

16-17 SEPT

Pratap Devarapalli
University of Tasmania, Centre for Law and Genetics, Faculty of Law, Hobart, Tasmania, Australia.

Patenting bioprinting innovations

Patent applications around the world must go through a stringent examination procedure before they can be granted. During the examination procedure, patent examiners assess a patent application in light of patentability criteria such as patentable subject matter, novelty, inventive step, utility and disclosure, and will only grant a patent if the subject matter disclosed in a patent application satisfies the patentability criteria. The proceedings between the patent office and patent applicant from filing the application until the grant of patent is part of the so-called 'patent prosecution history'. Considering the importance of patent prosecution data, the present research reports the results of an empirical analysis using the publicly available patent prosecution data of patent applications with claims directed to bioprinting technologies bioinks and bioprinted tissues in Australia, the United State of America (US) and Europe. Specifically, this research provides insights into how patent examiners are interpreting and applying the patent provisions related to different types of patentability criteria (patentable subject matter, novelty, inventive step or obviousness, utility and disclosure requirements) to object to specific subject matter related to bioprinting innovations. Conclusions of this research provides recommendations to bioprinting innovators and scientists on how patent applications related to bioprinted tissues and bioinks needs to be drafted to improve the patentability chances of specific bioprinting innovations in Australia, the US and Europe.

Biography

Pratap is an Intellectual Property Strategist and Patent researcher. He has expertise in dealing with Intellectual Property issues in relation to Artificial Intelligence, 3D Bioprinting, Biologics, Biosimilars and Systems Biology. Pratap is a Research Scholar at the Centre for Law and Genetics, University of Tasmania, Australia. In 2018, he has been invited by Govt. of Japan to assist the Japanese Patent Office (JPO) in the harmonization of Japanese Patent Law. In 2017, he completed his Masters of Law (LLM) in Intellectual Property from World Intellectual Property Organization (WIPO), Geneva and the Queensland University of Technology, Australia. He is the recipient of the prestigious International Fellowship offered by WIPO. He holds a Master's degree in Genomics from the Central University of Kerala, India and a Bachelors degree in Biotechnology, Microbiology, and Chemistry from Acharya Nagarjuna University, India.

Mr. Pratap pursued his Postgraduate Diploma in Patinformatics from the Academy of Scientific and Innovative Research (AcSIR) at CSIR Unit of Research and Development of Information Products, India and worked as a Patent Researcher in the same. Simultaneously, he pursued his Postgraduate Diploma in Patent Law from the National Academy of Legal Studies and Research (NALSAR), India.

Haidong Liang[1*], Bo Yuan[2], Wenji Song[3], Xuehui Liu[4], Zhengnan, Zhao[4], Xinghan Zhao[5]
[1]Dalian Medical university, The Second Affiliated Hospital of Dalian Medical University, Dalian, Liaoning, China

Clinical application and value of a new type of double-layer artificial dermis in the treatment of skin and soft tissue defects at the tip of fingers and toes

Finger tip skin and soft tissue defect is one of the most common hand injuries. Although many professional literatures have introduced and described its surgical treatment methods in detail,.treatment methods can not be widely developed because of their high requirements on microsurgical technology and great difficulty in operation..the new double-layer artificial dermis is effective in the treatment of finger tip skin and soft tissue defects. The regenerated finger has full shape, soft texture and no pigmentation. It provides a new choice for the treatment of finger tip skin and soft tissue defects.

Audience Take Away

- The choice of repair methods for skin and soft tissue defects at the fingertips and their advantages and disadvantages.
- Application details and key points of double layer artificial leather.
- The mechanism of a new double layer artificial dermis in repairing wounds.

Biography

2004-2013.6 Deputy Chief physician of hand and foot Microsurgery of Dalian Central Hospital. 2013. -2019.8 Chief physician of hand and foot Microsurgery of the second affiliated Hospital of Dalian Medical University. Now Chief physician of Bone and soft tissue repair and Reconstruction surgery of the second affiliated Hospital of Dalian Medical University. Member of the China Department of the International Society for limb lengthening and Reconstruction, the International Society for Research and Application of ilizarov Technology. Member of the American aofas foot and ankle Association. Standing member of limb function Reconstruction and external Fixation Committee of China Rehabilitation Aids Association (2016-2021). Application of VR/AR technology to clinical practice: The world's first application of VR/AR technology for free flap surgery.

Sara I AlSalhi[1*], Mohammad Alhashmi[1], David Young[2], Simon tew[1], kazuhiro yamamoto[1] and GeorgeBou-Gharios[1]

[1]Department of Musculoskeletal and Aging Science, Faculty of Health & Life Sciences, University ofLiverpool

[1]Skeletal Research Group, Biosciences Institute, Newcastle University

Transcriptional elements in the MMP13 gene: Can we target it in osteoarthritis?

Background: MMP13 is a primary catabolic factor involved in cartilage degradation through its ability to cleave type II collagen. Transcriptionally, MMP13 is regulated by 2 main elements; proximal promoter and distal enhancers. The aim of the study is to identify transcriptional elements that regulate the MMP13 gene in order to control the substantial rise in MMP13 expression observed in Osteoarthritis.

Methods: Possible enhancers have been determined by using the Encyclopaedia of DNA Elements (ENCODE), based on histone modifications (Limb H3K4ME1 and Limb H3k27AC), Evolutionarily conserved sequences, fibroblast and muscle peaks, ChIP peaks for RUNX2, and also based on published data on vitamin D elements. Each possible enhancer sequence has been ligated to the silent HSP68 proximal promoter in a vector that expresses the LacZ gene. Each of these constructs has been tested in transgenic embryos at E15.5 days.

Results: We have identified several active enhancers in distal and intronic sequences. Expressions in skeletal elements were detected in the 5th Intron, proximal promoter, and the distal enhancers at -19.4, and -21.5kb). In addition, expression was also seen in other cell types such as developing skin, tendon, and fibroblasts in other tissues. However, the sequence overlapping the highest peak of RunX2 at -29kb did not show any significant expression.

Conclusion: Our results showed that the MMP13 is regulated at the level of transcription in at least three different regions, some of which coincide with RunX2 peak activity. The main distal enhancer is around -19 to-22kb where expression goes beyond skeletal elements and includes other cell types. Intronic 5' sequence reporter to respond to1l-1also show exclusively skeletal expression.

Biography

Sara Ibrahim AlSalhi: 4th year PhD student in Bioengineering in Department of Musculoskeletal and Aging Science, Institute of Life course and Medical Sciences, Faculty of Health & Life Sciences, University of Liverpool.

Roberto Gramignoli, MS, PhD
Division of Pathology, Dept. of Laboratory medicine, Karolinska Institutet, Stockholm, Sweden

Cellular mechanism in support of perinatal amnion epithelial stem cell transplantation without immunosuppression

The full-term placenta is a non-controversial and readily available source of stem cells for regenerative medicine. Ourgroup was the first to isolate and validate regenerative effects offered by human amnion epithelial cells (hAEC), correcting congenital metabolic disorders. In all preclinical studies with immune-competent mice, hAEC engrafted and survived without the administration of immunosuppressive drugs. We proved safety and characterized multi-potent, immunomodulatory, and anti-inflammatory properties.

We studied profiled surfaceome in primary hAEC and identified molecular pathways critical for immune-modulation and enhanced regenerative effects. We quantified the level of expression of non-polymorphic HLA-G and -E molecules, both as membrane-bound and soluble forms. Furthermore, purinergic mediators, hydrolyzed by classical and alternative nucleotidase pathways, reinforced immune-modulatory effects generated by intact hAEC or secreted vesicles. Immunomodulation and enhance immune response were measured on purified immune effector cells (T-, B-, NK-cellsand macrophages), where the regulatory and anti-inflammatory switch was observed.

Repair and supportive effects were validated in preclinical models of liver, kidney, and vocal fold damages. Conclusions: primary hAEC are characterized by immunological tolerance and long-term acceptance upon transplantation. Modulation and regenerative effects offered by intact hAEC or secreted mediators may lead to new therapeutic interventions and enhanced regenerative effects in patients with acute or chronic disorders. Based on their safety and the successful preclinical studies, approval was granted to begin banking of hAEC under GMP conditions at Karolinska Institutet, and to perform allogenic transplants on 10 patients without immunosuppression

Audience Take Away

- I will provide a brief but complete overview on 30 years of cell-based therapies for liver disease and a glimpseon new perinatal treatments.
- Cell-based therapies are gaining recognition and importance as an alternative treatment to solid organ transplantation. Immunosuppression and short-term effects are currently the major limitations to expanding such applications. We have studied and developed solutions to circumvent such roadblocks and offer safe and efficient therapies to a largest cohort of patients with acute or chronic disorders, not only liver-based.

Biography

Roberto Gramignoli working as a Senior Researcher and Group Leader at Karolinska Institutet. He is specialized in Medical Genetics and has a PhD in Molecular and Translational Medicine. During his post-graduate studies at Univ. of Pittsburgh (PA-USA) he identified and proposed new solutions for roadblocks limiting clinical Hepatocyte Transplantation. Due to the paucity of human hepatocytes, he investigated alternative sources, such as iPS and placental stem cells. Working with his Mentor, Dr Strom, they became the first group to get approval for isolation and clinical infusion of human hepatocytes and amnion epithelial stem cells (AEC).

Christiane Salgado
Institute for Research and Innovation in Health (i3S), Universidade do Porto, Porto, Portugal

Design of 3D bioengineered personalized scaffolds to potentiate bone ingrowth and angiogenic network for oral tissues reconstruction

Population ageing (>70 years) and associated risk factors (alcohol addiction and smoke - 85%) increase the number of oral cancer (more frequently, head and neck squamous cell carcinoma - HNSCC) cases requiring large bone defects repair, raising the need for bone and oral mucosa regenerative solutions. The development of novel approaches to treat maxillofacial bone defects deriving from tumor removal will require a customized architecture, bioactive and responsive properties. The development of innovative bone grafts shall foster patient-specific therapeutic solution, that will stimulate angiogenesis and bone regeneration, while avoiding patient-tumor regrowth. A biomimetic hybrid system will deliver chemical and biological clues for a critical bone defect repair and overcome current limitations related with mechanic and biological performance. Here, the bone complex void-space will be filled with a cellular approach device derived from dental tissues, providing an ideal 3D microenvironment to foster the formation of vascularized bone tissue throughout the bioengineered scaffold. The personalized biomimetic materials will be radically more efficient approach to treat large maxillofacial defects and offer new hope to patients with oral cancer, condition that affect circa of 8.9M patients/year with a treatment overall cost of 100M€/year. This breakthrough technology will positive impact on patients' prognosis, reducing post-operative problems and recovery time while enhancing their life quality.

Biography

Dr. Christiane Salgado is dedicated to the biomaterials and regenerative research field. She is currently an Assistant researcher at INEB/i3S. She has a background of Dental Medicine (Brazil)and a PhD in Mechanical Engineering (Materials and Process) at State University of Campinas (Brazil) in 2009. By using tissue engineering strategies, she aims at providing an in situ required biological signals to promote vascular and bone tissue regeneration at critical bone defects that includes the development of new polymers for efficient cells/cell products delivery. She has also been engaged in technology transfer projects including the development of a bone graftat Portugal. To this date, she published 19 papers in peer reviewed international journals and 1 book chapters with more than 370 citations (h index = 10), 2 patents and 3 awards.

Neha Ashok Waghmare*, Parinita Agrawal, Prayag Bellur, Kamalnath Selvakumar, Suvro K. Chowdhury, Arun Chandru, Tuhin Bhowmick

Pandorum Technologies Pvt. Ltd, Bangalore Bioinnovation Centre, Bengaluru, Karnataka, India

Biomimetic 3D bioprinted scaffold for sutureless corneal regeneration

Cornea is the first transmitting layer of the eye, responsible for 75% of its refractive power. Damage to the cornea can cause blindness, which affects over 12 million people worldwide. While corneal transplant remains the sole treatment option to restore vision in many severe cases, it has associated shortcomings like donor cornea shortage, high costs, graft rejection, and disease transmission. To this end, tissue-engineered 3D constructs can serve as viable alternative, provided they emulate the mechanical strength, transparency, and curvature (refractive ability) aspects of the cornea. Herein, we propose 3D bioprinted corneal constructs which mimic the native cornea on the micro (orthogonal stromal lattice structure) as well as macro-level (shape, size, and curvature). The constructs are prepared using a combination of biomimetic materials: modified hyaluronic acid and collagen-derived peptide and are photo-crosslinked using blue light. The 3D bioprintedlenticule was elastic, demonstrated >94% transmittance, and ability to withstand intraocular pressure (IOP) as high as 27 kPa (~9 times IOP of native cornea). The adhesive nature of the hydrogel (to withstand upto29kPa liquid and mechanical pressure) could contribute to its application in suture-free corneal tissue repair. It showed controlled swelling and degradation properties, and the cells encapsulated in the bioinkwere viable after printing using extrusion based bioprinter. This 3D bioprintedlenticule has the potential to be custom-made according to the patient's needs and can be easily scaled-up to meet the huge transplant demands. Further promising uses include loading with therapeutic agents for scarless corneal regeneration, and as disease models to accelerate drug discovery.

Audience Take Away

- A glimpse into the important properties for generating a biomimetic tissue engineeredsubstitutes.
- Bioink propertiesconsideration to fulfil the process requirements using different types of bioprinters.
- A summary of essential target properties for generating corneal biomimetic scaffolds, and the initial properties of bioink required to achieve the target values.

Biography

Neha holds Bachelor's and Master'sdegree in Biological Sciences and Bioengineering from the Indian Institute of Technology Kanpur (IIT Kanpur), India. During her Masters, she fabricated a minimally invasive injectable scaffold system for enhanced cartilage regeneration. She has worked as a Research Fellow at the University of Zurich (UZH), Switzerland on FCS Swiss Government Excellence Scholarship. In her current position as Assistant Research Scientist at Pandorum Technologies, Neha works on the Biomaterials and Bioprinting platform to fabricate biomimetic scaffolds for corneal as well as liver regeneration.

Victor A. Ajisafe[1*] and Ashok M. Raichur[1]

[1]Materials Engineering Department, Indian Institute of Science, Bangalore, Karnataka, India

Bioactive snail mucus promotes cell attachment and mechanical properties of porous agarose 3D scaffold for tissue engineering applications

Snail mucin, obtained from snails, is a complex substance that has been recounted to contain glycosaminoglycans (GaGs), allantoin, hyaluronic acid, elastin, and glycolic acid. Some of these constituents, especially GaGs, are essential for reducing cartilage deterioration and inflammation.

In this study, 3D porous scaffolds were prepared from agarose - snail mucus blends, followed by freeze-drying to obtain porous scaffolds. The scaffolds were then characterized and evaluated for bioactivities (*in-vitro* studies) on the C28/I2 cells (human chondrocytes) to determine the potential capacity of the hybrid scaffolds for soft tissue engineering applications. The freeze-dried scaffolds were characterized by Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), Compression test, liquid displacement test, swelling behavior, and degradation test. The biocompatibility of the scaffolds was determined by 3-(4, 5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay. Confocal laser scanning (CLS) and Field emission scanning electron microscopy (FESEM) were used to determine cell attachment and morphology. Cell proliferation was determined by CLS of cells on the scaffolds on days 1, 3, and 7. The cytoskeletal integrity of the cells on the scaffolds was determined by immunohistochemistry studies.

The SEM result reveals the microporous morphology of the scaffolds with an average pore size of about 250 μm. FTIR suggests the nature of the interaction between agarose and snail mucus and the functional groups present in the scaffolds. The compression test indicates a significantly ($p<0.05$) improved mechanical strength of more than 80% in all the composite scaffolds compared to the pristine agarose scaffold. The degradation study indicates the scaffolds' tuneable degradation property, while the liquid displacement result shows that snail mucus reduced the porosity of the scaffolds. Meanwhile, MTT assay and FACS indicates the biocompatibility of all the scaffold. CLS and SEM images show the polygonal and spherical morphologies of the cells on the 2D and 3D scaffolds, respectively. The cells proliferated well on the 3D scaffolds from days 1 to 3 and 7, while the integrity of the cytoskeleton of the cells on the scaffolds was well preserved compared to the control.

In conclusion, snail mucus significantly improved the cell adhesion and the mechanical properties of 3D porous agarose scaffolds with tuneable degradation properties. Hence agarose snail mucus scaffold can be explored for its potential application in cartilage tissue engineering.

Audience Take Away

- The audience will learn the therapeutic property of snail mucus and how to prepare it.
- The audience will learn how to use snail mucus in preparing 3D scaffolds for tissue engineering application.
- This presentation will help academicians understand the complex property of mucin in general and how it can revolutionize the field of tissue engineering, just like silk fibroin, collagen, and others.

Biography

Victor AyobamiAjisafe is currently a Ph.D. student (Senior Research Fellow) at the Indian Institute of Science, Bangalore, India. He develops biomaterials and 3D scaffolds for tissue engineering applications.He has a Master's degree in Biotechnology with First Class from the Osmania University in Hyderabad, India. After obtaining his first degree in Biochemistry from the Lagos State University in Nigeria, Victor obtained an Associate degree in Biomedical Engineering from Valley View University, Accra, Ghana.In addition, he worked at the Biomedical Engineering Department of The Bells University of Technology in Ota Ogun State, Nigeria, as an Assistant Lecturer.

Dr. Shrikant L. Kulkarni
Kulkarni Clinic, India

In situ regeneration needs to etsablish a precise cellular microenvironment to restore renal function

As the patients with diabetes and obesity continue to grow, the trend of increasing prevalence of ckd will not to end. The current therapeutic option for ckd is ineffective. In spite of having, adequate reserve of cells and mechanism to repair the damaged tissueis replaced by functionally inefficient fibrosis (1).. Intra- renal microvascular network disrupted due to reduction of diameter and increased tortucity of vessels. Renal oxygenation in pathophysiology of ckd progression has received lot of interest. Imbalance between delivery and consumption of renal oxygenation leading to tissue hypoxia has been important cause to development and progression of ckd. Defective renal microcirculation is a universal pathological feature in ckd (2). Improving the function of surviving nephrons by regenerating the renal micro vascularity will be logical approach Organ dis- function and failure are major health problem affecting millions of patients many are desperate for even organ transplant. Renal fibrosis represents failed wound healing process due to chronic sustained injury

Implanted cells cannot survive for long term in cell therapy because of toxic fibrotic microenvironment Efforts require to understanding mechanism of cell microenvironment so that reconstruction is possible. New innovative therapy the whole kidney 'de novo' regeneration; with the help of endogenous stem cells present at the site of injury by creating a supporting microenvironment. Assist and accelerate regenerative process to regrow your own new kidney in CKD. (3)The effective ant- fibrotic strategy still lacking because collagen degradation does not keep pace with collagen production. The new self-repairing method requiresbetter understanding in mechanism and development of cell biology and morphology. (4)

The clinical trial must focus on to eliminate fibrosis to restore interstitial and glomerular capillary network."The word regeneration means born again". Self-organ regeneration or regenerative science is the body's regenerative power, which is an existing in our body since birth; this awakens when required and gives results, which indicates its proof of existence. Like any other systems in our body, there is regenerative system, whichconsists the power of generation during foetal development and power of regeneration after birth.

Inadequate blood flow to renal tissues resulting in hypoxia causes imbalance between supply and demand.. Restore blood supply by formation of new blood vessels and perfusion of ischemic renal tissues. Angiogenesis the development of new blood vessels from pre-existing is involved in physiological and pathological disorders. (5). Preventive therapeutic strategy should be initiated in the early stages were environment is associated with adequate functional reserve is favourable towards regeneration. In let stages having toxic environment in favour of renal regression

The quickest way to go to renal fibrosis is direct anti fibrotic retrograde pressure by creating artificial block at puj, (pelvi ureteric junction) which helps in eliminating fibrosis, when the artificial block removed it opens the micro vascular capillaries improves blood supply and alter the cellular microenvironment which stimulates regeneration Blue strip stem / proj. Cells presents under the renal capsule could be basis of a new endogenous regenerative medicine capable to form new segments of nephrons in healthy microenvironment which restores damaged renal function..(6) .

Audience Take Away

- There is no specific treatment for ckd at present. Elimination of renal fibrosis is the target treatment with the help of ant fibrotic medicines it will prolong life of patients with disease.
- The first kidney transplant done in 1953 since that time onwards this is the only treatment alone with the renal dialysis .There was hope when stem cell treatment came into picture but because of the toxic environment created by the fibrosis, regeneration of the stem cells is not possible in chronic kidney disease.
- Early detection of patient in ckd is very important because chances of regeneration more.
- Bio- artificial kidney is not the solution in chronic kidney disease.
- More research should be done regarding cellular microenvironment and assessment of renal fibrosis requires non-invasive test.

Biography

Dr. Shrikant L. Kulkarni completed his M.S.(General Surgery) in 1975 from B.J.Medical College Pune,Mahashtra India. The bachelor's degree M.B.B.S. completed from Miraj Medical College. Since 1971, he has worked at several government hospitals like the Wanless Hospital Miraj, Sangli General Hospital Sassoon Hospital Pune and multispecialty hospitals like Ruby Hall Clinic Pune and Jahangir Nursing Home, Pune. For the last 30 plus years, he is working at his own hospital at Chinch wad, Pune Maharashtra India.

Dina Ahmed Salem
Computer Engineering Department, MUST University, 6th of October, Cairo, Egypt

Predicting performance of nanofibrous scaffolds for skin tissue engineering: Deep learning compared to machine learning regression models

On a medical side, lot of attention is directed nowadays to the field of Tissue Engineering and Regenerative Medicine. Skin Tissue Engineering provides a significant improvement to wounds healing with a remarkable effect on scars formation. Skin components can be rebuilt with safeguarding its structure and function by the help of advanced scaffold manufacturing techniques. One is the Nanofibrous scaffolds which are artificial 3D structures that contribute to tissue regeneration in an alike-natural conditions. Owing grand surface to volume ratio, Nanofibrous scaffolds effectively assist cell adhesion, proliferation, and differentiation. Merging medical interests with huge explosion of artificial intelligence concepts is a key point towards preserving human life and providing better health. Nowadays, machines can reliably contribute taking critical decisions in a wide range of applications including regenerative medicine and tissue engineering. Machine Learning comes by presenting all available information in the form of training data to a computerized model which in turn takes or confirms a human decision. Regression machine learning models hit on correlations, associations and other relations between a dependent variable (output) and group of features (inputs). A currently booming machine learning model is Deep Learning that is basically a three layers or more neural network. Adding hidden layers drives Deep Learning towards more accuracy optimization, deeper analysis and automation enhancement. The objective of this research is to study the prediction performance of nanofibrous scaffolds using deep learning model. Then, results are compared to those of three well known regression models namely,Linear regression, k Nearest Neighbor and Support Vector Machine.

Audience Take Away

- Importance of Machine Learning in the field of Tissue Engineering.
- Introducing different Machine Learning Models.
- Introducing the concept of regression and its role in skin Tissue Engineering.
- Highlighting the trade offs between deep learning and other common machine learning models.

Biography

Dr. Dina Ahmed Salem graduated from faculty of Engineering, Mansoura, Egypt in 2000. She then joined Misr University for Science and Technology as a demonstrator in Faculty of Engineering in the same year. She received her Masters in 2012 from electronics Department, Faculty of Engineering and her PhD degree in 2015 from Biomedical Engineering and Systems Department, Cairo University. Research interest is Artificial Intelligence in Medical Applications.

Diana Stan[1,2*], Lavinia Ruta[2], Elena Codrici[3], Ana Duinea[4], Cristiana Tanase[1,3]

[1]Doctoral School of Medicine, "TituMaiorescu" University, Bucharest, Romania

[2]Research Department, DDS Diagnostic, Bucharest, Romania

[3]Biochemistry – Proteomics Department, Victor Babes National Institute of Pathology, Bucharest, Romania, [4]"Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

Smart hydrogel films for wound monitoring and healing

It is estimated that up to 2% of the population in developed countries will suffer from a chronic wound in their lifetime. This number will most likely increase due to the fact that the life expectancy increases and the world population with chronic diseases, such as diabetes and vasculopathy, prone to chronic wounds, will age in the following decades. Modern, smart, wound dressings not only provide an optimal healing environment but can also provide critical information about the wound healing process.

The scope of this work is to design and develop a "smart" hydrogel film wound dressing that can monitor and enhance the healing process of chronic dermo-epidermal wounds. In the process of product design, it is critical to take into account the following: 1) choosing the best polymer for matrix formation of the hydrogel film 2) choosing the proper components to be incorporated in the hydrogel film and their concentrations 3) choosing the best methods to evaluate the properties of the hydrogel film 4) optimisation of production and working strategy.

The hydrogel film can be made of natural and/or synthetic polymers that incorporate numerous compounds with different effects such as antimicrobial, wound healing enhancement and wound healing monitoring. One can use different polymers for product design, such as alginate, chitosan, polyvinyl alcohol, polyvinylpyrrolidone. The polymer used in this work was alginate since it has the unique property of gel-formation in the presence of multivalent cations (especially divalent cations) in aqueous media. In our experiments we used sodium alginate, a commonly used natural polysaccharide obtained from the condensation of β-D-mannuronic acid and 1-4 linked α-L-glucuronic residues. *Curcuma longa* extract, also known as curcumin, is a polyphenolic compound with antioxidant, anti-inflammatory, antibacterial and anticancer properties and also it can be used as a great pH indicator. In our experiments we used *Curcuma longa* extract as a pH indicator comparatively with phenolphthalein (pH 8.2-10) and brilliant yellow (pH 7.4-8.6). Chronic wounds are characterised by an enhanced protease activity so a dressing that modulates protease levels can help the wound healing process. It has been reported that doxycycline, beside the antimicrobial properties, can also non-selectively inhibit matrix metalloproteinases (MMPs) in skin keratinocytes by binding to zinc and calcium atoms and cause conformational changes and loss of enzymatic activity. It has been reported that silver nanoparticles have antibacterial activity against gram negative and gram positive bacteria. For antimicrobial activity doxycycline and silver nanoparticles were incorporated. Collagen, elastin and hyaluronic acid were incorporated to enhance the wound healing process. Preliminary results show that these hydrogels films can be used to monitor wound healing activity due to the presence of the pH indicator, have suitable mechanical and swelling properties and have good cytocompatibility.

Audience Take Away

- We present preliminary results of multiple types of smart hydrogels with pH monitoring activity, antimicrobial properties and wound enhancing activities.
- The hydrogel film dressings designed by us have the potential to be used for wound monitoring and healing.
- This product can enhance the quality of life of patients with chronic wounds and help healthcare professionals to provide better medical services, even in low developed areas.
- This type of dressing provides critical information about wound healing state with no need for advanced technology or devices.

Biography

PhD student Diana Stan graduated in 2018 from "Carol Davila" University of Medicine and Pharmacy in Bucharest, Romania. Since 2020 she is an otorhinolaryngology and head and neck surgery medical resident in Bucharest. She works at DDS Diagnostic company in the R&D department, since 2018, with the main focus on biosensors. In 2021 she started her PhD project in medicine at TituMaiorescu University, supervised by Prof. Cristiana Tanase, where she aims to develop a dressing for wound monitoring and healing. Until now she published several articles as first or co-author in prestigious journals.

POSTERS

DAY 01

2ND EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

16-17 SEPT

Alessandro Bertolo[1*], Reto Wettstein[2], Nicole Nyfeler[3], Jivko Stoyanov[4]
[1]Swiss Paraplegic Research, Guido A. Zäch Strasse 4, Nottwil, Switzerland;
[2]Swiss Paraplegic Centre, Guido A. Zäch Strasse 1, Nottwil, Switzerland;
[3]Swiss Paraplegic Research, Guido A. Zäch Strasse 4, Nottwil, Switzerland;
[4]Swiss Paraplegic Research, Guido A. Zäch Strasse 4, Nottwil, Switzerland;

Tissue engineering approach to decrease complications after surgical treatment of pressure injuries in spinal cord injured patients

Pressure injuries (PI) are chronic wounds caused by increased pressure over a prolonged period of time. Interruption of blood circulation leads to a shortage of oxygen, nutrient supplies, accumulation of toxic by-products and tissue necrosis. Patients with spinal cord injury (SCI) are at high risk of PI because of impaired mobility, and in many cases lack of protective sensory perception. Currently, treatment of PI is associated with long hospitalization and recurrence of lesions remains a major problem. We hypothesized that collagen scaffolds, designed to precisely fit the wound and populated with autologous ADSC, re-suspended in autologous platelet-rich plasma (PRP), will accelerate and improve wound healing. Here, we aim to test and optimize in vitro various combinations of adipose-derived mesenchymal stem cells (ADSC), PRP and collagen scaffolds to promote faster PI recovery after surgical intervention. As reference, we also included in our experimental protocols cells isolated from the PI tissues, such as endothelial cells and fibroblasts. ADSC monolayers and ADSC-constructs were differentiated for 14 days towards adipogenic lineage usingadipogenic medium supplemented with or without PRP, as well as different scaffolds. Outcomes were measures by cell proliferation assay, lipid quantification, DNA quantification and the expression of adipogenic genes, evaluated via qRT-PCR. ADSC could be successfully differentiated towards adipogenic lineage on the 3D cell-constructs, especially on porous scaffolds. Regarding the effects of PRP on the proliferation of ADSC, our results showed enhancement of cell proliferation, however it had an inhibitory effect on adipogenesis. ADSC and fibroblasts supported the formation of new blood vessel in 3D cultures by endothelial cells, detected by immunohistological staining with CD31 antibody. Based on the collection of these in vitro results, we plan to optimize a protocol which can be in future implementedinto surgical treatment of PI, to reduce their recurrence in SCI people.

Audience Take Away

- The characteristic features of a tissue engineering construct intended for application in the field of pressure injurie treatment.
- The potential implementation of results obtained in vitro into the clinical practice, during surgical intervention of pressure injuries.

Biography

Dr. Alessandro Bertolo studied Biological Sciences in his home city of Varese (Italy), receiving a degree in 2006. In 2008, he started working at Swiss Paraplegic Research (SPF) and began his PhD in Biomedical and Cellular Sciences at the University of Bern, completing it in 2012. As a post-doc at SPF, he is currently working on a project involving stem cells as an augmentation tissue for the recovery of pressure injuries. In the past years, he has been conducting a study on the application of stem cells for intervertebral disc repair and cellular aging.

Onwuegbuchulam O.[1]*, Diedrich A-M.[1], Buedeyri I.[1], Von Rueden S.[1], Mohr A.[1], Menck K.[2],Bleckmann A.[2], Pascher A.[1], Struecker B.[1]

[1] Department of General, Visceral and Transplant Surgery, University Hospital Muenster Germany
[2] Department of Hematology, Hemostaseology, Oncology and Pneumology, University Hospital Muenster Germany

Recellularized organs as ex vivo models for colorectal cancer metastasis

Colorectal cancer (CRC) is the second leading cause of cancer-related mortality worldwide. The main factor leading to mortality is the development of metastasis, mostly occurring in the liver. Reasons why the liver is the main metastatic site for CRC and which factors lead to invasive and metastatic growth of the primary tumor in this specific organ remain unclear. Previous studies have suggested that stromal cells are involved in altering the extracellular matrix (ECM) in the tumor microenvironment because they play a major role in these processes. However, the underlying mechanisms and factors are still largely unknown.

Experimental set-ups to decrypt the complex in vivo mechanisms responsible for metastatic spread in human cancers are mainly based on xenogeneic in vivo experiments or artificial in vitro models. Both models suffer from methodical limitations and are not sufficient to mimic complex in vivo processes. The tissue engineering concept of decellularization and recellularization could overcome these limitations and lead to novel and complex ex vivo tumor models. During decellularization cells and antigenic material are removed from an organ and only the organ-specific ECM is conserved. Thus, we aim to establish recellularized organs as a model system for CRC metastasis to understand how the organ-specific ECM and tumor stromal cells i.e. bone marrow-derived macrophages (BMDMs) and bone marrow stromal cells (BMSCs) affect engraftment, invasiveness and malignant potency of CRC cells in the liver in order to identify and validate potential genes, proteins and signaling pathways which play key roles in the development of CRC liver metastasis. These in turn could be potential targets for novel therapeutic approaches.

Audience Take Away

- Decellularized scaffold serves as a promising native ECM model for cancer research. Therefore, my presentation wouldpresent a new ex vivo model of liver metastasis (achieved by recellularizing CRC cells into a decellularized liver and kidney matrixes to investigate the role of ECM as well as stromal cells in colorectal cancer and its progression).
- The audience would learn a fast and efficient decellularization and recellularization method. Our model may help to understand the liver metastatic processes and the development of drugs preventing liver metastasis and its recurrence.

Biography

Ms. Onwuegbuchulam obtained her bachelor's in Biochemistry at Nnamdi Azikiwe University Nigeria. In 2020, she received her Masters's in Infection Biology at the University of Lübeck Germany. Now, she is currently doing her PhDin the research group of PD. Dr. Struecker at the Department of General, Visceral and Transplant Surgery, University Hospital Muenster Germany.

Deptula Milena[1]*, Fularczyk Martyna[2], Tyminska Agata[1], Dzierzynska Maria[2], Skoniecka Aneta[1], Zawrzykraj Malgorzata[3], Czerwiec Katarzyna[3], Sawicka Justyna[2], Zielinski Jacek[4], Rodziewicz-Motowidło Sylwia[2], Pikula Michal[1]

[1]Laboratory of Tissue Engineering and Regenerative Medicine, Department of Embryology, Medical University of Gdansk, Gdansk, Poland

[2]Department of Biomedical Chemistry, University of Gdansk, Gdansk, Poland

[3] Department of Clinical Anatomy, Medical University of Gdansk, Poland

[4] Department of Surgical Oncology, Medical University of Gdansk, Poland

RADA16-I based scaffolds for wound healing and regenerative medicine

In regenerative medicine there is a strong need for therapeutic delivery systems and tissue scaffolds. Additionally, wound healing complications affect thousands of people each year. The biggest problem constitute chronic wounds, e.g. diabetic ulcers. Currently available methods are not fully effective in the treatment of this wounds, thus new methods are constantly being sought. Hydrogel scaffolds may be the solution to this problems. They can be used not only to deliver bioactive compounds but also cells to the wound site. Additionally, they have appropriate properties like ability to modify, high water content or easy-controlled pore sizes, which promote their use in wound healing and regenerative medicine.

In this study we designed peptide hydrogels scaffolds built by bioactive peptides, bone morphogenetic protein (BMP) derivatives, linked to RADA16-I by a sequence specific for matrix metalloproteinase- 7 (MMP-7). The ability of the peptides to self-assembly and create a hydrogel was checked with transmission electron microscopy (TEM), atomic force microscopy (AFM) and scanning electron croymicroscopy (CryoSEM).The ability to release the active sequence from the scaffold was assessed by enzyme cleavage. Cytotoxicity of designed peptide scaffolds and their effect on proliferation of human cells was evaluated with colorimetric methods (XTT and LDH assays) on different in vitro models (human skin cells, adipose-derived stromal cells (AD-MSCs) and human primary fibroblasts). Their potential to induce allergies was checked with flow cytometric Basophil Activation Test (BAT).

The obtained result indicate that we havecreated a functional scaffolds which is able to form fibres and self-assemble. This compounds do not show cytotoxicity and express pro-proliferative properties towards human cells. Moreover, they do not show potential to induce allergies. It indicates that designed scaffolds show a potential to be used in wound healing and regenerative medicine for example as wound dressings or scaffolds for cell therapies.

Audience Take Away

- Design of new peptide scaffolds for wound healing regenerative medicine.
- The presented data will show information on biological effect of newly designed scaffolds based on RADA16-I on different human cells.

Biography

Dr. Milena Deptuła studied biotechnology at Gdansk University of Technology and graduated as Eng. in 2013 and MSc in 2014. Then she joined Prof. Pikula research group at Medical University of Gdansk. She is currently working on Laboratory of Tissue Engineering and Regenerative Medicine at the Department of Embryology at Medical University of Gdansk, where she received her PhD degree in 2019. Her research focuses on wound healing and regenerative medicine. She is working on new biomaterials, wound dressing and drugs stimulating wound healing. She is also interested in biology od adipose-derived stromal cells.

Yusser Olguín[1]*, Diego Benavente[1], Fernando Dorta[2], Nicole Orellana[2], Cristian Acevedo[1,2,3]

[1]*Centro Científico Tecnológico de Valparaíso CCTVaL, Universidad Técnica Federico Santa María, Valparaíso, Chile

[2]Centro de Biotecnología, Universidad Técnica Federico Santa María, Valparaíso, Chile

[3]Departamento de Física, Universidad Técnica Federico Santa María, Valparaíso, Chile

Electrical stimulation in nerve tissue engineering, Multifactorial analysis *In vitro*

Electrical stimulation in nerve tissue engineering is a way to promote cell differentiation, which experimentally demonstrates efficiency and characteristics dependent on the form of stimulation. Considering that the materials used to develop scaffolds usually incorporate chemical signals as inducers of proliferation and differentiation, together with the contribution of their own topological characteristics, it is necessary to incorporate a multifactorial analysis which allows understanding the dimensions of the contribution and the dependence of the different stimulating variables, which within an in vitro culture, represent sufficient evidence to determine synergisms that demonstrate significance for the development of therapeutic strategies.

In the present investigation we have developed a multifactorial analysis to understand the relationships between variables stimulating PC12 cell differentiation, including viscoelastic properties of hydrogels commonly used in nerve tissue engineering studies, concentrations of neurotrophic chemical stimuli, and a variety of electrical stimuli exerted in an arbitrary function generation system. Neurite development, along with length, frequency and branching analysis are used to compare the efficiency of differentiation dependent on various treatment schemes, which through multifactorial analysis provide insight into the relative activities of each type of stimulus.

Audience Take Away

The results of the present research allow understanding the interrelation of different factors that promote differentiation with a mathematical treatment, which allows a statistical approach to dimension the contributions, based on electrical stimulation.

- The audience will learn a multi factor approach to the analysis of cell proliferation in tissue engineering.
- The audience will be able to understand the magnitude of the influence of electrical stimulation systems on nerve cell differentiation.
- The audience will be able to obtain data for experimental design based on electrical stimulation systems.

Biography

Dr. Yusser Olguin studied chemistry and pharmaceutical sciences at the University of Valparaiso and obtained in 2013 his PhD in biotechnology at Santa Maria University in Chile. He has worked in tissue engineering in several biotechnology centers in Chile, focused on the characterization of cellular responses to scaffold for peripheral nerve repair. He has several publications in tissue engineering and in the generation of nano formulations. He is currently working at the Scientific and Technological Center of Valparaiso CCTVaL.

Adnan Alizadeh Naini[1*], Mohammad Jafar Hadianfard[*2], Seyedeh-Sara Hashemi[3], Mehdi Kian[4], Reyahaneh Bakhshizadeh[5]

[1]Department of Materials Science and Engineering, Shiraz University, Shiraz, Iran.
[2]Department of Materials Science and Engineering, Shiraz University, Shiraz, Iran.
[3]Burn and Wound Healing Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.
[4]Department of Comparative Biomedical Sciences, School of Advanced Medical Sciences and Technologies, Shiraz University of Medical Sciences, Shiraz, Iran
[5]Department of Nanobiotechnology, Faculty of Biological Sciences, TarbiatModares University, Tehran, Iran.

Hydrogels reinforced with TiO_2-NPs for wound healing application

Full-thickness wounds are a growing problem due to their high costs and complications. Despite recent advances in wound healing, several systemic and local factors can impair the physiological healing process. This article briefly examines the role of titanium dioxide nanoparticles in the healing wound process. Hydrogels are a type of scaffold with 3D networks that are widely used for tissue regeneration. Hydrogels have a porous structure containing macromolecules or polymers that can easily swell in water. Nano-based materials have unique physicochemical, optical, and biological properties compared to their bulk counterparts. Nanoparticles can be incorporated into scaffolds to create smart nanocomposite materials that improve wound healing through antimicrobial properties as well as anti-inflammatory and selective angiogenic properties. Nanoparticles have been used for drug delivery due to their high surface area. In addition, nanoparticles affect wound healing by influencing collagen deposition and reorganization, providing approaches for skin regeneration and wound healing.Titanium dioxide nanoparticles (TiO_2-NPs) is a metal oxide nanoparticle that has recently received attention in biomedical applications due to their non-toxicity, antibacterial activity, and chemical stability. Research into wound healing applications has led to reports of accelerated wound healing and ingrowth of vascular tissue.

Audience Take Away

- The review of the studies conducted on hydrogels containing titanium dioxide nanoparticles showed that the use of TiO_2 as a reinforcing agent in hydrogels is a new strategy that significantly improves the mechanical properties, antibacterial properties, swelling, and wound healing process. Increasing. Hydrogels reinforced with TiO_2-NPs are bioactive dressings for biomedical applications including wound healing. In addition, it is a low-cost and biodegradable alternative for faster wound healing and skin cell migration.

Biography

Adnan Alizadeh Naini: Department of Materials Science and Engineering, Shiraz University, Shiraz, Iran

KEYNOTE FORUM

DAY 02

2ND EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

16-17 SEPT

Prof. Sandeep Shrivastava*, Dr. Priyal Shrivastava, Prof. Deepti Shrivastava

DattaMeghe Institute of Medical Sciences,Wardha, Maharashtra, India

Emerging trends for regenerative care in complex wounds

The management of complex wounds is a huge challenge. It is associated with necrosis, infections and tissue losses. It need intense care and substantial cost. These cares include surgical and pharmaceutical interventions associated with risks, side effects and morbidity. The emergence of a Regenerative Care ispredicted to change the managements of health problems. Inclusions ofStem cells, Mesenchymal Stem cells or Platelet rich plasma in treatment protocol is bringing the much-desired changes. Platelet Rich plasma is leading this change. The problem of complex wound healing can be overcome by this shift in knowledge, developed and based on regenerative Properties of Platelets.The STARS (Sandeep's Technique for assisted regeneration of skin) technique is a very simple protocol, developed scientificallystep by step, through animal studies, standardisations of laboratorypreparations, clinical case based observations and needful adoptions, tilldesirable results were obtained. Through this study, the regenerative care takes a leading stride in establishing the clinical practices, bridging and building solution for complex wound management.

Audience Take Away

- Role of Regenerating Care in Wound Healing with PRP.
- The audience will learn how to use PRP for Wound Care.
- It would show them how a bench work can be converted to bed side problems, they can take further research in the same field.
- It offers avery simpleTechnique of imparting regenerative Care, which can easily be replicated & reproduced by others health care providers such as Nurses , general Doctors and Experts.

Biography

Dr. Sandeep Shrivastava is MS, DNB, PhD. He is Director-Professor of Orthopedics at J.N. Medical College, Datta Meghe Institute of Medical Sciences, (DU) Wardha. Maharashtra. India. He is Group CEO, Meghe Group of Hospitals; Director, Centre of Regenerative Medicine; and Ex DEAN, J.N. Medical College. He has 76 Indexed Publications, 4 books, 15 copyrights. He has pioneered the wound management with PRP, by developing the clinical protocol of "Sandeep's Technique" for Assisted Regeneration of Skin (STARS Therapy). His work is widely published and presented across the Globe. He is the author of book – The Illustrative guide on Platelet Rich Plasma

Vasiliki E Kalodimou

Director Flow Cytometry-Research & Regenerative Medicine Department, Greece

Characterization of mesenchymal stem cells (MSCs) and their use in the treatment of COVID-19

Outline

- Discuss the history and properties of MSCs.
- Discuss rationale for use of uMSC in COVID-19.
- Present institutional Protocol for use of uMSC in COVID-19 pneumonia.
- Present local experience and outcome of patients treated with uMSC with COVID-19.

Biography

Vasiliki E. Kalodimou is the Collaborative partner for training and research for Regenerative Medicine Program at the Institute of Personalized Molecular Medicine at the Medical City Hospital, Philippines, the Board/Committee on Research Ethics at the National Hellenic Research Foundation, the Vice-Chair of the UEL Alumni Advisory Board, previously was the Director at the Flow Cytometry-Research and Regenerative Medicine Department of IASO in Greece, as well as the CBB & Processing Facility Director at MedStem-Cryobanks. In addition to collaboration with state universities and pharmaceutical companies on research projects (17), frequently publishes (46 & 9 books) her findings. She has 2 patents.

SPEAKERS

DAY 02

2ND EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

16-17 SEPT

Yang Long*, Chuan Ye, Wei Seong Toh, Hey Hwee Weng Dennis

[1]Department of Orthopaedics, The Affiliated Hospital of Guizhou Medical University, Guiyang, China
[2]Department of Orthopaedic Surgery, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

Hierarchical delivery of nanofibers to promote vascularized osteogenesis by regulating macrophage polarization

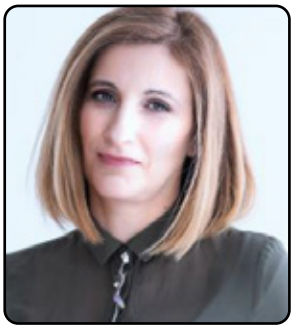
Poorly functioning scaffold materials and limitations in material-cell construction technology remain problems in bone tissue engineering. Electrospinning has been proven to be a suitable and available technique for production of 3D biomimetic scaffolds. To overcome these problems and retain the advantages of electrospinning, bioelectrospinning has been proposed to provide guidance by micropattern, homogeneous cell distribution, and effective nutrient utilization. Herein, we fabricated poly (3-hydroxybutyrate-co-4-hydroxybutyrate)/poly (vinyl alcohol) (P34HB/PVA) with human bone mesenchymal stem cells (hBMSCs) to biomimetic core-shell microfiber/cells complex by coaxial bioelectrospinning. Characterization of the fiber materials revealed that coaxial electrospinning combined the advantages of the two materials. In vitro cellular assays showed that after bioelectrospinning, the cells and material could be simultaneously spun while maintaining cell activity. The material provided a good 3D microenvironment allowing cell adhesion, proliferation, and differentiation. Both the in vitro and in vivo tests indicated the formation of mineralized nodules in both the co-spun and co-axial groups, while the implants formed bone-like tissue after 12 weeks of implantation. This study shows that coaxial bioelectrospinning technology can be used to construct tissue-engineered bone. Our technique might be applied in the future to fabricate more complex tissue and organs.

Audience Take Away

- Core-shell fibers have been widely studied because of their ability to isolate and release substances and to enhance mechanical properties.
- The scaffold has the same controllable mechanical property as P34HB and the same hydrophilicity and cytocompatibility as PVA.
- Bioelectrospinning using a variety of natural polymers and living cells, enables the guidance of cell growth via micro/nanofibrous structures.
- The fabrication conditions were carefully chosen to obtain a cell-laden structure with a reticular microstructure and high cell viability.

Biography

Dr. Yang Long studied Clinic Medicine at the GuiZhouMedical University, and graduated as MD in 2012. He then joined department of Orthopaedics, the Affiliated Hospital of Guizhou Medical University. He received his PhD degree in 2022 at the same institution. After he obtained the position of Research Fellow at the Department of Orthopaedic Surgery, Yong Loo Lin School of Medicine, National University of Singapore. He has published more than 10 research articles in SCIjournals.



E.Babaliari[1],L.Papadimitriou[1],D.Angelaki[1],P.Kavatzikidou[1],E.Strataki[1,2]and A.Ranella[1*]

[1]Institute of Electronic Structure and Laser (IESL), Foundation of Research and Technology (FORTH), Heraklion, Crete, Greece.

[2]UniversityofCrete,Heraklion,Crete,Greece

Mechanobiology in neural tissue regeneration

The peripheral nervous system consists of glial cells and neurons that receive the necessary chemical, physical, and mechanical stimuli for their adhesion, proliferation, and differentiation from their extracellular milieu.

Mechanotransduction refers to the ability of a cell to actively sense and respond to mechanical cues of its microenvironment by adapting its behavior accordingly. For such a response the cell activates a series of mechanisms to receive mechanical stimuli from the surrounding extracellular matrix (ECM) or from neighboring cells. These mechanical stimuli are converted intracellularly to biochemical ones and with their transduction into the nucleus they orchestrate the cell response by regulating gene expression.

Here we present an interdisciplinary approach, where laser engineering, static as well as dynamic flow rate cell cultures, and computational flow simulations were employed to evaluate the effect of topography, shear stress, and their combined action on the mechanosensing and mechanotransduction in neural cells. Specifically, spatial Si platforms of pseudo periodic morphologies were developed via direct ultrafast-laser structuring and were used as substrates for the patterning of neuronal cells. We have thus shown that NGF-treated PC12 cells differentiate well on flat Si and on Si substrates decorated with microcones with low and medium roughness but they do not diffrentiate on the high roughened pattern1. We then found that as the substrate's roughness increases the number of Focal adhessions (Vinculin staining) decreases especially in th growth cone areas, the activation of Myosin light chain (pMLC-II staining) decreases and YAP nuclear translocation decreases. We believe that in the high roughened substrate cells fail to stabilize growth cone formation and this leads to low differentiation ratio. Additionally, a precise flow-controlled microfluidic system was fabricated to assess the combined effect of shear stress and topography on Schwann and neuronal cells' behavior. Furthermore, the cell culture results were combined with computational flow simulations to calculate accurately the shear stress values. Via the study of the cytoskeleton rearrangement, vinculin and neural differentiation markers expression, and the YAP translocation, we envisage investigating the mechanisms of mechanotransduction involved in neural cell adhesion, orientation and differentiation. Our results denoted that different types of neural tissue cells respond differently to the underlying topography, but furthermore, the presence of the glial cells alters the adhesion behavior of the neuronal cells in their co-culture. The experimental findings also revealed that depending on the relation of the direction of flow with respect to the orientation of topographical features, wall shear stress gradients are acting in a synergistic or antagonistic manner to topography in promoting guided morphologic cell response3.

In conclusion, we demonstrated the ability to guide the outgrowth of a neural network, in vitro, via the combination of flow-induced shear stress and surface topography, which could in the future be a useful tool for understanding neural network interfaces and their electrical activity, synaptic processes and myelin formation.

Biography

Dr. Anthi Ranella, Researcher at IESL-FORTH, leads the Tissue Engineering –Regenerative Medicine and Immunoengineering Lab (TERMIM Lab). Her fields of interests comprise mainly the study of the biochemical mechanisms that take place at the interface between cells and biomaterials at the micro / nano scale and the examination of the potential medical and/or clinical applications of optimized artificial tissue scaffolds. She has published more than 50 peer reviewed papers with more than 1960 citations (Scopus h index: 22), 4 chapters in international scientific books, while also serving as a reviewer for many peer-review journals.

Yu.M. Alexandrovskaya[1*], O.I. Baum[1], E.N. Sobol[2]
[1]Institute of Photon Technologies, Federal Scientific Research Center "Crystallography and Photonics", Russian Academy of Sciences, 2 Pionerskaya Street, Troitsk, Moscow, 108840, Russia
[2]UCI Health Beckman Laser Institute & Medical Clinic, Irvine, CA 92612, USA

Mechanisms of tissue reshaping and regeneration using thermomechanical effect of infrared laser

The potential of thermomechanical effect of pulsed-periodic mid-IR laser radiation for the stimulation of tissue self-restoration and for implant modeling is discussed. The principle underlying the effect includes thermal and mechanical components when radiation is absorbed by interstitial water and the heat is distributed in the tissue volume according to its water content. By adjusting laser parameters, such as power density, pulse duration and repetition rate, several processes can be initiated and controlled within the localized tissue volume: (1) heating, (2) mechanical dilatation and shrinkage of the matrix, (3) formation of micropores and gas bubbles [1]. Cartilage is an avascular tissue with slow metabolism and low potential of self-restoration. Bioengineered implants are commonly used to address the late stages of the disease. The usual problems with implants are poor cell survival and differentiation, inadequate integration into the host tissue, de-differentiation of the normal cartilage and formation of fibrous tissue with unsatisfactory mechanical characteristics. Here we show, how laser irradiation may help to overcome these problems. The technology of low-invasive laser reconstruction of spine discs has been applied successfully to patients in Russia [2]. The first results of hyaline-type cartilage regeneration were obtained also in the joints on *in vivo* animal model and in clinical trials for knee joints of patients. The possible cellular mechanisms of laser-induced regeneration of hyaline cartilage are outlined as well [3].
The medical technology of laser-induced cartilage reshaping follows the same principle; however, the main target of radiation is cartilaginous matrix, in particular, proteoglycans which are responsible for the "shape memory" effect. It is shown how cartilaginous implants with new stable shape are obtained using laser technology. Clinical applications of the technology for surgery are discussed [4].

Audience Take Away

- The audience will get acquainted with the new application of mid-infrared lasers towards the less invasive diagnostics, treatment and modification of biological tissues.
- The physical and chemical mechanisms of stimulating laser effect will be discussed expending the knowledge of light-matter interactions.
- Particular clinical applications of the new laser technologies including reconstruction of spine discs, knee osteoarthritis healing and modeling of costal cartilage implants for trachea surgery will be demonstrated.

Biography

AlexandrovskayaYu.M. received her PhD in physical chemistry from Moscow State University in 2016. She is a senior researcher in Institute of Photon Technologies of RAS studying the laser interaction with biological tissues to develop new methods of diagnostics and therapy. Her research experience includes laser technology of modeling cartilage implants, laser-induced osteoarthritis healing, tissue diagnostics with Optical Coherence Elastography and absorbing nanoparticles, studies of optical clearing and diffusion in biological tissues. Yu.M. is an author of more than 30 peer reviewed papers.

Fajar Shodiq Permata[1*], Nurul Hidayah[2], Berina Anastya Cesaranti[2], Vike Deatartila[2]Hadi, Yuni Purnamasari[2], Mifta Rizqina Amalia[2]

[1]Faculty of Veterinary Medicine, UniversitasBrawijaya, Malang, East Java, Indonesia

[2]Bachelor of Veterinary Medicine, Faculty of Veterinary Medicine, UniversitasBrawijaya, Malang, East Java, Indonesia

Combination of tofu okara and etawa goat milk prevented inflammation and bone loss in the menopausal rat model

Osteoporosis is a disorder characterized by bone mass loss due to reduced calcium absorption. The menopause stage induces downregulation of calcium absorption in the intestine which caused low estrogen levels. One of the sources of estrogen could be phytoestrogen from Tofu. Exogenous calcium would be from milk like goat milk. The research proposed to examine the impact of the combination of Tofu okara and Etawa goat milk for inflammation and bone loss prevention in the menopausal rat model. The twenty female Wistar Rats, 8-12 weeks of age, were divided 5 groups: 1) negative control as normal Rats; 2) positive control as ovariectomized rats; 3) ovariectomized rats with treatment tofu okara 0.159 g/kgBW PO; 3) ovariectomized rats with treatment Etawa goat milk 0.3 mL; 5) ovariectomized rats with treatment combination Tofu okara and Etawa goat milk. The treatment was conducted one day after ovariectomy which was once daily until 30 days. The mandibular bone and femur bone were collected after the treatment was completed and then processed to tissue slide. The result showed that bone matrix and Bone Morphogenetic Protein 2 (BMP-2) expression was bigger significantly $p<0.05$ in group 5 compared with other groups. In addition, Tumor Necrosis Factor (TNF-α) expression and osteoclast count were at the lowest levels in group 5. The combination of Tofu okara as a phytoestrogen which is estrogen-like and Etawa goat milk as a calcium source prevents the bad effect of menopause in a rat model. The research concluded that the combination of Tofu okara and Etawa goat milk prevented bone loss and inflammation in the menopausal rat model.

Audience Take Away

- The audience will obtain benefits about how to prevent osteoporosis in the menopausal stage based on the result of the rat model.
- The industry of pharmacy will receive insight material about preventive medicine for osteoporosis due to menopause.
- The audience will learn the fruitful advantage of Tofu dregs and Goat milk, particularly for osteoporosis prevention.

Biography

Fajar, DVM, M.Biotech studied Biomedical Engineering from Biotechnology Master Program at UniversitasGadjahMada, Indonesia and graduated as MBiotech in 2013. He is a veterinarian (DVM) since 2009. His master thesis was about nerve xenograft from sheep using decellularization techniques. He is a lecturer in the Faculty of Veterinary Medicine, UniversitasBrawijaya started in 2013. He has an active researcher, and he achieved research grant Medical ministry of Indonesia in 2015, which developed xeno-cardiac tissue engineering. He got as the best presenter in Nichi-in Regenerative Medicine event in Tokyo, Japan, in 2019. He is one of the panelist in SYIS TERMIS AP in 2021. He become invited speaker in TERMC since 2019. Now he has 18 Scopus articles with H index scopus 2.

Mohan Malleshaiah

[1]Montreal Clinical Research Institute (IRCM), Montreal, Quebec, Canada.

[2]Department Biochemistry and Molecular Medicine, University of Montreal, Montreal, Quebec, Canada

Altering stem cell states by controlling cell signaling information

Cell fate determination induced by cell signaling is central to stem cells and regenerative medicine. Pluripotent stem cells such as embryonic stem cells (ESC) are an attractive model for understanding the relationship between cell signaling and cell fates. Cultured mouse ESCs are heterogeneous and can exist in multiple cell states such as Totipotent, Pluripotent, Primed and Primitive Endoderm. Such heterogeneity can compromise stem cell applications. The signaling mechanisms regulating the Totipotent state acquisition and coexistence of these multiple cell states are poorly understood. In this study, we identify BMP4 as an inducer of the Totipotent state. However, we discovered that BMP4-mediated induction of the Totipotent state is constrained by the cross-activation of FGF, TGF-β and WNT pathways. We exploited this finding to enhance the proportion of Totipotent cells in ESCs by rationally inhibiting the cross-activated pathways using small molecules. Next, we utilized single-cell mRNA-sequencing (scRNA-seq) to analyze the resulting impact on cellular heterogeneity. The scRNA-seq analysis revealed that induction of the Totipotent state is accompanied by the suppression of both the Primed and Primitive Endoderm states, thus reducing the overall stem cell heterogeneity. Furthermore, the reprogrammed Totipotent cells generated in culture have a molecular and functional resemblance to Totipotent cell stages of the preimplantation embryo. Our findings reveal a BMP4 signaling mechanism in ESCs to regulate multiple cell states, potentially significant for managing stem cell heterogeneity in differentiation and reprogramming.

Audience Take Away

- The audience will learn about stem cell heterogeneity and its implication in regenerative medicine.
- My talk will present the potential molecular mechanisms behind stem cell heterogeneity and how our efforts in understanding these mechanisms have led us to control it.
- The results from my talk will inspire the audience to think about creative solutions to control stem cell heterogeneity and mitigate its impact on regenerative medicine.

Biography

Dr. Mohan Malleshaiah studied Biotechnology at the Bangalore University, India and graduated as MS in 2002. He then worked for two years in the field of drug discovery at Aurigene Discovery Technologies. Inspired to pursueresearch, he then obtained PhD degree from the University of Montreal, Canada, in the field of Biochemistry. After postdoctoral fellowship at the Harvard Medical School, USA, he started independent research careerin 2018 as an Assistant Professor at the Montreal Clinical Research Institute (IRCM) in affiliation with the University of Montreal. Dr. Malleshaiah lab works on stem cells, cell reprogramming, disease modelling and pancreatic cancer.

***Dalia A. A. El-Waseef, Asmaa E. AbdElaziz, Manal H. Moussa andGhada G. Hamam**
Department of Histology and Cell Biology, Faculty of Medicine, Ain Shams University, Cairo, Egypt

Bone marrow- versus adipose tissue-derived mesenchymal stem cells: The long-term effect on experimentally lacerated gluteal muscle
A comparative histological study

Introduction: Skeletal muscle injuryis acommon clinical challenge.It is usually associated with fibrosis and disability. Regenerative medicine is an emerging promising strategy that could improve such cases. However, it is not clear if stem cells have beneficial long-term effects on skeletal muscle regeneration and re-innervation.

Aim:to compare the long-term effects of using bone marrow mesenchymal stem cells (BM-MSCs) versus adipose stromal stem cells (ADSCs) on the re-innervation and regeneration of experimental gluteal muscle laceration injury in adult female albino rats.

Methods: Six young male rats were used as a source of MSCs. Thirty-five adult female albino rats were divided into: Group I (negative control), Group II (Sham control), Group III (Untreated Laceration): in which laceration injury was done in the right gluteal muscle then rats were left for spontaneous healing, Group IV (laceration treated with BM-MSCs): right gluteal muscle was lacerated. Rats concomitantly received a single intramuscular injection of $1X10^6$ BM-MSCs in the lacerated muscle, Group V (laceration treated with ADSCs): in which right gluteal muscle was lacerated with concomitant single intramuscular injection of $1X10^6$ ADSCs in the lacerated muscle. Rats from each group were subdivided into two subgroups; subgroup "a and b" in which rats were sacrificed after ten days and eight weeks respectively. At each time point, muscle specimens were collected and prepared for proper histological techniques. Immune-histochemical staining of neurofilament light chain (NFL) protein was also done to study re-innervation. Morphometric study and statistical analysis were also performed.

Results: Granulation tissue and mononuclear cellular infiltration with significant increase in collagen fibers content and failure of re-innervation were noticed in untreated laceration group. The BM-MSCs treated groups showed regeneration of muscle fibers,however,collagen fibers content was increased. On the other hand, the ADSCs treated group showed better results regarding the regenerated muscle fibers, number of myotubes and collagen fibers content was significantly decreased. Muscle re-innervation was restored in both stem cell treated groups at long-term duration.

Conclusions: Both BM-MSCs and ADSCs improved skeletal muscle laceration injury at short- and long-term durations. But effective re-innervation of injured muscles occurred only at the long-term duration. ADSCs had better effects in treating muscle laceration injury than BM-MSCs as evidenced by increased number of regenerating myotubes and decrease collagen fibers content at site of injury.

Biography

Dr. Dalia Alaa El-Din Aly El-Waseef: Egyptian, Graduated at Faculty of Medicine, Ain Shams University-Cairo-Egypt (1998). Working at Department of Histology and Cell Biology since 10/2000.**Assistant Professor** at Department of Histology and Cell Biology since 3/2019 till now. Has several international publications and speaker at several international conferences. Has one published book in the field of histology.

MB BCh- Faculty of Medicine, Ain Shams University (1998)
Demonstrator at Department of Histology and Cell Biology (2000-2008)
MSc Histology (2008)
Ass.Lecturer at Department of Histology and Cell Biology (2008-2012)
MD Histology (2012)
Lecturer at Department of Histology and Cell Biology (2012 -2019)
Assistant Professor at Department of Histology and Cell Biology (2019 till now)

Panagiotis Mallis
Hellenic Cord Blood Bank, Biomedical Research Foundation Academy of Athens, Greece

Therapeutic applications of mesenchymal stromal cells in COVID- 19: Promising evidence from in vitro results

Background: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is responsible for the coronavirus disease 2019 (COVID-19) pandemic, which was initiated in December 2019. COVID-19 is characterized by a low mortality rate (< 6%); however, this percentage is higher in elderly people and patients with underlying disorders. COVID-19 is characterized by mild to severe outcomes. Currently, several therapeutic strategies are evaluated, such as the use of anti-viral drugs, prophylactic treatment, monoclonal antibodies, and vaccination. Advanced cellular therapies are also investigated, thus representing an additional therapeutic tool for clinicians. Mesenchymal stromal cells (MSCs), which are known for their immunoregulatory properties, may halt the induced cytokine release syndrome mediated by SARS-CoV-2, and can be considered as a potential stem cell therapy.

Aim: To evaluate the immunoregulatory properties of MSCs, upon stimulation with COVID-19 patient serum.

Methods: MSCs derived from the human Wharton's Jelly (WJ) tissue and bone marrow (BM) were isolated, cryopreserved, expanded, and defined according to the criteria outlined by the International Society for Cellular Therapies. Then, WJ and BM-MSCs were stimulated with a culture medium containing 15% COVID-19 patient serum, 1% penicillin-streptomycin, and 1% L-glutamine for 48 h. The quantification of interleukin (IL)-1 receptor a (Ra), IL-6, IL-10, IL-13, transforming growth factor (TGF)-β1, vascular endothelial growth factor (VEGF)-a, fibroblast growth factor (FGF), platelet-derived growth factor (PDGF), and indoleamine-2,3-dioxygenase (IDO) was performed using commercial ELISA kits. The expression of HLA-G1, G5, and G7 was evaluated in unstimulated and stimulated WJ and BM-MSCs. Finally, the interactions between MSCs and patients' macrophages were established using co-culture experiments.

Results: Thawed WJ and BM-MSCs exhibited a spindle-shaped morphology, successfully differentiated to "osteocytes", "adipocytes", and "chondrocytes", and in flow cytometric analysis were characterized by positivity for CD73, CD90, and CD105 (> 95%) and negativity for CD34, CD45, and HLA-DR (< 2%). Moreover, stimulated WJ and BM-MSCs were characterized by increased cytoplasmic granulation, in comparison to unstimulated cells. The HLA-G isoforms (G1, G5, and G7) were successfully expressed by the unstimulated and stimulated WJ-MSCs. On the other hand, only weak expression of HLA-G1 was identified in BM-MSCs. Stimulated MSCs secreted high levels of IL-1Ra, IL-6, IL-10, IL-13, TGF-β1, FGF, VEGF, PDGF, and IDO in comparison to unstimulated cells ($P < 0.05$) after 12 and 24 h. Finally, macrophages derived from COVID-19 patients successfully adapted the M2 phenotype after co-culturing with stimulated WJ and BM-MSCs.

Conclusion: WJ and BM-MSCs successfully produced high levels of immunoregulatory agents, which may efficiently modulate the over-activated immune responses of critically ill COVID-19 patients.

Audience Take Away

- Present the current status of Mesenchymal Stromal Cells.
- Present modern mechanisms regarding the immunomodulatory/ immunoregulatory role of MSCs.
- Evaluation of immunoregulatory properties between fetal and adult MSCs.
- Discuss the specific mechanism of action, through which the MSCs can exhibit their beneficial properties in immune-related disorders.

Biography

Panagiotis Mallis gained his bachelor degree (BSc) in Biomedical Sciences from the Athens University of Applied Sciences in 2010. In 2013, he received his master diploma (MSc) and in 2018, received his PhD in Tissue Engineering and Regenerative Medicine from the Medical School of National and Kapodistrian University of Athens. Currently, Mallis Panagiotis is member of the Hellenic Cord Blood Bank (HCBB). Panagiotis Mallis has extensive experience in mesenchymal stromal cell (MSCs) isolation and in vitro manipulation. His current research involves the investigation of MSCs'immunoregulatory/immunosuppressive properties and their applicability in tissue engineering and regenerative medicine approaches.

Dr. Madhu Gupta*
Department of Pharmaceutics, School of Pharmaceutical Sciences, Delhi Pharmaceutical Sciences & Research University- 110017

Placental therapy: Is really a natural weapon for wound healing therapy?

Placental extract formulation Regenerin (Patent no- RU 2469704 CI, dt: 07.07.2011) has been reported to possess antioxidant, antimicrobial, anti-inflammatory, cellular proliferation, and tissue regeneration properties. Considering the properties of placental extract, the present investigation was undertaken to investigate the effectiveness of this formulation in rat diabetic foot ulcer (DFU). Diabetes was induced by intraperitoneal (i.p) injection of 65 mg/kg of Streptozotocin (STZ) in rats and open excision wounds were produced in feet by using scalpel. The formulations were topically applied to all the groups once a day till the complete healing was achieved. Blood glucose monitoring, body weight, food and water content, parameters were measured weekly. Wound healing was assessed by analyzing % wound closure,wound area measurements, hydroxyproline content, epithelialization period, and inflammatory marker CRP At the end of study, foot was excised for histopathology and hydroxyproline level. Treatment with Regenerin gel produced decrease in wound size and increased epithelization from 8th day which continued until 18 days when complete closure was found. Regenerin-gel showed the higher hydroxyproline content, decrease in inflammatory markers, neovascularization as well as increases the collagen deposition. It can be concluded from this study that topically applied regernerin-gel may be a potential approach for faster wound healing for treatment of chronic diabetic wounds.

Audience Take Away

- They can get the exposure of regenerative based medicine and resources
- The newer area for their learning will be explored.
- Yes, other scientific community can get benefitted with this research.
- Yes, its provide more simple and effective formulation.
- Yes
- List all other benefits.

Biography

Dr. Madhu Gupta is working as an Associate Professor in Delhi Pharmaceutical Science and Research University, New Delhi. She has research experience pertaining to drug delivery to nanoformulations for magical molecule delivery, bioligands for targeting of bioactives and drug moiety, biopolymers, cancer nanomedicine as well as topical delivery. She has over 80 research publications to her credit published in journals of high scientific impact and contributed 30 chapters in various renowned books with h index 20 and more than 1000 citations.. She has the recipient of Research Excellence of the Year 2020, Youth Education Icon of the Year 2018, Young Scientist Award, Best Administrative Service Award, IDMA-G.P. Nair award and Prof. C.S. Chauhan award,BioAsia Innovation Award – 2012, Grace India awards. She has also filed the PCT patent for effective wound healing therapy.

Andrey Belousov[1,2,3]*, Elena Malygon[2,3], Vadim Yavorskiy[2,3], Ekateryna Belousova[1,3]
[1]Laboratory of Applied Nanotechnology of Belousov
[2]Kharkov Medical Academy of Postgraduate Education
[3]Kharkov Regional Center of Blood Service, Ukraine

Effect of nanotechnologically treated physiological saline solution on clinical and physiological parameters of preserved donor erythrocytes during the stages of their storage under hypothermic conditions

Background: The benefits gained by improved RBCs component quality should more than justify any real or perceived inconvenience to the blood services in implementing adjustments to their processing procedures or additional processing costs of the introduction of new generation RBCs additive solutions. Recently the FDA has tightened and increased the assessment and acceptance criteria making it potentially more difficult and expensive to bring new RBCs storage systems to market. The researches has proved that now of magnetite nanoparticles are able not only to considerably reduce hemolysis, and thereby prolong storage time of the blood's heparinized, influence on activity of adenosinetriphosphateses of erythrocytes, regulated transmembrane exchange, but also to extracorporeally influence on cellular apoptosis. The above was the basis for the choice of the theme of this study, devoted to the learning of the use of nanotechnology to correct the functional activity of red blood cells at the storage stages at a positive temperature.

The main purpose of the first stage of the study is to develop a simple and practical method of additive modernization of preservation solutions that does not violate the compliance requirements, improves the quality, efficiency and safety transfusion of red blood cells.

Object of research: red blood cells (RBCs) into bags containing anticoagulant citrate, nutrient phosphate and dextrose (CPD); red blood cells (RBCs) into bags containing anticoagulant citrate, nutrient phosphate, dextrose and adenine (CPDA-1).

Materials and methods: magnetite of nanoparticles (ICNB); saline solution of NaCl; MR-tomography; visual analysis of hemolysis; controlled by photometric method hemolysis; microscopic method; Panchenkov's method; pH metric.

Results: It was established that saline NaCl which had previously been processed by magnetite nanoparticles (ICNB) had a marked membrane-stabilizing effect, inhibits haemolysis and increasing the sedimentation stability of preserved RBCs. The complex analysis of the obtained data allowed to determine the primary mechanisms effect of the saline NaCl which had previously been processed by ICNB on the preserved RBCs. The proposed method of additive modernization of preserved RBCs was adapted to the production process. The optimisation results were obtained in creating a simple and practical method of additive modernization of preservation solution that does not violate the compliance requirements, improves the quality, efficiency and safety transfusion of RBCs. The effect of haemolysis inhibition by the method of additive modernization of preservation solutions, that adapted to the manufacture process on day 35 of the study is shown in Fig.1.

Biography

Andrey Nikolaevych Belousov is Doctor of Medicine degree on speciality - Anesthesiology and Intensive Care. Author a new medicine products – nanotechnology preparations based on magnetite nanoparticles (Fe_3O_4) (www.nanolab.com.ua): Micromage-B (officially registration in Ukraine); Magnet-controlled sorbent brand of MCS-B for extracorporeal detoxication of biological liquids (officially registration in Ukraine and was allowed for medical practice); NanoBiocorrector for intravenous application – ICNB (intracorporal nanosorbent). A.N. Belousov is author new method of extracorporeal hemocorrection using magnet-controlled sorbent (MCS-B). The published more 250 scientific works on results application of nanotechnology preparation in experimental and practical medicine. At now Andrey Belousov - the Head of Laboratory Applied Nanotechnologies in Ukraine, DM, Professor of Department Anesthesiology, Intensive Care, Transfusiology and Hematology Kharkov Medical Academy of Postgraduate Education.

Marie-PearlOtoo Seniagya[1*], Sarah Lotus Asare[3], James Boachie-Ansah[3], Patrick K. Arthur[2]

[1]Department of Biomedical Engineering, University of Ghana, Legon, Accra, Ghana
[2]West African Centre for Cell Biology of Infectious Pathogens, Legon, Accra, Ghana
[3]Department of Archaeology and Heritage Studies, University of Ghana, Legon, Accra, Ghana

Investigating the redox activities of antifungal drugs and selected cell lines in the presence of functionalized chitosan nanocomposites

Chitosan a deacetylation derivative of chitin, has several applications in biomedical and healthcare research as a result of being abundant in nature and its unique physicochemical properties such as biocompatibility and biodegradability. Functionalising chitosan improves its properties, thereby making it attractive for further traditional and novel scientific studies. In this study, functionalization of chitosan with acetic acid and tetraethylorthosilicate to explore the composite itself in addition to its biophysical properties, redox behaviour and influences on cell viability is reported. A one- step synthesization of functionalized chitosan beads were prepared using the cross-linking and sol- gel processes. The chitosan beads were characterised using Fourier Transform Infrared Spectroscopy (FTIR) and X-ray Diffraction (XRD) to ascertain their biophysical properties. Adsorption studies were then conducted on the beads using methylene blue dye to explore their drug delivery potentials. Selected cell lines:HeLa and S. Cerevisiae were treated with the chitosan beads and their cytotoxicity investigated. The redox potentials of the cells in the presence of these functionalized chitosan beads was measured using cyclic voltammetry to correlate the viability of the cells with the membrane disruption of the cells as a result of the presence of the chitosan beads. The generated voltammogramms were compared with those of some antifungal drugs: Amphotericin B, Fluconazole and Rifampicin to determine their electrochemical behaviour. Afterwards, the redox potentials of the drugs plus cells were determined too. The voltammogramms generated depicted a direct correlation between the electrochemical response and cell viability - with prominent anodic and cathodic peaks which relates to an increase in cell death. Cells treated with nanoparticles were compared with cells treated with drugs. The work hints on the diverse application of the chitosan nanocomposites in biomedical studies and sheds lights on the use of cyclic voltammetry in predicting cell behaviour.

Audience Take Away

- The cyclic voltammograms sheds lights on the possibility of screening antifungal drugs whiles determining their ability to penetrate the plasma membrane to elicit redox activities as well as the membrane target modulators.
- In their area of work and further research, molecular entities and drugs can be analysed with the experimental methods described in this work.
- Would better understand the mechanisms of drugs against disease models

Biography

Marie-Pearl OtooSeniagya studied Biomedical Engineering at University of Ghana, Legon, Accra, Ghana and graduated in 2017. She then joined the research group of Prof. Elvis Tiburu at the Biomedical Engineering laboratory and the West African Centre for Cell Biology of Infectious Pathogens, Ghana. She received her Master's degree at the same institution. She has extensive research knowledge and has published research articles in science journals.

Bita Shalbafan[1*], Sahar Shojaei[2]

[1]Labafinejad Clinical Research Development Unit, ShahidBeheshti University of Medical Sciences, Tehran,Iran

[2]Cell Therapy Department, Middle East Cell and Gene Therapy Company, Tehran, Iran

Mesenchymal stem cell–derived exosomes in neurological disorders

Exosomes are released by hematopoietic and non-hematopoietic stem cell origin. With ever-increasingdevelopments of MSCs-Exoresearch,severalresearch achievements have been made on the potential mechanism ofMSCs-Exo andtherapeutic effect in a variety of Neurological diseases, showing great potential for Neuromuscularregeneration. Not only the treatment-related research of MSCs-Exo is still in the early stage, but also there are manyresearch gaps and problems should be explored and solved. First of all, exosome bioactivity must be detectedprecisely. Only when exosomes have biological activity can they show function for diagnosing or treating neurologicdiseases. The next one, for exosomesbiodistribution, in vivo tracking and targeting should be monitored. The mostimportant gap is exosomes composition standardizations, therefore sharing the clinical experiment could fill this gapaboutusingdose,sourceproductionandsoon. Thispresentationincludesanunbelievablemusclepowerimprovementintwocasesinthefirstweek after exosomeinjection.These observationssuggestcell-signalingimprovement mayinduce neuroplasticityand neurorehabilitation.

Audience Take Away

- The restricted potential of stem cells has been challenged, therefore in neurodegenerative diseases research onstem cell-derived exosomes has been highlighted as bioactive agents, so, this review may motivate theaudienceto be hard-workingin this era.

Biography

Doctor BitaShalbafan is a Neurologist specialist since 1998. In 2002, she was one of the founders of the MultipleSclerosis Associations of Iran, and in 2010, she started researching neurogenetics, neurometabolic andneuroophthalmologyinordertofindprimarycausesofneuroinflammationinMS. Shehasseveralpublicationsandlecturesin “Genotype-Phenotypecorrelations”and”Optic CoherenceTomography”.

Her activity in Neuroplasticity started from 2007 by “Cerebrolysin effect” then focused on “Mesenchymal Stem CellTherapy in Neurometabolic disorders” from 2016 and developed her researches on “MSC derived Exosomes”.Since2018;shehas annuallypresentedher clinical experinces in BCNCinTehran.

Vyacheslav R. Shulunov
Institute of Physical Materials Science, Siberian Branch of the Russian Academy of Sciences, Russian Federation

Rapid parallel search technology for global control of the spread of respiratory infections

Developed a Rapid Parallel Search (RPS) technology shows keys to preventing the spread of virus outbreaks by exactly and quickly identify sick and asymptomatic carriers. RPS uses the time-tested Scanning Electron Microscopy (SEM) and Artificial Neural Network (ANN) methods for detecting all known viruses and microorganisms in ~50 s with 99.999% precision without reagents that are hard or impossible to identify by molecular methods. The proposed solution presents simultaneous automatic recognition of hundreds of pathogens with scanning resolution of 0.5 nm for real-time monitoring of every one arrival/departure traveler in huge transcontinental airports. RPS features make it possible to monitor most of the inhabitants of million-plus cities daily and precisely.

Biography

Vyacheslav Shulunov is a researcher at the Institute of Physical Materials Science of the Siberian Branch of the Russian Academy of Science. The author of the breakthrough innovative additive technology Roll Powder Sintering, 3 patents of the Russian Federation, 4 certificate of state registration of the program, 11 Web of Science and Scopus publications – https://www.researchgate.net/profile/Vyacheslav_Shulunov (Scopus h index: 5, https://www.scopus.com/authid/detail.uri?authorId=56536940900). His scientific interests are aimed at accelerating the arrival of a new scientific and technological revolution to improve and save human lives.

Yuqing Liu[1,2], Xiaobo Mao[1,2*]

[1]Institute for Cell Engineering, Johns Hopkins University School of Medicine, Baltimore, MD, 21205, USA

[2]Department of Neurology, Johns Hopkins University School of Medicine, Baltimore, MD, 21205, USA

Pathogenic α-synuclein cell-to-cell transmission mechanism and related therapeutic development

α-Synucleinopathies is characterized with accumulation of misfolded α-synuclein (α-syn), including Parkinson's disease (PD), Dementia with Lewy Bodies (DLB), and Multiple System Atrophy (MSA). Emerging evidence indicates that pathogenesis of α-synucleinopathies may be due to cell-to-cell transmission of prion-like preformed fibrils (PFF) of α-syn. We identified several receptors (Lag3, Aplp1, neurexins) that specifically bind with α-syn fibrils but not α-syn monomer. Lymphocyte-activation gene-3 (Lag3) exhibits the highest binding affinity with α-syn fibrils, and α-syn fibrils binding to Lag3 initiated pathogenic α-syn endocytosis, propagation, transmission, and toxicity. Lack of Lag3 (Lag3-/-) and anti-Lag3 can substantially delay α-syn PFF-induced loss of dopamine neurons, as well as biochemical and behavioral deficits in vivo. The identification of Lag3 that binds α-syn PFF provides a target for developing therapeutics designed to slow the progression of PD and related α-synucleinopathies. Biocompatible antioxidant nanozyme, PtCu nanoalloys (NAs), is applied to fight against α-syn spreading. The results show that PtCu NAs significantly inhibit α-syn pathology, cell death, and neuron-to-neuron transmission by scavenging reactive oxygen species (ROS) in primary neuron cultures. Moreover, the PtCu NAs significantly inhibit α-syn spreading induced by intrastriatal injection of PFF. It is the first time to observe nanozyme can block prion-like spreading, which provides a proof of concept for nanozyme therapy.

Audience Take Away

- The molecular mechanism of pathogenic α-syn cell-to-cell transmission via LAG3.
- LAG3 related therapeutic development against Parkinson's disease and related α-synucleinopathies.
- LAG3 antibody has been approved for cancer therapy, which encourage the application development in neurodegenerative disorders.
- Nanozyme can reduce pathogenic α-syn cell-to-cell transmission by scavenging reactive oxidative stress.

Biography

Dr. Mao received his PhD (Physical Chemistry) at the National Center for Nanoscience and Technology, Chinese Academy of Sciences in 2010. He then worked as postdoc in the labs of Profs. Drs. Ted and Valina Dawson at the Institute for Cell Engineering, Department of Neurology, Johns Hopkins School of Medicine (JHSOM) during 2010-2016. After postdoctoral fellowship, he worked as Assistant Professor in 2017 and became Associate Professor in 2021 at JHSOM. He has published more than 50 research articles in many high-impact journals (*Science, Nature, Nature Medicine, PNAS, Nature Comm, Nano Today*) focusing on pathogenic protein cell-to-cell spreading.

Dr Karin Schutze Tutzing
Germany

Non-destructive quality control of 2D and 3D cell cultures using Raman-Trapping-Microscopy (RTM)

Advanced cell culture technologies and especially three-dimensional (3D) cell cultivation combined with modern biotechnological methods are increasingly applied to regenerate damaged and diseased tissue, such as skin, cartilage or bones. In order to monitor and follow 3D cell cultures, analytical technologies are required that are fast, reliable and sensitive. They should especially be label-free and non-destructive. Most of the microscopic methods are limited with regard to thickness and opaqueness of cell materials. Raman trapping microscopy is a unique method to follow cell development and tissue growth but to also warrant quality of the explants.

The principle of spontaneous Raman spectroscopy will shortly be described. Raman spectroscopy records scattered photons caused by collision of photons incident derived from a near infrared laser with target molecules, which ultimately results in an energy transfer. This so-called "inelastic" scattering is a very rare event, and only one of ten million impinging photons will result in a Raman scattered photon. The benefit and great potential of integrated trapping features for measurement cells directly within liquid cell cultures will be demonstrated. We also will explain the rich chemical information and uniqueness that Raman spectra provide from individual cells and tissue.

RTM analysis helps to find best culturing conditions of stem cells, finds differences between pure and cocultured fibroblasts within collagen matrix or discriminates activated from non-activated gingival fibroblasts within opaque mucoderm matrix.

A skin graft matrix constructed on a 3D hydrogen scaffold was used as a model of 3D-cell culture. In a first step, the purity of patient derived, keratinocytes and fibroblasts expanded in selection media was measured using single cell Raman trapping spectroscopy. Secondly, Raman spectra of keratinocytes and fibroblasts within separate layers of the graft were taken, monitoring composition, functionality, and quality of the cells. Cluster analysis of Raman data reveals cross-contamination between the layers of the graft.

Furthermore, RTM can follow cell development within beating cardiomyocytes and provides direct information about penetration of drugs into spheroids. Spheroids have emerged recently as an attractive 3D cell-model representing tissue biology, complexity, and architecture of 3D in vitro systems.

These results indicate that Raman trapping microscopy is able to detect the biochemical profile of cells even in the depth of tissues and microspheres, providing the opportunity to trace and evaluate changes of cells in response to environmental impact or to compound treatment.

Biography
Dr. Karin Schütze is biologist. Together with her husband Raimund they founded and headed the former PALM company with emphasis on laser microdissection and catapulting. In 2008 they both founded CellTool GmbH developing innovative Raman trapping microscope systems for label-free, gentle and efficient cell analysis. Their expertise is transferring complex photonic systems into user friendly, easy to handle tools for biomedical applications - with focus on non-contact cell handling, cell characterization and cell enrichment based on complex laser-assisted technologies. They were awarded with the Phillip Morris Research Prize, the Berthold Leibinger Innovation prize - and nominated to the German Presidents 'Zukunftspreis'.

Participants List

A.Ranella	**35**
Alessandro Bertolo	**25**
Adnan Alizadeh Naini	**28**
Andrey Belousov	**43**
Bita Shalbafan	**46**
Christiane Salgado	**16**
Dalia A. A. El-Waseef	**39**
Deptula Milena	**26**
Dina Ahmed Salem	**21**
Diana Stan	**22**
Fajar Shodiq Permata	**37**
Federico Carpi	**7**
Haidong Liang	**13**
Karin Schutze Tutzing	**49**
Madhu Gupta	**42**
Marie-Pearl Otoo Seniagya	**45**
Michel Leclerc	**30**
Mohan Malleshaiah	**38**
Neha Ashok Waghmare	**17**
Orestis Ioannidis	**8**
Panagiotis Mallis	**40**
Pratap Devarapalli	**12**
Roberto Gramignoli	**15**
Ruben F. Pereira	**10**

UPCOMING CONFERENCES

3rd Edition of International Conference on

Tissue Engineering and Regenerative Medicine

August 21-23, 2023 at London, UK

https://magnusconferences.com/tissue-engineering/index.php

Questions? Contact

+1 (702) 988-2320 or

Inquires: tissue-engineering@magnusconference.com

For Registration:

https://magnusconferences.com/tissue-engineering/register