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21-23 AUGUST, 2023

LONDON, UK | HYBRID EVENT

3RD EDITION OF
INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Venue:

Copthorne Hotel Slough-Windsor
Cippenham Ln, Slough SL1 2YE, United Kingdom

BOOK OF ABSTRACTS

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BOOK OF
ABSTRACTS

3RD EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

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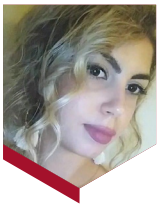

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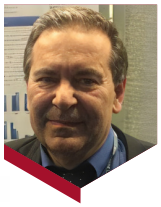

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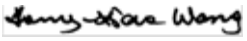
Thank You All...

Welcome Message

Tissue Engineering and Regenerative Medicine today have made unprecedented progress. No doubt, the “3rd International Conference on Tissue Engineering and Regenerative Medicine Conference (TERM C2023)” will bring together leading researchers, scientists, clinicians, and industry professionals from around the world to discuss the latest developments in tissue engineering and regenerative medicine. Attendees will have the opportunity to participate in both onsite and online versions of the event, allowing for a truly hybrid experience and will cover a broad range of topics, including biomaterials, stem cells, tissue regeneration, 3D printing, and tissue engineering applications in various fields such as cardiology, neurology, oncology, and others. The conference will provide a platform for attendees to share knowledge, network with peers, and collaborate on innovative solutions. Moreover, this conference will be an exciting event particularly for anyone interested in tissue engineering and regenerative medicine, with a focus on repairing, replacing, and regenerating tissues through the rising basic research, translational science, and medicine in these leading fields.



Prof. Dr. Yong-Xiao Wang

Albany Medical College, United States

Welcome Message

Welcome to the **3rd Edition of International Conference on Tissue Engineering and Regenerative Medicine** (#TERMC 2023). The conference provides international perspectives to educate, share methods and understand the field of engineering and the applications in regenerative medicine. The sessions address critical elements that will impact the future of health; tissue engineering and regenerative medicine applications could be a potential therapeutic approach that overcome today's limitations. We have an exciting program that will allow members to reflect upon and celebrate today's and past accomplishments, renew friendships and extend networks, and jointly explore current and future research directions. We hope that you will have a productive and fun-filled time at this innovate conference. I wish you a highly enjoyable and fruitful conference. I hope you enjoy your stay in this magnificent city, making use of your pre and post conference times to enjoy the many wonderful sites.

We sincerely look forward to welcoming you. Enjoy the conference.

Assist. Prof. Dr. Vasiliki E. Kalodimou

Director Flow Cytometry-Research, Greece

Welcome Message

At a time when the Medical community is called upon to capitalize on the experiences of the pandemic through the challenges it faces in a health context that is being tested, the **3rd Edition of International Conference on Tissue Engineering and Regenerative Medicine** aims to play an essential and transformative role in the way the medical professions are organized and operated. The challenge and the goal for us is to be able to create the necessary framework for a productive scientific dialogue, which touches, through a holistic approach, the practice of the profession in a worldwide context. Through a multifactorial and multidisciplinary approach, particular emphasis is placed on holistic person-centered models of patient management and precision medicine as they frame modern practice, alongside highlighting the contribution of artificial intelligence, cutting-edge technologies and digital media to the practice of Medicine. Addressing all the specialties involved, with special emphasis on young doctors who are now training and taking their first steps, special emphasis will be placed on their empowerment. We invite you to participate and together let us take the next step for our profession and through meaningful interaction with qualified scientists and centers from all over the world, co-shape and create a new approach for the doctor of the future, the perfect scientist, the leader, the human.

Orestis Loannidis

Aristotle University of Thessaloniki, Greece

Welcome Message

Great Expectations !!!

No, not the thirteenth classic novel by Charles Dickens, but our “Great Expectations”! I remember vividly, as I lived it, the Great Expectations that tissue engineering was to bring to medicine in the 1990s. We all thought that tissue engineering would revolutionize medicine. On the cover of *Science* and elsewhere were images of every tissue in the body being engineered, grown, and replaced. Gone were the days of waiting for kidney transplants ! Gone were the days of needing heart transplants ! Tissue engineering was to be the panacea for all of our medical problems ! Everyone from academic researchers to entrepreneurs to funding agencies to the media built a lot of hype for tissue engineering – and the falsehoods from today’s social media outlets did not even exist in the 1990s! Fast forward 30 years. Were our expectations met? Did we put too much pressure on a largely academic research area to solve *all* of our health problems? Did we *really* think that work from Universities and a few entrepreneurs could *really* be the solution to centuries of health problems? Yes, we do have some tissue engineering clinical solutions developed over those years, mostly in skin or tissues that are relatively easy to regrow, but what about those kidneys and the heart ? (In 2023, patients are still waiting for organ transplants for those and many other tissues for which we *still* have no tissue engineered solutions.) What happened to the “Great Expectations” of tissue engineering?

Regulatory concerns. Bankrupt tissue engineering start-up companies. Lack of suitable tissue engineering biodegradable materials. Extensive inflammation. Infection. Lack of industry involvement. These are just some of the reasons. But still, today, tissue engineering has persevered and *still* holds significant promise in medicine. So, come, join us and actively discuss these and many other areas of interest to tissue engineering. Learn and tell us where we have been and where we are going 30+ years after the field was first introduced. And give your opinion on what can we learn from the past 30 years of Great Expectations!

I look forward to hearing of your Great Expectations in Tissue Engineering and Regenerative Medicine!

Thomas J. Webster, Ph.D

Hebei University of Technology, China

Welcome Message

Dear participants, it is a pleasure to welcome you to the **3rd Edition of International Conference on Tissue Engineering and Regenerative Medicine** (TERMC 2023). The field of Tissue Engineering and Regenerative Medicine has experienced significant progress in recent years, ranging from advanced biomaterials with multifunctional properties to the bioprinting of in vitro tissue models and grafts. Such advances open new opportunities towards the delivery of new therapies to promote the repair of damaged tissues as well as novel tools for tissue modelling and drug screening. TERMC 2023 provides a perfect forum for discussion of recent advances in the field, trends and opportunities for future developments.

Prof. Dr. Ruben Pereira

University of Porto, Portugal

Welcome Message

Greetings,

I extend you all a very warm welcome to the TERM Conference in August 2023. It is indeed an exciting opportunity to participate in such an esteemed event focused on Tissue Engineering and Regenerative Medicine. The field of tissue engineering holds tremendous potential for advancing medical treatments and improving the lives of patients worldwide.

As scientists and delegates from different parts of the globe, we are eager to gather in London and exchange our knowledge, experiences, and ground-breaking research. The chance to network and collaborate with leading experts in the field is invaluable and will undoubtedly foster innovation and progress in tissue engineering and regenerative medicine. The TERM Conference promises to be a remarkable platform for showcasing high-impact research and setting the stage for future developments in the field. The discussions, presentations, and workshops will contribute to the collective understanding of tissue engineering and regenerative medicine and shape the roadmap for future advancements.

Prof. Sandeep Shrivastava

Scientific Org. Committee Member, TERMC 2023

Chief Scientific Officer, DMIHER, Wardha, India

Professor Director Orthopaedics, JNMC, Wardha. India

Keynote Speakers

Yong Xiao Wang

Albany Medical College, United States

Nagy Habib

Imperial College London, United Kingdom

Vasiliki E Kalodimou

Director Flow Cytometry-Research, Greece

Thomas J Webster

Hebei University of Technology, China

Sandeep Shrivastava

Datta Meghe Institute of Higher Education & Research, India

Ruben Pereira

University of Porto, Portugal

Orestis Ioannidis

Aristotle University of Thessaloniki, Greece

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 conferences 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 2023

Magnus Group cordially invites you to the exceptional "**3rd Edition of International Conference on Tissue Engineering and Regenerative Medicine**" (TERMC 2023) in **London, UK**, during **August 21-23, 2023**. This conference centres around the theme "R5: Repair, Replace, Regenerate Tissues through the Rising Research in Tissue Engineering," highlighting the latest innovations, methodologies, and strategies that have advanced the field over the past 30 years. Tissue engineering, a subfield of regenerative medicine, has gained considerable interest as a promising solution to the shortage of organ donors and the limitations of artificial organs and transplantation. TERMC 2023 aims to create a global platform for extensive discussions, knowledge sharing, and professional networking, offering a diverse program featuring keynote sessions, lectures, oral and poster presentations, scientific forums, podcasts, and symposiums, all dedicated to showcasing the latest trends and advancements in Tissue Engineering and Regenerative Medicine. This outstanding summit presents an opportunity to interact with leading experts, researchers, practitioners, and industry professionals, fostering collaborations and facilitating valuable insights to drive the progress of this critical field. Join us at TERMC 2023 to connect with peers from international universities, institutes, and various medical disciplines, including tissue engineers, stem cell experts, healthcare professionals, regenerative medicine specialists, researchers, and students, making it a truly enriching experience.

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DAY 01

KEYNOTE FORUM

3RD EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

RNA activation in cancer and rare genetic diseases

Small activating RNAs (saRNA) are double stranded 21 nucleotide RNA that either target promoters or enhance genes leading to mRNA upregulation. saRNAs can be delivered with liposomes into the systemic circulation or subcutaneously by conjugation with aptamers or GalNAC. MTL-CEBPA is an investigative drug that resulted from the conjugation of saRNA CEBPA with NOV 340 lipsomes that targets tumour associated macrophages in order to alter favourably the tumour microenvironment. MTL-CEBPA has been administered safely in over 100 patients with advanced cancer and improved clinical outcome in a sub-set of patients when co-administered with TKI or check point inhibitor

Audience Take Away Notes

- It will improve their knowledge in activating gene which could be very useful for cell differentiation and function especially in the context of pleuripotent stem cells
- It would be highly relevant in the field of stem cell and regeneration. In particular it will help them to avoid the high risk of lentivirus

Habib Nagy

Department of Surgery & Cancer, Imperial College London. London, United Kingdom

Biography

For over three decades Nagy has been at the forefront of clinical research and clinical practice in cancer. He pioneered the first clinical trial in the use of adenovirus and plasmid for the treatment of liver cancer, as well as the use of plasmid gene therapy in hydrodynamic gene delivery. Nagy is a founder and was the Head of R&D of MiNA Therapeutics. Whilst at MiNA he was driving the development of an saRNA drug (a new class of medicines) which is currently being trialed in patients with liver cancer in eight UK centres, and sites in Singapore and Taiwan (OUTREACH study, ClinicalTrials.gov ID NCT02716012) and in a second trial in patients with solid tumours (TIMEPOINT study, ClinicalTrials.gov ID NCT 04105335) in the UK, USA, Europe, Singapore and Taiwan. He has published widely in gene therapy, stem cell therapy, oligonucleotides, endoscopy and surgery. Currently he is the CEO of Apterna Limited, a company focussed on novel oligonucleotide deliver and Dawn Therapeutics specialising in gene therapy. Nagy is Lead Clinician and Head of the Department of HPB Surgery at Imperial College London.

Novel molecular mechanisms and therapeutic options for pulmonary hypertension

Pulmonary Hypertension (PH) is a common and devastating lung disease. The current primary medications for this disease are to use non-specific vasodilators, but patients do not always respond well to non-specific vasodilators. Voltage-dependent potassium channels and store-operated calcium channels may increase intracellular calcium concentration ([Ca^{2+}]i) in pulmonary arterial smooth muscle cells (PASMCs) to mediate the development of PH; however, experimental findings are uncertain. In a series of studies, we have explored the potential important role of ryanodine receptor 2 (RyR2) Ca^{2+} release channel in PH and its inhibition as therapeutic strategies for this disease. Our findings reveal that Rieske iron-sulfur protein (RISP) serves as a primary molecule to increase mitochondrial reactive oxygen species (ROS) generation, disassociate FKBP12.6 from RyR2, enhance the channel activity, and then induces calcium release from the sarcoplasmic reticulum (a major intracellular Ca^{2+} store), hereby causing PA vasoconstriction, remodeling, and ultimately hypertension. Moreover, the increased RISP-dependent ROS can also cause DNA damage to activate ataxia telangiectasia mutated (ATM) kinase, phosphorylate checkpoint kinases 2 (Chk2), and cause cell proliferation in PASMCs, leading to PA remodeling and hypertension. Our results further indicate that specific pharmacological and genetic RISP, RyR2, FKBP12.6 dissociation, ATM, and Chk2 inhibition may become specific and effective treatment options for PH and other relevant vascular diseases.

Audience Take Away Notes

- Our current presentation will greatly help the audience to create their future research directions
- The finding presented may significantly assist the audience to develop novel preventive and therapeutic strategies for PH and other relevant pulmonary diseases.
- Our research could also be used by other investigators to expand their research and/or teaching.

Yong-Xiao Wang

Department of Molecular and Cellular Physiology, Albany Medical College, Albany, New York, United States

Biography

Dr. Yong-Xiao Wang has been a Full Professor in Department of Molecular and Cellular Physiology at Albany Medical College since 2006. Dr. Wang obtained his MD at Wannan Medical University, PhD at Fourth Military Medical University, and postdoctoral training at Technology University of Munich and University of Pennsylvania. He has made many important findings using complementary molecular, biochemical, physiological, and genetic approaches at the molecular, organelle, cellular, tissue and organism levels in animals and human samples, had numerous publications in Nature Commun (impact factor: 14.290), Antioxid Redox Signal (8.209), Proc Natl Acad Sci USA (9.432), Nature (34.480), Circ Res (9.214), and other highly peer-reviewed journals and academic books, and served as the editorial board member and/or section editor as well as the executive committee member and/or subcommittee chair for professional societies.

Characterization of Mesenchymal Stem Cells (MSCs) and their use in the treatment of COVID-19

Worldwide more than 49 million individuals have been infected with severe acute respiratory syndrome corona virus 2 (SARS-CoV-2), the corona virus causing COVID-19. From the World Health Organization, as of November 6, 2020, a little over 1.2 million deaths have been reported globally and yet to date, there are no current specific drugs or vaccines available to cure patients with COVID-19 infection. Hence, there is a large unmet need for a safe and effective treatment for COVID-19 infected patients, especially the severe cases. A proposed mechanism of severe Corona virus Disease-2019 (COVID-19) is a deregulated innate immune response to an infection with SARS-CoV-2 resulting in cytokine release syndrome (CRS). Mesencymal stem cells (MSC) have been shown to have immunomodulatory effects and may attenuate the CRS. We present 11 cases of severe COVID-19 pneumonia treated with umbilical cord-derived, non-HLA matched MSC administered as four separate intravenous doses, 5×105 cells/kg. Clinical symptoms, measurements of inflammatory mediators and cytokines (IL6, IL10, IFN-γ, TNF-α), and radiological results were recorded for each patient. Although there were large variations in baseline cytokine pattern elevation, all cytokine levels decreased in all patients after the 4 infusions of UC-MSC, albeit in different magnitudes. Seven patients eventually improved in terms of need for supplemental oxygen and/or mechanical ventilation, clinical symptoms, resolution of pneumonia on imaging, and were discharged. Three patients expired, 1 of whom expired before completing the full course of therapy. This limited series of patients showed that UC-MSC therapy down regulates the cytokine storm and may improve clinical status in patients hospitalized with severe COVID-19 pneumonia without any infusion related reaction.

Keywords: MSCs, UMSC, QA, Potency Assays, COVID-19, pneumonia.

Vasiliki E Kalodimou

Director Flow Cytometry-Research, Greece

Biography

Dr. Vasiliki E. Kalodimou is the Assistant Professor, School of Medicine at the European University-Cyprus Ltd. Frankfurt Branch, the collaborative Partner for the Greek Research Infrastructure for the visualization and monitoring of fundamental Processes in Biology and Medicine (BIOIMAGING-GR) at NCSR "DEMOKRITOS", Athens-Greece, 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 (E.I.E), she elected to serve as the Vice-Chair of the UEL Alumni Advisory Board, previously was the Director at the Flow Cytometry-Research and Regenerative Medicine Department of IASO Maternity-Pediatric and Research Hospital in Athens, Greece, as well as the CBB Director & Processing Facility Director at MedStem-Cryobanks of IASO. Since 2006, Dr. Kalodimou has studied and working with stem cells from placenta, umbilical cord and adipose tissue, in every day practice and their applications in regenerative medicine, clinical trials, medical tourism and Flow Cytometry. Also is working in the area of human genetics & population genetics as well as cellular standards. In addition to collaboration with state universities and pharmaceutical companies on research projects (19), Kalodimou frequently publishes (49 & 10 books) her findings. She has 2 patents. She received the experienced “Shining Star” award, AABB PEP Program, 2017, the AABB PEP Volunteer of the Year Award for 2018, she is the AABB PEP International Ambassador, a TEDx Speaker & a Skill Mentor at EUvsVirus for 2020 Covid-19 Pandemic & in October 2020 she received the AABB President’s Award for her work in cellular therapy and as a mentor. She is in the editorial board and a reviewer in several scientific international journals as well as board member in scientific organizing committee’s for medical conferences worldwide.

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DAY 01

SPEAKERS

3RD EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Lindy K. Jang[1*], Aubree Hinckley[2], Michael Triplett[1], Claire Robertson[1], Monica L. Moya[1], Nicholas Be[2], William F. Hynes[1]

[1]Materials Engineering Division, Lawrence Livermore National Laboratory, Livermore, CA, United States

[2]Biosciences and Biotechnology Division, Lawrence Livermore National Laboratory, Livermore, CA, United States

Biofabrication of functional human intestinal tissue with villi and crypts using high-resolution 3D printing technique

The epithelium of the small intestine is composed of villi that protrude into the gut lumen like fingers and crypts that are epithelial invaginations. The architecture of villi and crypts is critical to maintain intestinal homeostasis and renewal. In recent years, researchers have explored several methods to engineer Three Dimensional (3D) intestinal tissue structures consisting of both villi and crypts. However, reproducing the complex architecture using a simple fabrication method while achieving both high resolution structures and good cell compatibility remains challenging. Here, we fabricated Gelatin Methacryloyl (GelMA) based intestinal crypt-villus scaffolds possessing physiologically relevant microstructures using our custom biological projection Micro-Stereolithography (BioPuSL) System. High-resolution intestinal scaffolds with 500 um tall villi and 250 um deep crypts were printed within 30 minutes. Human intestinal Caco-2 cells were seeded on the 3D printed intestinal tissue, and the cells exhibited strong adhesion and proliferation on the printed intestinal scaffold. After 21 days of cultivation, Caco-2 cells formed a complete monolayer from the bottom of the crypts to the top of the villi. Caco-2 cells on villi expressed characteristics of mature enterocytes showing apico-basal polarization as exhibited by actin filament and □-tubulin staining which indicates the presence of brush borders of polarized epithelium. This 3D intestinal tissue construct, with a complete epithelium, can serve as a physiologically relevant *in vitro* platform for studying human-microbiome interaction, disease diagnosis/prevention, and drug screening applications. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. The research was supported by LLNL LDRD-22-SI-002. Information release number LLNL-ABS-844898.

Audience Take Away Notes

- 3D printing technique using Bio projection Micro-Stereolithography (BioPuSL)
- Intestinal tissue engineering
- Intestinal cell behavior on 3D tissue structure

Biography

Dr. Jang earned BS degree in Chemistry and ME degree in Materials Science and Engineering at Gwangju Institute of Science and Technology, Korea in 2017. She received her PhD degree in Biomedical Engineering at Texas A&M University, USA in 2021. During her PhD, she developed multifunctional shape memory polyurethane foams for numerous biomedical applications. She worked in Dr. Ware's group at Texas A&M as a postdoctoral researcher for one year developing a unique shape changing polymer system by photopatterning crystal orientations. She joined Bioengineering and Advanced Fabrication group at Lawrence Livermore National Laboratory (LLNL) as a postdoctoral researcher in 2022.

Tong Ming Liu

Institute of Molecular and Cell Biology (IMCB), Agency for Science, Technology and Research (A*STAR), 61 Biopolis Drive, Proteos, Singapore 138673, Republic of Singapore

IPSC-MSCS for cell and gene therapy in cartilage repair

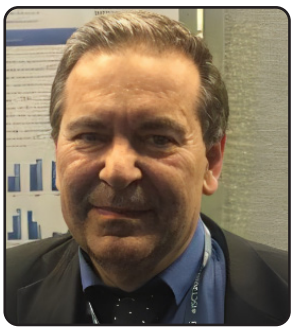
Human Mesenchymal Stem Cells (MSCs) represent the most used stem cells for clinical application, which have been used in over 1500 clinical trials to treat over 30 diseases due to multilineage differentiation potential, secretome and immunosuppression. The clinical application of MSCs is greatly hampered by limited life span of primary MSCs, resulting in insufficient cells. To overcome this problem, we established a step-wise, chemically defined and highly efficient iPSC-MSC platform, which will provide an alternative source of MSCs. iPSC-MSCs displayed similar surface antigen profile, trilineage differentiation potential, gene expression profile and epigenetic profile to primary MSCs. During defining differentiation protocol, we found ascorbate promoted specification and chondrogenesis of iPSC-MSCs through ion-dependent dioxygenase. Most importantly, iPSC-MSCs can repair cartilage similar to bone marrow-derived MSCs. Using our unique iPSC-MSC platform, we screened one novel gene regulating MSC stemness. So far, little is known about key transcription factors to MSC stemness. Knockdown of this gene abolished MSC proliferation and Colony Formation (CFU-F). Moreover, accelerated MSC senescence and a decrease in the expression of cell surface antigens linked to the MSC phenotype was observed, multi-linage differentiation was greatly impaired. Notably, overexpression resulted in improved multi-lineage differentiation, including chondrogenesis of MSCs. The identification of the novel genes regulating stemness will provide novel strategies for gene therapy in cartilage repair.

Audience Take Away Notes

- Human Mesenchymal Stem Cells (MSCs) represent the most used stem cells for clinical application
- iPSC-MSCs will provide an unlimited alternative to primary MSCs
- iPSC-MSCs are similar to primary MSCs in surface antigen profile, trilineage differentiation potential in vitro, gene expression profile and epigenetic profile
- iPSC-MSCs repaired cartilage defects similar to primary MSCs
- Identification of novel genes regulating stemness improves MSC quality, which not only provides insight into molecular basis of MSC biology, but also represents promising strategies of gene therapy in cartilage repair

Biography

Dr. Tong Ming Liu got his PhD in genetics from Institute of Hydrobiology, The Chinese Academy of Sciences in 2002. He then joined the research group of Prof. Eng Hin Lee at National University of Singapore and Prof. Bing Lim at Genome Institute of Singapore. He has published 31 research articles, served/serving as editorial board members of 29 international journals including World J Stem cells (IF 5.326) and guest editor of Front Cell Dev Biol (IF 6.684). He has 17 years of independent research in the field of mesenchymal stem cells (MSCs) focusing on gene and cell therapy of hMSCs, immortalization of MSCs, iPSC-MSCs, bone and cartilage disease modeling and drug screening etc. He has run multiple national grants as PI and co-PI for 15 years.



Georgios Koliakos[1,2*], Argyro Niti[1,2]

[1]Biohellenika Biotechnology S.A. Thessaloniki Greece
[2]Laboratory of Biological Chemistry, Medical School, Faculty of Health Sciences, Aristotle University Thessaloniki Greece

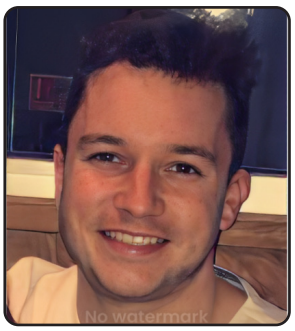
Laminin peptides attached to hydrogels may serve as flexible scaffolds for tissue repair

Tissue engineering and regenerative medicine seek innovative solutions to promote effective tissue regeneration. Laminins, essential components of the extracellular matrix, possess unique cell-adhesive properties crucial for tissue development and repair. A series of laminin derived bioactive peptides has been reported, including cell adhesion promoting peptides cell differentiation and proliferation promoting peptides, angiogenesis promoting peptides and cell migration promoting peptides. By incorporating laminin peptides into hydrogel scaffolds, our group aims to mimic the natural cellular microenvironment and enhance tissue regeneration. The combination of laminin peptides and hydrogels provides a flexible and bioactive platform that supports cell attachment, migration, and differentiation. This review explores the potential applications of laminin peptide-modified hydrogels as versatile scaffolds in tissue engineering, offering promising avenues for improved tissue repair and regeneration strategies. Furthermore, the use of laminin peptides attached to hydrogels offers several advantages in tissue repair. These peptide-modified hydrogels can be easily tailored to mimic specific tissue types by incorporating different laminin isoforms or combinations thereof. The flexibility of hydrogels allows for precise control over mechanical properties, porosity, and degradation kinetics, enabling optimal conditions for cellular growth and tissue integration. Laminin peptide-modified hydrogels can also provide a bioactive environment that facilitates cell-matrix interactions and signaling pathways crucial for tissue regeneration. The presence of laminin peptides promotes cell adhesion, proliferation, and migration, enhancing the recruitment and organization of cells at the site of injury. Additionally, these peptides can influence cell fate determination and differentiation, facilitating the regeneration of a functional tissue. The combination of laminin peptides and hydrogels holds significant potential in various fields of tissue repair, including wound healing, bone regeneration, and organ engineering. The modular nature of this approach allows for the development of customizable and patient-specific scaffolds that can be readily translated into clinical applications. In conclusion, the integration of laminin peptides into hydrogel scaffolds presents an innovative strategy for tissue repair and regeneration. This bioactive platform offers a flexible and tailored environment for cell growth and tissue integration, ultimately promoting improved outcomes in regenerative medicine. Further research and development in this field will undoubtedly contribute to advancements in tissue engineering and the eventual clinical translation of these promising technologies.

Biography

George Koliakos was born in Thessaloniki Greece at 1956. He is a graduate of Medical School Aristotle University (MD 1979) and has a doctoral degree in Biochemistry from the same school (PhD 1983). He specialized in Nuclear Medicine (1983-1987) He served as a postdoctoral associate at the medical school of the university of Minessota USA (1987-1989) and was a visiting research professor at the university of Miami USA (1993). Since 1989 he is a faculty member of the Medical School Aristotle University serving since 2012 as a professor of Biochemistry. He is since 2019 the director of the Joint postgraduate program of Aristotle University Thessaloniki and Democritus University Thrace “Stem Cell and Regenerative medicine”, editor of the “Aristotle Biomedical Journal” and president of the “Hellenic Society for Regen-

erative Medicine Research". He served as Director of the Laboratory of Clinical Biochemistry AHEPA University Hospital (2016-2019), Director of the Laboratory of Biological Chemistry Medical School Aristotle University (2018-2020) Head of the Department of Biological Sciences and Preventive Medicine (2017-2019 and 2020-2021). He also has served as member of the board of the Hellenic Society of Biochemistry and Molecular Biology, Member of the board of the Hellenic Society of Nuclear Medicine and coeditor of Hellenic Journal of Nuclear Medicine. Cofounder and associate manager of Hippocrates Diagnostic Center in Thessaloniki (1991-2006). CEO, of the Hellenic National Research Center Stem cell Bank (2007-1014). Currently, founder President and CEO of Biohellenika biotechnology company (since 2006). George Koliakos has co authored 191 peer reviewed papers listed in Pubmed and Scopus with more than 5300 citations and a current Hills Index of 38 (Google Scholar). He was a principal investigator in 17 national research Grants and inventor or coinventor in eight patents.



Jordan Copner*, Alan Copner

Copner Biotech Ltd, Research and Development Division, Ebbw Vale, Wales, United Kingdom

Next generation 3D-bioprinting through superior software modelling

The 3D-bioprinting industry has witnessed significant breakthroughs and advancements through the last 10 years, including but not limited to, novel methods of material deposition and highly tuneable bioinks for printing. Whilst the industry has enjoyed a clear advancement in hardware, software has been severely overlooked, and as such end users are faced with additional challenges. One such challenge is the design of complex architectures for bioprinting, in a manner that is easy to use and high throughput.

Copner Biotech Ltd has developed a novel and proprietary 3D modelling format; Graphical Rectangular Actual Positional Encoding (GRAPE). GRAPE enables users to create scaffold construct designs using a bottom-up approach, utilising a user-friendly CAD-type interface. GRAPE software is also capable of converting designed construct files into STL format, making this next generation interface easily adoptable to bioprinting workflows.

Since the development and validation of GRAPE through 3D modelling and printing of cell culture scaffolds, the company has since gone on to develop a suite of next-generation hardware for bioprinting, powered by GRAPE technology. Most notably, the GRAPE-S1, a microfluidic extrusion bioprinter that is capable of bioprinting highly complex architectures, does not require a condenser or air lines, and has an incredibly small footprint.

Copner Biotech Ltd has now filed an extensive portfolio of intellectual property and received a multitude of international awards for its work. Most recently, the company picked up the MediWales Start-Up of the Year Award 2022 and Corporate LiveWire's UK Biotechnology Company of the Year 2023.

Audience Take Away Notes

- A novel approach to 3D scaffold design and modelling, essential for downstream bioprinting of physiologically relevant tissue constructs.
- Improved 3D model processing for higher accuracy of complex geometry prints and ease-of-use for the end user.
- New approaches to coupling microfluidics and extrusion bioprinting, in a raster-style method of material deposition.

Biography

Jordan studied BSc Biochemistry at Cardiff University, graduating in 2018, before going on to a career in industry. He started his journey firstly in cancer research and the effects of cannabinoids on the body, before working for large multinationals on high-level projects, including GE Healthcare. During his time at GE, he spotted a gap in the market and decided to start a company focusing on next generation 3D cell culture technologies, Copner Biotech Ltd. Since its founding 3 years ago, the company has gone on to develop a portfolio of products and services for the 3D cell culture market and picked up several international awards.

Linas Jonusauskas*, Dovile Andrijec, Konradas Stonkus
Vital3D Technologies, Vilnius, Lithuania

Ultra-high throughput multiphoton 3D bio-printer

Fast development in the field of 3D bio-printing showed immense promise in the capability to produce fully functional organs for in vitro testing or even in vivo implantation. However, while there is an abundance of methodologies that can be employed in this role, the challenge of combining vasculature-enabling micro-resolution with high throughput persists. Therefore, in this presentation, a promising technique of using femtosecond laser in tandem with spatial beam shaping for ultra-high throughput high-precision bioprinting will be presented. Technical aspects and general configuration of such setup are provided. We show that with such a combination sub-1 μm printing resolution can be maintained while offering throughput up to ~several cm^3/h. Furthermore, as it is based on nonlinear absorption, we demonstrate that it has no inherently negative impact on cells present in bio-ink during the printing process. Additionally, we stress that this technology is not inherently limited to only bio-inks and similar materials, allowing the employment of basically any photosensitive resin, including bio-inert hybrid organic-inorganic photopolymers and elastomers. We use this capability to produce a huge array of different bio-oriented 3D structures, such as scaffolds, microfluidic devices, lab-on-chip structures, and stents for various-sized vasculature. With each demonstration, we highlight how multiphoton-based ultra-high throughput femtosecond 3D printing can act as a critical enabler going from laboratory-level experimentation to wider implementation of additive 3D manufacturing in medicine. Details on experimental considerations as well as possible further developments in the field are also provided with emphasis being placed on practical aspects arising from specifically bio-fabrication and tissue regeneration.

Audience Take Away Notes

- The presentation will show how femtosecond laser-based multiphoton 3D bioprinting can be utilized for biofabrication and organ printing
- The advantages of using optical non-linear absorption for tissue fabrication will be highlighted
- How to increase fabrication throughput by a factor of 10-1000 times in comparison to other similar optical 3D printing techniques without sacrificing ~1 μm resolution by employing spatial beam shaping will be explained
- Details and considerations on materials suitable for such a 3D fabrication method will be shared, steering experts of relevant fields in their research

Biography

Dr. Linas Jonusauskas is working with laser material processing since 2011 and received his Ph.D. at Vilnius University in March of 2021. He was also an Associated Professor of Partnership at Vilnius University from 2021 to 2023. In 2015, he became a part of a high-tech company “Femtika,” which aimed at commercializing hybrid femtosecond laser 3D nanofabrication. In 2018, he rose to a prominent figure in the company of Chief Scientific Officer, maintaining this position up until January 2022. In 2022 February he co-founded the company “Vital3D Technologies”, aimed at creating new generation laser 3D bioprinters.

Charalampos Oikonomidis*, Stathis Michalopoulos, Michalis Katsimpoulas, Catherine Stavropoulos Giokas

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

Rat kidney decellularization in purpose of development of tissue engineering scaffold and recellularization with human mesenchymal stem cells derived from human umbilical cord

Chronic kidney disease is a prevalent global issue as the 18th leading cause of death worldwide. The escalating demand for kidney transplants has prompted the scientific community to explore alternative strategies. In such a way, one promising alternative strategy to address the global demand of kidney transplants is the state-of-the-art tissue engineering approaches, including the decellulatization method. The objective of the research was to evaluate two distinct decellularization approaches for the production of whole kidney bioscaffolds. Wistar rat whole kidneys were decellularized using two different approaches. The decellularization solutions applied in both approaches were identical, involving the use of 3-[(3-Cholamidopropyl) Dimethylammonio]-1-Propanesulfonate (CHAPS) and Sodium Dodecyl Sulphate (SDS) buffers for 12 hours each, followed by incubation in a final buffer containing DNAses. Both approaches included three decellularization cycles for a total time of period of three weeks. The produced scaffolds were thoroughly analysed, including histological examination, biochemical assessments, DNA quantification, cytotoxicity assays, and recellularization of the acellular kidneys utilizing the Mesenchymal Stromal Cells (MSCs). The results obtained from histological, biochemical, and DNA quantification analyses confirmed that the second approach had the most favourable outcome, in terms of preservation of whole kidney composition and cell elimination. Furthermore, both decellularization approaches successfully produced acellular whole kidney scaffolds that were further successfully recellularized with the MSCs. The successful recellularization of the acellular kidneys further emphasizes the potential applicability of this approach in the field of tissue engineering, regenerative medicine, and transplantation. This proof-of-concept study may benefit the research focused on alternative strategies for addressing chronic kidney disease issues. The development of acellular kidney scaffolds may offer a potential solution to the global challenge of producing renal transplants. The next step of this study will be the application of the same principles in whole kidneys derived from large animal models or from cadaver donors and the possibility of recellularization with patient's cells, thus bringing the personalised medicine one step closer to its clinical application.

Audience Take Away Notes

- Gain insights into innovative approaches in tissue engineering and regenerative medicine in the context of renal scaffold development
- The knowledge gained can assist in the development of more accurate and functional kidney scaffolds, improving the development of renal scaffolds
- New information on alternative decellularization approaches that can be utilized to address challenges and design problems related to bioscaffold development

Biography

Charalampos Oikonomidis completed his integrated Master's Degree in Biological Applications and Technology from University of Ioannina in 2022. He conducted his dissertation experiments in the Hellenic Cord Blood Bank, Biomedical Research Foundation Academy of Athens, Greece under Professor Efstathios Michalopoulos' and Dr Panagiotis Mallis' supervision. He is currently working as a research assistant at Royal Free London NHS Foundation Trust vaccine research team.

Veronika Pavlinakova[1], Viera Khunova[2*], David Pavlinak[1], Zdenka Fohlerova[1], Lucy Vojtova[1]

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Biodegradable electrospun pcl/gel nanofibers: Effect of tubular halloysite on physical and biological properties

Tubular halloysite (HNT) is environmentally friendly, biocompatible, naturally occurring aluminosilicate clay with unique structure and properties. In this study the effect of HNT structure on properties of biocompatible electrospun nanofibers based on blend of hydrophobic, synthetic polycaprolactone and hydrophilic, natural gelatin (PCL/GEL) mixed at a 1:1 volume ratio has been studied. Nanofibers have been prepared on laboratory machine Nanospider TM based on needle-free, high voltage and free liquid surface electrospinning process. As a solvent has been used environmentally acceptable acetic acid. To evaluate the effect of halloysite structure and geometry on properties of PCL/GEL nanofibers several types of HNT from different deposits have been used. The main attention was given to the effect of halloysite content, inner and outer diameter, aspect ratio and specific surface area on morphology and mechanical properties of PCL/Gel nanofibers. The content of HNT in the nanofibers varied from 0.5 up to 9.0 wt.%. It was found that the addition of HNT significantly affected the polymer mixture spinnability, the fiber diameter, surface structure, thermal, mechanical, and biological properties of the resulting PCL/Gel/HNT nanofibers. Fiber diameter as well as porosity and water uptake of nanofibers were gradually decreased with increasing HNT concentration. The stress-strain analyses exposed that the incorporation of all types of HNTs significantly influenced the mechanical properties of the nanofibers. Young's modulus, elongation to failure and the tensile strength of the PCL/Gel/HNT nanofibers exhibited considerable improvements, in comparison to the pure PCL/Gel nanofibers. The highest improvement of mechanical properties has been achieved in nanofibers with 0.5 wt.% HNT when strength of nanofibers increased nearly twofold, whilst improvement of elongation was fourfold. With increasing HNT content in nanofibers, the effect of HNT structure and specific surface area was much more evident. Cytotoxicity using NIH-3T3 mouse fibroblasts revealed that the studied PCL/Gel/HNT nanofibers are non-toxic and fully acceptable for medical application. The cells appeared well adhered and characterized by normal fibroplastic behavior on all examined nanofibers. The prepared nanofibers can be used in the future in tissue engineering as substrate for cell growth and monitoring and as a type of delivery in wound healing management.

Biography

Assoc. Prof. Viera Khunová, PhD., is a senior researcher and teaching professor at the Faculty of Chemical and Food Technology, Slovak University of Technology, Bratislava, Slovakia. Her research activities are focused on development of multifunctional biopolymer nanocomposites based on natural fillers for different industrial and medical applications. Her pedagogical activities are oriented on polymer composite materials and polymer recycling. She has published more than 70 research articles, 1book and 9 book chapters.

H. Studenovska[1*], J. Novackova[1], L. Machova1, O. Janouskova[2], M. A. Thottappali[1], V. Proks[1], Y. Nemesh[3], T. Ardan[3], J. Motlik[3]

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Biodegradable ultrathin nanofibrous membranes for retinal tissue engineering

Degenerative retinal diseases such as Age-related Macular Degeneration (AMD) impair the function of the Retinal Pigment Epithelium (RPE), which results in failure of photoreceptors and loss of vision. Replacement of the RPE by a transplantation of retinal cells via nanofibrous membrane is therefore considered as a therapeutic option for patients with these eye conditions. In this work, we compare two conventional culturing membranes for retinal tissue engineering made either from Polyethylene Terephthalate (PET) or Polyimide (PI), with cell carrier based on 400-nm-thick poly(L-lactide-DL-lactide) fibres (thickness 4 μm, porosity 80%). Nanofibrous membranes were prepared by electrospinning that easily allowed an embedding of a supporting frame. Such a frame enables not only handling without irreversible folding of carrier and keeping a side-orientation of the sample while seeded with cells, but also to regain membrane's flat shape when inserted into the subretinal space during surgery. ARPE-19 cells were seeded onto PET, PI and Nanofibrous Membranes (NM uncoated, NM laminin coated). Viability of ARPE-19 cells was monitored in different stages of sample preparation. Flat surface of commercial PET and PI membranes with track-etched porosity enable formation of RPE monolayer. However, lower number of pores with a manufacturer-specified pore size is not sufficient to mimic real Bruch's membrane properties. In contrast to commercial membranes, electrospun membrane offers a 3D surrounding with large pore size which supports continuous flow of nutrients for seeded cells. PET and PI membranes could not be cut with our laser manufacturing setup because high thickness of the membranes. Cutting of NMs with a femtosecond laser is feasible. During laser ablation radicals and ions are generated in culturing medium. Seeded cells are sensitive to such a stress and are easily removed from the NMs, especially in case of laminin uncoated NMs. Laminin coated membranes showed better contact of ARPE cells with nanofibrous surface, which reflects in mechanically more stable adhesion of cells on the NMs during laser ablation and injector loading/unloading cycle.

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Audience Take Away Notes

- The novel setting for retinal carrier preparation is presented
- Using the femtosecond laser ablation is possible to cut aseptically the ultrathin nanofibrous membrane
- Stability of seeded RPE cell layer is possible to increase by laminin coating of NM

Biography

Dr. Studenovska (born Drnovska) studied Faculty of Chemistry at the Brno University of Technology, Czech Republic and graduated as MS in 1997. She received her PhD degree in Macromolecular Chemistry in 2003 at the same institution. In 2001 she joined the research group of Prof. Rypacek Biomaterials and Bioanalogous Systems at the Institute of Macromolecular Chemistry, Czech Academy of Sciences (CAS), Prague, Czech Republic. She has published more than 20 research articles in SCI journals (H-index 9, WOS).

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In vitro and *in vivo* osteogenic potential of bioactive glass PVA hybrid scaffolds colonized by mesenquimal stem cells

Bioactive glass/polymer composites are promising materials for bone tissue engineering. In this project has developed porous hybrid scaffolds comprised of 50% polyvinyl alcohol/50% bioactive glass with a 70%SiO2–30%CaO composition. Prior studies have also shown the adequate structural and mechanical behavior of these scaffolds. As such, the present study investigates the in vitro and in vivo osteogenic potential of the scaffold, using Mesenchymal Stem Cells (MSC) from the bone marrow of female rats. MTT, alkaline phosphatase activity, collagen secretion and Von Kossa staining were conducted to evaluate the differentiation ability of MSC in an osteogenic medium. The in vitro results indicate an increase in both cell proliferation and osteogenic differentiation when the hybrid material is present. Von Kossa staining showed a progressive increase in mineralization nodules, coupled with time differentiation. For the in vivo evaluation, three groups were studied: (1) group implanted with the hybrid scaffold, (2) group implanted with scaffold colonized by non-differentiated MSC and (3) group implanted with scaffold colonized by differentiated MSC. The scaffolds were subcutaneously implanted on the back of Wistar rats for 1–8 weeks, and histological and histomorphometric analyses were performed. The tissue ingrowth proved to be higher in the groups colonized by MSC in the first week. In the second week, only the hybrid colonized by differentiated MSC presented a larger percentage of connective tissue. In the third, fourth and eighth weeks, all groups presented 70% of the hybrid scaffold filled with tissue. However, only the group with differentiated MSC presented some form of osteoid tissue, indicating that the hybrid scaffold with differentiated MSC does indeed present osteogenic potential.

Audience Take Away Notes

- The work is directed to the growth of stem cells differentiating into osteoblasts forming bone tissue. The audience watching the presentation will be able to understand how to differentiate these cells and how they react to a bioactive biomaterial. The production of osteoid under these conditions is the highlight of the work. We will explain in detail how we achieve this and all the analysis that the researcher must do.This research can direct the researcher who is producing biomaterials used in bone tissue repair in the following way
- Demonstrate the physical-chemical analysis of the biomaterial
- Demonstrate the correct route of synthesis of bioactive material
- Show how stem cells differentiate and what needs to be done for this to occur correctly
- *In vivo* experiments are the most important when you want to validate a biomaterial, especially when this material induces cell proliferation and differentiation

Biography

She has a degree in physics from the Federal University of Ouro Preto, a master's degree in Mechanical Engineering from the State University of Campinas and a doctorate in Metallurgical Engineering from the Federal University of Minas Gerais. He has a post-doctorate carried out at the University of Porto and INEB and a second post-doc at Centre for the Development of Nuclear Technology. She is currently an adjunct professor at the Pontifical Catholic University of Minas Gerais. She has experience in biomaterials, acting mainly in the following sub-areas: advanced ceramics, composites, nanotechnology, bioengineering and artificial organs.

Obiweluozor Francis Onyekachi[1*], Mukhammad Kaymov[1], Do Wan Kim[1], Hwa-Jin Cho[2], In Seok Jeong[1]

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Optimizing electrospun biodegradable small diameter vascular graft via 3D printing reinforcement achieved a long-term patency neotissue formation in a small animal model

Introduction: Step-wise increase in cases of patients with cardiovascular disease globally has propelled scientist in this area to develop improved commercially available artificial blood vessel with large diameter for reducing adverse responds that drive acute thrombosis and the accompanying complications. However, these materials are still meet with considerable challenges when applied in small-diameter vessels. Other approaches such as preseeding of vascular cells in the scaffold are currently the primary solution for microvasculare substitutes, but they are often met with decline in the biological activities of implanted cells as well as limitations of storage and transportation. Here we designed and optimized a biomimetic acellular small-diameter via a combination of electrospinning and 3D printing to achieve a long-term patency and tremendous remodeling in a rat aortic replacement model.

Methods: A total of 10 Sprague dawley rats weighing 300-400g were used in this study with a graft of 2 mm internal diameter implanted in the abdominal aorta with no anticoagulation during fellow-up (3 months and 1 year). On explanation we compared the patency and remodeling with native vessel using angiography, ultrasound, H&E staining, fluorescence staining and scanning electron microscopy.

Results: Here, we tested tubular biodegradable Poly-e-Caprolactone/Polydioxanone (PCL/PDO) electrospun vascular grafts in a rat model of aortic interposition for up to 12 and 36 weeks. The grafts demonstrated excellent patency (100%) confirmed by Doppler Ultrasound, resisted aneurysmal dilation and intimal hyperplasia, and yielded neoarteries largely free of foreign materials. At 12 weeks, the grafts resembled native arteries with confluent endothelium, synchronous pulsation, a contractile smooth muscle layer, and co-expression of various extracellular matrix components (elastin, collagen, and glycosaminoglycan). Though there was presence of the 3D reinforcement at 12 weeks, at 36 weeks the reinforcement has degraded and absorbed leaving behind a native like vessel.

Conclusion: Acellular small-diameter artificial vessel appears essential in the clinical treatment of coronary heart disease and peripheral arterial disease. Here we applied a combination of electrospinning and 3D printing to fabricate a reinforced small-diameter prosthesis that achieved a long-term patency with substantial remodeling similar to native vessel at 36 weeks.

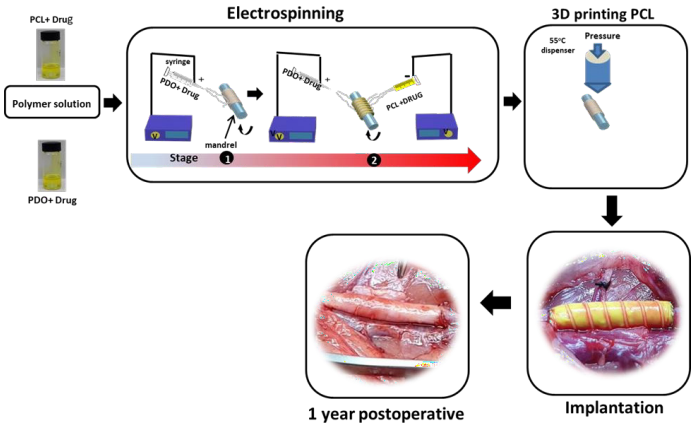

Figure 1: Acellular vascular graft fabrication via combination of electrospinning and 3D printing approach. PCL= polycaprolactone, PDO= polydioxanone

Audience Take Away Notes

- This study aims to minimize the overly thick layers employed by previous studies by using a 3D printer to attach a reinforcement that not only increase the burst pressure and strength but also increases the flexibility and compliance
- Yes I guess the vascular surgeons will benefit from this research considering the challenges observed in the commercially available small-diameter vascular grafts
- Yes this provides a practical solution to a problem that could simplify or make a designer's job more efficient
- Yes improve the accuracy of a design, or provide new information to assist in a design problem

Biography

Dr. Francis studied Chemical Engineering at Enugu state University of Science and Technology, and graduated as MS in 2004. He then joined the research group of Prof. Florian Stadlar at the Chonbuk National University, South Korea. He received his PhD degree in 2019 at the same institution. He has been working as a postdoc researcher supervised by In-Seok Jeong since 2019. He has published more than 17 research articles in SCI (E) journals.

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A long-acting bioactive patch consisting of copolymers with inherent antimicrobial properties

Statement of the Problem: Wound healing takes place in successive but overlapping stages involving cells, bioactive agents and the extracellular matrix. The last decades, a number of "bioactive" patches have been developed inspired by the normal mechanisms of healing, in order to treat chronic and incurable wounds where these mechanisms are often compromised. The aim of the present study is to synthesize and characterize a long-acting bioactive patch consisting of copolymers with inherent antimicrobial properties, reinforced with Arg-Gly-Asp (Arginylglycylaspartic acid - RGD) peptides and mesenchymal stem cells from adipose tissue (ASCs). Methodology & Theoretical Orientation: For this purpose, 2 cases of co-polymers were synthesized and tested. Copolymers of biocompatible aliphatic polyester (TEHA-co-PDLLA), patterned with micro/nano structures using thermal Nanoimprint Lithography (T-NIL), which enhance the antimicrobial activity of L-poly(lactic acid) (PLLA), an aliphatic polyester with biodegradability, biocompatibility and exceptional mechanical and thermal properties and copolymers of chitosan (CS-SBMA) enriched with increased amounts of SBMA with inherent antimicrobial property of the base material, namely chitosan (CS), a linear semi-natural polysaccharide derived from chitin, which is a biocompatible, biodegradable and non-toxic polymer with enhanced antimicrobial and antioxidant activity. Moreover, the tripeptide RGD is found in all major ECM proteins and has been shown to enhance the adhesion and spreading of fibroblasts, endothelial cells and smooth muscle cells on different surfaces. Finally, ASCs have an important role in the healing process of the skin as well as in dealing with the deficits that arise due to aging. To do so, initially human ASCs were isolated by enzymatic digestion. The copolymers were primarily validated for its biocompatibility by performing MTT. The final goal was to provide a patch supplemented by coating the RGD peptide on its surface and further enhanced by seeding ASCs. To optimize the conditions for the best bioactivity of the final product, we beforehand assayed the response of ASCs to different concentrations of the RGD biopeptide (10, 20, 50 μg / ml) considering: 1. proliferation / viability / cytotoxicity by MTT, 2. cell adhesion with crystal violet cell adhesion assay. In order to further evaluate the biological activity of the final patch, the expression of genes that induce angiogenesis in ASCs by QPCR was examined. Finally, the candidate copolymers were assessed for potential their antimicrobial activity against the bacterium Escherichia coli (gram negative) and Staphylococcus aureus (gram positive). Findings: The above experimental procedures showed an induction of cell adhesion in the presence of RGD in a dose-response manner suggesting a biological relevance. However, cell proliferation in ASCs were inversely proportional to the RGD concentration. Therefore, the minimum RGD concentration was chosen for maximum biological activity of the final patch. This is due to the potential cytotoxicity of the peptide or the degree of cell attachment to the material. The strong attachment of cells to the substrate is incompatible with the process of cell proliferation in which cells "loosen" their attachment to divide. Lower concentrations of RGD could be examined in future investigations, with the aim of determining the most suitable concentration that would allow induction of cell adhesion combined with maximal cell viability and induction of expression of angiogenic factors for wound healing. As for the expression

of vasoactive agents in ASCs, we have an induction only in the patch of CS-SBMA. In vitro TEHA-co-PDLLA patch evaluation showed that the presence of RGD did not improve cell adhesion, proliferation or VEGF / Angiopoietin-1 expression in the final product. This may concern the topography and the properties of the material. Perhaps coating the material on its entire surface with the RGD peptide may have had negative consequences on the overall properties of the material, and perhaps its controlled placement during material preparation should be attempted. As for the antimicrobial properties, both patches showed satisfactory results, the CS-SBMA due to the chitosan's properties, and the TEHA-co-PDLLA due to the nanostructures that prevent the growth of pathogenic microorganisms due to their geometry and arrangement in space. Conclusion & Significance: In conclusion, the enhanced TEHA-co-PDLLA and CS-SBMA in vitro patches exhibits bioactive properties important for inducing wound healing. Further improvement could be achieved by using lower concentrations, considering alternative ways of incorporating RGD or by using similar peptides.

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Bioengineering of identifying transcriptional elements driving MMP13 gene in skeletal development

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 prompter and distal enhancers by both molecular and epigenetic factors. The aim of this study is to identify transcriptional elements that regulate the MMP13 gene in order to control the substantial rise in MMP13 expression observed in Osteoarthritis and other diseases. Identification of MMP13 novel Enhancers In silico was by using the Encyclopaedia of DNA Elements (ENCODE), Based on RUNX2 peaks and VDR, Histone modifications (Limb H3K4ME1 and Limb H3k27AC), fibroblast coverage, Chondrocyte and Embryonic limb regulatory elements, Regulatory regions from Public ChIP- Seq data for transcriptional regulators based on osteoblast cells and evolutionarily conserved sequence. along to Main MMP13 Enhancer Based on Encode Mouse (GRCm38/mm10) of candidate cis- regulatory elements that exists at chr9:7,250,844-7,251,224 (381bp). All MMP13 Enhancers sequences went through 3 different analysis software: CIIIDER, TRANSFAC, and JASPAR used in the prediction of Transcription factors binding sites. Construction of MMP13 Enhancers in expression Vector was by cloning each Enhancer upstream of the HSP68 Silenced promoter and LacZ gene to create a ß-galactosidase reporter construct. Each of these constructs has been Identified with R.Es. And then linearized and tested In Vivo (Transgenic embryos at E15.5 days). Genotyping was carried out embryo's tail to verify DNA integration. Constructs Also, were transfected In Vitro to detect the ß-galactosidase activity from the cell lysate of Mice Pre-Osteoblast (MC3T3E1), NIH3T3 Adult Mice Fibroblast, Human Chondrocyte (SW1353) and Primary extracted cells from OA patient (Human articular cartilage) (P69 p.2). In Vivo, From 7 tested regions of MMP13 Enhancer; the skeletal elements expressing in Transgenic Embryos at E15.5 were detected in the 5th Intron, Proximal Promoter, and the distal enhancers at -10, -19.4, and -21.4kb. In addition, expression was also seen in other cell types such as developing skin, tendons, muscles, and fibroblasts in other types of tissues. In contrast, the sequence overlapping with the highest peak of Runx2 at -29kb and -32.5kb did not show a significant expression. Sections of Whole mount reporter from each sequence of intron5', Proximal promoter, -10, -19.4, and -21.4kb showed high localization expression in Chondrocyte and Osteoblast cells in specific limbs expression. The Expression ratio vs. Genotyping ratio showed the Enhancer region at -21.4 to -21.07kb has the highest and equal level of expression as conformation to the main enhancer ofMMP13 in the early stages of the skeletal development, matching with the main distal enhancer at around -21.6 to -21.2 kb in ENCODE Mouse (GRCm38/mm10) of cis- regulatory elements where expression goes beyond skeletal elements. The Transgenic Embryos results showed that the MMP13 is regulated at the level of transcription in at least four different regions, which coincides with Runx2 peak activity. The expression is not located only at the hypertrophic zone but in proliferating chondrocytes. Intronic 5 sequences that respond to IL-1 showed an exclusively skeletal expression. In vitro, MMP13 Enhancers were transfected in Mice Pre-Osteoblast (MC3T3E1), NIH3T3 Adult Mice Fibroblast, Human Chondrocyte (SW1353), and Primary OA Human articular cartilage to detect the ß-galactosidase activity from the cell lysate using Glacton-Plus substrate. The cleaved enzyme activity and triggering light

emission of MMP13 Enhancers for skeletal development showed that -10 kb and -29 kb from the MMP13 gene are major enhancers in chondrocyte cells in adult mice and Human cells. Comparisons of potential enhancers' ability in mouse embryos supported -10 kb enhancers but contradicted -29 and -32.5 kb and instead provided evidence for the -21.4 kb region as an MMP13 enhancer. Disagreements were speculated to be caused by complexities of gene regulation in whole organisms compared with isolated ones. The preservation of MMP13 in tissue development and repair while relieving osteoarthritis symptoms requires drugs that can selectively block MMP13 activity. As a key to controlling the development of selective drugs; the effect of -21.4kb enhancer in the early stages of skeletal development to the late stages at -29.3kb, can be used as a targeted drug that controls the substantial rise in MMP13 expression observed in osteoarthritis either to suppress or to minimize the secretion of MMP13 in the ECM.

Biography

Sara Ibrahim AlSalhi - PhD Researcher in Bioengineering | Department of Musculoskeletal and Ageing Science | Institute of Life course and Medical Sciences | Faculty of Health and Life Sciences.-Research Field: Bioengineering, Bioinformatics (Encode UCSC, Integrative Genomics Viewer IGV, CIIIDER, JASPAR2022, Biochemistry, Biology, Musculoskeletal (Remodelling of Bone and Cartilage), Transgenic mice, Molecular Biology, Genetics, Histology, Cell culturing, CRISPR, Biomedical Sciences, Biomedical Engineering, Musculoskeletal, Ageing Science (Osteoarthritis).-Master of Science (Engineering) in Biomedical Engineering, School of Engineering, University of Liverpool, Biomedical Engineering department. Liverpool, United Kingdom.-MSc Research: Developing Nanoparticle Sensor Technology for Real-Time in Vitro Applications (Study on Human Mesenchymal Stem Cells for Bone and Cartilage in 3D Hydrogel system).

Darwin Eton, MD FACS DFSVS
Vasogenesis Inc., Boston, MA, United States

Strategy to promote neovascularization and fibrinolysis in vascular disease

Neovascularization (NV) via growth of collateral arteries (arteriogenesis) and capillaries, arterioles, and venules (angiogenesis) becomes impaired as ischemia from vascular disease progresses. Our premise is that overcoming hemodynamic and cellular obstacles to NV should yield an effective, durable, low-risk, home-based, inexpensive option to surgical or catheter revascularization. NV and segmental recanalization of chronically occluded arteries were observed in patients with chronic limb-threatening ischemia (CLTI) treated with Filgrastim, a granulocyte colony stimulating factor, every 72 h for up to a month, and an infra-geniculate programmed compression pump (PCP) for 3 h daily. Molecular evidence for fibrinolysis and NV was sought. CLTI patients were treated with PCP alone (N = 19), or with Filgrastim and PCP (N = 8 and N = 6, at two institutions). Enzyme-Linked Immunosorbent Assay was used to measure the plasma concentration of plasmin and of fibrin degradation products (FDP), and the serum concentration of proteins associated with NV. In the PCP-alone group, blood was sampled on Day 1 (baseline) and after 30 days of daily PCP. In the Filgrastim and PCP group, blood was drawn on Day 1, and 1 day after the 5th and the 10th Filgrastim doses. Each blood draw occurred before and after 2 h of supervised PCP. Significant ($p < 0.01$) PCP independent increases in the plasma concentration of plasmin (>10-fold) and FDP (>5-fold) were observed 1 day after both the 5th and the 10th Filgrastim doses, compared to Day 1. Significant ($p < 0.05$) increases in the concentration of pro-angiogenic proteins (e.g., HGF, MMP-9, VEGF A) were also observed. Filgrastim at this novel dosimetry induced fibrinolysis without causing acute haemorrhage, in addition to inducing a pro-angiogenic milieu conducive to NV. Further clinical testing is warranted at this novel dosimetry in CLTI, as well as in other chronically ischemic tissue beds.

Audience Take Away Note:

- Improving the biochemical and cellular environment in ischemic tissue is achievable. Doing so can:
- Restore the innate capability to improve blood flow
- Promote clot lysis in chronically occluded vascular beds
- Reduce the complexity required to promote neovascularization (eliminates the need to micromanage the biology)
- Reduce the need for invasive vascular procedures with variable durability
- Nature micro-manages the circulation until vascular disease becomes too advanced. Strategies to optimize the bio-synthetic environment in the ischemic tissue should restore this capacity. Trials using specific drugs, specific cell types, or specific devices have not yielded a clinically accepted revascularization strategy. This is the 1st report of a novel method that overcomes specific obstacles so that Nature's synthetic processes may operate more efficiently. While the clinical model used is limb threatening ischemia, the results have implications for central vascular disease (heart, lung, brain, etc). This study opens the door for a new research initiative to optimize the environment so natural compensatory mechanisms can be harnessed to treat vascular disease.

- List all other benefits: The goal of our approach is to improve blood flow. Achieving limb salvage also requires assiduous wound care, infection control, nutrition, avoidance of trauma, smoking cessation, and patient compliance. Ischemic rest pain, coldness, and numbness typically begin to improve in the second week. Filgrastim period was 30 days. PCP was continued until rest pain resolved and wounds healed. The larger forefoot ischemic wounds required over 12 months to heal. There is a race between the rate NV and fibrinolysis occur and the rate of progression of the destructive effect of severe tissue ischemia. Whether filgrastim or a long-acting form of filgrastim (e.g. peg-filgrastim) should continue for more than a month will need further investigation. As with all vascular interventions, the earlier

- the intervention the better. Improved blood flow was associated with limb salvage. The longest "nooption" patient that achieved limb salvage was treated in 2008 and remained amputation free at last follow-up in 2021. The proteomic, biochemical and cytometry data support the observed clinical benefit, angiographic observations, and confirmatory hemodynamic testing data. The study provides a foundation for refinement of the approach. As more experience is gained, and efficacy and durability is confirmed, this approach may become the first line treatment for patients with severe ischemia, even if amenable to invasive revascularization treatments.

Below are opportunities for research and education.

- Fibrinolysis: An association between filgrastim and fibrinolysis was previously reported but was never evaluated clinically. , , ., Filgrastim, has a half-life of 3.5 hours. Our measurements were a day after the Filgrastim dose. Whether the increased plasmin is due to the increase in neutrophils, or to a specific change in the thrombostatic milieu will need further investigation. Furthermore, confirmation of the plasmin effect will require measuring the plasma concentrations of plasmin-alpha 2 antiplasmin and of tissue plasminogen activator- plasmin activator inhibitor complexes (tPA-PAI1) in patients with Chronic Limb Threatening Ischemia (CLTI). Also, any contribution to the protein concentrations from the local tissue response to subcutaneous injection will require future placebo comparison. Our clinical discovery offered an unexpected solution to the management of chronic thrombus. Spontaneous recanalization of chronic thrombus is rare in CLTI. Moreover, it is unlikely to be achieved with prolonged intravascular infusion of potent fibrinolytic agents without the risk of hemorrhage. An agent that can safely lyse chronic obstructive thrombus over a period of weeks at a physiologic level is a potentially transformative therapy. Such a novel strategy would facilitate management of chronic ischemia not only in CLTI, but also in other vascular tissue beds (heart, brain, lung, kidney, etc.). While PCP is not feasible in central ischemic beds, it may not be needed due to proximity to the force of the pumping heart. Whether other forms of mechanical force can help provide a hemodynamic stimulus (e.g. ultrasound) to activate the endothelium to induce arteriogenesis would need further investigation.

- Filgrastim and VEGF 165b: The VEGF 165b isoform inhibits VEGFR2 signaling by inducing differential phosphorylation and has been reported to block angiogenesis in vivo . A monoclonal isoform-specific antibody against VEGF 165b was recently reported to promote nitric oxide independent therapeutic angiogenesis in a preclinical ischemia model . To assess the effect of Filgrastim on VEGF-165b expression in CLTI, its ELISA serum concentration was measured on Day 0, and then one day after the 5th and 10th doses in 8 CLTI patients. It was not detected in the 8 patients at baseline, nor after the 5th dose. In only one patient was it detected after the 10th dose (52+13 pg/ml). He had presented with diffuse tibial artery occlusive disease and toe gangrene. Deterioration in ischemic symptoms was observed at the end of the fourth week of the Filgrastim regimen, despite early improvement. A 20% drop in hemoglobin was detected at the time of the 10th dose, compared to before the first filgrastim dose. Occult blood in the stool (melena) led to the diagnosis of stage 4 adenocarcinoma of the stomach. The ELISA concentration of plasmin increased 4300% and 6733% after the 5th and 10th doses compared to baseline. Concurrently the ELISA FDP concentration increased 722% and 678% from baseline. The required hematology/oncology screens for hypercoaguability and for neoplasm prior to management

- of CLTI with Filgrastim were insufficient to make the oncologic diagnosis (exclusion criterion). The tumor did not respond to Folinic acid, Fluorouracil, and Oxaliplatin. It did respond to Taxol and Cyramza (anti-angiogenic) and was undetectable for nearly a year, though during this regimen ischemia progressed in both legs, culminating in unilateral below knee amputation. After chemotherapy the circulation in the remaining leg improved. However the tumor recurred briskly one year later and was unresponsive to further treatment. Filgrastim has been used in the oncologic population for decades, and has not been associated with promoting tumor growth, despite the pro-neovascularization and pro-fibrinolysis properties we observed. Whether Filgrastim induction of VEGF-165b tumor expression is the reason for this requires further investigation. The fibrinolytic effect may have contributed to the melena, which directly led to detection of this virulent tumor.

- Filgrastim Resistance: Stem cell mobilization with G-CSF may not be effective in 15%–20% of patients, particularly in diabetics . Diabetics are also prone to accelerated atherosclerosis leading to CLTI. The concentration of proteins associated with fibrinolysis and NV in patients with this G-CSF resistance is yet to be delineated. Our patient cohort was too small to accurately observe differential influence of diabetes . Plerixafor (Mozobil, Genzyme) binds to CXCR4 and blocks the binding of its cognate ligand CXCL12 (Stroma-derived factor 1 alpha) . The combination of G- CSF with plerixafor showed promise in overcoming ineffective hematopoietic stem cell mobilization and may be a solution to this problem if it arises in CLTI. There are no data yet on synergy of our approach with other agents (e.g. Growth hormone, anabolic agents), or devices (e.g. epidural), or modalities (ultrasound) or therapies (e.g. hyperbaric oxygen).

- Role after resolution of Vasculitis: An interesting observation is that two patients with CLTI following vasculitis (outside our reported patient cohort) had dramatic resolution of their ischemic symptoms (amputation free survival at 9 years) despite tissue loss and progression prior to treatment. One had Buerger's vasculitis, the other marijuana associated vasculitis. Both were treated after smoking cessation and vasculitis resolution. Whether our findings related to NV and fibrinolysis by Filgrastim can be used to manage pulmonary hypertension following cessation of the vasculitis from COVID (long COVID) needs to be ascertained.

- Immunologic deficit and Wound healing: Filgrastim amplifies cellular immunity after cytotoxic chemotherapy. Diabetes impairs the immune system. In a 2013 Cochrane review of diabetic foot infections (not CLTI), Filgrastim was reported to reduce the need for surgical interventions, especially amputations, as well as the duration of hospitalization . The role of Filgrastim in assisting in the management of infection in CLTI wounds will need further investigation at the novel dosimetry we used.

- Next steps: With these favorable preliminary data, a controlled clinical trial is indicated. Previous trials of Filgrastim in the leg and in other circulatory beds (e.g., coronary) will need to be revisited at a dosimetry that capitalizes on both fibrinolysis and NV. In the lower extremity, increasing endothelial shear stress (for example with a PCP) to activate the endothelium and initiate arteriogenesis is important to overcome the hemodynamic obstacles to NV.

Biography

Dr Darwin Eton is a Distinguished Fellow of the Society of Vascular Surgery. He graduated from the Massachusetts Institute of Technology (B.Sc, MSc.) in 1978 and New York University Medical School (M.D.) in 1982. He initiated this project in 1999 at University of Miami where he was Professor and Chief of Vascular Surgery. He continued the clinical work as Professor of Surgery at the University of Chicago. This project won the Cures Within Reach Award in 2016. The proceeds were used to fund a confirmatory study at University of Illinois at Chicago, where Dr Eton had a Voluntary Professor appointment in Surgery. He started Vasogenesis Inc (Boston MA), where he presently serves as the Chief Research and Medical Officer. He has authored 45 peer review publications, book chapters, and books in Vascular Surgery, and has been an invited speaker in USA and internationally.

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Influence of exposure to pesticides on telomere length and pregnancy outcome: Diethylphosphates but not dimethylphosphates are associated with accelerated telomere attrition in a palestinian cohort

Exposure to environmental pesticides during pregnancy is associated with adverse health outcomes such as low birth weight and impaired neuro-development. In this study, we assessed maternal leukocyte telomere lengths (TL) in Palestinian pregnant women and compared the data with urinary organophosphate concentrations, demographic, lifestyle and dietary factors, birth weight, body length, gestational age, and head circumference. Women with high urine levels of creatinine adjusted diethylphosphate(DE)derived pesticide metabolites DEP, DETP or DEDTP had shorter telomeres ($p = 0.05$). Women living in proximity to agricultural fields had shorter telomeres compared to women not living in proximity to agricultural fields ($p = 0.011$). Regular consumption of organic food was associated with shorter telomeres ($p = 0.01$), whereas the consumption of other vegetables such as artichokes was rather associated with longer telomeres. By contrast, urine levels of dimethylphosphate(DM)- derived pesticide metabolites DMTP and DMDTP were associated with lower birth weight ($p = 0.05$) but not with shrter telomeres. In conclusion organophosphate pesticides and living in proximity to agriculture are associated with shorter TL, likely due to higher consumption of contaminated fruits and vegetables and/or the transport of pesticides to non-treatment sites. DE and DM substituted pesticides seem to have different effects on telomeres and development.

Biography

Mr Jaber studied laboratory medicine at AL-Quds University, Palestine and graduated as MS in 2010. He then joined the research group of prof. Michael Walter at the Institute of Laboratory medicine, Cinical Chemistry and Pathobiochemistry, Charite Universitates Medizin-Berlin, Germany for his PhD. Mr. Jaber also is the director of he Consulting Medical Laboratory at Nablus Palestine since 2007.

Samar H Kassem

Biotechnology Department, Faculty of Applied Health Sciences Technology, October 6 University, Giza, Egypt

Cellular conflict, degenerative disease onset, and nutritional demands: A novel insight into the role of single-cell nutrients as an adjuvant to cell therapy

As the incidence of degenerative disease increases with age, we argue that conditions are related to nutritional defects in a particular organ. As not all genetic risk factors trigger diseases in old age, other factors likely intervene. Many recent studies have revealed nutritional status deficiency without providing a holistic rationale for interpreting such derangements. Alternatively, many disease markers reflect a state of imbalanced metabolite levels that respond to nutritional therapy. A variety of diseases, including osteoporosis, MS, Alzheimer's disease, ALS, diabetic ulcers, and cancers, will be reviewed as examples of a particular deficiency status triggering an organ degeneration tendency. Organ functions, metabolism, and activities are under dynamic conditions depending on numerous extrinsic and intrinsic factors, such as stress, nutrient availability, environment, and genetics. Therefore, the dietary requirements of a particular organ are changeable according to the demands of interplay among various circumstances. Which organ could meet its optimum needs is dependent on its biochemical, physiological and activity potential. Under conditions of inadequate nutritional resources, the most "endowed" cells and/or organs will receive the right amount of nutrients leaving other cells and /or organs in deficit state that demands a change in metabolic status of this organ to compensate for a deficit in the food supply. This food shortage can affect signalling, energy, structural, or defence mechanisms in cells, leading to an unbalanced state. Moreover, if an organ experiences an increase in food demand as a result of an unprecedented stressful condition without being able to meet it optimally from the body nutrient pool, this will necessitate a way of "getting rid" of some cells. This could be conceptualized as a type of organ conflict, and even cells fight over finite nutrients. If such defects can be corrected by supplying the right nutrients to the right site at the right time, many degenerative diseases can be prevented. Notably, natural products contain growth factors, functional food ingredients, and nutrients. They can restore the balanced state of the cells and protect them. Additionally, one benefit of stem cell therapy might be its ability to provide a cellular microenvironment with the necessary elements needed to maintain a balanced cell internal environment. To the best of our knowledge, this study provides novel insights into the interpretation of degenerative processes. In conclusion, single-cell nutritional status warrants further research. We also look forward to adding adjuvant nutrients to potentiate cell therapy, which may greatly enhance the process of organ regeneration via extending stem cell longevity of the transplanted cells. Daily nutritional requirements can be modified to meet the daily nutritional requirements of different organs based on real-time needs. A detailed map outlining the tailored nutritional needs of various types of cells must be built

Audience Take Away Notes

- This proposal may guide people to take care of their different organs based on good acquaintance with their various nutritional needs in order to avoid old age diseases and maintain health
- Everyone activity may affect a particular cell and/or organ, which necessitates a particular diet measure to counteract any unwanted effects triggered by this specific type of activity on a particular organ

- This may provide new insights into the importance of lifestyle and types of targeted diet to avoid degenerative diseases. The care of body organs turns out to be an art and science.
- Diseases. Care of body organs turns out to be an art and science

Biography

Dr. Samar H Kassem studied Biochemistry at Ain Shams University, Egypt, and finished her M.SC Degree in 1997. She then joined the research group at Tumor Markers Oncology Research center, Al-Azhar University. She received her PhD degree in 2005 at Helwan University. She obtained the position of an Associate Professor at October 6 University in 2019. She has published more than 10 research articles in international journals.

Seyed Mohammad Gheibihayat
Department of Medical Biotechnology, School of Medicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

The role of efferocytosis in stem cell-based tissue engineering

Tissue engineering is a rapidly evolving field that aims to develop new approaches for tissue regeneration using a combination of cells, growth factors, and biomaterials. Stem cells, in particular, hold great promise for tissue engineering due to their ability to differentiate into various cell types and their potential for self-renewal. However, the success of stem cell-based tissue engineering relies on the proper integration and function of the transplanted cells within the host tissue. This is where efferocytosis, the process of clearing dead or dying cells, plays a crucial role. Efferocytosis is essential for maintaining tissue homeostasis and preventing inflammation. In the context of stem cell-based tissue engineering, efferocytosis can help to ensure the proper integration and function of the transplanted cells. When stem cells are transplanted into damaged tissue, they may undergo cell death due to various factors, such as lack of oxygen or limited nutrient supply. If not cleared efficiently, these dead or dying cells can release intracellular contents that could trigger an immune response and impair the healing process. Professional and non-professional phagocytes are responsible for efferocytosis, with the process involving the recognition of "find me" and "eat me" signals, followed by phagosome-lysosome fusion and digestion of apoptotic cells. Defective efferocytosis has been linked to various inflammatory disorders, such as atherosclerosis and rheumatoid arthritis. Stem cells have been shown to enhance efferocytosis by releasing soluble factors that attract phagocytes and promote their activation. Furthermore, stem cells can differentiate into phagocytes themselves, further contributing to the clearance of apoptotic cells. Mesenchymal stem cells, in particular, have been shown to enhance efferocytosis through the production of various cytokines and growth factors, such as TGF-β and IL-10. In addition to promoting the clearance of apoptotic cells, stem cells can also modulate the immune response and enhance tissue repair through the production of various cytokines and growth factors. For example, mesenchymal stem cells can secrete factors that promote angiogenesis and reduce inflammation, thereby enhancing tissue regeneration. In summary, efferocytosis plays a crucial role in stem cell-based tissue engineering by ensuring the proper integration and function of transplanted cells. Stem cells can enhance efferocytosis through the secretion of soluble factors and differentiation into phagocytes. Further research is needed to fully understand the mechanisms underlying the interaction between stem cells and efferocytosis and to optimize their use in tissue engineering applications.

Aaudience Take Away Notes

- The audience will learn about the critical role efferocytosis plays in stem cell-based tissue engineering and the mechanisms underlying this process. They will gain insights into how stem cells, particularly mesenchymal stem cells, can enhance efferocytosis and tissue regeneration by promoting angiogenesis, reducing inflammation, and modulating the immune response. The presentation will also cover various cytokines and growth factors involved in efferocytosis and their potential clinical applications in regenerative medicine and tissue repair
- By understanding how stem cells can improve efferocytosis, the audience can optimize their tissue engineering techniques and maximize the integration and function of transplanted cells within the host tissue. This knowledge can be useful for researchers, faculty, and designers in developing new approaches for tissue regeneration and expanding their research in the field of medical biotechnology

- The practical solutions provided by this research can simplify the job of designing tissue engineering strategies, improve the accuracy of design, and provide new information to assist in design problems. Additionally, the potential clinical applications of stem cell-based tissue engineering provide a promising avenue for the development of novel therapies for various diseases and injuries

Biography

Dr. Gheibihayat is an esteemed Assistant Professor of Medical Biotechnology at Shahid Sadoughi University of Medical Sciences, Iran. He completed his PhD in Medical Biotechnology from Mashhad University of Medical Sciences, where his research was centered on the development and production of nanoliposomes for efficient drug delivery, as well as the investigation of efferocytosis across a range of diseases such as autoimmune diseases, cardiovascular disease, cancer, and diabetes. Dr. Gheibihayat has authored more than 100 research papers, and he serves as the Head of Publications at Shahid Sadoghi University of Medical Sciences, where he supervises 20 journals.

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POSTERS

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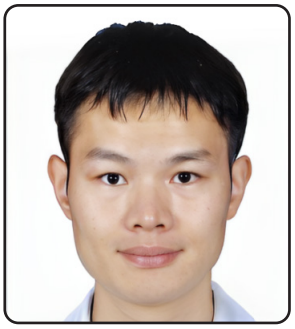

Jiaming Zhou

Bioteh The Biotechnology Research Center (BRC), The Technology Innovation Institute (TII), Abu Dhabi, United Arab Emirates

Exploration of the cGMP-PKG-dependent transcriptome in photoreceptors via spatial capture technology

Purpose: Retinitis Pigmentosa (RP) refers to a group of inherited disorders that lead to the dysfunction and death of photoreceptors, which causes progressive vision loss, and there is in principle no treatment available. The cGMP-PKG system has been suggested as a disease driver in several mouse RP models, although the downstream signaling of this enzyme system has not been clarified. Here we investigate the cGMP-PKG-system with the aim to reveal its potential target(s) in the genetic level that may have a direct detrimental effect during retinal degeneration.

Method: The so-called rd1 mouse model, with the character of fast retinal degeneration and abnormally high cGMP levels in photoreceptors, due to the mutation of gene Phosphodiesterase 6 (PDE6) as well as its normal healthy Wild-Type (WT) were used in this study. The mice were sacrificed at the same age of postnatal 11, with the retinas being fixed and sectioned. We previously found that RAF-1 proto-oncogene, serine/threonine kinase (RAF1) was higher expressed in the Outer Nuclear Layer (ONL) of rd1 than WT, where photoreceptors reside and thus appears to play a vital role during retinal degeneration. We therefore immune-stained this marker on the sections and applied the spatial-based technique to explore transcriptome. The subsequent bioinformatics analysis regarding comparison of the genetic profiles specifically in ONL between these two strains will provide revealing insights in retinal degeneration, as well as details of RAF1 related mechanisms during photoreceptor death.

Results: Upon comparison, we observed a series of differential expressed genes in ONL between rd1 and WT, which are potential cGMP-PKG downstream targets and likely have a direct detrimental effect in photoreceptor degeneration. Mechanisms regarding how RAF1 functions during degeneration were also identified.

Audience Take Away Notes

- The differential expressed genes between rd1 and WT would be explored
- The role of RAF1 during retinal degeneration would be described
- Potential targets would be identified to develop novel treatments towards retinal degeneration

Biography

Jiaming started his undergraduate program in laboratory medicine in Guangzhou Medical University and received the Master Degree (M.Sc.) Cancer Science in University of Glasgow. Since mid-September 2018 Jiaming is performing his ESR project / PhD thesis within the transMed consortium in Prof. per Ekstrom's Lab (Lund University) in Sweden and works on genes and proteins under modulation of cGMP-PKG system in normal vs. disease retina. He has now 10 publications in scientific journals and conference proceedings.

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NIR-degradable and biocompatible hydrogels derived from hyaluronic acid and coumarin for drug delivery and bio-imaging

In this work, bioorthogonal and photodegradable hydrogels derived from Norbornene (Nb) functionalized hyaluronic acid and a water soluble coumarin-based cross-linker possessing terminal Tetrazine (Tz) groups, were developed for NIR-responsive release of Doxorubicin (DOX). The inverse electron demand Diels–Alder crosslinking reaction between Nb and Tz functionalities formed the hydrogels at physiological conditions, whereas N2 gas liberated during the reaction created pores in the hydrogels. The gelation time ranges (about 5–20 min) and the viscoelastic behaviour (G' ~ 346–1380 Pa) demonstrated that the resulting hydrogels were injectable and possessed tunable mechanical properties. Moreover, hydrogels released the encapsulated DOX upon NIR irradiation, owing to the NIR-responsive cleavage of coumarin-ester, and consequently, induced anti-tumor activity in BT-20 cancer cells. Additionally, the hydrogels could be excited at various wavelengths of the visible spectrum and can emit green to red fluorescence, demonstrating their simultaneous photo-responsive drug release and bioimaging applications.

Audience Take Away Notes

- The novel NIR–responsive hydrogels derived from HA and coumarin-based cross-linker, could be auspicious carriers for on demand drug release and bio-imaging applications

Biography

Dr. Kwon Taek Lim has completed his Ph.D. from Korea Advanced Institute of Science and Technology, Chemistry. He is a professor of Smart Green Technology Engineering, Pukyong National University. He has published over 400 articles on polymer science including polymer synthesis and nano particles & composites. His research group recently focuses on development of novel smart drug delivery systems such as stimuli responsive hydrogels and polymeric micelles.

Mohamad Abou-Eid, Raihaan Biju*, Ali Mohammed, Joyal Tom
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Corneal tissue engineering at a glance

Tissue Engineering and Regenerative Medicine (TERM) has been growing rapidly and is a promising approach to address the limitations of traditional corneal transplantation and revolutionise corneal therapy. This poster provides an overview of what corneal tissue comprises of and what the current strategies and future advancements of corneal TERM are.The cornea, with its vital role in maintaining visual acuity, is susceptible to various diseases and injuries, leading to significant visual impairment and blindness. Traditional corneal transplantation faces challenges such as donor scarcity, graft rejection, and post-surgical complications, prompting the need for innovative alternatives. Corneal tissue engineering involves the fabrication of biomimetic scaffolds that mimic the native corneal extracellular matrix, providing a conducive microenvironment for cell adhesion, proliferation, and differentiation. Incorporation of bioactive factors and growth factors within the scaffolds stimulates cell migration and tissue regeneration. Cell sources for tissue engineering range from autologous and allogeneic primary corneal cells to induced Pluripotent Stem Cells (iPSCs) and Mesenchymal Stem Cells (MSCs). Acellular corneal matrices and decellularization techniques preserve the native structure and bioactive components of the cornea while eliminating immune response-related risks. These methods offer reduced immunogenicity and improved integration with the host tissue. Advancements in 3D bioprinting technologies enable the precise fabrication of corneal tissue constructs with controlled microarchitecture and mechanical properties. This technology shows promise for producing patient-specific corneal implants, mitigating graft rejection risks, and eliminating the need for donor tissues. In conclusion, corneal tissue engineering and regenerative medicine hold significant potential in transforming corneal therapy. They offer novel and promising strategies for treating corneal diseases and injuries. Nonetheless, extensive preclinical and clinical studies are essential to validate the safety, efficacy, and long-term outcomes before widespread clinical implementation can be realized. Continued research and collaboration between scientists, clinicians, and industry stakeholders are crucial to fully harness the potential of these innovative technologies in improving visual outcomes for patients with corneal disorders.

Audience Take Away Note:

- We will discuss corneal tissue engineering using the 3 pillars.
- The first of the pillars is cells, this is all of the different types of cells to be comprised in corneal tissue.
- The second pillar is scaffolds, these are what hold the cells together and allows for different types of signaling pathways to occur in a mechanical manner.
- The last pillar is signaling, these are the different ways the cells and scaffolds are able to communicate to one another through signals as well as how external signals such as from their environment influences them.
- We will also discuss how these 3 pillars are being integrated in current research to establish innovative and amazing opportunities to advance corneal regeneration.

Biography

We are currently all fifth-year medical students studying at Imperial College London. In our fourth-year, we undertook an intercalated BSc in Biomedical Engineering where our interests were caught by the innovative nature of tissue engineering and regenerative medicine. Hence, we decided to embark on an adventure to further explore this in relation to corneal tissue.

Maria Toumazou[1*], Marios Kozakos[2], Lars Haneveld[3], Chiara-Marie Neeb[3], Louisa Bauer[3], Ramnarayan Padmanabhan[3], Vasiliki E. Kalodimou[4,5]

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Preliminary data of adipose stem cells and stem cells markers by flow cytometry and their use in regenerative medicine-plastic surgery

Background: In the field of regenerative medicine, basic research and preclinical studies have been conducted to overcome clinical shortcomings with the use of mesenchymal stem cells. They are present in adult tissues, including bone marrow and adipose tissue. For many years, bone marrow-derived stem cells were the primary source of stem cells for tissue engineering applications. However, recent studies have shown that subcutaneous adipose tissue provides a clear advantage over other stem cell sources due to the ease with which adipose tissue can be accessed as well as the ease of isolating stem cells from harvested tissue. This cell population, termed Adipose-Derived Stem Cells (ADSCs), represents a promising approach to future cell-based therapies, such as tissue engineering and regeneration. Furthermore, these cells can be readily harvested in large numbers with low donor-site morbidity.

Method: It has been shown that human adult adipocytes have a roughly 10% turnover rate. One of the hallmark characteristics of Human Adipose-Derived Stem Cells (hADSCs) is their ability to differentiate into cells of mesenchymal lineages. Although there is still no clear consensus on the antigen expression pattern that will clearly define hADSCs, a flow cytometry analysis protocol is presented from our lab. We also developed a novel protocol for the isolation of hASCs co-expressing at least 2 different mesenchymal adipose markers (CD271-APC ++ & CD14-FITC --). Finally the viability has been checked by Trypan Blue Microscopy and Flow Cytometry.

Results: Our preliminary result data shows us that the hADSCs antigen expression (> 97% in positive markers and < 1.5% in negative), was higher in all processed fat samples with collagenase with high viability values (> 96%), allows talking about the superiority of the collagenase processed fat on the ADSCs concentration over the pure fat and the unprocessed fat samples. More studies will allows us to present sufficient data for effective and safe lipo-injection of hADSCs in patients.

Conclusion: We succeed to isolate hADSCs with a mean value of 8.10x10^6 with over 97% adipose antigen expression. ASCs have therapeutic potential in regenerative medicine and applications in tissue engineering. While the biologic properties of ASCs are not yet fully delineated, the cells are under clinical investigation in human trials for an array of diseases. ASCs have been widely studied for their immunomodulatory effects, antifibrotic, anti-apoptotic, and anti-oxidative capabilities in preclinical and human clinical trials. Additionally, the ASC secretome has demonstrated similar effectiveness in regenerative medicine applications.

Oleksandr Sopko[1*], Oleksandr Parkhomenko[2]

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MicroRNA-155 in mononuclears as a predictor of acute kidney injury in patients with ST-elevation myocardial infarction

Acute kidney injury (AKI) in patients with ST-Elevation Myocardial Infarction (STEMI) is a substantial problem, particularly, its prediction and therapy approaches. Earlier we analyzed the change of microRNAs subset in different blood fractions (plasma, platelets, mononuclears), and microRNA-155 have demonstrated the profound difference in STEMI patients compared to control persons. In this study, we have estimated the level of microRNA-155 in blood plasma and mononuclears in patients with STEMI using RT real-time PCR, and built the model for AKI prediction. Level of microRNA-155 in mononuclears on day 1 is a positive predictor of day 7 eGFR (regression coefficient 21.75, p = 0.008), while level of microRNA-155 in plasma is weaker but negative predictor (model p = 0.002, R squared: 0.36).

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	71.86	4.085	17.591	2.57e-16 ***
microRNA-155 in plasma	-0.63	0.261	-2.420	0.023 *
microRNA-155 in mononuclears	21.75	7.617	2.856	0.008 **

Among three of studied fractions, the most prominent and reproducible results are shown for microRNA-155 in mononuclears: its level on day 7 is 12 times higher compared to day 1 (paired Wilcoxon test, p = 3.57e-05). At day 7, microRNA-155 in mononuclears was positively correlated with eGFR (Spearman's rho = 0.69) and plasma level of microRNA-155 was negatively correlated with eGFR (Spearman's rho = -0.77). Furthermore, we observe less frequency of AKI in patients who have 5-fold or more increase of microRNA-155 in mononuclears than in other those who have not (p = 0.045). In conclusion, microRNA-155 in mononuclears can be considered as a positive predictive factor regarding renal function in patients with STEMI, and its 5-fold or more increase in 7 days after STEMI onset can be considered as protective against AKI.

Audience Take away Notes:

- The abstract highlights that AKI is a significant problem in patients with STEMI. This information provides an understanding of the context and the importance of studying AKI in this specific patient population.
- Differences in microRNA-155 Expression: analysis of microRNAs, specifically microRNA-155, in different blood fractions (plasma, platelets, mononuclears). It states that microRNA-155 demonstrated a profound difference in STEMI patients compared to control individuals. This finding suggests that microRNA-155 may play a role in the development or progression of AKI in STEMI patients.
- Research Expansion: Faculty members can use this research as a foundation to expand their own investigations related to microRNAs, AKI, and STEMI. They can build upon the findings presented in this study and conduct further experiments or studies to explore related aspects or specific mechanisms underlying the role of microRNA-155 in AKI prediction and therapy.

- Collaborative Research: The findings can also serve as a basis for collaboration among faculty members working in related fields. They can discuss and explore possibilities for joint research projects, combining their expertise to further investigate the role of microRNA-155 and its implications for AKI in STEMI.
- Clinical Applications: Faculty members involved in clinical practice can utilize the research findings to improve patient care and develop new strategies for AKI prevention or treatment. They can incorporate the knowledge gained from this study into their clinical decision-making processes and treatment plans.
- In conclusion, the audience will gain knowledge about the association between microRNA-155 and AKI in patients with STEMI. They will learn about the predictive potential of microRNA-155 levels, correlations with renal function, and the possible protective effect of its increase.

Biography

Dr. Sopko studied Medicine at the Bogomolets National medical university, Ukraine and graduated as MD in 2007. He then joined the research group of Prof. O. Parkhomenko at the National Scientific Center "Institute of cardiology M.D.Strazhesko", Ukrainian Academy of Sciences. He received his PhD degree in 2020 at the same institution. Since 2014, he has been the head of the cardiology department in State Institution of Science "Research and Practical Center of Preventive and Clinical Medicine" State Administrative Department until now. He has published more than 20 research articles and abstracts in SCI journals.

BOOK OF ABSTRACTS

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21-23 AUGUST

DAY 02

KEYNOTE FORUM

3RD EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

A revolution or surrender: The success and failures of tissue engineering and regenerative medicine

In the 1990s, tissue engineering promised to change healthcare forever. Images on the cover of journals showed humans with almost every organ regenerated using tissue engineering approaches. From bone to skin to the brain to the heart, tissue engineering was destined to change the world. However, almost 30 years later, while there have been some successes in tissue engineering clinically, we are still waiting for the tissue engineering revolution. This invited talk will explore why it has been so difficult to translate advances in tissue engineering and regenerative medicine into real commercial products. It will highlight one key obstacle in that most of these innovations have come out of Universities, which do not have a good track record for commercialization. At the same time, industry has been slow to embrace tissue engineering, viewing it as largely an academic exercise. It will also highlight why regulatory agencies have not embraced tissue engineering including issues with biodegradable materials, the use of cells and pharmaceuticals in combined tissue engineering products, and so much more. Lastly, the presentation will end with some advice on how tissue engineering and regenerative medicine can truly revolutionize medicine.

Audience Take Away Notes

- The promise of tissue engineering and regenerative medicine
- Why tissue engineering has not revolutionized medicine like promised
- Problems starting companies out of Universities
- What is needed to commercialize tissue engineering and regenerative medicine products

Thomas J. Webster

School of Health Sciences and Biomedical Engineering, Hebei University of Technology, Tianjin, China

Biography

Thomas J. Webster's (H index: 113; Google Scholar) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995; USA) and in biomedical engineering from RPI (Ph.D., 2000; USA). He has served as a professor at Purdue (2000-2005), Brown (2005-2012), and Northeastern (2012-2021; serving as Chemical Engineering Department Chair from 2012 - 2019) Universities and has formed over a dozen companies who have numerous FDA approved medical products currently improving human health. He is currently helping those companies and serves as a professor at Hebei University of Technology, Saveetha University, Vellore Institute of Technology, UFPI, and others. Dr. Webster has numerous awards including: 2020, World Top 2% Scientist by Citations (PLOS); 2020, SCOPUS Highly Cited Research (Top 1% Materials Science and Mixed Fields); 2021, Clarivate Top 0.1% Most Influential Researchers (Pharmacology and Toxicology); 2022, Best Materials Science Scientist by Citations (Research.com); and is a fellow of over 8 societies.

Sandeep's Procedure for Induction of Neo-angiogenesis (SPIN) for management of necrosis in tissue & impending gangrenes

After high-velocity trauma, de-vascularization leads to the death of vital structures including Bone, Tendons, Muscles and loose Skin flaps. Open fractures associated with prolonged exposure of the underlying tissue and the presence of infection are critical factors, leading to further damage. Such tissues undergo physical changes including blackening and tend to peel off. The bones tend to sequestrate. A vicious cycle of necrosis, infection and more tissue losses sets in.The reversal of vascular viability in these tissues is ordinarily not possible with current treatment. A ray of hope is evolving through propagating "Proliferative healing" by regenerative products such as Platelet Rich Plasma (PRP). The basis of This proliferative healing is induced neo-angiogenesis.We have developed a Technique of inducing neo-angiogenesis and reverting these changes. The technique consists of infiltrating the tissues with platelet Rich Plasma I a standardized protocol. The PRP is a simulant & trigger for proliferative healing leading to the salvage of such critical near-dead tissues. We present case series where in "Gangrene/ impending Gangrene reversals" have been achieved in conditions such as severe necrosis after Compartment syndrome, Diabetic gangrenes and Complex wounds. This study has been conducted over the last 1 decade, since 2009. gradually evolving a therapeutic protocol which is a game changer. The safety, efficacy and standardization towards the form, method, doses and duration for PRP treatment and results is presented.We conclude, "Re-inducing Viability through induction of Neo-Angiogenesis in such near dead tissues is possible through Platelet Rich Plasma by SPIN technique and it triggers the biologic environment conducive to Milieu for their survival and regeneration.

Keywords: PRP; Gangrene; Neo-Angiogenesis, SPIN technique.

Sandeep Shrivastava*, Aditya Pundkar, Priyal Shrivastava

Dept. of Orthopedics, JLN Medical College, Datta Meghe Institute of Higher Education & Research (DU), Wardha, MS, India

Biography

Dr. Sandeep Shrivastava is MS, DNB, PhD, MBA.He is Director-Professor of Orthopedics, Chief Scientific Officer and Mentor of DMIHER Global at J.N. Medical College, Datta Meghe Institute of Higher Education & Research, (DU) Wardha. Maharashtra. India. He is also the Director of the Centre of Regenerative Medicine. He is also a former DEAN; Group CEO, of Meghe Group of Hospitals; He has >100 International Presentations, 76 Indexed Publications, 4 books, 15 copyrights and 3 Patents. He has pioneered wound management with PRP, by developing the clinical protocol of "Sandeep's Technique" for Assisted Regeneration of Skin (STARS Therapy) and currently working on SPIN technique for ganagrene reversal. His work is widely published and presented across the Globe. He is the author of the book – The Illustrative Guide on Platelet-Rich Plasma.

BOOK OF ABSTRACTS

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SPEAKERS

3RD EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Hongjie Zheng*, Ziyou Yu, Mingwu Deng, Yizuo Cai, Xiangsheng Wang, Yuda Xu, Lu Zhang, Wenjie Zhang and Wei Li

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Fat extract improves fat graft survival via proangiogenic, anti-apoptotic and pro-proliferative activities

Nanofat has been reported to enhance fat graft survival by promoting neovascularization. We previously introduced Fat Extract (FE), a cell-free component derived from nanofat, and demonstrated its proangiogenic potential. This study aimed to investigate the effect of FE and its combined application with nanofat on fat graft survival. In the first animal study, macrofat from lipoaspirate was co-transplanted with either FE or nanofat into nude mice. The grafts were evaluated at 2, 4 and 12 weeks post-transplantation. The nanofat- and FE-treated groups showed significantly higher fat graft weights compared to the control group. Moreover, these groups exhibited improved fat integrity, increased viable adipocytes, enhanced CD31-positive blood vessels, reduced apoptotic cells, and increased Ki67-positive proliferating cells. In the second animal study, nude mice received a mixture of macrofat and nanofat, followed by intra-graft injections of FE at days 1, 7, 14, 21 and 28 post-transplantation. After 12 weeks, the fat grafts in the nanofat+FE group had significantly higher weights than the control group. In vitro, FE showed proangiogenic effects on HUVECs, anti-apoptotic effects on fat tissue under hypoxic conditions and an ability to promote ADSC proliferation and maintain their multiple differentiation capacity. Our findings indicate that FE can enhance fat graft survival via proangiogenic, anti-apoptotic, and pro-proliferative effects on ADSCs. FE plus nanofat-assisted fat grafting represents a promising approach in clinical applications.

Audience Take Away Notes

- Fat extract (FE), a cell-free component derived from nanofat, has demonstrated proangiogenic, anti-apoptotic, and pro-proliferative potential
- FE-assisted fat grafting improved the survival and quality of fat grafts
- FE and nanofat could work synergistically to enhance fat graft survival
- The combination of FE and nanofat in assisted fat grafting holds promise for clinical applications, offering the benefits of both nanofat's high efficiency and FE's advantages of long-term storage and multiple uses

Biography

Dr. Zheng studied Medicine at the Shanghai Jiao Tong University, School of Medicine and earned her bachelor's degree in 2017. She then became a member of Prof. Li's research group at the Department of Plastic and Reconstructive Surgery, Shanghai Ninth People's Hospital, and received her master's degree in 2020. Following that, she joined Prof. Yao's research group at the same institution, where she is anticipated to obtain her doctoral degree in June 2023. She has published 7 research articles in SCI journals, and she also holds 2 patents as the primary inventor.

Tiah Oates[1*], Louise Dolan[1], Ash Toye[2,3], Adam Perriman[1], Asme Boussahel[1]

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A 3D-bioprinted in vitro adipose tissue model for the study of macrophage polarisation and function within metabolic disease

Macrophages dynamically polarise into specialized phenotypes to perform an array of functions as part of both the innate immune response and tissue homeostasis. The ability of macrophages to polarise stems from the sensitivity of these cells to the local tissue environment. The composition of the extracellular matrix has been observed to induce macrophage polarisation and modulate macrophage function through providing both mechanical cues and controlling the concentration gradients of key factors. Here, the polarization and function of human macrophages is comprehensively characterized within a 3D bio-printed collagen-based hydrogel in comparison to standard 2D culture. We observe that macrophages retain morphology, viability, and expression of key cell surface markers throughout 3D culture. Within adipose tissue the crosstalk between macrophages and adipocytes underlies the pathogenesis of metabolic disease. Utilizing the workflow established here we investigate the phenotype and polarisation of macrophages in response to adipocytes changes induced by metabolic disorders. Further, through a bespoke high-throughput image analysis pipeline the interaction dynamics between macrophages and these adipocytes within the 3D space are analyzed. This comprehensive characterization of macrophages within 3D- bioprinted models is essential for understanding the phenotype of these highly responsive cells and for the recapitulation of in vivo microenvironments for the study and potential modulation of macrophage behavior within specific biological states.

Audience Take Away Notes

- This comprehensive study of macrophages within 3D hydrogel culture highlights the benefits of utilizing a 3D culture method in comparison to standard 2D macrophage cultures
- The use of flow cytometry, high-throughput confocal imaging, and secretion profile analysis used here illustrates a powerful tool-box of techniques that can be utilized for the characterization of macrophage polarisation within 3D environments
- This 3D subcutaneous tissue model highlights the interactions between macrophages and adipocytes in the context of metabolic disease

Biography

Dr Oates studied Molecular and Cellular Biology at the University of Exeter with an industrial placement year at AstraZeneca. She joined the research group of Prof. Ash Toye in the school of Biochemistry at the University of Bristol receiving her PhD in 2023. She then joined the Dr. Asme Boussahel research group in the school of Cellular and Molecular medicine at the University of Bristol as a postdoctoral researcher.

Vyacheslav Shulunov

Institute of Physical Materials Science of the Siberian Branch of the Russian Academy of Science Ulan-Ude, Buryatia, Russian Federation

Simultaneous 3D bioprinting of multilayer tissues, blood vessels and organs

The enhanced Roll Porous Scaffold (RPS) technology describes ways to increase droplet-based bioprinting cell density > × 100 and outperform extrusion bioprinters by achieving compactness of ~1.6×10^{8} cells ml^{-1}. The use of multiple inkjet heads and a winding from roll to roll scaffold allows the formation of complex multi-cell structures with higher precision than syringe systems. New RPS methods for fast volume bioprinting of 15 μm thickness multilayer tissues, with blood vessels and organs providing a physiologically relevant 3D environment without the lack of only planar cell-cell interactions. These specifications are based on next-generation bioink-friendly 50 kHz piezoelectric print heads with 800 nozzles (two rows of 400 nozzles), each of which is approximately 20 microns in diameter and capable of passing droplets up to 1.5 picoliter (1.5×10^{-12} liter). The potential of RPS in a spatially mediated microenvironment and controlled several micron position of living cells and intercellular distance due to ribbon 5 μm scaffolds consisting of biomaterials such as nanofibers, sponge. These thin tape scaffolds ensure that the cell droplets of the next layer do not leak from the calculated locations. RPS presents major features of novel multifunctional 3D bioprinting suitable for forming of human tissues (own print head for each kind of cells and collagen) according to digital model. The rapid development of 3D bioprinting technologies is important for tissue engineering, regenerative medicine and drug evaluation. The improved RPS offers not only new hope for overcoming the shortage of organs for transplantation but rejuvenation of the whole organism due to the forming of your own endocrine glands.

Audience Take Away Notes

- The novel RPS offers not only new hope for overcoming the shortage of organs for transplantation but rejuvenation of the whole organism due to the forming of your own endocrine glands.
- New methods are suitable for formation of multilayer tissues, blood vessels and organs at the same time for its repair, transplantation
- Solution for the problem of the lack of only planar intercellular interactions in multilayer tissues, nerves, bones and entire organ
- A potential accelerator for the development of complex “body on a chip” systems
- Improvement of the organ tissue biomodel and testing of new drugs on it

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, His scientific interests are aimed at accelerating the arrival of a new scientific and technological revolution to improve and save human lives.

Madhu Gupta

Department of Pharmaceutics, School of Pharmaceutical Sciences, Delhi Pharmaceutical Sciences & Research University, Associate Professor, New Delhi-110017, India

Embracing the potential of biopolymer based hydrogel: The new frontier in chronic wound therapy

Chronic, non-healing diabetic wounds put a massive economic burden on health services causing patient incompliance and discomfort. Thorough interpreting of chronic wound pathophysiology led to the fabrication of targeted systems of drug delivery that can improve and accelerate the wound healing process. Natural polymers or biopolymers are now explored for the fabrication of wound dressings. Polysaccharides elicit enormous and promising applications due to their extensive obtainability, innocuousness, and biodegradability. Various outstanding features of polysaccharides can be employed to fabricate biomimetic and multifunctional hydrogels as efficient wound dressings. These hydrogels mimic the natural extracellular matrix and also boost the proliferation of cells. Owing to distinctive architectures and abundance of functional groups, polysaccharide-derived hydrogels have exceptional physicochemical properties and unique therapeutic interventions. Hydrogels designed using polysaccharides can effectively safeguard wounds from bacterial attack. More research is required to engineer multifaceted advanced polysaccharide hydrogels with tuneable and adjustable properties to attain huge potential in wound healing. Chitosan- based hydrogels demonstrated better healing as they inhibited bacterial growth and expedited re-epithelization and cell proliferation. So, these hydrogels can be used for effective wound care offering truly valuable material in the field of wound healing and certainly opening new avenues for future research and development.

Audience Take Away Notes

- They can get the exposure of Biopolymer based hydrogel with their mechanism on chronic wound healing
- 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

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 100 research publications to her credit published in journals of high scientific impact and contributed 30 chapters in various renowned books with h index 25 and more than 3000 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 published the PCT patent and granted Indian patent for effective wound healing therapy.

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Degradation, bioactivity and cytotoxicity evaluation of PolyHydroxyAlkanoate (PHA) reinforced with nano-Calcium Phosphate (nCaP) and chitosan for bone regeneration

Polyhydroxyalkanoates (PHA) exhibit tremendous potential for bone tissue regeneration, owing to their biocompatibility and biodegradability. To address limitations in supporting bone growth, researchers have employed a strategic approach of reinforcing PHA with calcium phosphate (CaP), leading to transformative advancements. This comprehensive study investigates the bioactivity properties of composites prepared using biodegradable PHA reinforced with nano-CaP and chitosan (CH), which serve as natural carriers for growth factors and demonstrate antimicrobial properties. Various in vitro methods, including Tris-HCL degradation, simulated body fluids (SBF), and cytotoxicity tests, were employed to evaluate the performance of the composites. PHA served as the matrix, while nano-CaP (3-15wt%) was incorporated as a reinforcement along with a constant 10wt% of CH. The results revealed slower and steady degradation rates for both PHA and PHA/n-CaP/CH composites, as evidenced by water uptake and mass change profiles. SBF testing, confirmed by scanning electron microscopy-energy-dispersive X-ray spectroscopy (SEM-EDX) analysis, demonstrated the formation of an apatite layer on the composites' surface within three days, indicating excellent bioactivity potential of nano-CaP. Furthermore, the sustained apatite layer formation after 28 days strongly indicated the composites' effectiveness in promoting bone integration in vivo. Moreover, the composites maintained a neutral pH of Tris-HCl degradation and SBF media, closely resembling the physiological environment (pH 7.40). Cytotoxicity evaluations using the Alamar Blue assay confirmed the non-toxicity of the composites to osteoblast cells, accompanied by enhanced cell proliferation and viabilities exceeding 100%. Additionally, the osteogenic differentiation of human fetal osteoblasts assessed via alkaline phosphatase activity testing further emphasized the potential of PHA and PHA/n-CaP/CH composites as promising materials for bone regeneration applications. Collectively, these findings highlight the remarkable prospects of PHA-based composites in advancing bone tissue engineering and regeneration therapies.

Audience Take Away Notes

- The research investigates the bioactivity properties of PHA and PHA/n-CaP/CH composites, shedding light on their potential for applications in tissue engineering and regenerative medicine
- The water uptake and mass change profiles of the composites provide insights into their degradation behavior and potential for use as scaffolds in biomedical applications
- The pH values of the degradation media demonstrate the stability of the composites in a physiological environment, further supporting their potential as biomaterials
- The formation of apatite layers on the composites' surfaces indicates their excellent bioactivity capabilities, which is crucial for promoting bone regeneration and integration

- The calcium-to-phosphate ratio in the formed apatite layer resembles that of natural bone, highlighting the biomimetic properties of the composites and their potential to support bone tissue growth and healing

Biography

Constance Gnanasagaran is a Chartered Engineer and Lecturer in Mechanical Engineering at Kingston University London. Her research focuses on Tissue Engineering, Biomaterials, and Additive Manufacturing, with interests in sustainability, life cycle assessments, and computational biology. Her work in tissue engineering scaffolds and advanced composites holds promise for regenerative medicine and orthopedic implants. With dedication to innovation and interdisciplinary collaboration, she aims to drive advancements, developing novel biomaterials for clinical practice. Gnanasagaran strives to contribute at the intersection of engineering and healthcare, addressing challenges and improving patient outcomes through research endeavors.

Fajar Shodiq Permata[1*], Nurmaulida Hasanah[2], Kinanthi Az Zahra[3], Resti Vanda Arantika[4], Dewi Lutfiana Sari[5]

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[5]Bachelor program of Veterinary Medicine, Faculty of Veterinary Medicine, Universitas Brawijaya, Malang, East Java, Indonesia

Rat's subcutaneous response toward decellularized goat skin and heterologous Platelet-Rich Plasma (PRP)

The decellularized tissue is famous for grafts that can be a combined growth factor. One tissue graft is dermal matrix-derived animal skin, and the source of the cocktail growth factor is platelet-rich plasma. The study developed a dermal matrix from a goat that combined with heterologous PRP. The research proposed examining the response of rats' subcutaneous tissue toward decellularized goat skin mixed with PRP. The parameters were extracellular matrix, histopathology features, fibroblast cell count, inflammation cell count, Interleukin (IL) 10, 6, 1β, and TNF-α. As many as twenty Wistar male rats, 150-200 grams, were separated into four groups: control group, decellularized goat skin group, PRP group, and mix of decellularized goat skin and PRP group. Decellularization for goat skin used Sodium Dodecyl Sulphate (SDS) solution and PRP preparation from rat's blood heterologous. The biomaterial based on each group was implanted inside the rats subcutaneously for 14 days. On Day 15th, the subcutaneous tissue-implanted area was collected in NBF solution and continued for tissue processing. The results highlighted that a combination of decellularized goat skin and heterologous PRP reduced IL-10, IL-6, and IL-1β expression. Otherwise, it affected the elevation of fibroblast cells and TNF-α expression. There was good integration scaffold into skin based on histopathology and extracellular matrix features of the combination group, although there was no difference in inflammation cell number among biomaterial implant groups. The conclusion was that the combination of decellularized goat skin and PRP showed good biocompatibility to fasten the integration of the dermal scaffold matrix with host tissue. The decellularized goat skin can be considered for xeno-dermal graft combining heterologous PRP for better results than implanting each material lonely.

Audience Take Away Notes

- The audience will obtain benefits to learn about decellularized goat skin as candidates of dermal matrix combined PRP
- The industry of pharmacy will receive insight material for dermal graft from goat skin
- The audience will learn the fruitful advantage of the subcutaneous response of rats toward dermal grafts (as combining decellularized goat skin and PRP)

Biography

Fajar, DVM, M.Biotech studied Biomedical Engineering from Biotechnology Master Program at Universitas Gadjah Mada, Indonesia and graduated as M.Biotech 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, Universitas Brawijaya 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 panelists in SYIS TERMIS AP in 2021. He became invited speaker in TERMC since 2019. Now he has 20 Scopus articles with H index scopus 3.

Kunal Mitra
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3D bio printed vascularized tissue model for cardiovascular and cerebrovascular applications

The goal of this research is to develop a bioprinted 3D tissue model system for disease modeling and treatment with a focus on the cardiovascular and cerebrovascular systems. Such studies have been typically limited to two-dimensional (2D) culture systems, which fail to capture the complex functionalities of real three-dimensional (3D) tissue architecture. Using organoids as a cell source for organ-on-a-chip technology will enable the creation of more physiologically relevant models. In addition, bioprinting techniques will enhance the automatic introduction of a range of cells with high precision in microfluidic devices leading to less-time consuming experiments with higher reproducibility than the manual introduction of cells using pipettes. By mimicking natural tissue architecture and microenvironmental chemical and physical cues within microfluidic devices, reconstitution of complex organ-level functionality can be achieved that cannot be recapitulated with conventional culture systems. Despite the progress, there exists a significant challenge with regard to the vascularization of the bioprinted tissue constructs. There is a need to transport nutrients, growth factors, and oxygen to cells while extracting metabolic waste products for the long-term survival and functionality of bioprinted tissue constructs. Vascularization is strongly regulated by cell-extracellular matrix (ECM) and cell-cell interactions. The ideal bioink for mimicking the ECM environment should be capable of bioprinting structures with high resolution, possess strong mechanical properties, and demonstrate excellent biodegradability, biocompatibility, and cellular viability. An extrusion-based six-head bioprinter (Celllink BioX6) is used for bioprinting tissue constructs. The bioprinted tissue constructs are imaged using fluorescence microscopy to assess cell attachment and cell distribution within the channel. Cellular viability if the bioprinted tissue constructs are assessed using live-dead assay and MTS (a calorimetric method for detecting the number of viable cells).

Biography

Dr. Mitra is currently a Tenured Professor of Biomedical Engineering with joint appointment in Mechanical Engineering at Florida Tech. He earned his BSME degree from Jadavpur University, Calcutta, India in 1991. He then earned his M.S. and Ph.D. degree in Mechanical Engineering from NYU School of Engineering in 1993 and 1996 respectively. He is a Fellow of American Society of Mechanical Engineers and American Society for Laser Medicine and Surgery. He is also Associate Editor of four journal in the areas of medical device, and tissue engineering. He has published more than 60 articles in peer reviewed journals.

Karma Pace
Harrisburg University, United States

The effects of exosomal L1cam on glioblastoma migration and proliferation

L1CAM (L1, CD171) is a cell surface immunoglobulin superfamily protein normally involved in axon guidance, differentiation, and cell migration during development. LI also is expressed abnormally in many types of cancers including breast, pancreatic, colon, melanoma and glioma, and has been associated with poor prognosis due to increased proliferation, invasiveness or metastasis. We have shown previously that the soluble L1 ectodomain, which can be proteolyzed from the normal transmembrane form, can stimulate proliferation and motility of Glioblastoma (GBM) cells in vitro by acting through integrins and Fibroblast Growth Factor Receptors (FGFRs). We also previously showed that minute exosomal membrane vesicles are released by glioma cells and are decorated with L1, and these potentially could stimulate motility, proliferation, and invasiveness into brain tissue. Here, L1-decorated exosomes were isolated from T98G glioma cell media and evaluated for their effects on glioma cell behavior. The hypothesis being tested was that L1-decorated exosomes increase the proliferation, motility and invasiveness of glioma cells through integrins and FGFRs. This study tested the effect of L1-decorated exosomes on several glioma cell lines and primary tumor cell cultures. The velocity of migrating cells was assessed in a highly quantitative Super Scratch assay using time-lapse microscopy. Effects on proliferation were determined by quantitation of DNA and cell cycle analysis. L1-decorated exosomes significantly increased cell velocity in the three glioma cell lines tested (T98G/shL1, U-118 MG, primary GBM cells). There also was a marked increase in cell proliferation. Chemical inhibitors against Focal Adhesion Kinase (FAK) and FGFR activity decreased this augmented motility and proliferation to various degrees. L1-decorated exosomes also facilitated cell invasion in our chick embryo brain tumor model. Taken together, these data show that L1-decoratred exosomes stimulate motility, proliferation and invasion through both integrins and FGFRS, which adds to the complexity of how L1CAM stimulates cancer cells. This information may help to find novel approaches to combat glioblastoma.

Biography

Originally from Winston-Salem, NC, Dr. Karma Pace has always had a great interest in science and math courses. She received a B.S. in Biology from Howard University in Washington, DC while researching the effect of acid rain on salamander populations in West Virginia. After graduating and working in education, Dr. Pace went on to receive an M.S. in Biology/ Secondary Education and becoming a certified science educator. Relocating to the Philadelphia area, she taught science and math courses while enrolling in a graduate program at Drexel University receiving an MS in Bioscience research.Dr. Pace continued teaching and went on to enroll in Ph.D. in Neuroscience at Delaware State University. She completed her degree with an emphasis Nerve cell adhesion protein L1 and its effects in Glioblastoma metastasis and invasion in the lab of Deni Galileo at the University of Delaware. She is currently seeking to publish the finding of her dissertation as she continues to advance her career in Science and Math Education. As the first in her family to attend college, Dr.Pace feels it is important to provide a role model for women and minorities on the importance of pursuing higher ED degrees and research. Dr. Pace's primary research interest involves improving human health and impacting minority access to science and engineering. She has extensive experience in cancer research specifically Glioblastoma metastasis with exosomal effect on the disease process. Dr.Pace would like to further her lab research while she continues her teaching responsibilities.

Philip Friedlander

Department of Medicine and Dermatology, Mount Sinai Hospital, New York, NY, United States

Advances in treatment of metastatic stage iv melanoma through modulation of the microenvironment of metastases using immune checkpoint modulators and subsequent use to treat micrometastases in the adjuvant setting

Melanoma metastases develop through genomic changes in the tumour cells and through micro environmental factors that create an immunosuppressive tissue microenvironment. Historically the median life expectancy for patients with stage IV melanoma was less than one year. Modulation of immune checkpoint protein activity particularly through inhibition of programmed death-1 protein (PD-1) alone or in combination with other modifiers has translated into increased rate of durable responses and survival benefit. Currently in the United States approved treatment options include single agent anti-PD-1 inhibitor, combination PD-1 and CTLA-4 inhibition and combination PD-1 and LAG-3 inhibition. Proper patient selection for these options is crucial. This efficacy has led to investigation of benefit in the adjuvant setting following resection of stage IIB, IIC, or III melanomas. Novel combinations also are under active investigation including neoadjuvant approaches to kill micrometastatic tumour cells leading to regeneration of a normal tissue environment. This presentation will detail real world best practice use and patient selection of the different immunotherapy treatment regimens to treat clinically detectable metastatic melanoma and in the adjuvant setting for high risk resected melanomas.

Audience Take Away Notes:

- Treatment of clinically detectable stage IV melanoma through modulation of the tumor immune microenvironment and how to best select amongst the different treatment options. stage II and III melanoma
- Strategies to manipulate microenvironment of tumor micrometastases to allow for use of immune modulators as adjuvant therapy in patients with high risk resected melanoma.
- Understand investigational clinical approaches to manipulate with therapeutic efficacy the melanoma tumor microenvironment

Biography

Dr. Friedlander graduated with B.Sci. in Biochemistry from Brown University, USA in 1990. He obtained his medical degree and biology PhD from Columbia University in 1999. He completed internal medicine residency at Columbia University and oncology fellowship at Memorial Sloan Kettering Cancer Institute in 2005. He joined the faculty of Dana Farber Cancer Institute focused on management of melanoma. He joined Mount Sinai Hospital in 2011 as an Assistant Professor (Departments of Medicine and Dermatology) and as Director of the Melanoma Medical Oncology Program. He serves as Principal Investigator on many clinical trials and leads an active specialized clinical practice.

Colette Cordonin[1]*, Imade Ait Arsa[1,2], Eva Naffrichoux[1,2]*, Giovedie Stanislas[1], Emmanuelle Jestin[2], Vincent Meneyrol[2], Koushanee Madub[3], Itisha Chummun Phul[3], Nowsheen Goonoo[3], Archana Bhaw- Luximon[3], Fanny Gimie[1,2]

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Importance of nanofiber scaffolds porosity on bone regeneration of calvaria defect in a wistar rat model

Skeletal tissue injury is a major burden on the global healthcare system due to an aging population. In addition, metabolic disorders such as diabetes and osteoporosis further impede the healing process. Tissue engineering scaffolds for reconstructive strategies offer exciting opportunities to overcome poor self-healing capacity of skeletal tissue. We studied bone regeneration potential of 2 cellulose-based nanostructured-biomaterials, CC8 and CC8H, on a pre-clinical model of surgically induced cranial bone defect in Wistar rats. Bone healing was monitored every 2 weeks, up to 12 weeks, using clinical monitoring of animals, CT and PET imaging with Na18F radiotracer. Terminal bone samples were then analyzed by immunohistochemistry. Scanning electron microscopy reveals the higher porosity of CC8 scaffold as well as its capacity to enhance cell colonization. Results of in vivo studies show different bone healing profiles depending on the scaffold used. Indeed, the metabolic stimulation induced by CC8 scaffold led to a higher bone density than with CC8H scaffold, indicating that scaffold's porosity is an important parameter in the bone healing capacity of scaffolds. This work is ongoing on a more complex in vivo model of bone regeneration: a long bone skeleton defect with mechanical constraints, such as a femur fracture.

Audience Take Away Notes

- The audience will be able to see an example of biological study (in vitro and in vivo) to assess the healing potential of a cellulose-based nano-biomaterial
- The audience will be able to see the usefulness of a bone healing monitoring with high-performance tools such as CT imaging or PET imaging and the conclusions we can draw from it
- The audience will be able to see an example of a study highlighting the importance of physical structure of nanoscaffolds, and in particular porosity, in the process of bone healing

Biography

Dr Eva Naffrichoux (DMV) studied at the Veterinary School of Lyon in France from 2016 to 2021. She completed her last year of thesis with a Master's degree at the University of Claude Bernard Lyon 1 in Preclinical and Clinical Animal Research. After few months working as a companion-animal veterinarian, she joined in 2021 the Animal Facility of CYROI research center as a junior research veterinarian and director of studies. She is the vice-president of the ethics committee of Reunion Island and is currently working on tissue regeneration and testing a new device for fat xenografts. She is well concerned by ethics and animal reduction, refinement and replacement.

Dr Colette Cordonin studied Biology at the University of Reunion Island and graduated as MS in 2013. In 2016 she joined UMR PIMIT under the supervision of Prof. Pablo Tortosa on Reunion Island and received her PhD degree in 2019. Since 2019, she works at the Animal Facility at the CYROI biomedical research center on Reunion Island as a research associate on in vivo models. In 2023 she also joined the In Vitro Unit of CYROI as a research associate in Microbiology.

Basok Yu.[1*] and Sevastianov V.I.[1,2]

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Fine dispersed tissue-specific scaffolds as a tool of tissue engineering

One of the ways to obtain tissue-specific scaffolds is decellularization. The tissue-specific extracellular matrix (ECM) proteins preserved during decellularization make it possible not only to optimize the conditions for prolonged vital activity of attached cells but also to stimulate the regeneration of damaged tissues. Grinding facilitates the diffusion of decellularizing solutions deep into the tissue and their removal, increases the effective surface area for cell adhesion, and also allows the use of scaffolds injection. In a series of studies, original technologies were developed for the production of finely dispersed tissue-specific scaffolds from decellularized fragments of the liver, pancreas and articular cartilage of a pig. The used technique of decellularization of the liver of a person with severe hepatosis allowed to obtain a liver scaffold with a residual amount of DNA less than 1%, capable of maintaining adhesion, proliferation, specific metabolic and secretory functions of HepG2. The fine dispersed scaffold of the rat pancreas preserved the fine-fibrous porous structure and the main fibrillar proteins of the pancreatic tissue, and also provided prolongation of the secretory ability and islets of Langerhans for 14 days in vitro. It was shown that on the 21st day of cultivation in a chondrogenic culture medium of cellular engineering structures based on decellularized micronized porcine articular cartilage, and mesenchymal stromal cells of human adipose tissue, viable cells forming a dense conglomerate with a matrix synthesizing glycosaminoglycans, and Type II collagen were observed in the samples. The results obtained indicate that the developed fine dispersed tissue-specific scaffolds based on decellularized fragments of the liver, pancreas and articular cartilage are biocompatible and can be used in the relevant areas of tissue engineering. Acknowledgments: The research was carried out at the expense of the Russian Science Foundation grant No. 21-15-00251, https://rscf.ru/project/21-15-00251/ (Accessed on 07 July 2023).

Audience Take Away Notes:

- Basic aspects of decellularization methods
- New opportunities offered by the using the technology of decellularization of fine dispersed tissue particles
- Information about ongoing research on the formation of cell-engineered constructs with fine dispersed decellularized particles in the field of tissue engineering of the liver, pancreas and articular cartilage

Biography

Yulia Basok is the Head of Biomedical Technology and Tissue Engineering Department of V.I. Shumakov National Medical Research Center of Transplantology and Artificial Organs, Russia, Ph.D. at Transplantology and Artificial Organs and Pharmacology and Clinical Pharmacology (2009), and Sc.D. (2022). Research in: Tissue Engineering and Regenerative Medicine, Cell Biomaterials Interactions, Biomaterial Risk Assessment, Hydrogel development, Drug Delivery Systems (54 publications).

Lucas Leite Ribeiro*, Eduardo Fonseca Vicente, José Fábio Santos Duarte Lana, Lucas Furtado da Fonseca, Gabriel Ohana Marques Azzini, Tomas Mosaner, Lucas Leite

Brazilian Institute of Regenerative Medicina, Brazil

"Preparing the soil"- optimizing metabolic management in regenerative medicine procedures

Background: Osteoarthritis (OA) is a degenerative disease linked to metabolic syndrome and chronic inflammation. Studies show that metabolic management is important in regenerative medicine treatments for degenerative diseases, including OA. The connection between metabolic syndrome, inflammation, and osteoarthritis is explored, with a focus on the importance of lifestyle habits in managing metabolic syndrome risk factors and protecting the subchondral bone to prevent OA progression.

Objectives: This article aims to explore the role of metabolic management in regenerative treatments for osteoarthritis. It discusses the importance of pre-treatment evaluation and complementary exams and the impact of diet and the gut microbiome on bone and cartilage health. The article also explores drug strategies for treating OA and the role of hormones in tendinopathies.

Methods: This article is a literature review of studies exploring the connection between metabolic syndrome, inflammation, and degenerative diseases like OA. It provides an overview of the role of lifestyle habits, complementary exams, diet, gut microbiome, drug strategies, and hormones in managing OA.

Results: Complementary exams provide important data for physicians to choose the appropriate therapeutic modality. The importance of diet in bone and cartilage health is emphasized, with studies showing the effects of high fat and high sugar diets and the benefits of a Mediterranean-style diet. The gut microbiome plays a key role in bone health, and nutritional supplements with prebiotics and probiotics can positively affect skeletal health. Drug strategies for treating OA, including antiresorptive, bone anabolic, and antihypertensive drugs, have shown potential benefits in protecting bone and cartilage. Hormones, including insulin, sex hormones, growth hormones, and thyroid hormones, also play an important role in bone and cartilage health.

Conclusions: Metabolic management is important in regenerative medicine treatments for degenerative diseases, including OA. The gut microbiome and its metabolites, drug strategies, and hormones play a key role in bone and cartilage health. Complementary exams, lifestyle habits, and diet are important factors in managing metabolic syndrome risk factors and preventing OA progression. Further research is needed to explore the connection between metabolic management and regenerative treatments for OA.

Biography

Lucas Leite Ribeiro is an orthopedic physician and professor with extensive experience in orthopedics, hip surgery, regenerative medicine, and integrative medicine. He has developed a personalized and effective evaluation model that combines regenerative and conventional approaches to healthcare. Lucas's evaluation model is based on the belief that health and well-being are achieved through a holistic approach that integrates regenerative therapies with surgical techniques. His goal is to improve the quality of life for each patient by evaluating them from a regenerative and integrative perspective. In summary, his evaluation model is unique and innovative, based on his extensive experience and knowledge in various fields. It allows for a comprehensive view of the health and well-being of each patient, providing a personalized and effective approach to treating injuries and illnesses.

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Efficacy and safety outcomes in patients with chronic traumatic brain injury: final analysis of the randomized, double-blind, surgical sham-controlled phase 2 stemtra trial

BACKGROUND: Patients with traumatic brain injury (TBI) frequently experience chronic motor deficits, for which no approved pharmacological or biological agents are available.

OBJECTIVE: To determine whether the stereotactic intracranial implantation of allogeneic modified bone marrow-derived mesenchymal stromal (SB623) cells can reduce chronic motor deficits secondary to TBI.

METHODS: The 1-year, randomized, double-blind, surgical sham-controlled Phase 2 STEMTRA trial (NCT02416492) enrolled 63 moderate to severe TBI patients (GOS-E score: 3-6) with chronic motor deficits (≥12 months post-injury). Patients were randomized to single-dose stereotactic implantation of 2.5x106, 5.0x106, or 10x106 SB623 cells or surgical sham procedure in a 1:1:1:1 ratio. 61 patients who underwent surgery were assessed for safety and efficacy (SB623=46, controls=15).

RESULTS: The primary efficacy endpoint was achieved of statistically significant improvement of the Fugl-Meyer Motor Scale score (FMMS) from baseline of SB623-treated compared with control patients at 6 months (least squares mean [SE] SB623: +8.3 [1.4] vs. control: +2.3 [2.5], P=0.04). However, at 12 months FMMS change from baseline was not statistically significantly different for SB623-treated compared to control patients. Compared to controls, improvement of FMMS in SB623-treated patients was more rapid to 6 months and was sustained to 12 months. Patients in the SB623 5.0x106 cell dose group (n=15)

experienced statistically significant improvement of FMMS from baseline compared to control patients at 6 months (SB623 5x106 cell dose: +10.9 [1.8] vs. control: +2.4 [1.8], P=0.002) and 12 months (SB623 5x106 cell dose: +10.5 [1.8] vs. control: +4.1 [1.8], P=0.02). At 12 months, SB623-treated patients experienced statistically significant improvement from baseline of the secondary efficacy endpoints of Action Research Arm Test (SB623: +3.1 [1.2] vs. control: +1.8 [2.1], P=0.59), NeuroQOL Upper Extremity Function T-score (SB623: +3.6 [1.2] vs. control: +1.2 [2.1], P=0.32), NeuroQOL Lower Extremity Function T-score (SB623: +4.6 [0.9] vs. control: +1.0 [1.7], P=0.07), and Gait Velocity (SB623: +0.26 [0.06] vs. control: +0.05 [0.11], P=0.32), but differences between SB623-treated and control patients were not significant. In addition, the secondary endpoint of Disability Rating Scale did not significantly improve from baseline for SB623-treated or control patients at 12 months (SB623: -0.3 [0.2] vs. control: -0.1 [0.4], P=0.61). All SB623-treated and control patients had at least one treatment-emergent adverse event at 12 months, with headache being most frequently reported. Four (8.7%) SB623-treated patients experienced six treatment-emergent serious adverse events (TESAEs) (delirium x2, TIA, seizure x2, worsening of poor balance) compared with three (20%, P=0.35) control patients who experienced three TESAEs (wound infection, bicycle fall, seizure). The majority of TESAEs were not related to cell treatment. No patients withdrew due to adverse events, and there were no deaths or dose-limiting toxicities at 12 months.

CONCLUSION: The stereotactic implantation of SB623 cells appeared to be safe and well tolerated in patients with chronic motor deficits secondary to TBI. The primary efficacy endpoint of statistically significant improvement of FMMS by SB623-treated compared to control patients at 6 months was achieved, with a trend toward improvement of function and activities of daily living compared to baseline at 12 months.

Audience Take Away Notes

- No pharmacological or biological agents are approved for the treatment of chronic motor deficits secondary to traumatic brain injury
- Cell-based therapies are a promising approach for the treatment of chronic motor deficits secondary to traumatic brain injury
- The Phase 2 STEMTRA trial demonstrated that stereotactic implantation of SB623 cells was safe and well tolerated in patients with chronic motor deficits secondary to traumatic brain injury
- Implantation of SB623 cells resulted in significant improvement of motor impairment at 6 months and a trend toward improvement of function and activities of daily living at 12 months.

Biography

Dr. Nejadnik graduated from the University of Louvain in Belgium for both his undergraduate degree in premedical studies, graduating Summa Cum Laude, and his medical degree (MD), graduating Magna Cum Laude. He completed post-graduate fellowships at Cornell University and Johns Hopkins University. Dr. Nejadnik was a member of the teaching faculty at University of California and Stanford University, and has held key roles Johnson & Johnson, Jazz Pharmaceuticals, Galena Biopharma, and Eureka Therapeutics. Dr. Nejadnik is currently Chief Medical Officer and Head of Research at SanBio, Inc.

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21-23 AUGUST

DAY 02

POSTERS

3RD EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Lianqin Liu

Department of Pathology, Henan Provincial People's Hospital, People's Hospital of Zhengzhou University, People's Hospital of Henan University, Zhengzhou, Henan, 450003, the People's Republic of China

The role and mechanism of ASS1 and urea in the regulation of glycolysis and pyrimidine synthesis by UT-B in b16 cells, respectively

Malignant melanoma is the most malignant skin tumor, which is prone to distant transfer. At present, the research methods are limited, and there is an urgent need to find new treatment targets. The results showed that UT-B overexpression in B16 cells would inhibit the cytosocytical process to inhibit cell proliferation. We found that the expression of ASS1 in B16 cells expressing UT-B was reduced, and it is reported that the glycolysis pathway was inhibited by knockout ASS1 in colorectal cancer. UT-B knockout inhibits urea to discharge extracellular, so urea content in UT-B knockout mice increases. UT-B knockout mice construction B16 tumor model showed that UT-B knockout promoted tumor growth. B16 cells were cultured with urea-containing medium, and the results showed that urea promoted cell proliferation. A number of studies have shown that inhibition of urea circulation promotes pyrimidine synthesis and cell proliferation. It is suggested that the promotion of urea to B16 cells may be achieved by promoting pyrimidine synthesis. Based on this, we guess: 1) The inhibitory effect of UT-B on the glycolysis of B16 cells is achieved by ASS1; 2) UT-B may inhibit cell proliferation by inhibiting cytosine synthesis. This study will start from these two perspectives: the role and mechanism of ASS1 and urea in the regulation of glycolysis and pyrimidine synthesis by UT-B in B16 cells, respectively.

Audience Take Away Notes

- This is the first report to date describing the role of UT-B protein in the skin
- We have demonstrated the role of UT-B in the development of cutaneous melanoma and how altered UT-B function severely affects long-term skin health
- These studies can not only help us understand the development of skin lesions, but also improve our understanding of other cancer types

Biography

Lianqin Liu works in the Department of Pathology, the People's Hospital of Henan province. In 2019, he received his doctorate from Jilin University, Changchun Province, China. She has published five research papers in SCI.

Tingting Li
Henan Provincial People's Hospital, China

Single-cell RNA-seq reveals the transcriptome differences of spermatogonial stem cells between pre-pubertal and adult buffalo

Aging leads to a progressive decline in homeostasis and regenerative function, including age-related degeneration of stem cell function. In order to investigate whether there were differences in the functions of Spermatogonial Stem Cells(SSCs) at different periods, Magnetic Activated Cell Sorting(MACS) was used to separate buffalo spermatogonial stem cell-like cells (SSC-like cells) from Pre-Pubertal Buffalo (PUB) and Adult Buffalo (ADU), which were used to constructing the transcription maps of buffalo SSC-like cells by single-cell transcriptomic technology. In total 21803 genes from PUB and ADU SSC-like cells identified by Single-cell RNA-seq, among which 10431 were expressed in PUB and ADU SSC-like cells, 9911 were expressed in only ADU SSC-like cells, and 1461 were expressed in only PUB SSC-like cells. GO analysis showed that compared with adult buffalo SSC-like cells, the up-regulated genes in pre-pubertal buffalo SSC-like cells were mainly involved in lipid metabolism, cell surface receptor signaling pathways, and biological processes related to migration. The down-regulated genes were mainly involved in the biological processes related to the meiosis cycle, the meiosis cell cycle and the production of male gametes. Subsequently, through the combination with KEGG analysis, compared with adult buffalo SSC-like cells, the up-regulated expression genes of pre-pubertal buffalo SSC-like cells were mainly involved in the signaling pathways related to the self-renewal of stem cells, while the down-regulated expression genes were mainly involved in the oocyte meiosis pathway, the biosynthesis pathway of secondary metabolites and the insulin signaling pathway. In conclusion, our data provide detailed information on the mRNA transcriptome of PUB and ADU SSC-like cells, revealing differences in function of SSC-like cells at different periods, and providing new evidence for stem cell aging.

Audience Take Away Notes

- Through single-cell sequencing, we found that the number of genes with significantly different expression levels of prepubertal buffalo compared to adult buffalo SSC-like cells totaled 1,419 (fold difference> 2; P <0.05), of which there were 274 significantly up-regulated differential genes, meanwhile, 1145 differentially down-regulated genes
- We performed GO analysis on these differential genes and found that the biological processes involved in the up-regulated expression of SSC-like cells in PUB were mainly lipid metabolism, cell surface receptor signaling pathways, migration processes and other biological processes related to the maintenance of stem cell self-renewal status and stem cell migration. The down-regulated genes were mainly involved in the biological processes related to the formation and differentiation of late gametes, such as the meiosis cycle, the meiosis cell cycle and the generation of male gametes
- We performed KEGG analysis on these differential genes and enriched 151 signaling pathways which may be closely related to the regulatory processes of buffalo SSCs, such as self-renewal, proliferation and migration, and key genes corresponding to these pathways

Biography

Dr. Tingting Li studied at the College of Animal Science and Technology of Guangxi University from 2013 and received her doctorate in 2018, and then worked at Henan Provincial People's Hospital.

Peiye Song

Department of Pathology, Henan Provincial People's Hospital, Zhengzhou, Henan Province, China

SIRT1 inhibits metastasis of ovarian cancer cells through ERβ-mediated autophagy

Ovarian cancer is one of the most common gynecological malignancies. Because the early typical symptoms are not obvious, the lack of effective screening means, its mortality is the highest in gynecological tumors. Therefore, the prevention and treatment of ovarian cancer remains a huge challenge. It was found that the Silent Information Regulator 1 (SIRT1) was low expressed in ovarian cancer tissues, and the increased expression of SIRT1 inhibited the metastasis of ovarian cancer cells, but the molecular mechanism was not clear. As a histone deacetylase, SIRT1 is involved in the regulation of autophagy, energy metabolism, cancer and other physiological and pathological processes. SIRT1-induced autophagy can delay the formation of atherosclerosis and the progression of neurodegenerative diseases. However, there are few studies on the role of SIRT1-induced autophagy in the process of tumor metastasis in ovarian cancer. Our previous work found that Estrogen Receptor Beta (ERβ) could induce autophagy to inhibit metastasis of breast cancer cells through the claudin6/beclin1 axis. The expression of ERβ was low in ovarian cancer tissues and correlated with the expression of SIRT1. Therefore, we speculated that ERβ might be the target gene of SIRT1, and SIRT1 could induce autophagy and inhibit the metastasis of ovarian cancer cells through ERβ. The study provides a theoretical basis for the search of molecular markers and targeted therapy for early metastasis of ovarian cancer.

Audience Take Away Notes

- You can study the role of SIRT1 in inducing autophagy in ovarian cancer cells
- You can learn the relationship between SIRT1-mediated autophagy and ovarian cancer metastasis
- You can study the regulatory relationship between SIRT1 and ERβ in ovarian cancer cells
- This study elucidates the mechanism of SIRT1/ERβ in ovarian cancer metastasis, and provides valuable theoretical and experimental basis for the early diagnosis and drug development of ovarian cancer

Biography

Dr. Peiye Song studied pathology and pathophysiology at Jilin University and received the PhD degree in 2019. Subsequently, she joined the Molecular Pathology Group of Prof. Lingfei Kong at Henan Provincial People's Hospital and obtained the position of Supervisor Technician in the same year. She has published 5 research articles in SCI (E) journals.

Xinwei Zhang

Department of Pathology, Henan Provincial People's Hospital, Zhengzhou, Henan Province, China

Molecular mechanism of GATA2 and AR regulating BRCA1 transcription in sporadic ovarian cancer

Ovarian cancer is one of the malignancies of the female reproductive system. Due to the lack of clinical symptoms in the early stage, it is very important to study the mechanism of the occurrence and development of ovarian cancer at the molecular level for early diagnosis and prognosis of this disease. BRCA1 is an important tumor suppressor gene. The ovarian cancer patients with this gene mutation have a poor prognosis. Although the relationship between BRCA1 mutation and ovarian cancer has been studied thoroughly, it is difficult to explain the mechanism of sporadic ovarian cancer with very low mutation frequency. The reduction of its expression may be another key factor, which is closely related to the transcriptional regulation of BRCA1 gene by transcription factors. By far, the knowledge about this aspect is still relatively scarce. GATA binging protein 2 (GATA2), a member of the zinc finger transcription factor GATA family, has been proved to be closely related to the occurrence and development of ovarian cancer. Androgen Receptor (AR) is a nuclear transcription factor. In addition to playing an important role in male growth and development, it is also closely related to ovarian cancer and is functionally related to GATA2. What is the relationship between the three genes in ovarian cancer? This research analyzed the regulatory effects of GATA2 and AR on BRCA1 from the perspective of transcriptional regulation, and clarified the influence of this regulatory mechanism on the malignant biological behavior of ovarian cancer. The results provide a theoretical basis for further revealing the molecular regulation mechanism of BRCA1 in ovarian cancer, and lay the foundation for the further development of new potential targets for ovarian cancer.

Audience Take Away Notes

- You can learn knowledge about the transcriptional regulation research
- You can know effect of reduced expression of BRCA1 gene on ovarian cancer
- You can learn about the link between transcription factors GATA2 and AR in ovarian cancer
- You can use the idea of this research to explore whether reduced BRCA1 expression
- in other cancer species affects the biological behavior of cancer cells

Biography

Dr. Xinwei Zhang studied Genetics at Anhui Agricultural University and received the PhD degree in 2019. Subsequently, he joined the Molecular Pathology Group of Prof. Lingfei Kong at Henan Provincial People's Hospital and obtained the position of Supervisor Technician in the same year. He has published 5 research articles in SCI (E) journals.

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

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[3]Department of Nanobiotechnology, Faculty of Biological Sciences, Tarbiat Modares University, Tehran, Iran
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The pH-sensitive natural polymers in wound healing drug delivery

Full-thickness wounds are a growing problem due to high costs and complications. pH variations in the wound healing process are divided into four stages: homeostasis, inflammation, proliferation, and regeneration. The transition from the inflammatory phase to the proliferative phase leads to a gradual increase in pH from 5.7 to 7.6. pH-responsive natural polymers based on functional groups can accept or release protons in response to environmental pH changes and increase smart drug delivery systems.

Keratin with its unique biological properties has been widely developed in wound healing applications. Recently, a smart antibacterial biomaterial based on keratin hydrogel with pH-dependent behaviour and Zinc Oxide (ZnO) nanoplates as abiocide agent resulted in the release of ZnO nanoparticles for wound healing. Alginate is a natural polysaccharide, biocompatible, and non-toxic that has been introduced as a suitable option for smart drug delivery. Recently, alginate-based microparticles have been studied for pH-sensitive for sustainable release of drugs in wound healing applications. Chitosan is a non-toxic, biodegradable, and biocompatible polymer with natural pH-responsive properties. Chitosan pH-responsive hydrogels have the potential as a non- toxic transdermal nobiletin delivery carrier for the treatment of skin lesions such as acne. Hyaluronic Acid (HA), a natural polysaccharide, plays important physiological and biological roles in the human body. HA contains carboxyl groups with a pKa in the range of 3-4 and has been used to develop pH-responsive systems. A pH-responsive hydrogel based on hyaluronic acid has been investigated to deliver isoliquiritigenin (ILTG), an antimicrobial therapeutic agent, to inhibit acne growth. It was found that the hydrogel has excellent skin permeability of ILTG, which penetrated mostly via the follicular pathway.

Audience Take Away Notes

- Introduction of polymers with pH-sensitive properties for wound healing
- Identification and control of all types of infections with their changes in pH
- Application of nanoparticles in improving wound healing process

Biography

Mr. Adnan Alizadeh Naeini studied Materials' science at the Shiraz University, and graduated as MS in 2022. His expertise is in the field of wound dressings and natural and synthetic biopolymers. He has also published more than 5 research articles in international conference.

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21-23 AUGUST

DAY 03

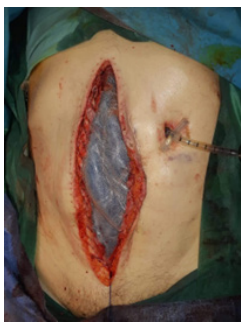
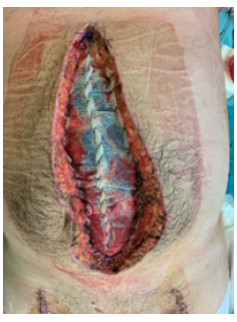
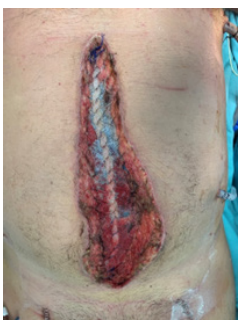
KEYNOTE FORUM

3RD EDITION OF INTERNATIONAL CONFERENCE ON

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

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.

Orestis Ioannidis

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

Biography

Dr. Ioannidis is currently an Assistant Professor of Surgery in the Medical School of Aristotle University of Thessaloniki. He 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 as valedictorian 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 and vascular access. He has received fellowships for EAES, ESSO, EPC, ESCP and ACS and has published more than 180 articles with more than 3000 citations and an H-index of 28 ACS and has published more than 180 articles with more than 3000 citations and an H-index of 28

Audience Take Away Notes

- 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

- Negative pressure wound therapy in peritonitis seems to improve results in terms of morbidity and mortality and definitive abdominal closure
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Light-based bioprinting: From bioink design to modulation of cell response in 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, and spatial heterogeneity of the ECM and, in most cases, the presence of a vascular network. The ability of 3D bioprinting technologies to deposit cells, biomaterials and bioactive molecules into precise locations in 3D has provided new opportunities in the fabrication of grafts for tissue repair and in vitro models with high degree of accuracy, automation and reproducibility. Light-based bioprinting technologies are attracting great interest for the fabrication of hierarchical 3D constructs with complex architectures due to their superior resolution and ability to create cellularized constructs within a biologically relevant time frame. The success of light-based bioprinting is intimately linked to the design of photosensitive bioinks which can be rapidly crosslinked in the presence of cells, while supporting essential cellular functions, such as adhesion, migration, proliferation and de novo tissue synthesis. This talk will discuss the role of photopolymerization reactions in 3D bioprinting as well as introduce design strategies to engineer photocrosslinkable bioinks capable of directing cell response within 3D bioprinted hydrogel constructs.

Audience Take Away Notes

- Rational design of photocrosslinkable biomaterials for 3D bioprinting
- How to characterize the impact of light-based reactions on cell fate within 3D bioprinted hydrogels
- Challenges and opportunities in bioink design of 3D bioprinting

Ruben F. Pereira

ICBAS – Abel Salazar Institute of Biomedical Sciences, University of Porto, Porto, Portugal

i3S – Institute for Research and Innovation in Health, University of Porto, Porto, Portugal

INEB – Institute of Biomedical Engineering, University of Porto, Porto, Portugal

Biography

Ruben Pereira is an Assistant Professor at Institute de Ciencias Biomedicas Abel Salazar (ICBAS, University of Porto) and Assistant Researcher at the Biofabrication Group (i3S, Institute de Investigacao e Inovacao em Saude). 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.

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SPEAKERS

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TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Roberto Gramignoli
Division of Pathology, Dept. of Laboratory Medicine, Karolinska Institutet, Stockholm, Sweden

Humanized chimeric animals to test drugs or evaluate novel cell and gene therapies

Advances in preclinical models have allowed the creation of animals with genetic alterations that tolerate xenogenic transplants of human hepatocytes. Over time, the loss of native (murine) hepatocytes, is replaced by human cells leading to a "humanization" process of the liver. Such chimeric mice have served as final proof in preclinical studies where gene therapies (e.g., CrispR-Cas technology) or advanced cell treatments have been tested to correct congenital disorders.Our laboratory has pioneered the use of cell therapy to treat patients with liver disease. However, for preclinical studies, many small animal models of monogenetic liver disease do not faithfully recreate the phenotype observed in human patients. Using a special FAH-deficient and immune-compromised mouse, we have generated new human-relevant models. Hepatocytes isolated from normal donors or patients undergoing liver transplants due to inborn errors of metabolism were transplanted into the murine liver, replacing 85-95% of the mouse hepatocytes with human hepatocytes, as quantified by plasma human albumin levels. Mice repopulated with normal hepatocytes displayed normal hepatic functions including ammonia levels, while mice repopulated with hepatocytes deficient for one specific liver enzyme displayed increased basal levels of ammonia or other systemic alterations characteristics of donor disease. Such new preclinical models are extremely useful for investigations of the disease process, in vivo, and for possible corrective interventions such as gene or cellular therapies. When the strengths and weaknesses of these humanized mouse models are fully understood, they will likely be quite valuable for investigations of human liver-mediated metabolism and excretion of drugs and xenobiotics, patient-specific pharmacological effects, and short- and long-term investigation of the toxicity of drugs or chemicals with significant human exposure. Finally, the effective and functional maturation of stem/progenitor cells isolated or engineered using the most advanced techniques has in this model the final validation.

Audience Take Away Notes

- It will provide a brief overview on novel preclinical models and their use in cell-based therapies for liver disease
- 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 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 andplacental 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).Over the past years, they have accumulated evidence on the potential of AEC in several models of congenital liver diseases and as supporting therapy in fulminant hepatic failure. Based on safety and efficacy, in addition to AEC immunomodulatory and anti-inflammatory effects, they are in the process to start a phase I/IIa clinical trial for liver disease and creating the first placenta stem cell bank.

Krashenyuk Albert Ivanovich
Academy of Hirudotherapy, St.- Petersburg, Russia

Pandemic “COVID-19 – postcovid syndrome”: Was it possible to save the doctors and staff of the "red zone" of hospitals from illness and death?

An analysis of the morbidity and mortality of medical personnel in different countries revealed an interesting pattern: surgeons and nurses were most often ill and dying. At the same time, the most likely version is that medical personnel violated the anti-epidemic regime. However, there is another reason - this is the remote (distant) interaction of the Aquasystems of a sick and healthy person. The experiments of Academician V.P. Kaznacheev and co-authors, at the International Research Institute of Space Anthropoecology (RISA) in Novosibirsk (Russia), since 1994, on the basis of more than 20,000 experiments, made it possible to establish a reliable fact of remote interconnection of cell cultures in the optical range. Thus, cell cultures, under the influence of an experimental factor (viruses, toxins, radiation, etc.) on them, acquire the ability to distribute destructive information (pathological process) to healthy cellular structures remotely. When two cell cultures come into contact through optical media (quartz glasses, mica, and others). This means that the realization of action information is remembered through structural information (genetic, molecular-structural destruction of the cell) and a new factor of its distribution in space is formed. Confirmation was also carried out at our department, on the model of ultraviolet irradiation of people with the definition of the criterion of chaos (Kch) and the criterion of order (Ko) - development of the works of the Nobel laureate Prigogine I. These materials are published in detail in the author's article: “Krashenyuk A.I., “COVID-19” – “POSTCOVID SYNDROME” Pandemic: How to Protect Doctors and Nurses in the “Red Zone” of Hospital? J. of Medical & Clinical Nursing, 2022, Volume 3(4): 1-9”. It is not difficult to imagine a doctor or nurse who is in close contact with patients in the "Red Zone" for 10-12 hours, performing medical procedures: doctors operate on sick patients, nurses measure blood pressure, make injections, droppers, and other procedures. At the same time, the Aquasystem of a sick person affects the Aquasystem of a healthy person, which reproduces the "Image of the disease", in this case “COVID-19”.Today, there is a whole scientific direction: the ability to transmit radio signals from one aquatic environment to another. Today, obtaining information copies of medicines is a matter of information. The technology takes advantage of the ability of chemical and biological substances to produce ultra-weak radiation that can be transmitted over long distances over communication lines, including the Internet. According to professor V.I. Slesarev, the author of the theory of "Aquacommunication", it is not substances that emit, but their aquamodels! Since water is a source of radiation and is sensitive to external radiation, water is an aquaradiosystem. In our already published work, the mechanism of interaction between the aquatic systems of a healthy and sick person is analyzed in detail, and if we do not apply this knowledge in practice, we will continue to lose medical workers in the "Red Zone". And this is obvious, since the mechanism of this phenomenon has been proven by many studies, including ours.

From this point of view, the protection of health workers requires a different design of protective clothing for doctors, i.e. protection from acoustic-electromagnetic radiation of the aquatic system of a person with”COVID-19” coronavirus, for example, using a Faraday grid or using a radar detector. In addition, the discovery of wave (acoustic-electromagnetic) radiation of medical leeches allows us to consider another possible aspect of the therapeutic and preventive effect of the "System method of leeching" (SML). The

wave radiation of leeches significantly exceeds the radiation of influenza and herpes viruses serotype 2 (from the literature data 800 and 440 Hz, respectively).

The leech emits in the range of 25-250 kHz. We do not yet know the frequency of radiation of the coronavirus "COVID-19", but we assume that it is significantly lower than that of a medical leech. And this is the basis for our assumption about the preventive role of the SML in health workers in contact with those infected with the “COVID-19” virus. Moreover, this has been proven in practice by our students who own the "System method of leeching" (SML).

Biography

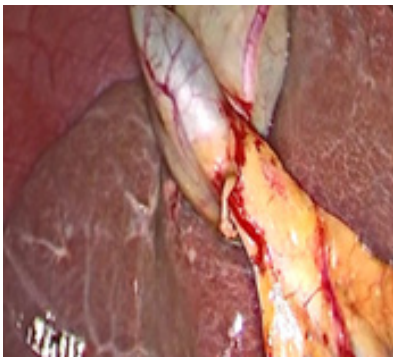
Krashenyuk A.I. Graduated from the 1st Pavlov Medical Institute in 1971 in Leningrad, and postgraduate studies in biochemistry at the same institute in 1974 from Professor V.I. Rosengart. In 1974 he received the degree of Candidate of Medical Sciences. From 1974 to 1985 he worked as a senior researcher and head of the laboratory of biophysical methods of research at the Pasteur Institute in Leningrad. He was engaged in the development of vaccines against measles, mumps, influenza, tick-borne encephalitis. From 1985 to 1992 he headed the laboratory of live influenza vaccines and biophysical methods of research. Created the world first purified live influenza vaccine, which was vaccinated 4.5 million people without post-vaccination complications. In 1995 he received the degree of Doctor of Medical Sciences from the Institute of Influenza of the Russian Academy of Medical Sciences (RAS). One of the creators of space biotechnology for the production of highly purified viral proteins in microgravity. In 1996 and to the present time the creator of the world first department and Academy of Hirudotherapy. Honorary Scientist of Europe, Academician of the European Academy of Natural Sciences (Germany), Grand Doctor in Biology and Medicine (Oxford), Full Professor of Oxford. For a series of works in the field of virology in 2023 the author was awarded the diploma "Pasteur-Professor" of the European Academy of Natural Sciences (Germany).

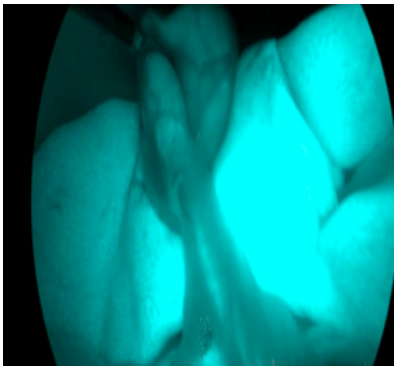
Orestis Ioannidis

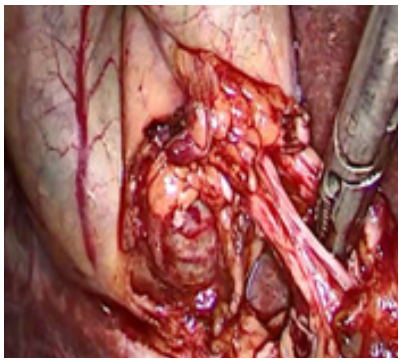
4th Department of Surgery, Medical School, Aristotle University of Thessaloniki, General Hospital "George Papanikolaou", Thessaloniki, Greece

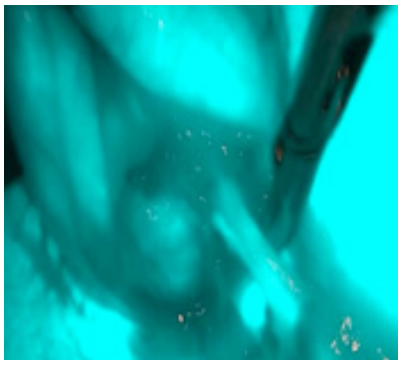
Use of indocyanine green fluorescence imaging in the extrahepatic biliary tract surgery

Cholelithiasis presents in approximately 20 % of the total population, ranging between 10% and 30 %. It presents one of the most common causes for non malignant surgical treatment. The cornerstone therapy is laparoscopic cholecystectomy, urgent of elective. Laparoscopic cholecystectomy is nowadays the gold standard surgical treatment method, however bile duct injury occurred to as high as 0.4-3% of all laparoscopic cholecystectomies. The percentage has decreased significantly to 0.26-0.7% because of increased surgical experience and advances in laparoscopic imaging the past decade which have brought to light new achievements and new methods for better intraoperative visualization such as HD and 3D imaging system. However, bile duct injury remains a significant issue and indocyanine green fluorescence imaging, mainly cholangiography but also angiography, can further enhance the safety of laparoscopic cholecystectomy as it allows the earlier recognition of the cystic and common bile duct, even in several times before dissecting the Callot triangle. Fluorescence cholangiography could be an ideal method in order to improve bile tree anatomy identification and enhance prevention of iatrogenic injuries during laparoscopic cholecystectomies and also it could be helpful in young surgeons training because it provides enhanced intraoperative safety, but however this method does not replace CVS. Finally, our ongoing current study results comparing intravenous to direct administration of ICG in the gallbladder will be presented.









Audience Take Away Notes

- ICG fluorescence cholangiography can enhance the safety of laparoscopic cholecystectomy as it allows the earlier recognition of the cystic and common bile duct, even in several times before dissecting the Callot triangle
- The best timing and dosage of ICG administration in order to perform ICG cholangiography and angiography
- ICG fluoresce imaging doesn't replace the critical view of safety

Biography

Dr. Ioannidis is currently an Assistant Professor of Surgery in the Medical School of Aristotle University of Thessaloniki. He 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 as valedictorian 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 and vascular access. He has received fellowships for EAES, ESSO, EPC, ESCP and ACS and has published more than 180 articles with more than 3000 citations and an H-index of 28.

Hitesh Rana and Ratan K. Choudhary*

College of Animal Biotechnology, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana -141004, Punjab, INDIA

Harnessing canine stromal vascular fractions: Unraveling immunomodulation in co-culture with PBMCs for enhanced tissue repair and regeneration

In recent years, Mesenchymal Stem Cell (MSC) therapy has been investigated in dogs, but inconsistent outcomes have been observed. Stromal Vascular Fractions (SVFs) present a heterogeneous cell population, including MSCs, progenitor cells, endothelial cells, pericytes, and immune cells, with potential advantages for tissue repair and regeneration over isolated MSCs. This study aimed to analyze SVFs' growth dynamics and assess their immunomodulatory efficacy in co-culture with PBMCs and allogeneic SVFs. SVFs were isolated from healthy female dogs (n = 3) undergoing cesarean section, with owner consent, while PBMCs were collected from tumor-free and lymphoma dogs (n = 5 each). Quantitative evaluation of SVFs cell proliferation and gene expression analysis (OCT4, CD44, CD90, and CD105) was performed in a 3-day culture. Next, SFVs were co-cultured with PBMCs (of healthy and lymphoma dogs) at different ratios (1:1, 1:0.5, and 1:0.1; N/N) for three days, and the resulting co-cultures were assessed for cell proliferation. Results showed canine SVFs expressed cell surface markers CD105+/CD90+/CD44+ and pluripotency transcription factor OCT4. Co-culturing SVFs and PBMCs resulted in increased population doubling time (PDT) in both the PBMCs and decreased Ki67 expression in the lymphoma group. Cell proliferation in co-culture decreased in a ratio-dependent manner. Immunomodulatory properties of canine SFVs were evident by the down-regulation (44x; p-value = 0.0003) of the anti-inflammatory cytokine TNFA and up-regulation (88x; p-value = 0.008) of the anti-inflammatory cytokine PTGS1 in PBMCs in a mixed culture of SVFs (1:1 ratio). In conclusion, canine SVFs derived from periovarian fatty tissue exhibited a heterogeneous cell population, including mesenchymal stem cells and immune cells. Co-culture with PBMCs demonstrated immunomodulatory effects, complementing their potential for therapeutic applications. The expression of key stem cell markers further supports their therapeutic promise.

Audience Take Away Notes

- The audience will know about stem cell research and its utility in canine regenerative medicine.
- The practical utility of this research lies in the potential application of Stromal Vascular Fractions (SVFs) in mesenchymal stem cell (MSC) therapy for dogs. The study shows SVFs have advantages over isolated MSCs for tissue repair and regeneration.
- A methodology for SVF isolation from canine adipose tissue

Biography

Dr. Ratan K. Choudhary is an Assistant Professor at the College of Animal Biotechnology, Guru Angad Dev Veterinary and Animal Sciences University, Punjab, India. With BVSc from TNVASU, Chennai, and a master's degree in Animal Genetics and Breeding from IVRI, Bareilly, he earned a doctoral degree in Animal Science from the University of Maryland, USA. Dr. Choudhary's research focused on bovine mammary stem cells, enhancing lactation persistency in cattle. Having worked at the USDA facility for over six years, he gained valuable experience in stem cell research during two post-doctoral positions at the University of Kentucky and the University of Vermont, USA. His long-term research goal is to develop stem cell therapies for dairy animals, including mastitis treatment. He has been recognized with numerous awards and fellowships for his research work and has published three books and more than 50 papers in international peer-reviewed journals. Dr. Choudhary is an active member of various international scientific societies and organizations, contributing significantly to the field of stem cells in veterinary sciences.

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

Immunomodulatory and regenerative properties of mesenchymal stromal cells: Can we improve their abilities?

Background: Accumulated evidence has emerged on the role of stem cells in key cellular functions such as their implication in host immune response and tissue regeneration. Currently, Mesenchymal Stromal Cells (MSCs), which are multipotent stem cells, have been used in a great number of clinical trials (> 1300 studies, worldwide), ensuring the safety and tolerability of these cells in several human disorders, such as autoimmune diseases, Graft Versus Host Disease (GvHD) and cancer. Lately, well-defined MSCs were used for the toleration of the acute immune response and cytokine release syndrome in severely ill COVID-19 patients. However, significant differences have been reported regarding immune modulation and tissue regeneration exerted by the MSCs. Late evidence has shown that inborn errors of immunity and the presence of different Human Leukocytes Antigens (HLA) may either prevent or promote the beneficial properties of MSCs towards human disorders.

Aim: This study aimed to the evaluation of the immunomodulatory and regenerative properties of MSCs by comprehensively investigating the HLA alleles.

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 Cell and Gene Therapies (ISCT). WJ and BM-MSCs were stimulated with a culture medium containing IFN-γ (50 ng/ μl), 1% penicillin-streptomycin, and 1% L-glutamine for 48 h. The quantification of IL-1Ra, IL-6, IL-10, IL-13, TGF-β1, VEGF-a, FGF, PDGF, and IDO was performed using ELISA kits. The expression of HLA-G1, G5, and G7 was evaluated in WJ and BM-MSCs. The determination of the HLA alleles of the MSCs was performed using the Next Generation Sequencing technology (HLA Holotype 11 loci, Omixon Inc., MiSeq, Illumina). The frequencies of the HLA alleles were estimated using the Arlequin and MEGA X software.

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. Also, the most frequent HLA alleles were determined, to identify potential correlation with the MSCs immunomodulatory and regenerative properties.

Conclusion: Specific HLA alleles were correlated positively with the MSCs immune responses and regenerative properties. In this way, the establishment of a stem cell bank with specific MSCs lines may be performed, in order properly defined MSCs to be used for specific patients, thus bringing precision medicine one step closer to its clinical application.

Audience Take Away Notes

- 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's Degree (BSc) in Biomedical Sciences from the University of West Attica in 2010. In 2013, he received his Master's 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 an affiliate scientist 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 application in tissue engineering and regenerative medicine approaches.

Agnieszka Ewa Wiacek[1*], Kacper Przykaza[2] and Małgorzata Jurak[1]

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Physicochemical characteristics of the bioactive substances films deposited onto PEEK or PEEK/bioglass

Now-a-days, biomedical engineering makes great attempts to develop materials that could imitate living tissues (mechanical properties or biocompatibility). Among them is polyetheretherketone (PEEK) which despite owing very similar mechanical properties to human bones, does not induce the appropriate cellular response (osseointegration) through limited cell adhesion as an effect of chemical passivity and low surface free energy. In the research it was proposed to activate PEEK with air plasma in order to produce single- and multi-component films of biologically active substances on its surface (antibacterial chitosan, bioglass supporting osseointegration, typical components of biological membranes or an immunosuppressive cyclosporine (preventing from implant rejection) to change and improve its surface properties and biocompatibility. Various methods were used of layer formation (solution spreading, dip-coating and the Langmuir-Blodgett (LB) technique). The use of the LB technique required the characterization of layers deposited at the liquid/gas interface to select the optimal transfer parameters and information on the interactions of the layer components. The modified PEEK surfaces were characterized mainly by changes of surface wettability, surface free energy and its components based on the contact angle and its hysteresis for the test liquids, topography and surface chemistry using the following techniques: profilometry, FTIR, BAM, AFM and TOF-SIMS. During researches, it was also possible to produce multi-component and multi-layer films on the PEEK surface for controlled desorption of the CsA after contact with aqueous solutions.

Audience Take Away Notes

- The combination of chitosan and bioglass allow to obtain a film on the surface of PEEK showing significant biocompatibility
- The obtained results and conclusions have a permanent value in the scientific literature
- These can be extremely useful for further development of interdisciplinary research on the optimization of the properties of polymers applied in implantology
- These can be also helpful for obtaining an ideal biomaterial with a wide range of applications

Biography

Prof. Agnieszka Ewa Wiącek studied chemistry in 1989-1994 at Maria Curie-Skłodowska University in Lublin (Poland) and in 1994 was employed as a research assistant in the Department of Physical Chemistry. She received D. Sc. degree in chemistry in September 2000 on the base of PhD thesis including the effect of natural stabilizers on oil/water emulsion stability. In 2013 she received Dr. habilitation degree in physical chemistry writing dissertation titled “Effect of the selected biologically-active substances, mainly phospholipids and (phospho)lipases on the interfacial properties of dispersed systems” and in 2018 associate professor position. She published about 90 scientific papers (including 15 monoauthor’s paper) which were cited according to GoogleScholar about 1700 times. Additionally she is author or co-author of about 100 conference' presentations. In 1997-2004 she was an examiner of Recruitment Commission of Chemistry Faculty in Lublin and outer cities. She was promoter of more than 50 master of science thesis (M. Sc) or licentiate thesis (B. Sc.) and 2 doctoral thesis. She participated in 6 scientific projects including international projects.

Popov S.V.[2], Vinokurov A.Y.[1], Guseinov R.G.[2,3*], Belyakov D.Y.[1], Popov D.Y.[1], Nikulin A.S.[1], Potapova E.V.[1], Sivak K.V.[2], Perepelitsa V.V.[2]

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Possible protection mechanism of cells by sodium fumarate during warm ischemia in partial nephrectomy

Warm ischemia is widely used in the treatment of renal cell carcinoma for improvement of tumor visual assessment, minimizing blood loss and providing hemostasis during partial nephrectomy. However, the resulting process of acute hypoxia leads to critical consequences for the health of patients already after 25-30 minutes of the blocking of blood perfusion through the vascular bed of the kidney. The use of antihypoxants based on mitochondrial substrates, in particular sodium fumarate, can increase the acceptable duration of the operation and reduce the degree of damage immediately after nephrectomy as well as in the process of kidney recovery. Understanding the molecular and cellular mechanisms of nephroprotection may help to validate both the exact duration of blood perfusion blocking and the subsequent process of resected organ recovery. Since 95% of the oxygen supplied to cells is consumed by mitochondria, we investigated the effect of sodium fumarate on the mitochondrial metabolic parameters of MDCK epithelial cell culture under hypoxia conditions. For this purpose, we estimated the pharmaceutical "Konfumin", which is used in surgical practice.The obtained results showed a significant decrease of apoptosis level in the presence of sodium fumarate in comparison with the control after 1, 2 and 3 hours of incubation under conditions of complete oxygen binding by sodium dithionite. Due to the reversible action of complex II of the mitochondrial electrotransport chain (ETC), sodium fumarate ensures the functioning of the NADH dehydrogenase complex in the absence of oxygen, which is experimentally confirmed by the part conversion of the coenzyme into the oxidized nonfluorescent form. However, this does not lead to significant improvements in the ETC activity and maintenance of the mitochondrial membrane potential at a physiologically acceptable level: in the model conditions of hypoxia without antihypoxant as well as in the presence of sodium fumarate, the formation of the proton gradient is supported by the inverse action of complex V which is ATP- consuming process. At the same time, it was shown that sodium fumarate action changes the level of mitophagy leading to the utilization of defective mitochondria, as well as normalization of the reactive oxygen species rate production in comparison with control. The observed effect can be explained by the known stabilization and increase in transcription of hypoxia-inducible factor 1□ and, accordingly, activation of protective mechanisms during hypoxia. It can be hypothesized that the use of 15% sodium fumarate solution will increase the time of warm ischemia during renal resection to 45-60 min. However, confirmation of this requires additional research.

Audience Take Away Notes

- Understanding the mechanisms of the processes of changing the functional state of the kidney at the cellular level allows us to develop new approaches to nephroprotective therapy, and consequently, to minimize the development of complications in the postoperative period and increase the overall survival rate of cancer patients
- The application of sodium fumarate allows to increase the time of warm ischemia in organ-saving surgery of renal cancer up to 40 - 50 minutes

- The research of renal tissue bioenergetics, investigation of the role of reactive oxygen species in the formation of acute renal injury during hypoxia and reperfusion at the cellular level allows to improve the results of treatment of oncologic patients

Biography

Dr. Guseynov R.G. studied medicine at the First St. Petersburg Medical University. Then he underwent a two-year specialization in urology at the Northwestern Medical University, graduating in 2011. After that he joined the research group of Prof. Popov S.V. at St. Luke's Clinical Hospital, St. Petersburg, Russia. He received his Ph.D. degree in 2020. In 2021, he was promoted to Assistant Professor at St. Petersburg State University, Department of Hospital Surgery. He has published more than 90 research articles in scientific journals.

Katerina Stepankova[1], Barbora Smejkalova[1], Kristyna Karova[1], Lucia Machova, Urdzikova[1], Jessica Kwok[1,2], James Fawcett[1,3], Pavla Jendelova[1*]

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Axon regeneration after spinal cord injury using AAV-mediated gene therapy

The damaged nervous system leads to the impairment of the motor, sensory and autonomic functions, since the Central Nervous System (CNS) regeneration is very limited. Failure of axon regeneration in the CNS is partly due to the inhibitory environment, and partly due to the intrinsic loss of regenerative ability with neuronal maturation. The regenerating axons must overcome nonpermissive extracellular matrix of the glial scar, in which, among others, tenascin-C is upregulated after spinal cord injury and contributes to the inhibitory environment around the lesion site. The migration-inducing tenascin-binding integrin is alpha9beta1, which is expressed in the embryonic nervous system but downregulated in adults and not upregulated after injury. A key molecule for promoting migration and growth is membrane-associated PIP3, which is produced by PI3Kδ. In mature neurons many axon growth molecules are excluded from axons, and PI3Kδ expression enables anterograde transport of developmentally restricted molecules, such as the integrins, which has been shown to promote growth. In our studies we focus on regeneration of sensory axons and Corticospinal Tract Axons (CST) using two different approaches based on gene therapy. Sensory regeneration was achieved in animals with dorsal column crush lesion using AAV based viral vector delivery of the integrin □9 and kindlin 1 genes to the Dorsal Root Ganglia (DRG). We addressed two different levels of SCI, C4 lesion with DRG C6 and C7 injections for forelimb sensory restoration and T10 lesion with DRG L4 and L5 injections for hindlimb sensory restoration. Significant improvement was observed in Von Frey test for mechanical perception and Hargreaves test for thermal sensation in treated animals with both, cervical and thoracic lesions when compared to controls. Tape removal test was improved only in treated animals with T10 lesion. Positive behavioural outcome was confirmed by counting axons from □9 and kindlin 1 group above the lesion and c fos staining showing the connectivity of newly grown axons in the treated groups. To regenerate CST, we performed C4 dorsal lesion and injected the right motor cortex at 4 sites concurrently with viral vector mixture of PIK3CD and GFP. Significant improvement was detected in paw reaching test and grip strength test in treated animals compared to controls. Vector mixtures transducing neurons with PI3KD and GFP elicited growth of CST axons at least 1.3 cm below lesion 16 weeks after SCI. These axons make synaptic connections bellow lesion as proved by anti- vGlut1 staining. Electrophysiology confirmed connectivity bellow the lesion. In conclusion, the AAV-mediated gene therapy leads to robust sensory and CST axon regeneration after SCI proved by behavioural tests, electrophysiology and immunohistochemical staining.

Biography

Pavla Jendelova is a Head of the Department of Neuroregeneration at the Institute of Experimental Medicine, Academy of Sciences of the Czech Republic. Her Lab. studies cell and gene therapy for the treatment of spinal cord injury. Her group collaborates with chemists on developing biomaterials for CNS injury and magnetic nanoparticles for cell labeling and drug delivery for the treatment of glioblastoma. Currently, she is running with James Fawcett from Cambridge University a Center for Reconstructive Neuroscience, with the focus on nervous tissue regeneration and plasticity using viral vector gene delivery and extracellular matrix manipulations.

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Stochastic analysis of cell encapsulation in picoliter droplets in a microfluidic system designed for 3D cell culture

3D cell cultures are superior in resembling the natural physiological settings of tissues compared to 2D cell cultures that limit mass transport and cell-cell interactions to two directions. The number of cells encapsulated in droplets can be regulated by controlling the cell concentration and flow rates in two-phase microfluidic systems and can be restricted to only a few cells. We designed a simple continuous microfluidic platform that allows for better monitoring of cell behavior in ultra-small picocapsules that provide the medium for proliferation of a small number of encapsulated cells. The two-phase microfluidic system involves a dynamic stage, where cells are encapsulated in aqueous spherical picocapsules, and a static stage, where these capsules are stabilized for 3D cell culture. We used the standard soft lithography methods to produce a completely transparent microfluidic device made of polydimethylsiloxane (PDMS) allowing for the monitoring and analysis of the droplets and the cells on an inverted microscope with a fast camera and imaging software. We used soybean oil saturated with water as the continuous phase and cell medium as the dispersed aqueous phase. In the dynamic stage, we optimized the flow conditions for a flow focusing device with an x-junction of 100 micron width. The likelihood of encapsulating cells in a droplet depends on the flow rate of each phase, the size of the droplets and the size of the cells, the concentration of the cell suspension, and the other unknown factors during the course of encapsulation rendering it as a stochastic process. We employed the Poisson distribution to analyze the number of encapsulated cells per droplet at different flow rates. In the static stage, aqueous picocapsules with cells are stabilized in wells with 1000 micron depth and 500 micron diameter. Droplets remained stable in these wells, which is the first step for 3D cell culture. We demonstrated that this design in its premature state can be further improved and used for 3D culture of cells in small numbers. This study is supported by TUBITAK 1001 Project 214M323 and Hacettepe University BAB grant.

Audience Take Away Notes

- We provided systematic information for cell encapsulation in a two-phase microfluidic design
- We analyzed cell encapsulation as a stochastic process and showed the use of Poisson distribution with actual data
- We developed a microwell design to host uniform aqueous picocapsules with cells
- We presented a 3D cell culture platform that can be used for monitoring response of cells to nano drug delivery systems
- Researchers that are not familiar with microfluidic systems can benefit from such systems by using ultra small amount of chemical and biological materials.

Biography

Anıl Hatiboglu received BS in mechanical engineering and MS in micro and nanotechnology at Middle East Technical University in Ankara. He worked at the Turkish Aerospace Industries as a systems engineer and joined the Lab-On-Chip Microfluidic Systems, Micro Machining and Advanced Materials Research Laboratory directed by Dr. Onel in the Department of Chemical Engineering at Hacettepe University as a research engineer and will receive a PhD degree in nanotechnology and nanomedicine. He is experienced in the design, fabrication, and operation of microfluidic systems towards single cell manipulation, investigation of physicochemical processes, and synthesis of nanoparticles.

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Role of hepatic progenitor cells in chronic liver disease and cancer

Hepatic Progenitor Cells (HPCs) form ductular reactions and peritumoral ductules in the postnatal liver. HPCs are facultative progenitors mainly derived from normal cholangiocytes activated in response to injury. Ductular reactions are observed in several chronic liver diseases, including those associated with increased risks of developing Hepatocellular Carcinoma (HCC). Previous studies have demonstrated that the in vivo conversion of HPCs into hepatocytes only occurs in the setting of extreme injury, and hepatocytes, not HPCs, are the main cell-of-origin of liver cancer. Therefore, the role of HPCs in liver disease and cancer remains largely unknown. We previously demonstrated that HPCs accumulate in the peritumoral areas of pediatric patients with hepatoblastoma and HCC. Furthermore, our immunostaining analysis indicated that the number and proliferation of peritumoral ductules as well as their expression of angiogenic paracrine factors correlate with intratumoral parameters. Therefore, the current study aims to test the hypothesis that HPCs promote pathogenic processes associated with liver cancer development by secreting paracrine factors. For labeling and isolation of forkhead box L1 (Foxl1)-expressing HPCs, we used Foxl1- re;RosaYFP mice treated with the 3,5-diethoxycarbonyl-1,4-dihydrocollidine-supplemented diet (DDC). This model simulates cholestatic liver disease, one of the risk factors for liver cancer. Cell culture experiments indicated that HPCs secrete paracrine factors to communicate with endothelial cells, induce angiogenic gene expression, enhance endothelial cell viability, proliferation, and tubulogenesis, and inhibit apoptosis. This paracrine function of HPCs was inversely correlated with their differentiation status toward hepatocytes. Our data suggest that modulation of HPCs may represent an attractive therapeutic strategy for inhibiting pathogenic progression leading to HCC.

Audience Take Away Notes:

- The definition of postnatal hepatic progenitor cells.
- The relationship between hepatic progenitor cell differentiation and pathogenic functions.
- Association between peritumoral ductules and pediatric liver cancer.

Biography

Dr. Shin is an Associate Professor in the Division of Pediatric General and Thoracic Surgery at Cincinnati Children's Hospital Medical Center (CCHMC). She received her Ph.D. degree at the Johns Hopkins University School of Medicine. During her postdoctoral research at the University of Pennsylvania, Dr. Shin discovered that hepatocytes, but not hepatic progenitor cells, are the cell-of-origin of liver cancer using mouse molecular genetics approaches. Upon establishing an independent laboratory at CCHMC, Dr. Shin has developed her research focus on pediatric liver cancer, paracrine cell-to-cell communication, and the pathogenic role of facultative hepatic progenitor cells.

Kaifu Chen

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Department of Pediatrics, Harvard Medical School, Boston, MA, United States

System methods to define master regulator of cell identity in development and diseases

A cell type is determined by the network function of its cell identity genes, including master transcription factors that govern the expression status of this network. Cell identity transition is fundamental in normal differentiation and development, whereas a cell that loses its normal identity may cause disease including cancers. Targeting the driver genes for an abnormal cell identity holds great promise for new therapy. However, our understanding of cell identity regulators is incomplete. Integrating over >10,000 genomic and epigenomic profiles, we uncovered that cell identity genes as a unique group are distinct from other genes in the mechanisms to regulate their expression. These including epigenetic mechanism from the regulation of transcription by chromatin modifications to the post-transcriptional regulation of gene expression by RNA modifications. These discoveries laid the foundation for us to develop novel machine learning techniques, which utilize expression regulation mechanisms for systematic identification of driver genes for normal cell differentiation. By applying these techniques to endothelial cell, we successfully recaptured reported endothelial lineage factors. The techniques further revealed new endothelial lineage regulators, which were experimentally verified as required for the maintenance of normal endothelial cell identity, the differentiation from iPSCs to endothelial lineage, and the development of blood vessels. Applying these techniques to cancer samples further revealed new tumor suppressors and oncogenes that were hard to identify by conventional mutation analysis methods. The driver genes identified by our new techniques will lead to new therapeutic targets and diagnostic markers, as successfully verified in cell, xenograft, and PDX model for cancers, and thus, will benefit numerous patients.

Audience Take Away Note:

- Epigenetic regulation mechanism at cell identity genes.
- Artificial intelligence techniques to uncover cell identity genes.
- Cell identity regulation in cell differentiation and tissue development.
- Role of MECOM in endothelial cell identity regulation and cardiovascular diseases.

Biography

Dr. Chen is a computational biologist interested in computational modeling of cell identity regulation. He received PhD degree from the renowned Beijing Institute of Genomics. Thereafter, he joined the Dan L Duncan Cancer Center at Baylor College of Medicine as a postdoctoral fellow. Dr. Chen started his bioinformatics lab as an Assistant Professor in the Cornell University Weill Cornell Medical College at Houston Methodist Hospital Research Institute, where he further became an Associate Professor and was designated as the founding Director to develop a Center for Bioinformatics and Computational Biology. Dr. Chen is currently an Associate Professor in the Harvard Medical School at Boston Children's Hospital.

Marek Konop*, Łukasz Mazurek, Mateusz Szudzik, Mateusz Rybka

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Application of keratin biomaterials in healthy and diabetic wound healing – experimental studies

Biomaterials are used in regenerative medicine as wound dressings, implantable materials, controlled-release carriers, or scaffolds for tissue engineering. Chronic, nonhealing wounds are a serious problem for people suffering from diabetes. Therefore, various scientific groups have studied potential dressings based on natural or synthetic substances in healthy and diabetic conditions. which would significantly accelerate the healing process. In this context, keratin biomaterials soluble or insoluble gain much attention due to their unique set of properties, such as excellent biocompatibility, biodegradability, and bioactivity. Our team examined the effect of insoluble fractions of keratin and their modification as a potential wound dressing in healthy and diabetic animal models. Our results showed that keratin biomaterials are non-toxic, tissue biocompatible, and support the growth of the NIH/3T3 cell line. In vivo experiments in healthy and diabetic mice showed, that wounds treated with keratin dressing healed significantly faster than control wounds. In the next study, we examined keratin dressing and its modifications (with casomorphin, AgNP and butyrate) in diabetic conditions. Our studies showed that obtained wound dressings are tissue-biocompatible and support wound healing in diabetic animals. Histopathological and immunofluorescence examination showed, that in treated wounds predominant macrophages and their morphological variants compared with control wounds were predominant neutrophils. The dressings were incorporated naturally into granulation and regenerating tissue without any visible signs of the inflammatory response, which was confirmed by histopathological analysis. Our study showed that obtained keratin dressings are safe and can efficiently accelerate skin wound healing in healthy and diabetic animals.

Audience Take Away Notes

- Biomedical properties of keratin biomaterials
- The role of the insoluble fraction of keratin biomaterials as a potential wound dressing.
- The impact of antimicrobial, anti-inflammatory and pain relief substances on wound healing.

Biography

Dr. Marek Konop received his PhD degree in 20017 at the Mossakowski Medical Research Institute Polish Academy of Sciences. After receiving his Ph.D., he joined the Department of Dermatology at the Medical University of Warsaw (MUW), where he worked until 2017. After one year postdoctoral fellowship supervised by Prof. Marcin Ufnal at the Department of Experimental Physiology and Pathophysiology MUW, he obtained the position of Assistant Professor. He has published more than 30 research articles in SCI (E) journals.

Anna Gosiewska*, Adrian Kilcoyne, Sharmila Koppisetti, Yuechao Zhao, Chenfei Huang, Raja Sivalenka, Joseph Gleason, Shawn He, Stephen A. Brigido and Robert, J. Hariri

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Placental derived-mesenchymal like stromal adherent cells and their therapeutic potential

Placental-derived Mesenchymal-Like Adherent Stromal Cells (MLASCs) are proprietary culture expanded, undifferentiated mesenchymal-like adherent stromal cells derived from full term placental tissue that have immuno- modulatory and anti-inflammatory properties. These cells are available in systemic and injectable/local delivery formulations for use in endogenous repair and trophic support. MLASCs are isolated and expanded in a GMP clinical manufacturing facility and have demonstrated high batch-to-batch reproducibility of cell phenotype, growth rate, identity, and purity of final cell product derived from different donors. In vitro studies indicated that MLASCs grow to passage 23 and undergo normal senescence with no evidence of transformation or telomerase expression. MLASCs secrete a wide range of immunomodulatory cytokines (HGF, MCP-1, IL-6, VEGF, PDGF-BB, IL-8, etc). As these cells express tissue factor (TF), we performed CRISPR/Cas9-mediated TF gene Knock Out (TFKO) in MLASCs, leading to a significantly lower TF expression, activity and thrombotic effects. These genetically edited cells had unchanged characteristics, including expansion, expression of phenotypic markers and secretory profile, as well as their immunomodulatory activities, which are functionally relevant to therapeutic applications, were not affected upon TFKO. In vivo animal studies demonstrated the immunomodulatory effects of MLASCs on immune cells (T cells, macrophages, and DC cells). The biodistribution of these cells was established, as well as efficacy in several animal models including Autoimmune Encephalomyelitis, Hind Limb Ischemia, Neuritis, Stroke, and Parkinson's Disease. These cells target specific biological and cellular processes implicated in diseases including Crohn's disease and diabetic foot ulcers, and diabetic peripheral neuropathy. In clinical studies, MLASCs have demonstrated the capability to support wound closure in patients with DFU and were well tolerated and demonstrated promising clinical response and remission rates in Crohn's disease patients.

Audience Take Away Notes:

- The presentation will provide key considerations for development of allogeneic off-the shelf cell technologies for various therapeutic applications.
- The characterization studies of MLASC provide a roadmap for development of a scalable allogeneic cell technology for clinical translation.
- The mechanism of action studies discussed in the presentation will provide a de-risking mechanism towards successful clinical translation.

Biography

Dr. Gosiewska is a leading expert in regenerative medicine. She received her PhD in Medical Biology from Medical University of Bialystok, Poland. She conducted her postdoctoral studies of cell-extracellular matrix interactions at the National Institutes of Health (Bethesda, Maryland). In 2020, after 25 years of focusing on cell therapy and regenerative medicine at Johnson & Johnson Inc., she joined Celularity Inc., as Vice President R&D, Degenerative Diseases to drive strategy and product development based on placental-derived biomaterials and cells. Anna has published many research articles and has 122 patent applications. She is a member of several international scientific societies.

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Regenerative therapy for the treatment of peri-implantitis in patients with type 2 diabetes mellitus

Introduction: The high prevalence of peri-implantitis reflects the lack of effectiveness of treatment methods, which makes the search for new therapeutic approaches relevant.The use of hyaluronic acid in the treatment of peri-implantitis is expedient, which determined the purpose of the study

Objectives: To evaluate the outcome of regenerative therapy of peri-implantitis in patients with type 2 diabetesmellitus

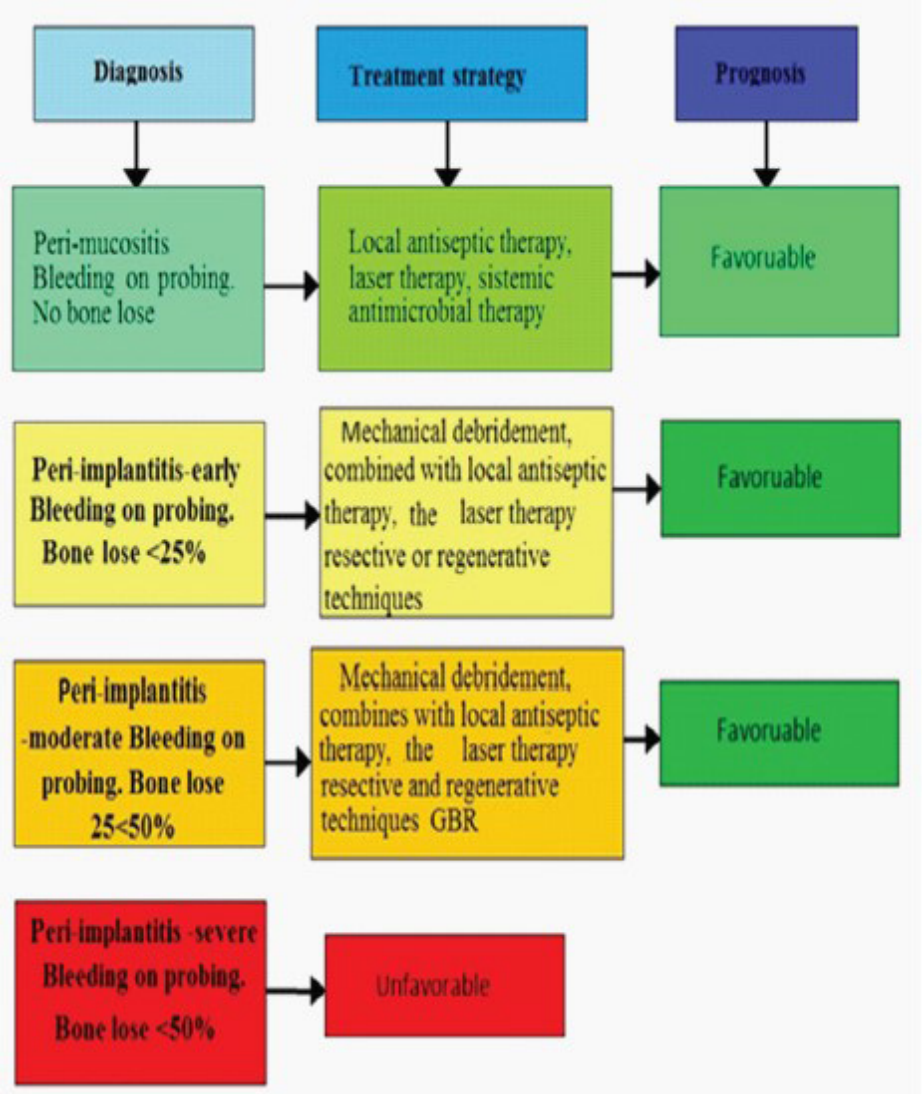
Material and Methods: Study included 53 patients with type 2 diabetes mellitus diagnosed peri-implantis.38 implants with early peri-implantitis, 23 implants with moderate peri-implantitis. The diagnostic parameters used for assessing peri-implantitis include clinical indices, Probing Pocket Depth (PPD), Bleeding On Probing (BOP), peri-implant radiography, data at the re-examination were retrospectively compared to baseline data. Patients underwent treatment with HbA1c levels <7.2% or less than 154 mg/dL.Treatment including systemic antibiotics (amoxicillin 500mg and metronidazole 200mg) with duration of 7-10 days. Granulation tissue was carefully removed in the bone defect with titanium instruments. The implant surface is decontaminated with successive topical applications of citric acid, 0.12% chlorhexidine, sterile physiological saline and adjunctive magneto-laser therapy with a wavelength of 810nm power density of 100mW during 30 seconds. After degranulatin and antiseptic preparation Bio-Oss had mixed with hyaluronic acid (Gengigel) and the periimplant bone defect was filled. A membrane Bio-Gide was placed over the filled defect.Local applications Elzylol dental gel.

Results: A statistical significant reduction in both PPD and BOP were seen at all-timepoints as compared with the baseline clinical measurements. Stable clinical measurements PPD and BOP were demonstrated after 1 year the initial treatment, remaining stable during the following three years. Based on the clinical experience developed by us Algorithm for the treatment of peri-implantitis at different stages.

Conclusion: Surgical regenerative treatment combined with systemic antibiotics, on pocket elimination, detoxification of the implants' surface,bone grafting with grafts materials and hyaluronic acid Gengigel, magnetolaser therapy was an effective therapy for treatment of peri-implantitis.

Keywords: Peri-Implantitis; Implants; Regenerative Therapy; Magneto-Laser Therapy; Hyaluronic Acid

Algorithm For Treating Peri-implantitis At Different Stages



Biography

Professor Gagik Hakobyan-Doctor of Medical Sciences, PhD, Head of the Department of Surgical Stomatology and Maxillofacial Surgery, Yerevan State University after M. Heratsi, Chief Editor Scientific and practical journal BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY. Education-1978-1983, Yerevan State Medical Institute, Faculty of Stomatology. Specialization-Oral surgeon, implantologist, general dentist. Author of over 100 scientific articles some of which were published in international scientific journals, in scientific collections of international congresses. Author of educational text book "Dental implantology". Co-author of educational text book "Propaedeutics of surgical dentistry", text book"Surgical Stomatology and maxillofacial surgery", text book "Neuropathies of the maxillofacial region", "Alternative implantologic decisions for severe atrophic maxilla" in English, Dusseldorf, Germany.

Peyvand Parhizkar Roudsari
Tehran University of Medical Sciences, Tehran, Iran

Advancements in Mesenchymal Stem Cell (MSC)-based therapies for diabetic ulcers: Focus on placenta-derived MSCS and acellular amniotic membrane

Diabetic foot ulcers are prevalent and long-term complications of diabetes mellitus with significant health care influences and costs. These mentionable instances of chronic wounds can be accompanied by other severe complications, including limb amputation and gangrene, infections, and even death in some severe cases. Financial, emotional, and cosmetic issues are also remarkable challenges following these chronic ulcers. All these complications can remarkably impact the quality of life of individuals. Thus, more attention should be paid to the discovery of novel treatments. Mesenchymal Stem Cells (MSCs) have been introduced as satisfactory therapeutic tools in recent years in the personalized medicine era. MSCs could be obtained from various sources regarding numerous researches. Herein, Placenta MSCs (PMSCs) as the rich MSCs sources have attracted great concern due to their advantages compared to others, such as their better accessibility and expansion and decreased immunogenic impacts. In this regard, the effectiveness of PMSC- based therapies in the treatment of different disorders and particularly for wound management has been established so far. On the other hand, the Amniotic Membrane (AM) itself can provide a graft with regenerative, immune regulatory and healing functions with limited ethical concerns. Indeed, acellularized AM can offer an accessible natural scaffold that has become more popular in regenerative medicine. It provides a swelling and moisture-retention environment and contains different bioactive molecules, growth factors, and elastic properties (without the associated complications of synthetic scaffolds) for ideal wound healing. Many studies indicated that acellular AM loaded with MSC can even promote the regeneration process and acts as an efficient wound dressing. However, there is a requirement for more research works that focus on the influences of the PMSCs in a company with AM (as a scaffold) to be utilized as a wound dressing for diabetic ulcers. In this approach PMSCs should be manufactured after obtaining to be seeded on the prepared acellularized AM. Eventually, the topical use of the provided scaffold must be evaluated. Altogether, we have concluded from the results of many studies that PMSCs+AM graft can be considered a novel wound dressing that should be assessed more in further studies to cure diabetic wounds.

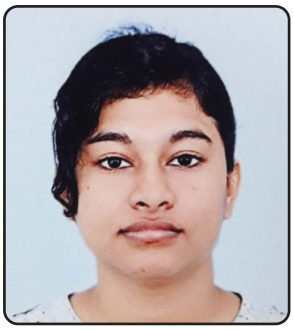
Audience Take Away Notes

- Clinical Applications: Healthcare professionals, including physicians and wound care specialists, can utilize the information to enhance their understanding of the potential benefits of Mesenchymal Stem Cells (MSCs) and acellular Amniotic Membrane (AM) in the treatment of diabetic foot ulcers. This knowledge can guide their clinical decision-making and treatment strategies, leading to improved patient outcomes
- Teaching and Education: The research outcomes can be incorporated into educational curricula and courses related to tissue engineering, regenerative medicine, and wound care. Faculty members can utilize the information to provide students with up-to-date knowledge, encourage critical thinking, and inspire research projects in the field

- Research Expansion: Faculty and researchers in the field of tissue engineering and regenerative medicine can use the research presented as a foundation for expanding their own investigations. They can build upon the findings related to placenta-derived MSCs (PMSCs) and acellular AM, exploring further aspects of their application in wound management and tissue regeneration
- Practical Wound Management Solutions: The combined use of PMSCs and acellular AM as a wound dressing for diabetic ulcers offers a practical solution to a complex problem. This approach has the potential to simplify and streamline wound care protocols, providing a more efficient and effective method for treating diabetic foot ulcers.
- Enhanced Design and Accuracy: For researchers or designers working on developing wound dressings or regenerative scaffolds, the information presented can provide valuable insights into the properties and advantages of acellular AM as a natural scaffold. This knowledge can aid in designing more accurate and effective products for wound healing, leading to improved outcomes for patients

Biography

Peyvand Parhizkar Roudsari is a last-year medical student at Tehran University of Medical Sciences, Tehran, Iran. Her research interests encompass the areas of metabolomics and genomics, resulting in her authorship or co- authorship of a number of publications related to regenerative medicine and stem cell-based therapies. Notably, her contributions have garnered recognition among her peers, as evidenced by over 100 citations of her work and an H- index of 6.



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Normal cellular differentiation without reprogramming pluripotent factors and banking cancer stem cells: A new era in regenerative medicine

Stem cells hold great promise for tissue regeneration and have the potential to treat many incurable degenerative diseases. Stem cell banking offers faster transplantation, reduced waiting times, and cost-effective treatments for degenerative diseases. However, universal preservation methods remain challenging due to donor shortages. Cancer stem cells (CSC) differentiate into multiple normal cell lineages without reprogramming pluripotent factors and escape immune detection and destruction, offering a novel strategy for disease modeling, drug discovery, and economically viable cell therapy, potentially reducing immune rejection despite diversity among individuals human leukocyte antigen markers. The research was conducted in accordance with PRISMA guidelines. The literature, including terms such as cancer differentiation, stem cell banks, pluripotency, 3D cell culture, and plasticity, was searched through Google Scholar. The work cited in the selected articles was also searched for additional relevant literature. Several cancer types that responded to differentiation therapy were focused on during the research. Solid tumors, including melanoma, neuroblastoma, osteosarcoma, hepatocellular carcinoma, and breast cancer, were found to differentiate into normal cells, while other solid tumors, such as leukemia, glioma, skin cancer, ovarian cancer, and lung carcinoma, were found to differentiate into mature cells. Moreover, clinical studies show CSCs are non-tumorigenic after differentiation, making them a viable treatment option in regenerative medicine. And absolutely guarantee that, whether for an adult or newborn, it will amount to a viable treatment in the future that could one day prevent degenerative diseases.

Audience Take Away Notes:

- The stem cell banking sector is rapidly growing, with public hospitals and private businesses exploring various types of stem cells because stem cell banking offers faster transplantation, reduced waiting times, and reduced costs, making allogeneic stem cells useful for treating various incurable degenerative diseases.
- The objective is to store cancer stem cells and use them in an emergency so that we can save time. Every time cells are needed, one sample from the stem cell bank is taken and a fresh dose is grown. Grand View Research predicts a global stem cell market of $31.6 billion by 2030, driven by increasing stem cell banks, therapeutic potential, and regenerative medicine research. CSCs can differentiate into normal cells of interest and will never be rejected by the host immune system upon allogeneic transplantation. Moreover, clinical studies show that CSCs, upon differentiation into normal cells, are not tumorigenic. The audience will learn a new strategy in stem cell therapy to treat many incurable degenerative diseases using cancer stem cell banks

Biography

Miss. Josita Jude Alloysius is an undergraduate at the KAATSU International University (KIU), currently pursuing a Bsc (hons) in Biomedical Science. She obtained 1.05 Z-scores in the bioscience field in the G.C.E. A/L 2019. She is the author of the mini-review titled "Normal Cell Differentiation Potential of Cancer Stem Cells Without Reprogramming Pluripotent Factors: a Novel Strategy in Stem Cell-Based Therapy for Tissue Regeneration." Josita excelled in high school and is currently pursuing a Biomedical science degree. Passionate about stem cell research, she believes written and analytical skills are essential for academic excellence and critical thinking. Her interests include stem cell research and cancer differentiation therapy, which involve research and creative thinking in her projects.

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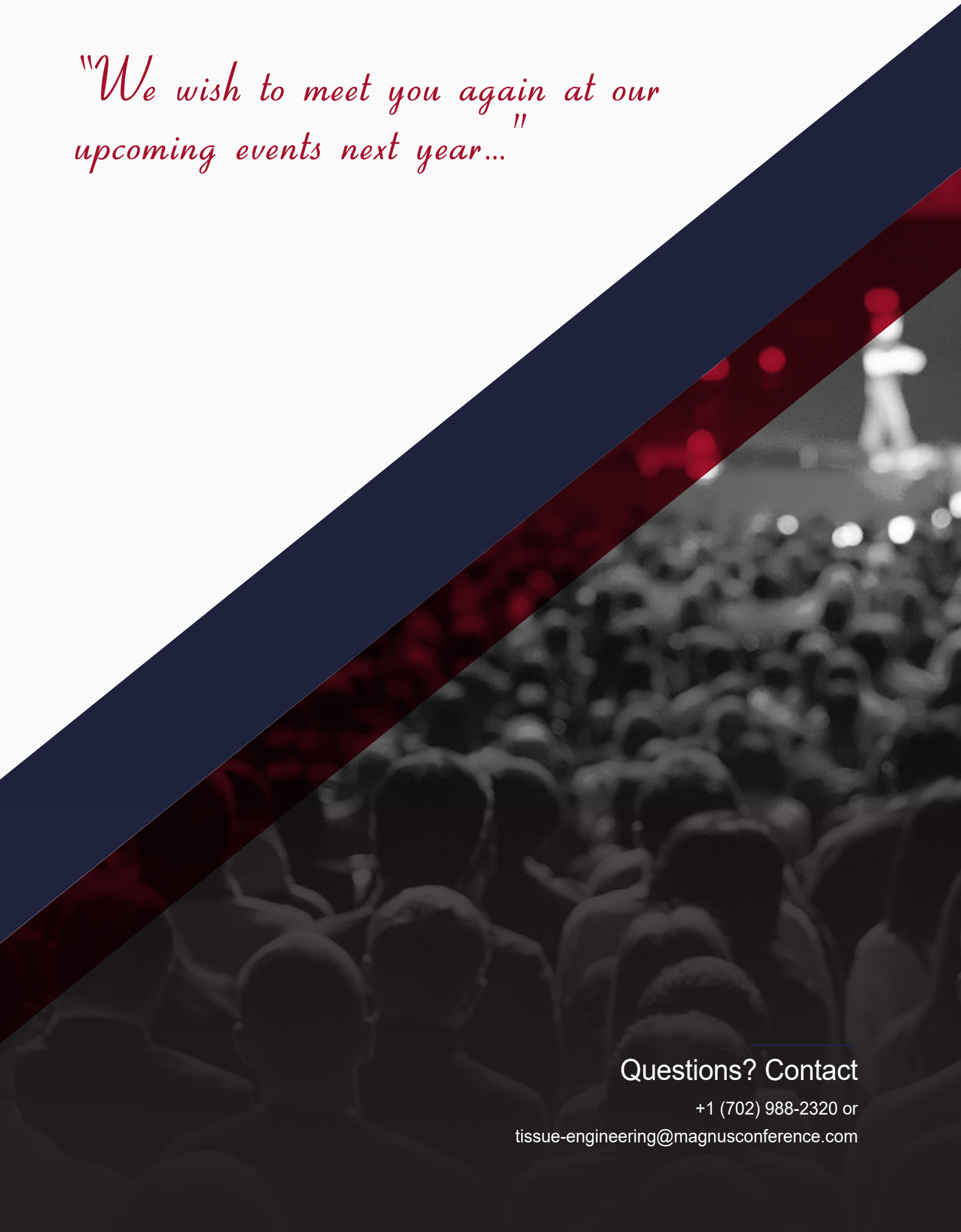
Notes

"We wish to meet you again at our upcoming events next year..."



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