magnus Group

Joint Event

4th Edition of International Conference on

Tissue Engineering and Regenerative Medicine &

4th Edition of Euro-Global Conference on

Biotechnology and Bioengineering

19-21
Sept, 2024
Rome, Italy

Venue: NH Villa Carpegna
Via Pio IV, 6, 00165 Roma RM, Italy

BOOK OF ABSTRACTS

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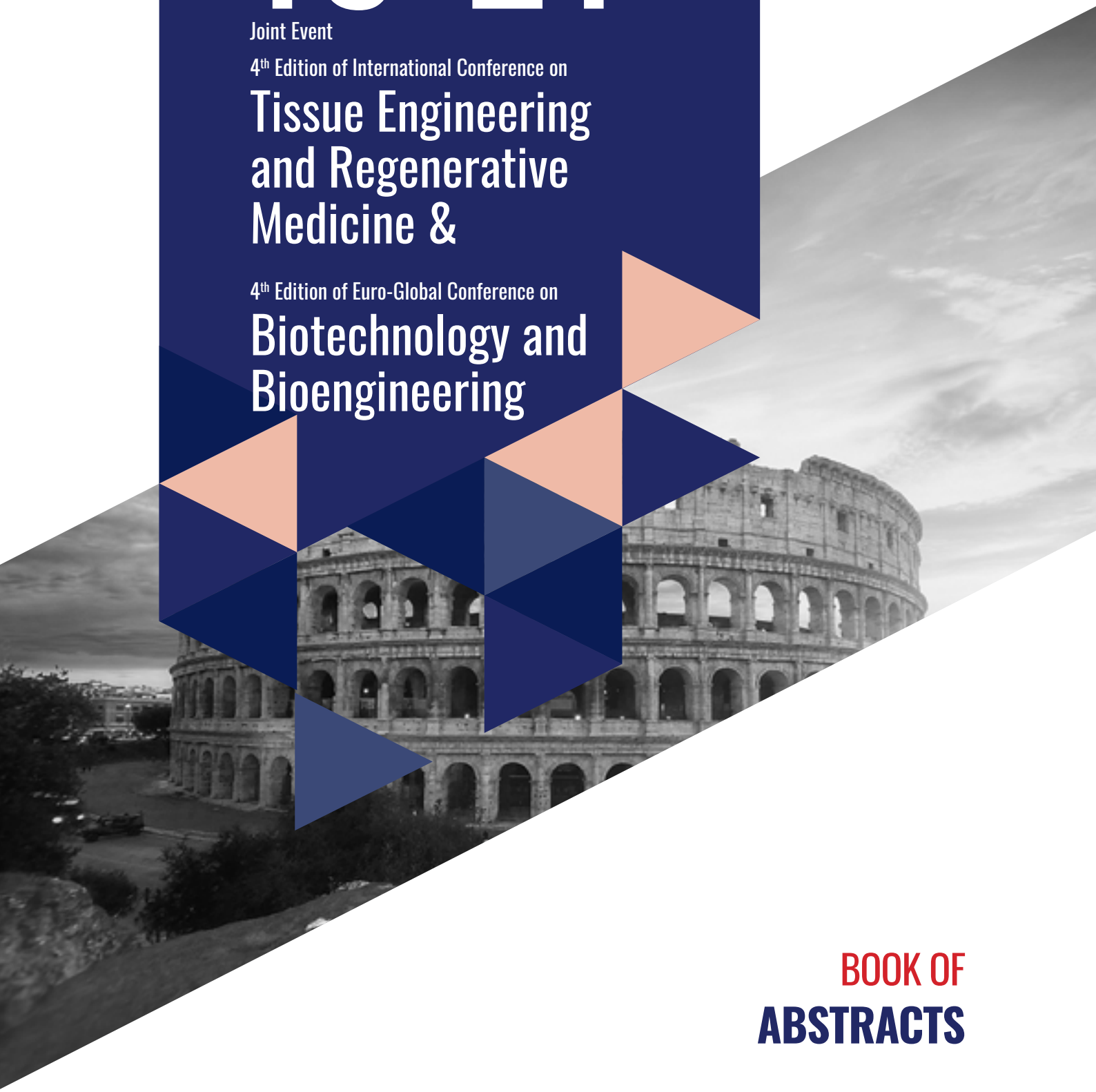

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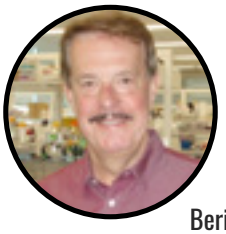
Western University of Health Sciences, USA



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Sergey Suchkov
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Thomas J. Webster
Interstellar Therapeutics, USA

Thank You All...

Speakers

Abdulsada A. Rahi Al-Ghnaimawi
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Isfahan University of Medical Sciences, Iran

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University of Fukui, Japan

Anastasia Polikarpova
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Jong Seung Kim
Jeonbuk National University Medical School, Republic of Korea

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Komal Vig
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Mariam Taib
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Adamas University, India

Obakeng Jona
University of Cape Town, South Africa

Palak Gupta
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Parth Shinde
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Pawar Sunil Trimbak
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Prashant Bhagwat
Durban University of Technology, South Africa

Sergey Suchkov
The Russian University of Medicine and The Russian Academy of Natural Sciences, Russia

Sergio Bordel
University of Valladolid, Spain

Shweta Gupta
University of San Diego, USA

Sinem Durmus
Izmir Katip Celebi University, Türkiye

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Stefanie Kurtz
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Queen Mary University of London, United Kingdom

Youngwook Ham
Korea Research Institute of Bioscience and Biotechnology, Republic of Korea

Yu-Chieh Wu
Institute of Physiology, CAS, Czech Republic

Thank You All...

Welcome Message

Thomas J. Webster, Ph.D.

Interstellar Therapeutics, USA

Without a doubt, tissue engineering and regenerative medicine has revolutionized medical research over the last several decades. With new biomaterials, stem cells, growth factors, and more, research in tissue engineering and regenerative medicine has exploded. But, where are the products ? Are we doing enough to translate tissue engineering and regenerative medicine into real products ? Are companies not paying attention to this wonderful research ? Are Universities not doing enough to license academic research or start new companies ? What about federal funding agencies ? Are they supporting the commercialization of tissue engineering and regenerative medicine ? Are you in the right environment to commercialize your research ?

Well in my own experience, above all else, it takes a supportive environment. It takes a proper mind set to translate lab research into commercial products. It takes determination and fortitude to see it through. You need to surround yourself by the right people – and if you are currently not around a supportive optimistic environment, leave ! Leave the University you are at - I did ! And once I found a supportive environment, I was able to not only start a company on my research, but commercialize my over 25 years of University research into medical devices now in over 30,000 patients with no implant failures. No infection. No chronic inflammation. No implant loosening. No failures. My most successful product is a nanotextured spinal screw (originally developed through over 10 years of hard academic research) which has never failed in humans to date. Since conventional spinal screws have an average failure rate of 5-10%, this is quite an improvement. An improvement to health. An improvement to life expectancy. And an improvement to tissue engineering and regenerative medicine.

So I encourage everyone to find that right environment. Attend TERMC 2024 ! Meet the right people ! Be energized by optimistic people ! At TERMC 2024 we will not only discuss the next tissue engineering and regenerative medicine breakthrough, but more importantly, we will discuss how to commercialize it !

I look forward to seeing everyone in Rome !

Welcome Message

Dr. Luis Jesús Villarreal Gómez

Autonomous University of Baja California, Mexico

It is an honor and pleasure to welcome you to the 4th Edition of the Euro-Global Conference on Biotechnology and Bioengineering (ECBB-2024). Our field is advancing at a remarkable pace, with groundbreaking innovations in gene editing, synthetic biology, and bioengineering transforming the landscape of medicine, agriculture, and environmental sustainability. These advancements not only offer unprecedented opportunities for scientific discovery but also provide practical solutions to some of the world's most pressing challenges. As we gather here, let us embrace the spirit of collaboration and innovation, sharing insights and forging partnerships that will drive the future of biotechnology and bioengineering. Together, we can harness the power of these technologies to create a better, healthier, and more sustainable world.

ABOUT
MAGNUS GROUP

Magnus Group, a distinguished scientific event organizer, has been at the forefront of fostering knowledge exchange and collaboration since its inception in 2015. With a steadfast commitment to the ethos of Share, receive, grow, Magnus Group has successfully organized over 200 conferences spanning diverse fields, including Healthcare, Medical, Pharmaceutics, Chemistry, Nursing, Agriculture, and Plant Sciences.

The core philosophy of Magnus Group revolves around creating dynamic platforms that facilitate the exchange of cutting-edge research, insights, and innovations within the global scientific community. By bringing together experts, scholars, and professionals from various disciplines, Magnus Group cultivates an environment conducive to intellectual discourse, networking, and interdisciplinary collaboration.

Magnus Group's unwavering dedication to organizing impactful scientific events has positioned it as a key player in the global scientific community. By adhering to the motto of Share, receive, grow, Magnus Group continues to contribute significantly to the advancement of knowledge and the development of innovative solutions in various scientific domains.

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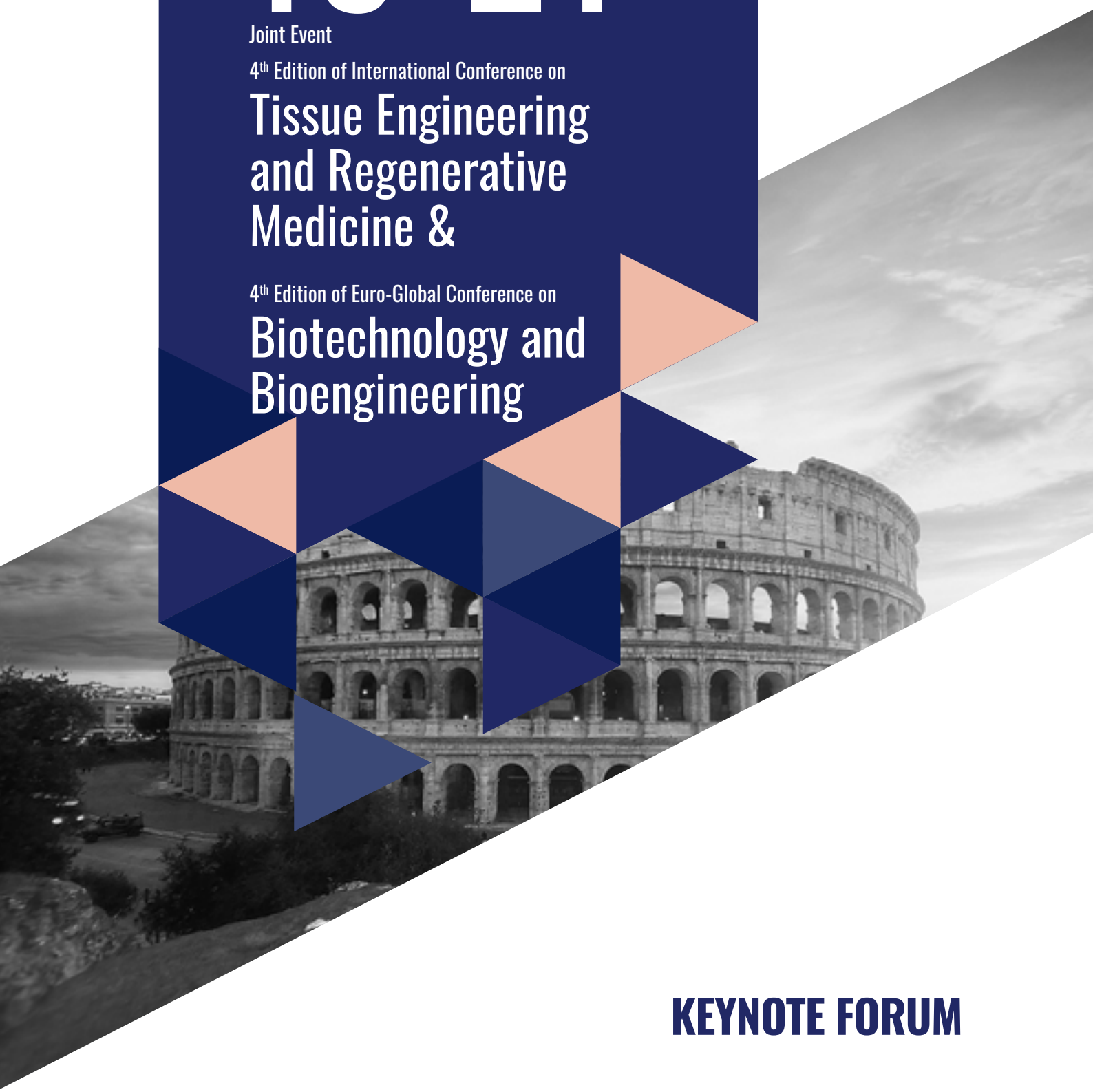


KEYNOTE FORUM

Pressure plate analysis in musculoskeletal injuries: An overview

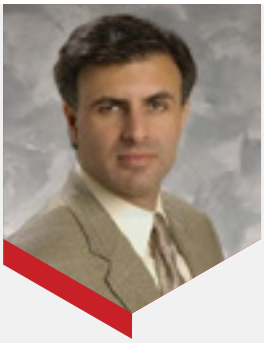
Musculoskeletal injuries are extremely common in both humans and animals. The prevalence of musculoskeletal injuries has increased due to a number of variables, such as decreasing physical activity, higher life expectancy, and professional athleticism. Joint deterioration is a frequent and expected occurrence in the elderly population. Less movement and weakened soft tissues and muscles put more strain on the cartilage in the bones and joints. A global issue, emerging obesity is a precursor to numerous illnesses. More weight puts more biomechanical strain on the joints, ligaments, and tendons. As a result, joint degeneration is becoming more of an issue in both human and veterinary medicine.

The diagnosis of such musculoskeletal injuries can be challenging for medical professionals. It is considerably more difficult for patients who are unable to interact with medical staff in an efficient manner. Young children, anyone with communication impairments, and of course animals would be examples. To put it simply, the pain makes you transfer your weight to the other limb from the injured one. Until recently, visual observation has been the primary method used to diagnose weightbearing fluctuations. According to recent research, human visual examination is not perfect and is prone to error. The visual examination can be readily distorted by variations in the observation's direction, angle, and light exposure. Recent developments in biomedical technologies have made it possible for us to identify minute variations in weight-bearing that are readily overlooked.

Force plates have been the gold standard for this use; nevertheless, their installation requires specialized space and facilities and is not user-friendly for regular practitioners. Force plates can be replaced with pressure plates, which don't require installation and have user-friendly software. Podiatrists, among other practitioners, are using technology to identify patients with abnormalities in foot placement and weight bearing. When creating the appropriate orthotics and medical equipment for those people, this is incredibly helpful. In contrast, they can serve as an important diagnostic tool in veterinary medicine. Pressure plates have been used to assess patients' recovery from surgical or medical treatments, as well as the effectiveness of medical devices, and to identify lameness in a range of species, including humans and animals. They have been shown to be very practical and is expected to be used by more and more practitioners over next years.

Audience Take Away Notes

- This talk introduces the use of new technologies in diagnosis and understanding of imbalances of weight distribution in patients with musculoskeletal injuries.



Babak Faramarzi DVM, MSc, CVA, PhD.

Western University of Health Sciences, College of Veterinary Medicine, Pomona, Ca, USA

Biography

In 1995, Dr. Babak Faramarzi obtained his DVM. In 2008, he graduated with a master's degree and a doctorate in biomedical sciences from the University of Guelph in Canada. His studies are mostly concerned with diagnostic imaging and gait analysis. He is a tenured professor at the Western University of Health Sciences in the US. For the past 30 years, Dr. Faramarzi has served as a practitioner and an educator. He has won numerous honors over his career, including the Innovation Champion Award, Research Excellence Award, Teaching Excellence Award, and most recently, the "International Equine Veterinarian Hall of Fame" induction.

- Recent technological advances have provided new avenues for diagnostic and long-term analysis of patient monitoring.
- This technology is becoming more available and is user-friendly.
- More and more practitioners are using such advanced technologies and it is a growing filed.
- Data obtained from advanced gait analysis is more accurate and superior to merely visual examination by human eyes of weight bearing imbalances in patients.

Cell and gene therapies in models of vascular brain disorders

Cell and gene therapies hold promise for brain repair in disorders of the central nervous system. Here, I will focus on stroke and brain disorders associated with vascular dysfunction, particularly blood-brain barrier (BBB) breakdown.

I will review the basic pathophysiology of ischemic stroke and the types of different stem and progenitor cells that have been studied to promote brain repair after stroke. I will examine recent clinical trials with results using stem cells for treating stroke and preclinical studies using cell therapy for stroke Specifically, I will provide more detailed results from one of our earlier studies showing that 3K3A–activated protein C (APC) stimulates postischemic neuronal repair by human neural stem cells in mice.

APC is a blood protease with anticoagulant activity and cell-signaling activities mediated by the activation of protease-activated receptors 1 and 3. Recombinant variants of APC, such as the 3K3A-APC (Lys191–193Ala) mutant with reduced (>90%) anticoagulant activity, engineered to reduce APC-associated bleeding risk while retaining normal cell-signaling activity, have shown benefits in preclinical models of ischemic stroke, brain trauma, multiple sclerosis, amyotrophic lateral sclerosis and different systemic disorders. 3K3A-APC has advanced to clinical trials as a neuroprotectant in ischemic stroke. I will show that late postischemic treatment of mice with 3K3A-APC stimulates neuronal production by transplanted human neural stem and progenitor cells, promotes circuit restoration and improves functional recovery.

Then, I will examine potential of human iPSC-derived brain pericytes (iPSC-PC) that we have been developing recently as a possible replacement therapy for neurological disorders associated with BBB breakdown and pericyte deficiency such as Alzheimer's disease and related neurodegenerative disorders. Pericytes maintain BBB, and their loss leads to BBB breakdown and neuronal dysfunction. Thus, replacement of lost pericytes holds potential to restore cerebrovascular and potentially neuronal function. Our quantitative analysis of total proteome and phosphoproteome indicated that human iiPSC-PC share 96% of total proteins and 98% of protein phosphorylation sites with primary human brain pericytes including cell adhesion and tight junction proteins, transcription factors, and different protein kinase families of the human kinome. Functionally, they increase BBB integrity in human and mouse models of BBB, and they home to host brain capillaries in pericyte-deficient mice to form hybrid human-mouse microvessels. They also exert neuroprotective effects in pericyte-deficient mice and clear Alzheimer's amyloid-β and tau neurotoxins.

Berislav V. Zlokovic

Zilkha Neurogenetic Institute and Department of Physiology and Neuroscience, Keck School of Medicine, University of Southern California, Los Angeles, California

Biography

Berislav V Zlokovic is University Professor, Director of the Zilkha Neurogenetic Institute, and professor and chair of the Department of Physiology and Neuroscience at the University of Southern California. Berislav V Zlokovic identified the cellular and molecular mechanisms causing blood-brain barrier (BBB) dysfunction and breakdown and showed that BBB dysfunction/breakdown can initiate neuronal and synaptic dysfunction and is an early biomarker of human cognitive impairment. Thomson Reuters/Clarivate Analytics listed Zlokovic as one of "The World's Most Influential Scientific Minds" 2002-2023 for ranking in top one percent of the most-cited authors in the field of neurosciences and behavioral sciences for 21 consecutive years.

Finally, I will discuss our recent work showing that gene therapy directed at restoring lost low-density lipoprotein receptor–related protein 1 (LRP1) at the BBB improves cerebrovascular and neuronal function. LRP1, a cell signaling transmembrane protein, clears proteinaceous toxins at the BBB, but is increasingly reduced in Alzheimer's disease associated with BBB breakdown and neurodegeneration. I will show that LRP1 inactivation from the mouse brain endothelium results in progressive BBB breakdown, followed by neuron loss and cognitive deficits, which is reversible by brain endothelial-specific LRP1 gene therapy.

Audience Take Away Notes

- The types of different stem and progenitor cells that have been studied to promote brain repair after stroke.
- Recent clinical trials with results using stem cells for treating stroke and preclinical studies using cell therapy for stroke.
- Late 3K3A–activated protein C therapy after stroke to stimulate postischemic neuronal repair by transplanted human neural stem cells in mice.
- Potential of human iPSC-derived brain pericytes (iPSC-PC) as a possible replacement therapy for neurological disorders associated with blood-brain barrier breakdown such as Alzheimer's disease and related neurodegenerative disorders.
- Gene therapies specifically directed at the blood-brain barrier to improve cerebrovascular and neuronal function due to loss of a lipoprotein receptor.
- This research may help other faculty to expand their research and teaching.
- The audience will learn about practical solutions used with different types of stem and progenitor cells for stroke and how their survival in brain after transplantation of human neural stem and progenitor cells can be promoted by agents that stimulate neurogenesis and formation of neuronal circuits such as for example 3K3A-APC.
- They will learn about potential of iPSC-derived pericytes to improve cerebrovascular and neuronal function and clear Alzheimer's toxins from brain.
- They will also get a better idea that gene therapy directed at the BBB can restore cerebrovascular integrity and slow down development of neurodegenerative and cognitive changes.

Immunogenicity of therapeutic antibodies: Role of aggregation in T lymphocyte response

Immunogenicity has been described as a major concern to the clinical use of therapeutic antibodies, as treated patients frequently develop Anti-Drug Antibodies (ADA) with potential neutralizing capacities leading to loss of clinical response. Among other factors, it is now well accepted that protein aggregation is associated with an enhanced potential for immunogenicity. Moreover, the presence of ADA suggests a CD4 T-cell dependent adaptive immune response and therefore a pivotal role for antigen presenting cells, such as dendritic cells.

This talk will focus on the optimization of in vitro methods to evaluate the potential of aggregated therapeutic antibodies to induce early adaptive immune responses that could drive ADA development.

We first developed a model of nano-sized, well-characterized Infliximab (IFX) aggregates by exposing the native antibody to ultraviolet light. Then, using an original autologous co-culture model with monocyte-derived Dendritic Cells (moDC) and CD4 T cells, we identified a higher frequency of CD4 T cells specific of IFX aggregates compared to the native antibody. Even though IFX aggregates did not induce moDC maturation, they tend to be more internalized by healthy donors' moDC compared to native IFX, with endocytosis being the main pathway. The implicated receptors and mechanisms are currently under investigation. Our results indicate that nano-sized aggregates have a significant role in immune system activation, emphasizing the importance of assessing the implicated cellular mechanisms that drive the immune response to aggregated proteins. In conclusion, cell-based assays are valuable tools to anticipate and prevent immunogenicity of therapeutic antibodies.

Audience Take Away Notes

- Immunogenicity due to aggregation of therapeutic antibodies represent a significant challenge and our study highlights the importance of evaluating the immune effect of small aggregates as they could increase the probability of recruiting aggregate-recognizing CD4 T cells.
- Audience will learn information regarding the impact of therapeutic antibodies aggregates on innate and specific immune responses, and also some keys about the potential mechanisms that could give rise to immunogenicity.
- The presented data allow to gain insight the internalization and processing mechanisms of monoclonal antibodies by dendritic cells.
- In vitro cell-based models are non-clinical valuable tools for the assessment of therapeutic antibodies immunogenicity, and therefore can help for screening of therapeutic antibodies under development

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[2]Université Paris Saclay, CNRS UMR 8612, Institut Galien Paris Saclay, 91400 Orsay, France

Biography

Dr. Isabelle Turbica is Assistant Professor in Biotechnology, at the School of Pharmacy of Paris-Saclay University since 2002, with skills that focus on therapeutic protein engineering and production. She is in charge of the Master degree "Pharmaceutical biotechnology and advanced therapies". Her research field of interest deals with the immunogenicity of biotherapeutics, as she develops cellular models to assess the potential of aggregated therapeutic proteins to induce immune responses. She's now interested in the description of cellular mechanisms involved in the activation of dendritic cells by the aggregates, along with the description of the switch towards adaptive immune responses, allowing the production of anti-drug antibodies.

Modifications of chitin-glucan complex in ionic liquids: A tool to generate nanostructured materials for tissue engineering

Chitin and related chitosan are important biopolymers with antibacterial activity, even more medically relevant effects possess various types of water soluble glucans. Both polysaccharides are present mainly in various fungi like Aspergillus niger, which also contain important or even dominant fraction of Chitin-Glucan Complex (CGC). In spite of its high suitability for different medicinal applications, the potential of CGC is not fully exploited due to insolubility in most of traditional solvents. In this area is most effective way application of various Ionic Liquids (IL), which allow or even support many chemical modifications. In this work we focused on parallel modifications of both constituents of CGC, including grafting of polymer chains. Presented are effects of modification on solubility in IL and other solvents including formation of self-assembled structures. In the case of polycaprolactone and polylactide chains grafting, effects of such modifications on ordering in IL is highlighted. This work was supported by Ministry of Education Youth and Sports of the Czech Republic (Grant LUAUS 23004).

Audience Take Away Notes

- Highlighting of chemical modifications of CGC
- Effect of chemical modifications of CGC on ordering in IL
- Introduction of a new tool to prepare CGC-based nanostructures

Ivan Kelnar*, Miroslav Janata

Institute of Macromolecular Chemistry, Czech Academy of Sciences, Heyrovského nám. 2, Praha 162 00, Czech Republic

Biography

Ivan Kelnar is head of the Department of nanostructured polymers and composites at the Institute of Macromolecular Chemistry, Academy of Sciences of the Czech Republic. His research is mainly focused on structure-properties relationships in polymer systems with complex structures, especially rigid/soft self-assembled nanostructures and interfaces also based on modified polysaccharides. Most of the research is done within national and international projects, published in more than 100 research articles.

Deep learning-based survival analysis of omics and clinicopathological data

Consider the problem of assessing the success of a treatment A and treatment B in cancer patients. The response variable is Y, the patient's survival in days, and the clinicopathological variables are age, sex, gene expression, and so on. Such data is often censored, meaning that some patients survived past the end of the study, while the actual survival time is unknown. One can not use regression to find an association between the clinicopathological variables and the response variable, and one can not use the two-sample test (neither Wilcoxon nor t-test) to compare those treated with A vs B. Ingenious algorithms were constructed to answer inferential questions. The three main methodologies of survival analysis are: (1.) the Kaplan-Meier estimate for a graphical comparison, e.g. --Do patients live longer with treatment A vs treatment B, (2.) the Log-rank test, a non-parametric two-sample comparison of censored data, permits one to answer the question: Is treatment A really better than treatment B, or this is just random variability? (3.) Cox proportional hazard model allows for a full regression analysis of censored data. From 1975 till now, survival analysis has been a gold standard in medical statistics. The deep era has brought undeniable improvement for the image modality, e.g. in radiomics. Yet, for omics data with p>>n, where p is the number of features and n is the number of patients, the improvement is questionable. What one would want from a deep variety of survival analysis? Do clinical protocols already exist? What the algorithm designer should keep in mind when proposing a new algorithm? The 2017–2024 period has been prolific in the area of the algorithms for deep-based survival analysis. We have searched the answers to the following three questions. (1) Is there a new "gold standard" already in clinical data analysis? (2) Does the DL component lead to a notably improved performance? (3) Are there tangible benefits of deep-based survival that are not directly attainable with non-deep methods?

Audience Take Away Notes

- Survival analysis is the "gold standard" of medical statistics. A non-expert will learn the three main methods that allow inference regarding the patients' survival. Expert audience will learn about advantages and non trivial shortcomings of the deep learning paradigm in survival analysis.
- Teaching personnel can include the new material as an expansion of the classical survival analysis, both in theory and labs, as all the mentioned methods have open source libraries. Clinical bioinformaticians can include the new deep methods, as their uses have appeared this year in the central clinical journals not only as technical research but as tools for routine analysis of clinical data.
- Survival analysis is included in undergraduate curriculum for medical and technical students, however it is also a developing research field. It is central in bioinformatics analysis especially in cancer research.

Julia Sidorova

Bioinformatics Platform, Centro de Investigación Biomédica en Red Enfermedades Hepáticas y Digestivas (CIBEREHD), Instituto de Salud Carlos III, Monforte de Lemos 3-5, Pabellón nº 11, 8029 Madrid, Spain

Biography

Julia Sidorova was born in 1980, PhD from Universidad Pompeu Fabra in 2009, Spain. After an extensive and international postdoctoral training in algorithms and bioinformatics (incl. Universidad Carlos III de Madrid, ETH-Zurich), She served as an Assistant Professor at Blekinge Institute of Technology, Sweden, where She was predominantly working in industrial projects with Sony, Boeing, Telenor, Ericsson. In 2019/2020 she held a position of honour at Universidad Complutense de Madrid and was an Adjunct Professor teaching research methodology and deep learning at KTH Royal Institute of Technology, Stockholm. From 2021, She has been Senior Researcher in service at the CIBER, the Spanish national consortium of hospitals. As far as research is concerned, her interests lie in classical data analysis vs deep neural networks,--understanding their suitability or deficiencies. She also serves on the Editorial Board of Frontiers of Neuroscience (Biomakers).

3D bioprinted cardiovascular tissue model for space based applications

Microgravity is one of the most significant stress factors experienced by living organisms during spaceflight. Controlled in vitro studies of cells and tissues under the conditions of microgravity can improve our understanding of gravity sensing, transduction and responses in living cells and tissues. Cells exposed to microgravity show reorganization of the cytoskeletal system, altered proliferation and increased apoptosis. Most culture systems used to study effects of microgravity are limited by the 2D confines of the culture dish. This limits proliferation and differentiation of cells in 2D which could potentially limit cell-cell interactions that is important for developing the level of organization in tissue obtained in vivo. 3D culture in microgravity can profoundly modulate cell proliferation and survival by allowing cells to self-organize by aggregation and facilitate spatially unrestricted interactions between cells and their surroundings. Research studies have demonstrated that exposure to microgravity in space leads to cardiovascular deconditioning in astronauts by inducing adaptive alterations in vascular structure and function which is measured through cell morphological studies and gene expression. Although microgravity clearly alters gene expression of cells in culture and induces the aggregation of cells into tissue-like structures, each cell appears to have cell-specific responses to microgravity and therefore mechanical characterization is conducted on the 3D bioprinted constructs to assess the contractility of the tissue. This 3D bioprinted tissue model will help in understanding the effects of microgravity on endothelial dysfunction by studying the changes in the 3D construct embedded with endothelial cells, forming the inner wall of the vasculature. 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. These bioprinted constructs are finally exposed to 3-D clinostat Gravite microgravity simulator system available at NASA KSC over a period of 24-72 hours. Following exposure, biochemical analysis is performed by measuring the availability of Nitric Oxide (NO) and Reactive Oxygen Species (ROS) generation and compared with the controls.

Kunal Mitra

Biomedical Engineering, Florida Tech, Melbourne, FL, USA

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.

Antimicrobial electrospun fibrous scaffolds and their potential use as wound dressings

Traditional wound dressings historically served to clean, shield, and safeguard wounds from external factors. However, the right dressing choice can expedite healing, provide cost-effective care, and enhance a patient's well-being. Electrospun fibers, renowned for their varied traits like biocompatibility, biodegradability, adequate strength, and moisture retention, have gained popularity. A sought-after feature is the ability to combat microorganisms. Thus, this research aims to propose a wound dressing system using functionalized electrospun nanofibers comprising Poly (Caprolactone)/Poly (Vinyl Pyrrolidone) (PCL/PVP) blended with a nanocomposite of Chitosan/Silver Nanocrystals/Graphene Oxide (ChAgG). The ChAgG nanocomposite combines Chitosan from corn, silver nanocrystals sourced from garlic, and Graphene Oxide. To achieve this, the fibers underwent functionalization with a ChAgG nanocomposite solution via blending electrospinning in varying proportions (1%, 5%, and 10%). Characterization techniques such as Infrared Spectroscopy (FTIR), X-ray Photoelectron Spectroscopy (XPS), and Transmission Electron Microscopy (TEM) determined the nanocomposite composition. Scanning electron microscopy analyzed the resulting fibrous dressings' morphology and diameter. Thermal analyses (TGA and DSC) and FTIR confirmed ChAgG's incorporation into the fiber matrix. Mechanical property assessments indicated that the 5% ChAgG formulation showed promise and suitability for wound dressing applications. Future studies might explore cytotoxicity, antimicrobial activity, and animal testing to further establish the system's effectiveness. These findings hold the potential to develop an optimized antimicrobial wound dressing poised to compete in today's market.

Audience Take Away Notes

- The audience will learn about the basis of the electrospinning technique, the potential use of electrospun nanofibers, method for surface modification of these fibrous smart in order to promote bioactive properties such as antimicrobial, desired mechanical properties and biocompatibility. Audience interested in biomedical devices, biomaterials and drug delivery system will be benefited

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Biography

Dr. Luis Villarreal is a research professor at the Faculty of Engineering Sciences and Technology, Autonomous University of Baja California, Tijuana, Baja California, Mexico. So far, Dr. Villarreal has published 43 indexed articles, with a total of 742 citations in Scopus. He has participated in more than 55 national and international congresses. Founder and editor-in-chief of the Revista de Ciencias Tecnológicas (RECIT), member of the editorial board of important publishers such as Bentham, MDPI, Hindawi and referee of 183 articles. Evaluator of research projects in Mexico, Italy, Malaysia and Peru. His research lines Biomaterials, Tissue Engineering, Drug-Release Systems and Biotechnology.

Connections between modern physics and practice regenerative medicine

A new autologous regenerative therapy, consistent with the laws of modern physics, is effective for antiaging and for some diseases difficult to treat in veterinary medicine.

This presentation briefly explains a very complex theory that is realized in a simple application technique that does not require laboratories.

The videos depict neurological, orthopedic, dermatological and other pathologies.... considered incurable in veterinary medicine, and their evolution.

This advanced type of regenerative therapy comes from the subtle energy contained in the blood assisted by the activation of progenitor stem cells and other blood components in to through chemical, electromagnetic and thermodynamic energy.

The blood subsystem activated in this way, is sterilized from exogenous and endogenous contamination by an oxygen-ozone mixture.

The in vivo application, in use for more than 10 years on a few thousand cases, following a consolidated protocol, has not had any side effects and during this long period of therapeutic application a great antiaging effect was observed.

The effects produced by the energetic dimension that vibrates under matter are directed to pathological causes, not only to symptoms, thus offering the best disease prevention.

The small amount of "activated blood", according to Weber and Fechner's "Theory of the least stimulus" law, is inoculated systemically and locally in the neuro-epidermal points, those that for Robert Becker are the most active in tissue regeneration.

In the presentation I will show some very suggestive videos to prove the theory

Audience Take Away Notes

- Audience will learn to use concepts of modern physics applied to a simple, autologous regenerative medicine practice without side effects
- Before they have to understand the theory and in the future, when the physics of quantum, attractors, fractals and resonance will have replaced Newton's physics in Medicine, they will be able to use a simple and non-invasive way to treat various types of pathologies
- The benefits will be the sterility by exogenous and endogenous contamination of the autologous sample used, the simplicity of collection and inoculation and the elimination of sending to laboratories for preparation

Marco Polettini DVM

DVM, Italy

Biography

Marco Polettini was born in Rome (Italy) on Dec.08.1954. He graduated in Veterinary Science at Pisa (Italy) University in 1979. He was official vet of the Italian Horse Team at the Olympic Games in Barcellona, at the European Games in Austria and at the World Wide Games. He developed a theory that previewed that adult pluripotent stem cells could exist in blood, and he found collaboration between his society and Tor Vergata Rome University, biologically confirming his idea. He has published several international papers and has written 4 books about regenerative medicine.

Biotech scale-up: Bioengineering imperatives in biomanufacturing

During the recent pandemic, it became clear that the main deterrence of manufacturing of newly discovered vaccines was the implementation of prerequisite bioreactor design, operation and control for commercial production. The range of imperatives for success can be wide and complicated in relevant industrial practice. In laboratory experiments, we have encountered concerns of oxygen mass transfer limitations, instability of genetically-engineered microbial hosts for fermentation processes, and rheological irregularities in bioreactor media. Our examples here include wave-induced aeration bioreactor design, reference to regular mechanical stirred-tank and air-lift fermenters, Crispr-based microbial host delivery pattern derivatives, and energy processing requirements. Relevance of geopolitics in biotechnology innovations are observed in the global eco-systems.

Audience Take Away Notes

- All aspects noted here could be covered in the presentation and Q/A session following, as an idea/discovery of the audience quality/ education is deciphered by that time. In addition, relevant consulting of my (EIC) major reference work, Comprehesive Biotechnolgy (Elsevier) would be instructive, completely.

Keywords: Bioprocess Engineering; Fermentation Process Aeration; Bioreactor Design, Operation, Control; Fermentation Kinetics-Relevance; Biomanufacturing Bottlenecks; Biotechnology Geopolitical Interferences; Multidisciplinary Nature Of Biotechnology; Employment Constraints In Biomanufacturing.

Murray Moo-Young*, Perry Chou, Bill Anderson

Dept. of Chemical Engineering, University of Waterloo, Waterloo, Ontario, Canada

Biography

Murray Moo-Young is a distinguished professor emeritus at the University of Waterloo, Canada, where he supervises postgraduates in bioengineering research. His university education includes BSc, PhD (London), MSc (Toronto), postdoctoral fellowship (Edinburgh). He is recipient of prestigious awards from professional organizations including the American Chemical Society, American Institute for Medical and Biological Engineering, Canadian Society for Chemical Engineering, the Royal Society, IUPAC, UNESCO. He is the founding executive editor of the hi-impact journal, Biotechnology Advances, and the six-volume encyclopedic major reference work, Comprehensive Biotechnology (Elsevier). He has numerous peer-reviewed journal publications. He is a consultant to industry, government and academia worldwide.

Pretilachlor-induced physiological, biochemical and morphological changes in Indian paddy field agroecosystem inhabited *Anabaena doliolum*

Pretilachlor is a systemic, pre-emergence herbicide applied in the paddy fields to kill narrow and broadleaf weeds. The present study evaluates the toxicity of pretilachlor on the non-target diazotrophic free-living cyanobacterium Anabaena doliolum, commonly found in the paddy fields of eastern Uttar Pradesh (India) and used as a biofertilizer. A.doliolum was subjected to several doses (0, 2, 5, 7, 10, 20 and 40 µg/ml) of pretilachlor and its effects were examined in terms of alterations in cellular morphology, ultrastructure, physiology, and biochemical attributes. The treatment of pretilachlor decreased the growth, total pigment content and photosynthetic efficiency of the test organism in a dose-dependent manner. The decline in growth was observed on 20th day at 2, 5, 7, 10, 20 and 40 µg/ml of pretilachlor concentration by 4, 9, 26, 47, 71 and 92%, respectively. Furthermore, Chlorophyll a and phycocyanin levels were noticeably declined. As a result, the photosynthetic performance also registered a similar decline as measured by chlorophyll fluorescence. However, carotenoid content increased by 13%, 41% and 53% at 5, 10 and 20 µg/ml on 5th day reflecting its protective property. A marked increase in fluorescence intensity and malondialdehyde content by 2.65 and 2.45 folds at 10 and 20 µg/ ml on 7th day was registered. The enzymatic antioxidants (SOD and CAT) and a concurrent increase in glutathione reductase activity were registered (1.75 and 2.11-fold at 20 and 40 µg/ml on 5th day), indicating pretilachlor mediated ROS generation. Moreover, ultrastructural studies done by SEM and TEM revealed plasma membrane and thylakoid membrane damage and fragmentation. These findings have contributed to the broader comprehension of the stress responses triggered by pretilachlor in cyanobacteria. Moreover, they can aid in the evaluation of the detrimental impact of pretilachlor on A. doliolum, given their crucial function as a nitrogen contributor in paddy fields.

Audience Take Away Notes

- The repeated use of the herbicide pretilachlor can have detrimental effects on environment-friendly paddy field N2-fixing cyanobacteria in higher concentration environments than on those growing in sufficient lower herbicide concentration environments, indirectly affecting paddy production and endangering global food security.
- The adverse effect observed including inhibition of growth, distruption of cellular morphology and potential alteration in metabolic process on cyanobacterium Anaaena doilolum, emphasize the vulnerability of aquatic organism to this herbicide.
- As we navigate the intricate balance between agricultural practice and environmental preservation, it is imperative to consider the potential repercussions on other non target species.
- Ultimately, fostering a sustainable coexistence between agriculture and food security demands a thoughtful and science driven approach to herbicide management.

Tripti Kanda[1], Rupanshee Srivastava[1], Sadhana Yadav[1], Nidhi Singh[1], Shivam Yadav[2], Prof. Neelam Atri[1]*

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Biography

Dr. Neelam Atri studied Botany at Banaras Hindu University, Varanasi and post graduated in the year 1997. She received her PhD in the year 2002 at the same institute. After one year of postdoctoral fellowship supervised by Dr. L.C Rai. She obtained the position of an Assistant professor at the Banaras Hindu University, Varanasi. She has published more than 40 research article in SCI (E) journals.

Personalized and Precision Medicine (PPM) as a unique healthcare model to secure the human healthcare, wellness and biosafety: Through the view of cell-based therapy and rehabilitation

A principally new and upgraded systems approach to subclinical and/or diseased states and wellness resulted in a new trend in the healthcare services, is called as *Personalized and Precision Medicine* (PPM). But despite breakthroughs in translational research that have led to an increased understanding of PPM-based human disease, the translation of discoveries into therapies for patients has not kept pace with medical need.

Genomics and *Genomics editing* have raised great expectations concerning the impact on PPM-related customizing the individualized treatment based on the use of *genomic products* and development of *targeted drugs*. So, PPM has progressed into fields such as gene therapy and surgical treatment/design. And thus the targeted gene-based therapies today represent an important stake for the clinical community, patients, persons-at-risk and biopharma, in terms of market access, of return on investment and of image among the prescribers.

Meanwhile, most disease, trauma, cancer and regeneration-related pathologies are consequences of cellular damage at differing levels. And the key to the mitigating cell and/or tissue damage repair needs cell therapy which, in turn, is becoming a promising treatment that can be tailored not only to an illness but also to an individual patient and even for a person-at-risk. So, simultaneously, *regenerative medicine* and *cellular therapy* use *cell-rooted products* in order to develop PPM-based treatments being based on different sources of Stem Cells (SCs) which are being used in targeted therapies whilst providing a *personalized approach* and could give many advantages as well, including a possibility for SC-based *individualized therapy* be adjusted according to the patient-specific profile.

For instance, *intracerebral SC therapy* has provided promising results for treatment of Parkinson's Disease (PD). But! The method is very invasive and is often associated with unacceptable side effects which would hamper the implementation of peripheral administration of SC-derived neural precursor cells for the recovery of impaired motor function and amelioration in PD cases. So, cellular reprogramming and PPM-based approach would allow for previously unattainable cell therapies and patient-specific modeling of PD with no risks of immune rejection, using induced Pluripotent Stem Cells (iPSCs) which, in turn, is considered to be the foundation of SC-based regenerative medicine, including PD and Muscular Dystrophies (MDs). Moreover, in combination with genome editing, hiPSC technology is utilized in functional genomic screening for identification of the roles essential genes play in specific cellular

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process, whilst securing the availability of less severe phenotypes compared with patient-specific hiPSCs carrying the same mutations, and thus providing the exclusively important functional implications for PPM and PPM-based cardiac treatment.

A key role in bone tissue engineering may play *patient-derived Mesenchymal Stromal Cells* (MSCs) whose pooling would help to compensate donor-dependent variability and does not negatively influence MSC vitality, proliferation and osteogenic differentiation.

Ex vivo expansion of *Hematopoietic Stem Cells* (HSCs) can help to overcome material shortage for transplantation purposes and genetic modification protocols. But translating new findings from basic research into clinical protocols is still crucial to eventually boost SC gene therapy.

The establishment of *2D- and 3D-based intestinal SC cultures* of patient-derived epithelial tissues is becoming a promising breakthrough for treating some cases of Colorectal Cancer (CRC).

Of particular interest to be stressed on, are *SC-based therapies to strengthen the heart muscle and treat cardiovascular diseases* (including ischemic attacks and post-infarction conditions). For instance, human hiPSCs have revolutionized the field of disease modeling, with an enormous potential to serve as paradigm shifting platforms for preclinical trials, personalized clinical diagnosis, and drug treatment, whilst bridging the gap between basic and clinical research via translational bridge to bring the best science to every patient. The phenomenal achievement in this area is the identification of resident Cardiac SCs (CSCs), supposed to be a crucial source to initiate and prompt myocardial self-renewal and regeneration but can be developed inside immature cardiac cells by formation of "Cell-In-Cell Structures" (CICSs), which, in turn, being encapsulated are involved into cardiac myogenesis and thus opening up a green light to secure the targeted management of post-infarction regeneration.

The above-mentioned areas being an integral part of PPM is really an *interdisciplinary* field that results from the application of the innovative tools and approaches to medicine and has the potential to significantly improve some canonical treatments, prevention, prophylaxis and rehabilitation. The SCs would confirm a high *subclinical* and *predictive* value as tools for PPM-based monitoring protocols. SCs can be programmed and re-programmed to suit the needs of the body metabolism or could be designed for the development of principally new combinatorial (*genomics/cellomics-rooted*) drugs with no natural counterparts. So, PPM through SC therapy has many benefits that are essential for the future of personal health and wellness.

The SC market itself is predicted to grow to around $12.1 billion by 2024, whilst the true potential of regenerative medicine has yet to

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Biography

Sergey Suchkov was born in the City of Astrakhan, Russia, in a family of dynasty medical doctors. In 1980, graduated from Astrakhan State Medical University and was awarded with MD. In 1985, Suchkov maintained his PhD as a PhD student of the I.M. Sechenov Moscow Medical Academy and Institute of Medical Enzymology. In 2001, Suchkov maintained his Doctor Degree at the National Institute of Immunology, Russia. From 1989 through 1995, Dr. Suchkov was being a Head of the Lab of Clinical Immunology, Helmholtz Eye Research Institute in Moscow. From 1995 through 2004 - a Chair of the Dept for Clinical Immunology, Moscow Clinical Research Institute (MONIKI). In 1993-1996, Dr. Suchkov was a Secretary-in-Chief of the Editorial Board, *Biomedical Science*, an international journal published jointly by the USSR Academy of Sciences and the Royal Society of Chemistry, UK. At present, Dr. Sergey Suchkov, MD, PhD, is: Professor, Dept for Clinical Allergology & Immunology of the Russian University of Medicine, Moscow, Russia. Member of the Russian Academy of Natural Sciences, Moscow, Russia. Dr. Suchkov is a member of the: New

be demonstrated fully. For instance, the allogeneic or 'off-the-shelf' business model for SC-based therapies is far more akin to current biopharma-related products. So, partnering between SC-related researchers, cell bio-designers and bioengineers, cardiac clinicians and surgeons, business and regulatory bodies and government can help ensure an optimal development program that leverages the Academia and industry experience and FDA's new and evolving toolkit to speed our way to getting new tools into the innovative SC markets.

The worldwide SC therapy market is still in an early stage. And the developing translational pipelines for rising applications in the above-mentioned areas will build the competition among merchants amid the conjecture time frame.

Meanwhile, the prospective research in the above-mentioned area should focus on the identification of prognostic SC- and cardiac damage-related biomarkers to identify patient cohorts who benefit most from SC-based treatments. Thereby, a higher standardization of study designs and the establishment of a global open-access database for the registration and publication of pre-clinical and clinical trials would greatly improve the comparability and access of obtained data. And now would be extremely useful to integrate those data harvesting from different databanks for applications such as prediction and personalization of further treatment to thus provide more tailored measures for the patients and persons-at-risk resulting in improved outcomes and more cost effective use of the latest health care resources including *preventive*, *prophylactic*, *therapeutic* and rehabilitative manipulations as the new and upgraded *Restorative* ENTITY!

The latter would provide a unique platform for dialogue and collaboration among thought leaders and stakeholders in government, academia, bioindustry, foundations, and disease and patient advocacy with an interest in improving the system of healthcare delivery on one hand and drug discovery, development, and translation, on the other one, whilst educating the policy community about issues where biomedical science and policy intersect.

York Academy of Sciences, USA. American Chemical Society (ACS), USA; American Heart Association (AHA), USA; European Association for Medical Education (AMEE), Dundee, UK; EPMA (European Association for Predictive, Preventive and Personalized Medicine), Brussels, EU; ARVO (American Association for Research in Vision and Ophthalmology); ISER (International Society for Eye Research); Personalized Medicine Coalition (PMC), Washington, DC, USA. Secretary General, United Cultural Convention (UCC), Cambridge, UK.

30,000 nano implants in humans with no infections, no loosening and no failures

Nanomedicine is the use of nanomaterials to improve disease prevention, detection, and treatment which has resulted in hundreds of FDA approved medical products. While nanomedicine has been around for several decades, new technological advances are pushing its boundaries. For example, this presentation will present an over 25 year journey of commercializing nano orthopedic implants now in over 30,000 patients to date showing no signs of failure. Current orthopedic implants face a failure rate of 5–10% and sometimes as high as 60% for bone cancer patients. Further, Artificial Intelligence (AI) has revolutionized numerous industries to date. However, its use in nanomedicine has remained few and far between. One area that AI has significantly improved nanomedicine is through implantable sensors. This talk will present research in which implantable sensors, using AI, can learn from patient's response to implants and predict future outcomes. Such implantable sensors not only incorporate AI, but also communicate to a handheld device, and can reverse AI predicted adverse events. Examples will be given in which AI implantable sensors have been used in orthopedics to inhibit implant infection and promote prolonged bone growth. In vitro and in vivo experiments will be provided that demonstrate how AI can be used towards our advantage in nanomedicine, especially implantable sensors. Lastly, this talk will summarize recent advances in nanomedicine to both help human health and save the environment.

Audience Take Away Notes

- Nanotechnology improving medicine
- Sensors are usage on implantable devices to improve health
- Human clinical data with nanotextured implants

Thomas J. Webster

School of Health Sciences and Biomedical Engineering, Hebei University of Technology, Tianjin, China; School of Engineering, Saveetha University, Chennai, India; and Program in Materials Science, UFPI, Teresina, Brazil; Division of Pre-College CSO and co-founder, 12 start-up companies, Mansfield Bioincubator, Mansfield, MA, USA

Biography

Thomas J. Webster's (H index: 121; 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 in over 20,000 patients. His technology is also being used in commercial products to improve sustainability and renewable energy. He is currently helping those companies and serves as a professor at Brown University, 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. Prof. Webster is a former President of the U.S. Society For Biomaterials and has over 1,350 publications to his credit with over 55,000 citations. He was recently nominated for the Nobel Prize in Chemistry.

A real BandAId™: Incorporating Artificial Intelligence (AI) into biomaterials and medicine

Artificial Intelligence (AI) has already revolutionized numerous industries, yet, its use in nanotechnology and biomaterials is almost non-existent. This invited presentation will provide a summary of how AI can be used to design better biomaterials for various biomedical applications. In particular, AI is being used in implantable nano sensor design to prevent, diagnose, and treat various diseases from cancer to infection. AI has been used to predict what types of drug delivery vehicles will be most effective for that particular patient based on prior patient health data and real time response to therapies. It is well known that due to variants in immune systems from patient to patient, patients will respond differently to the same biomaterial and drug treatment, thus, personalized or tailored treatments are necessary and can result from AI. In vitro, in vivo, and human clinical studies will be presented in which AI has already improved medicine. In this manner, this abstract presents a positive view on the implementation of AI into medicine showing how it can be used to improve disease prevention, diagnosis, and treatment.

Audience Take Away Notes

- What is AI
- How is it being used in medicine
- How is it being used to improve biomaterial design and use

Thomas J. Webster

School of Health Sciences and Biomedical Engineering, Hebei University of Technology, Tianjin, China and Interstellar Therapeutics, Mansfield, MA 02806 USA

Biography

Thomas J. Webster's (H index: 121; 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 in over 20,000 patients. His technology is also being used in commercial products to improve sustainability and renewable energy. He is currently helping those companies and serves as a professor at Brown University, 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. Prof. Webster is a former President of the U.S. Society For Biomaterials and has over 1,350 publications to his credit with over 55,000 citations. He was recently nominated for the Nobel Prize in Chemistry.

BOOK OF ABSTRACTS

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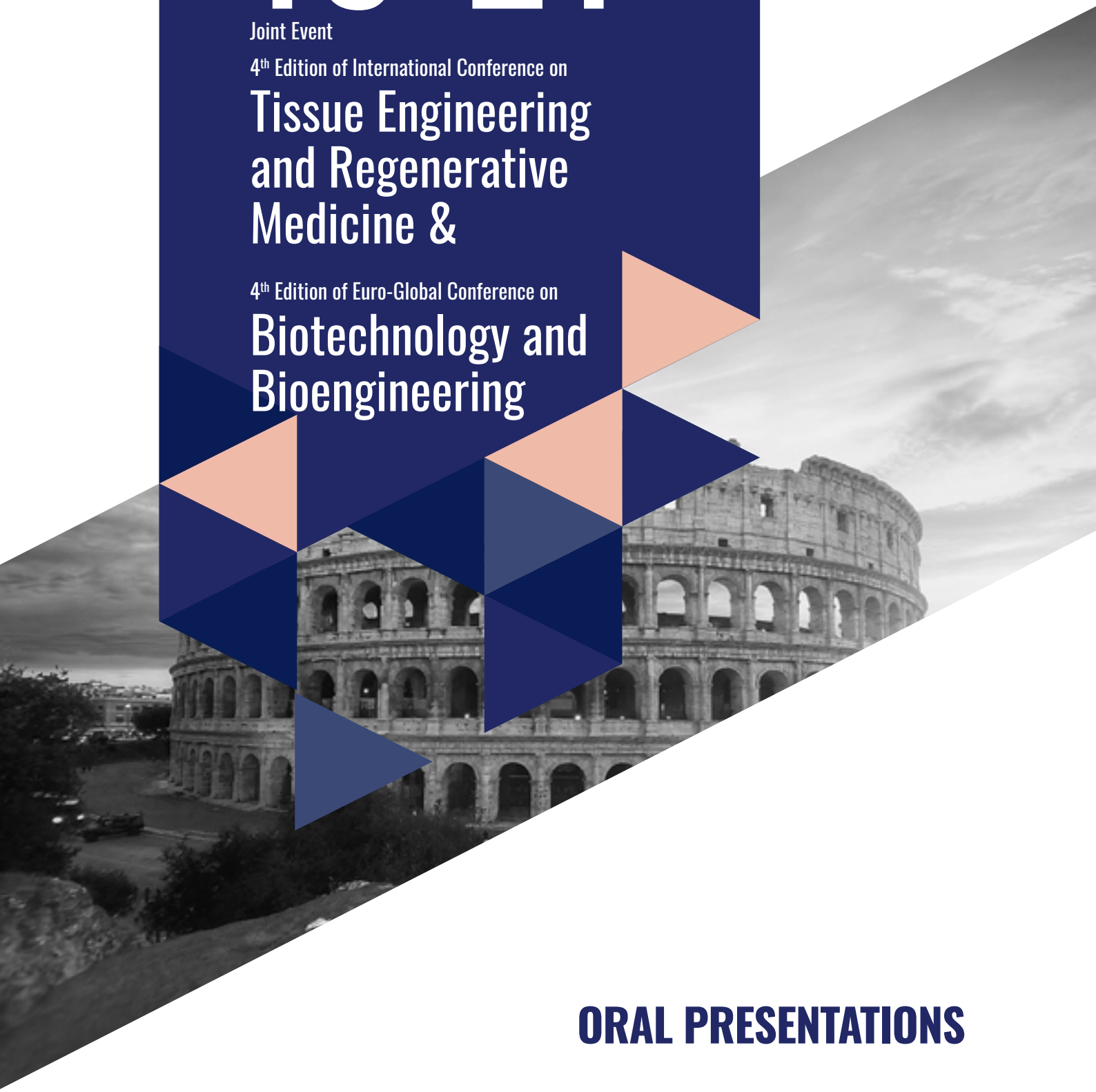
Joint Event

4th Edition of International Conference on

Tissue Engineering and Regenerative Medicine &

4th Edition of Euro-Global Conference on

Biotechnology and Bioengineering



ORAL PRESENTATIONS

Prof. Dr. Abdulsada A. Rahi Al- Ghnaimawi[1*], Assist Prof. Dr. Magda A. Ali[1], Dr. Zaid A. Rahi[2]
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Production of nanoliposomal amphotercin B topical gel as effective treatment for human Cutaneous Leishmaniasis (CL) disease

Human Cutaneous Leishmaniasis (CL) is the disease caused by Leishmania sp. parasite and it endemic in Iraq and other world countries. This study comprised 78 cases of suspected CL disease. Before treatment, 66 (84.6%) cases were positive and 12 (15.4%) cases were negative among the three treatment groups. The reduction in the percentage of cases with positive microscopical examination was more pronounced in the case of Pentostam (Sodium Stibogluconate) during the first three weeks, but Nanoliposomal amphotericin B 0.4 % becomes more effective as the percent of cases with positive microscopical examination decreases.

Using the Nested-PCR reaction, the molecular technique revealed 60 (76.9%) positive and 18 (23.1%) negative examples from 78 skin lesion samples. The best results were found with Nanoliposomal amphotercin B 0.4 % topical gel, followed by pentostam 3 (20%), and finally flagyl 3 (12%) injections, when nested PCR exams were compared between the three therapy groups during weeks of follow up.

The study found a highly significant difference in mean recovery time between treatment groups ($p<0.001$). The mean recovery time for the Nanoliposomal amphotericin B 0.4 % group was 2.87±0.67 (1-4) weeks, which was the shortest time ever documented. The mean recovery time in the flagyl group was 5.08±1.55 (1-8) weeks, which was the longest duration ever documented. The pentostam group had a mean recovery time of 4.00±1.13 (2-6) weeks, which was comparable to nanoliposomal amphotericin B0.4 % and flagyl.

In comparison to flagyl and pentostam groups, there was a significant change (reduction) in lesion size (cm) in the Nanoliposomal amphotericin B 0.4% group; however, changes in mean size were equivalent in the majority of weeks of follow up ($p>0.05$). Lesion sizes shrank after three and four weeks.

Keywords: Leishmaniasis, Human, Diagnostic Methods, Kala-Azar, PCR Methods, Nanobiotechnology.

Audience Take Away Notes

- Eco-friendly method
- The first study in Iraq
- The produced ointment was treated CL ulcers or boil without pain and decrease or remove the skin ulcers
- We hope to expand this product with the assistance of other company
- We have got 3 golden medals for this invention from Germany and Poland

Biography

Prof. Dr. Abdulsada Abdulabbas Rahi is currently working as Dean of Science College of Wasit University, Iraq. Dr. Rahi received his Postdoctoral degree on Medical Parasitology from the University of Tehran of Medical Sciences (TUMS), Iran. Dr. Rahi completed his PhD on Biotechnology of Leishmaniasis from Al-Nahrain University, Iraq. Dr. Rahi completed his Masters on Medical Microbiology from the University of Al-Anbar, Iraq. He then worked at the Institute Wasit University/ Iraq, served as Professor at the University in Medical Biotechnology. Dr. Rahi has authored several publications (67 Published papers) in various reputed journals. His publications reflect his research interests in Biotechnology and Medical Parasitology. Dr. Rahi is also an Associate Editor of the Journals: Journal of Applied Sciences and Research, Journal of Agri-Food and Applied Sciences (JAAS), Journal of Scientific Research and Studies and Scholars Academic and Scientific Journals (SAS). Dr. Scientist is serving as a member or fellow in Association of American Society for Microbiology (ASM). He is currently in charge of ongoing scholarly project Nanobiotechnology. Dr. Rahi is awarded Golden Prize by 10th International Exihibition of Inventions and Innovation Forum and 3rd World Inventions and Innovation Forum in China/Foshan and in SiriLanka, 2020. Dr. Rahi is awarded Golden Prizes from Germany 2021, 2023 and INTARG Poland 2023, 2024. Also, Dr. Rahi is awarded Scientific Day's Prize for Medical Researchs, 2014 by Iraqi Ministry of Higher Education and Scientific Research. Dr. Rahi is awarded Silver Prize by International Exihibition of Inventions and Innovation Forum in Germany/Nuremberg, 2021. Dr. Rahi is supervised PhD and MSc students and Scientific referee.

Dr. Adel Mohammadalipour[1*], Mustafa Ghanadian[2], Farjam Goudarzi[3]
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Inflammation and the osteogenesis ability of mesenchymal stem cells, the effect of natural compounds

Inflammation has a significant impact on the osteogenic differentiation and function of Mesenchymal Stem Cells (MSCs). Proinflammatory cytokines like TNF-□, IL-1□, and IL-6 have been shown to inhibit osteoblast differentiation, induce apoptosis in osteoblasts, and impair their migration and function. This disrupts the delicate balance between bone-forming osteoblasts and bone-resorbing osteoclasts, leading to abnormal bone loss or formation. The mechanisms by which inflammation impairs osteogenesis involve complex signaling pathways. Inflammatory mediators can activate the NF-□B pathway, which in turn inhibits the osteogenic differentiation of MSCs. Inflammation also alters the expression of genes and transcription factors critical for osteoblast development. Interestingly, some natural compounds have demonstrated the ability to mitigate the negative effects of inflammation on MSC osteogenesis. For example, studies have shown that compounds like curcumin, resveratrol, and vitamin D can suppress inflammatory cytokines and promote osteoblast differentiation even in the presence of inflammatory stimuli. Our previous study investigates the impact of apigenin, a natural compound, on the osteogenic differentiation of human Mesenchymal Stem Cells (hMSCs) by inhibiting inflammation through the modulation of the NF-□B/I□Balpha pathway. Apigenin was found to have stimulatory effects on osteogenic differentiation and anti-inflammatory properties. By targeting the NF-□B/I□Balpha pathway, apigenin neutralizes the inhibitory effects of inflammation on hMSCs' osteogenic differentiation. This research highlights the potential of apigenin in promoting bone formation by counteracting the negative impact of inflammation on MSCs, offering insights into novel therapeutic strategies for bone health and regeneration. In continuation of our previous study, we used the 6-prenylatedapigenin, the positive results of which will be published. So, these natural agents may help restore the balance between bone formation and resorption, making them potential therapeutic candidates for inflammatory bone diseases. In summary, inflammation significantly impairs the osteogenic potential of MSCs through various molecular mechanisms. Natural compounds with anti-inflammatory and pro-osteogenic properties may offer a promising approach to counteract the detrimental effects of inflammation on bone health and regeneration.

Audience Take Away Notes

- Understanding the mechanisms by which inflammation impairs the osteogenic differentiation and function of mesenchymal stem cells (MSCs): This knowledge can help researchers and clinicians develop targeted interventions to mitigate the detrimental effects of inflammation on bone health and regeneration.
- Insights into the potential of natural compounds like apigenin to counteract the negative impact of inflammation on MSC osteogenesis: This information can guide the development of novel, more natural therapeutic strategies for treating inflammatory bone diseases, which could be of interest to both researchers and clinicians.
- Practical solutions for restoring the balance between bone formation and resorption in the context

of inflammatory conditions: This research can help simplify the design of future in vitro and in vivo studies aimed at improving bone health, as it provides a framework for targeting the interplay between inflammation and osteogenesis.

- Opportunities for interdisciplinary collaboration: The findings presented in this summary could be of interest to researchers across various fields, including stem cell biology, regenerative medicine, and materials science, potentially leading to new synergies and expanded research direction.

Biography

Dr. Adel Mohammadalipour is an Assistant Professor in the Department of Clinical Biochemistry at Isfahan University of Medical Sciences. He earned his Doctor of Veterinary Medicine (DVM) degree from Shiraz University and later received his PhD in Clinical Biochemistry from Hamedan University of Medical Sciences in 2017. He currently collaborates with the Pharmacognosy and Regenerative Medicine Research Center, focusing on the intersection of inflammation and bone physiology. Dr. Mohammadalipour's research explores the mechanisms by which inflammatory processes can impact bone health and regeneration. Over the years, he has published more than 22 international ISI articles.

Akihiko Sakurai[1*], Masanori Hatashita[2]
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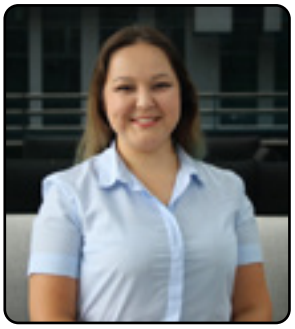
Efficient production of cordycepin, adenosine analog, by cordyceps militaris mutant

Cordyceps spp., a mushroom species that parasitizes and grows on insects, has long been used as a herbal medicine. One of its active ingredients, cordycepin, is an analog of adenosine. It is a promising raw material for pharmaceuticals and cosmetics due to its known biological activities, including antibacterial and antiviral properties. However, the conventional production method, extraction from the fruiting body of *Cordyceps militaris*, has not reached practical use due to its remarkably low productivity. Accordingly, the authors investigated the highly efficient production of cordycepin using *Cordyceps militaris* mycelia from the viewpoint of enhancement of the production performance of the strain and optimization of the culture method. A mutant strain exhibiting approximately threefold higher productivity than the wild strain was obtained by breeding using ion-beam irradiation with protons. Concerning the culture method for cordycepin production, the shaking culture method was unsuitable. The cordycepin productivity was quite low in the shaking culture. Instead, a concentration of cordycepin exceeding 10g/L was obtained using a liquid surface culture with the medium optimized using response surface methodology. However, the production rate of cordycepin by the liquid surface culture was relatively low; it took approximately 30 days to obtain 10g/L cordycepin. To enhance the production rate, we developed a rotating disc contactor, which shows low mechanical stress to the *Cordyceps militaris* and is suitable for repeated batch operation. A repeated batch culture in a rotating disc contactor further enhanced productivity, resulting in a production rate approximately five times higher than that of the liquid surface culture. The mechanism underlying enhanced cordycepin production in the mutant strain is currently being investigated at the genome and metabolome levels.

Audience Take Away Notes

- Cordycepin's usefulness as an analog of nucleic acid will be explained. The audience will be able to apply cordycepin in cosmetics or pharmaceuticals.
- The usefulness of ion beam irradiation as a breeding technique will also be presented. This technique may be applied to microorganisms for which the metabolic pathways remain unknown and for which efficient production methods by genetic modification have not yet been established.
- Introduction of the usefulness of the rotating disc contactor as a unique culture device to address the application of microorganisms that are difficult to culture.

Biography
Dr. Sakurai studied Biochemical Engineering at Hokkaido University, Japan, and graduated with a PhD in 1992. He then joined the research group at Japan Synthetic Rubber Co., Ltd., Japan. He obtained the position of an Assistant Professor at the University of Fukui in 1996 and has been a Professor at the same university since 2012. He has published over 40 research articles in SCI(E) journals.



Polikarpova A[1*], Rivero Garcia I[2], Gerber T[3], Wang J[1], Torres M[2], Sánchez-Cabo F[2], Tanaka E.M[1]
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Cellular and molecular profiling of critical bone fractures in axolotl

Axolotls regenerate the amputated limb by forming a transient progenitor pool, blastema. Descendants of the Soft Connective Tissue (SCT) cells build the blastema and contribute to the regenerating skeleton. Paradoxically, axolotls cannot heal bone Critical-Size Defects (CSD).

We aim to understand if SCT cells migrate to CSD and to identify the factors inducing SCT to contribute to bone. To investigate if SCT cells are able to migrate and contribute to cartilage in CSD, we transplanted tissues with fluorescently labelled CT cells to the wildtype host prior to fracture surgery. The labelled CT cells are migrating to the CSD gap, and some are expressing cartilage progenitor marker, SOX9. Next we assayed cell proliferation, which was diminished in CSD in comparison to blastema.

To identify the factors involved in differentiation of SCT cells to blastema versus CSD, we used bulk and single-cell transcriptomics, which showed changes in proliferation- and blastema-specific gene expression, as well as differences in interaction with wound epidermis and macrophages. Using NicheNet algorithm we examined ligand-receptor interactions in early regenerating limb and CSD. The analysis showed strong interaction of early (3-5 dpa) blastema CT cells with epidermis and macrophages. The epidermal subpopulation in BL samples, but not in CSD samples, manifested Wound Epidermis (WE) signature. As interaction between WE and stump fibroblasts is essential for activation of the latter to migrate and form blastema. In CSD, fibroblasts and epidermis did not exhibit strong connection and lacked ligand-receptor pairs present in the blastema. To understand if particular blastema-specific signaling influences transcriptome profile of CT cells, we analyzed CT GRNs in blastema and CSD.

Whole transcriptome GRN inference identified switching of Transcriptional Factor (TF) hubs, such as WNT and TGFb pathway TF. We discovered differential usage of $TCF7L_2$ and LEF1 TFs in BL and CSD and revealed members of WNT pathway possibly influencing the SCT cell fate between homeostatic and regenerative mode. We suggest to rewire GRN in CSD to induce blastema-like phenotype and eventually promote bone bridging.

Audience Take Away Notes

- Learn about an extraordinary regenerative species–axolotl.
- Comparing regeneration and fracture non-union could help to discover means to treat the latter.
- GRN construction could help predicting the regulatory hubs determining cell fate.
- The audience will be able to expand their understanding of fracture repair and regeneration in the non-conventional model organism. Moreover, the insight into bulk and single cell RNAseq, GRN construction, novel single-molecule FISH will be given.
- The presentation will expand the general knowledge on regeneration processes and offer state-of-art technological solutions for cellular and molecular analysis of fracture repair.

- The predicted candidate genes may be further tested in mammals and lead to fracture healing and appendix regeneration therapies development.

Biography

Dr. Polikarpova studied Genetics at the Kazan State University, Russia and graduated in 2012. She then joined the research group of Prof. Dr.Med. Axel Roers at the Medical Theoretical Center at the Technical University of Dresden, Germany. She received her PhD degree in 2017 for work on tumor immunology. After receiving a postdoctoral fellowship she has moved to the Institute of Molecular Pathology in Vienna to join the research group of Prof. Dr. Elly Tanaka. Dr. Polikarpova studies regeneration and bone fracture in axolotl and mouse and seeks to find the factors facilitating fracture healing.

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Application of biocompatible magnetite nanoparticles (Micromage-B) in the complex treatment of multiple sclerosis

Multiple Sclerosis (MS) is a serious neurological problem because of its high prevalence, chronic course, frequent disability, and propensity to affect young people. The immunopathogenesis hypothesis underlies the origin of MS. Selective sorption activity of biocompatible magnetite nanoparticles against surface proteins of cell membranes, circulating immune complexes, lymphocytotoxic antibodies, complement system, the effect of increasing phagocytic activity and leukocyte phagocytosis completion index allows the effective use of these nanodevices for immunocorrection. The main goal of the study is to slow down the progression of MS, improve the neurological status and general condition of the patient, and reduce the dynamics of the spread of demyelinating foci in the brain. Materials and methods: a patient diagnosed with multiple sclerosis, secondary progressive type of course, cerebro-spinal form, clinical aggravation stage; EDSS neurological status and disability assessment scales; contrast-enhanced MRI of the brain. An oral form of the nanodevice Micromage-B was used as an immunosorbent and immunomodulator. The choice of the regimen and dosage of Micromage-B was personalized. Assessment of the general condition and neurological status was performed every 7 days for 6 months. Contrast-enhanced MRI of the brain was performed at the 5th month of the study. As a result of using Micromage-B in MS treatment, objective improvement of neurological status, reduction of stiffness and rapid fatigability of the lower extremities were observed. Gait and coordination improved, hand tremors decreased, depression and signs of concentration disorders disappeared, appetite restored, and speech improved. During the entire period of Micromage-B application, positive dynamics in the normalization of the neurological status was observed. After 6 months of treatment, the total score dropped by 210 to 45. It was found that the maximum positive effect was observed in the evaluation of the pyramidal system and coordination. The EDSS Disability Scale score decreased from 6.0 to 5.0. Contrast-enhanced MRI brain examination for the first time showed a decrease in the number of new foci of demyelination in the brain by the 4th month of Micromage-B administration. The positive dynamics of normalization of the neurological status correlated with the results of brain MRI. The process of recovery of central nervous system activity in MS is not only due to the immunosuppressive properties of magnetite nanoparticles, but is probably caused by the activation of remyelination mechanisms and oligodendrocyte differentiation through enzymatic methylation. Considering the above, the use of biocompatible nanodevices in the complex treatment of MS is a promising direction. The scheme and method of using biocompatible magnetite nanoparticles to improve the effectiveness of MS treatment require further improvement and study.

Biography

Andrey Nikolaevych Belousov is Doctor of Medicine degree on speciality-Anesthesiology and Intensive Care. Author a new medicine products–nanotechnology preparations based on magnetite nanoparticles (Fe_3O_4) (www.nanolab.com.ua): Micromage-B (officially registration in Ukraine); Magnet-controlled sorbent brand of MCS-B for extracorporeal detoxication of biological liquids (officially registration in Ukraine and was allowed for medical practice); NanoBiocorrector for intravenous application–ICNB (intracorporal nanosorbent). A.N. Belousov is author new method of extracorporeal hemocorrection using magnet-controlled sorbent (MCS-B). The published more 280 scientific works on results application of nanotechnology preparation in experimental and practical medicine. At now Andrey Belousov - the Head of Laboratory Applied Nanotechnologies in Ukraine, DM, Professor of Kharkiv National Medical University, Ukraine.

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Optimizing the regenerative effects on equine tendons and ligaments using a multi-frequency laser device as a standalone therapy: A methodological approach

MIn recent decades, extensive research has explored the effects of laser light on cells, resulting in well-documented photo-bio-modulation. The significant potential of laser light for tissue regeneration has been effectively applied to treat soft tissue injuries. Our developed methodology employs a multifrequency laser for transcutaneous application under precise skin thermal control to address tendon and ligament injuries in sports horses. The methodology was first validated through a clinical study (Pluim et al., 2018) and standardized experimental studies utilising diagnostic imaging (Pluim et al., 2020) and at the ultrastructural level (Pluim et al., 2022).

In this retrospective clinical study, over 150 tendon and ligament lesions were treated between January 2021 and June 2023, using high-power multifrequency laser therapy under thermal control with individually customised parameters. The horses' ages ranged from 5 to 14 years old, with the majority competing in high-level show-jumping competitions.

The 12-month follow-up was conducted through clinical examinations and analysis of competition entry records. Laser protocols included a combination of 3 to 4 wavelengths spanning from 450 to 980 nanometers. Commonly utilised laser wavelength combinations were 450, 660, 808 nanometers and 650, 808, 905 nanometers. Laser emissions were adjusted to continuous or interrupted-continuous modes (pulse duration>100 ms) to enhance the photo-bio-modulation effect, with each micro-session lasting 10 to 40 seconds. Each treatment involved 3 to 20 micro-sessions. The horses underwent treatment for a period of 10 to 30 days, receiving a total of 8 to 20 sessions. The number of treatments increased depending on whether the lesion being treated was more acute or chronic. Total power density ranged from 2.5 to 6 Watt/cm2 at the skin surface, tailored based on skin photo-type.

The thermal control system was regulated to temperatures ranging from 37 to 42 degrees, based on the pathology's phase (acute vs. chronic), considering inflammation levels and fluid presence confirmed through clinical and power doppler examinations. Power and energy settings were adapted according to injury site (depth from the skin), desired therapeutic effect, and lesion size. Parameters were dynamically adjusted as the pathology progressed, with feedback from the thermal control system guiding protocol adaptation.

During treatment, blue and red light laser sources operated at power densities below 0.5 Watt/cm^2, while infrared sources ranged from 1 to 3 Watts/cm^2. Follow-up assessments demonstrated a notable reduction in rehabilitation time (6 to 8 weeks for controlled exercise) compared to traditional orthobiologic therapies. Re-injury rates varied from 5% to 12% based on lesion characteristics. Full recovery to pre-injury performance levels ranged from 4 to 5 months.

This methodology presents itself as an independent regenerative approach for treating tendon and ligament injuries. By harnessing the benefits of both low and high-powered laser light, it shows promising outcomes in sport horses and holds potential for adaptation in human applications with appropriate modifications.

Biography

After studying at the Faculty of Physics, Dr. Luciani attended the Faculty of Veterinary Medicine at the University of Bologna, where he graduated in 2003. He later conducted an academic experience at the aforesaid faculty, in which he has been involved as a surgeon in the BAL (Bio Artificial Liver) Project and afterwards moved to Germany, where he specialised in Equine Medicine. He came back to Italy in 2009 and his practice focuses mainly on Orthopaedics and Sports Medicine in high level sport horses. Beside his professional career, since a few years he is involved in the field of laser medicine. Since 2013, he has been spearheading research on this topic, collaborating with the faculties of Veterinary Medicine at Gent and Utrecht and the renowned Clinic Lüsche. Over the years, he has been frequently invited as a speaker on the laser therapy at conferences and has produced peer-reviewed scientific publications in veterinary medicine journals.

Danijela Pezer
Department of Mechanical Engineering, University Department of Professional Studies, Split, Croatia

Process planning optimization of holes drilling using genetic algorithm

The production efficiency has an important role for each manufacturing process, especially in the process of drilling a large number of holes, where production depends on the time required for drilling. The tool path optimization during the drilling is necessary because it leads to increase productivity and to save production costs, especially if the tool which performs drilling operation must visit a significant number of places. Solving the optimization problem of tool path has an important role especially at mass production because reducing the time to perform one work-piece ultimately leads to a significant reduction in cost of the entire series of products. Determination of drilling sequence is similar to the Travelling Salesman Problem based on finding the shortest path, where each city is visited only once and when it is known the distance between each city. Travelling Salesman Problem is one of the best known and most extensively studied combinatorial optimization problems and it is classified as NP (nondeterministic polynomial time) - hard problems. A Genetic Algorithm (GA) is used in order to minimize the path length, i.e. to reduce the total time of the tool path. Genetic Algorithm is the optimization method based on the natural evolution, with the basic idea of survival the best individuals in the population. Unlike most of the deterministic algorithms, GA does not start search from the one point of solution, but from a whole range of potential solutions that are usually randomly generated and represents the initial population of the genetic algorithm. Depending on the given problem, goodness defined in fitness (objective) function, are determinate to the initial population. In every generation chosen solution is closer to the optimum in comparison with other members of the population, while inferior solutions were rejected. Selected solutions are subjected to genetic crossover and mutation operators in order to create a new generation. The procedure is performed iteratively until the stopping criterion is met which is defined by the user. With the proposed GA algorithm, a satisfactory solution was achieved in a relatively short time, and the algorithm has shown that is reliable to use. The solution of the problem was achieved using the MATLAB software.

Audience Take Away Notes

- The audience will get the basic knowledge about the used method and learn about the possibility of using optimization method on other engineering problems.
- By reducing the time of planning and the technological process time.
- There are many parameters that can be optimized which lead to reduce the total production time and costs for multiple hole drilling and similar engineering problems.
- The results of Genetic Algorithm optimization method, achieved by criteria of minimum tool path, leads to saving of technological time and reducing the total costs of production.

Biography

Danijela Pezer is a Senior Lecturer at University Department of Professional Studies at the University of Split in Croatia. She holds the position as a Head of the Mechanical Engineering Department. She has published a numerous scientific papers in indexed International Journals and Conferences as an author or co-author. She won the award for the best scientific paper in the category of Young Researchers (Dubrovnik, Croatia, 2017) and also for the best paper presentation (Kecskemét, Hungary, 2014) as Young Researcher. She is a member as a Reviewer Board in three International Journals and also as Editorial Board Member in two International Journals.

Elizabeth Vinod[1,2*], Ganesh Parasuraman[2], Abel Livingston[3], Solomon Sathishkumar[1], Boopalan Ramasamy[4,5]

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Potential of articular cartilage resident progenitor in the field of cartilage regeneration

Our research goal is to characterize cartilage-derived progenitors, isolate a purer population of cells with enhanced chondrogenic potential, and apply this knowledge towards the evolution of improved therapeutics for the regeneration of genuine hyaline-like cartilage. In the field of cartilage tissue engineering and regenerative medicine, there is still a requirement to enhance biological and functional outcomes, in terms of improving ongoing treatment and developing new therapeutic strategies.

Our research focuses on the creation and validation of osteoarthritic models in animals, characterization of cartilage-derived progenitors, and assessing their potential implications for cartilage regeneration using in-vitro and in-vivo conditions in comparison to commonly employed cells named bone marrow derived MSCs and chondrocytes.

We hypothesize that a better understanding of these progenitors, in comparison to other cell types, will enable us to create a detailed biological profile and develop better approaches towards the treatment of cartilage pathologies.

Ultimately, the overarching goal of our research is to establish translational studies that leverage cell isolates from cartilage to facilitate effective cartilage repair.

Audience Take Away Notes

- The standardized methodology for the isolation of cartilage resident cells: chondroprogenitors and chondrocytes
- The comparative chondrogenic potential of chondrogenitors to commonly employed cells in the field of cartilage repair
- The upcoming advances in the field using articular cartilage derived chondroprogenitors

Biography

Elizabeth Vinod serves as an Associate professor in the Department of Physiology and an Adjunct Scientist at the Centre for Stem Cell Research at Christian Medical College, Vellore, Tamil Nadu, India. Intrigued by articular cartilage-derived chondroprogenitors for their chondrogenic potential and reduced hypertrophy, she focuses on characterizing these cells and their potential for cartilage repair. Her research team, comprising basic scientists and orthopedic surgeons, aims to isolate and enhance the chondrogenic potential of these progenitors to advance cartilage regeneration therapies. She has published 45 papers and received grants to establish translational studies using cartilage-derived cell isolates for effective cartilage repair.

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Laboratory of Veterinary Anatomy, Histology and Embryology, Faculty of Veterinary Medicine, Universitas Brawijaya, Malang, East Java, Indonesia

Comparison of decellularization results of chicken achilles tendon using triton X-100 and Sodium Dodecyl Sulphate (SDS) media

Tissue engineering is the latest technology in creating artificial tissues ex vivo (outside the body). One of the materials for tissue engineering is scaffolds derived from the decellularization of xenograft tissues from animals, such as chicken tissues. One of the artificial tissues needed is a tendon as a tendon graft tissue. This study aims to perform the decellularization process of chicken Achilles tendons by immersion as a candidate for graft tissue through two types of chemical decellularization materials, namely SDS and Triton X-100, with various concentrations and variations in immersion time. A total of 100 chicken Achilles tendon segments, each 1 cm in length, were divided into two groups: the negative control group (non-decellularized, n=5) and the decellularization treatment group. The decellularization treatment group was divided into two major groups: the decellularization group with SDS and Triton X-100, each of which was divided into three groups based on the concentration, namely 0.1%, 0.5%, and 1%, and each concentration was divided into three groups again based on immersion time variations. Each small group had five tendon segments. The decellularization process was performed by soaking at 37°C. After immersion, samples were placed into 10% NS-formalin and processed into paraffin tissue slide preparations. Cell residue was counted based on HE staining tissue preparations, and collagen thickness was measured based on Mallory staining preparations. Calculations used Image J, and data analysis was performed statistically with Two-Way ANOVA followed by Tukey's Comparison Test with a 95% confidence level using Graph Prism 9.5. This research has received an ethical clearance certificate from Research Ethics of UB, no. 095-KEP-UB-2023. The results showed that immersion in SDS and Triton X-100 with various concentrations could significantly remove cells on various days of immersion. However, the immersion also caused a decrease in the thickness of chicken tendon collagen fibers. The best results showed that immersion in 0.5% Triton X-100 concentration for 21 days was able to reduce the number of cells to no residual cells and maintain the collagen fiber thickness the same as the normal tendon collagen thickness. The conclusion of this study is that the decellularization agent Triton X-100 concentration of 0.5% with a immersion time of 21 days is the best method compared to other group variations for the decellularization process of chicken tendons.
Keywords: decellularization, chicken Achilles tendon, immersion, Triton X-100

Audience Take Away Notes

- The audience can apply the knowledge gained from this presentation in several practical and theoretical contexts, including academic research, clinical applications, and the development of tissue engineering technologies.
- Researchers focusing on tissue engineering, regenerative medicine, or material science can utilize the decellularization techniques discussed as a reference or a starting point for their experimental designs. The comparison between Triton X-100 and SDS provides a basis for selecting appropriate decellularization agents based on their specific research needs.

- The research can be highly beneficial for other faculty in several ways, both for expanding their research and enhancing their teaching.
- The research offers practical solutions that could simplify or enhance the efficiency of a designer's job, particularly in the context of biomedical engineering and tissue engineering scaffold design.
- The research can significantly improve the accuracy of scaffold designs and provide new information to assist in resolving design problems in tissue engineering.

Biography

Fajar Shodiq Permata, DVM, M.Biotech studied Biomedical Engineering from Biotechnology Master Program at Universitas Gadjah Mada, Indonesia, graduating as MBiotech in 2013. He is a veterinarian (DVM) since 2009. His master thesis was about nerve xenograft from sheep using decellularization techniques. He is a lecturer in the Faculty of Veterinary Medicine, Universitas Brawijaya started in 2013. He has an active researcher and 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 and International Conference in Malaysia in 2022. He was one of the panelist in SYIS TERMIS AP in 2021. Now he has 22 Scopus articles, 71 google citations with H index Google scholar 5 and H index scopus 4.

Gemma Arderiu
Cardiovascular area, Institut de Recerca Sant Pau, Barcelona, Spain

Adipose tissue mesenchymal stem cells therapy in ischemic diseases

Adipose stem cell therapy, also known as adipose-derived stem cell therapy, is a promising approach in the treatment of various conditions, including ischemia. Ischemia refers to a condition where there's an inadequate blood supply to tissues, often resulting in tissue damage or death due to lack of oxygen and nutrients. Adipose Stem Cells (ASCs), which are derived from fat tissue, have several advantages for therapeutic use. ASCs are an ideal cell source, characterized by their ease of acquisition, they are abundant and easily accessible through minimally invasive procedures like liposuction, they present high proliferation, and low immunogenicity, Moreover, ASCs act in their microenvironment and surrounding cells releasing cytokines, growth factors, and beneficial biomolecules. Additionally, ASCs cells have the potential to differentiate into various cell types, including endothelial cells, which are crucial for forming new blood vessels (a process known as angiogenesis).

In the context of ischemic conditions, such as peripheral artery disease or myocardial ischemia, adipose stem cell therapy aims to improve blood flow to the affected tissues by promoting the growth of new blood vessels and enhancing tissue repair. This can potentially alleviate symptoms and improve overall tissue function.

Clinical trials and research studies are ongoing to assess the safety and efficacy of adipose stem cell therapy for ischemic conditions. While preliminary results are promising, further research is needed to optimize treatment protocols, determine long-term outcomes, and address potential risks and limitations.

The interest of our group throughout these years has been the study of the angiogenic capacity of ASCs as a therapeutic tool in ischemic diseases. We have characterized ASCs properties according to their fat depot, seeing different genetic and protein patterns. More importantly, we have increased their angiogenic capacity by direct reprogramming into endothelial cells through miRNA modification. Results obtained during these years have increased our knowledge on ASCs-derived angiogenesis, and more importantly, we have improved ASCs-angiogenic capacity. However, challenges remain regarding how to form stable tubular structures for in vivo delivery purposes.

Audience Take Away Notes

- ASCs have demonstrated regenerative potential in preclinical and clinical studies for various ischemic conditions, including peripheral artery disease, myocardial ischemia, and stroke. They have shown the ability to improve tissue perfusion, reduce ischemic damage, and enhance functional recovery.
- Overall, adipose-derived stem cells hold great promise for ischemic therapy due to their angiogenic, immunomodulatory, paracrine, and regenerative properties. However, further research is needed to fully understand their mechanisms of action, optimize treatment protocols, and evaluate long-term safety and efficacy in clinical settings.

Biography

Gemma Arderiu has over 25 years of experience in biomedical research, a well-established career in the scientific, clinical, and academic aspects on cardiovascular diseases. She has worked with joining institutions like Hospital Clinic (Barcelona), Theodor Kocher Institute (Bern–CH), UCSF (San Francisco–US) and ICCC (Barcelona). Currently, she supervises the research line "Impact of neovascularization on ischemic processes and angiogenesis in cardiovascular disease" at the Institut de Recerca de Sant Pau-IIB Sant Pau (Barcelona). During all these years, her interest has been to improve the health and well-being of patients around the world focusing on the discovery of new therapeutic targets to treat bleeding disorders and ischemic diseases.

Gilad Gome
Department of Biotechnology, The Hebrew University Faculty of Agriculture, Rehovot, Israel

Macrofluidic single use bioreactors

One of the main challenges of cultured meat is reducing costs of production, often described as scaling. The main components of the operation are cells, media, scaffolds and bioreactors. This work presents an alternative to current stainless steel or glass bioreactors and uses plant based scaffolds that are food grade.

Bioreactors must be sterile and leak-free to maintain a proper environment for cell growth. Thermoplastic films are a popular material for constructing these fluidic systems, but traditional methods of welding these film are expensive and do not allow rapid prototyping. In this study, a laser welding method was developed to join thermoplastic films in a way that prevents contamination and leaks affording effective macro-fluidics fabrication. The technique was tested using Polyethylene (PET) films and a laser cutter operating with settings calibrated for the material to be welded or cut. The laser welding method was found to produce strong, leak-free seals in PET films with minimal heat-induced damage to the films. The ability to design fluidics and chambers using this method afforded to incorporate Plant based scaffolds from food grade plants (Rice). The laser welding method developed in this study provides a reliable, contamination-free method for the rapid fabrication of fluidic systems for cell cultivation. The technique is compatible with a vast range of cell types and scaffolds and has the potential to be widely adopted in tissue engineering for regenerative medicine and for food applications such as cultured meat.

Audience Take Away Notes

- **Implementation in Bioreactor Design:** Researchers and professionals in the field can apply the laser welding technique to enhance the construction of bioreactors, ensuring sterility and leak-free operation crucial for successful cell growth in cultured meat and tissue engineering applications.
- **Exploration of Sustainable Materials:** Designers and researchers can explore the use of food-grade plant scaffolds, such as those derived from rice, in bioreactor construction, contributing to sustainable and eco-friendly practices in the production of cultured meat.
- **Streamlined Prototyping Process:** The audience can use the contamination-free and rapid prototyping capabilities of the laser welding method to efficiently test and iterate different fluidic system designs for diverse cell types and scaffolds, accelerating the development process.
- **Interdisciplinary Applications and adoption:** The technique's compatibility with various cell types and scaffolds makes it valuable for interdisciplinary research, facilitating collaboration between researchers in tissue engineering, regenerative medicine, and cultured meat production. Professionals in the industry can consider adopting this method for large-scale production, potentially reducing costs and addressing scalability challenges in cultured meat production. The technique's versatility enhances its potential for widespread adoption in various applications beyond the scope of the presented study.

Biography

Gilad Gome completed his undergraduate degree in life science at Tel Aviv University. He is currently a Ph.D. candidate at the Hebrew University Faculty of Agriculture, his scientific research is centered on advancing bioreactor technology for cultivating stem cells on scaffolds. With expertise spanning material science, engineering, design, and bioprocessing, his significant contributions have been recognized in various journals and conferences. He serves as a lecturer in biotechnology entrepreneurship at Reichman University, his commitment to both research and education in the field.

Giuseppe Tancredi Patanè
University of Messina, Italy

Biochemical modification of poly-vinyl-alcohol-based bioplastics with a combinatory approach with microcrystalline cellulose, glycerol and natural antioxidant to increase its food packaging application

Today, more and more attempts are being made to apply the circular economy model, to overcome the linear economy model, also favouring green and ecological industrial and chemical processes. As a result, molecules from the plant world are becoming increasingly relevant and attempts are being made to use them to construct and functionalise new materials. Based on this background, in our laboratory we have developed Poly-vinyl-alcohol-based bioplastics which is particularly useful, as it is synthetic but biodegradable, as demonstrated by numerous studies in the literature. However, already from the first analyses, this material has limitations, such as its high solubility in water and slow biodegradability. Thus, to overcome these limitations we modified the casting solutions with various % of Glycerol (GLY) and Microcrystalline Cellulose (MC). In this way, we increased biodegradability due to the presence of MC, but also increased elasticity and water resistance due to the presence of GLY. Then, we functionalised them with an Anthocyanin-Enriched Fraction (EAC), obtained by green extraction methods (MAE/UAE), from a widespread ornamental plant called Callistemon Citrinus. In this way, we obtained new PVA/GLY/MC bioplastics, which, being functionalised with EAC (0-1%), are useful for food packaging. Subsequently, we performed several assays to analyse their morpho-functional characteristics, moisture and water absorption, optical properties, antioxidant characteristics, and investigated the release of anthocyanidins in different food simulant. First, we performed the FTIR spectra, from where we can see that the MC concentration changes spectrum; infact, we can see a new pronounced peak at 1650 cm−1 which is attributed to the so-called “bound” water. Then, we analyze the interaction between the bioplastics and water. Infact, most biopolymers, like PVA, have the high sensitivity to water and the study of Wa parameter is particularly essential in relation to food packaging applications. In this case, the addition of MC increase by 1.5 times the Wa for PVA/MC, which could be associated with the strong ability to interact with water due to the hydrophilicity of the added cellulose, but when GLY is added, the Wa is greatly reduced. On the other hand, all the films have low moisture content. Regarding optical properties the obtained results show that transparency of the film in terms of light Transmittance (T%) for PVA alone is very high, but when functionalised it had a reduced T%. To confirm these results, we also calculated the opacity of our biofilms, in relation to their thickness, and saw how this decreases compared to PVA alone. Furthermore, after different antioxidant activity (DPPH, FRAP, ABTS), we can say that films functionalised with various % EAC, acquire considerable antioxidant power. The release of anthocyanins was assessed by detecting their presence in food simulants, and we saw that the release is independent of the concentration of anthocyanins in the functionalised bioplastic and occurs more in EtOh solution. In conclusion, this work is the first step in understanding how anthocyanins can be used in food packaging to produce biodegradable materials. Of course, further investigations will be carried out to find out the degradation time of these new biomaterials.

Biography

Giuseppe Tancredi Patanè is a young scientist in Biochemistry, at the University of Messina. I started studying biochemistry in 2017 in the research group of Prof. Davide Barreca until now. During my work I utilize biochemical methods to investigate the nature of proteins and the properties of natural compounds, like antioxidants, anti-aggregative, anti-inflammatory, and anti-microbial. I have analyzed the molecular basis of interactions between the flavonoids and human serum albumin to clarify the blood transportation process and the stabilization process of protein structure and, actually, I am getting into the production of bioplastics, which are biodegradable and functionalized with natural compounds that can increase the shelf life of food. I have published 12 papers in reputed journals, and I participated at several international congress.

Haidong Liang*, Xinghan Zhao
The Second Hospital of Dalian Medical University, China, Liaoning, Dalian

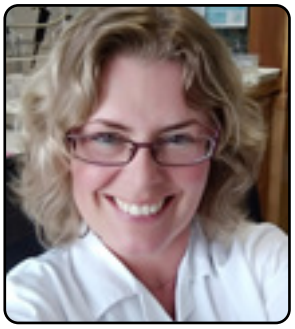
Comparison of the clinical efficacy of platelet-rich plasma and artificial dermis in the treatment of fingertip defects

This study included a total of 30 patients with finger tip defects in the Department of Bone and Soft Tissue Repair and Reconstructive Surgery of the Second Affiliated Hospital of Dalian Medical University from January 2020 to January 2023. The causes of patient injuries include: crush injury, thermal pressure injury, chemical burns and other reasons leading to partial defects in the distal 1/3 of the soft tissue and nail bed of the finger, with or without trochanter fracture and bone exposure, emergency primary debridement is performed according to the cause of the patient's injury, and antibiotics are given postoperatively. Inflammation, analgesia and other treatment, the wound bacterial culture showed no obvious bacterial growth. After the second stage, the patient can choose to cover the wound with platelet-rich plasma or artificial dermis, change the dressing regularly and continue to follow up to observe the healing condition and effectiveness of the fingertip wound. Indicators such as no infection and bone exposure, finger function, two-point discrimination of the flap at the finger tip, and patient satisfaction.

Audience Take Away Notes

- To understand and recognize the fingertip defects
- To know the principle of artificial dermis and PRP in the treatment of fingertip defect
- To provide a new treatment for repairing fingertip defect

Biography
Haidong Liang, Chief Physician, Professor, Department Director and Doctoral Supervisor of bone and soft tissue repair and reconstruction surgery in the second affiliated Hospital of Dalian Medical University. He is currently a young member of the Microsurgery Branch of the Chinese Medical Association, a member of the Professional Committee of external Fixation and limb Reconstruction of the Orthopaedic Branch of the Chinese Medical Association. He has been engaged in the clinical and research work of limb injury repair, bone and soft tissue tumor resection and reconstruction, peripheral nerve injury repair and regeneration, and functional reconstruction after nerve injury for a long time. He has published more than 20 papers in SCI journals and won provincial and municipal scientific and technological awards for many times. He is the chief editor of 2 books, co-edited 3 books, and participated in 3 translation works.



H. Studenovska[1*], J. Nováčková[1], M. A. Thottappali[1], V. Proks[1], J. Trousil[2], J.V. Cabral[2], E. Voukali[2], K. Jirsova[2], Y. Nemesh[3], Š. Juhás[3], T. Ardan[3], J. Motlík[3], P. Studený[4], Z. Straňák[4]

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Regeneration of the eye via ultrathin PDLLA-based nanofibrous membranes

Eye related diseases can cover diseases of the front segment of the eye as e.g. Limbal Stem Cell Deficiency (LSCD) but also diseases related to the back segment, the retina, as e.g Age-Related Macular Degeneration (AMD). In both cases one of the ways to treat the impaired part of the eye could be based on principles of tissue engineering, on suitable biodegradable scaffold combined with the cell cultivation. In this work we demonstrated, that ultrathin membrane can provide a stable substrate for cell cultivation while maintaining high optical transparency in limbal cell cultivation (1) and the same substrates can be applied subretinally to deliver retinal pigment epithelial cells to treat AMD (2).

Nanofibrous membranes were prepared by electrospinning of poly (L-lactide-DL-lactide) from pyridine. This technique allows to incorporate a supporting frame. Such a frame enables not only handling without irreversible folding of the membrane and keeping a side-orientation of the sample while seeded with cells, but also to regain membrane's flat shape during loading to the injector in subretinal surgery.

1) The fabricated scaffolds were found to successfully support the ex vivo cultivation of Limbal Epithelial Cells (LEC). Compared to cultivation on fibrin gel, LEC cultivation on PDLLA nanofibrous scaffolds revealed heterogeneity in terms of cell expansion and morphology while maintaining similar LEC and stemness marker expression. The optical transparency of the wet PDLLA membrane could allow eyelid function and ocular surface inflammatory status control in clinical use.
2) Primary porcine RPE were cultivated on ultrathin nanofibrous membranes. The RPE monolayer showed proper differentiation, correct polarization, high phagocytic activity, good confluence and long-term survival. After implantation into subretinal space of the minipig's eye, the minipigs were examined in postoperative period using fundus imaging and optical coherent tomography.

The ultrathin, PDLLA-based nanofibrous membranes demonstrate potential for application in the field of regenerative medicine of the eye and contribute to the development of xeno-free, highly defined, and fully standardized scaffolds.

Audience Take Away Notes

- The novel setting of scaffolds for eye tissue engineering is presented.
- Unique characteristics of nanofibrous membranes are demonstrated.
- Different applications in eye-related diseases are presented.

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 25 research articles in SCI journals (H-index 9, WOS).

Nadia Salehi, Jon Luzuriaga, Manuel Candil, Itziar Gonzalez*
Group RESULT, Institute of Physical Technologies ITEIF, National Research Council of Spain, Madrid, Spain

Tumor cell microspheroids induced by non-contact mechanical forces

We present a novel device actuated by ultrasound to induce rapid formation of cellular spheroids in very short times of less than 5 minutes, an order of magnitude less than those of conventional systems, which usually require more than 24h. It consists of a 2D polymeric array with 3x3 wells of square geometry and is driven by an ultrasonic transducer attached. The wells have a rectangular geometry with parallel sidewalls, necessary for the establishment of half-wave standing waves inside with highly reflectant sidewalls. The cells contained in the liquid suspension are exposed to a radiation force arising from pressure gradients. This hydrodynamic force drives the particles toward positions of acoustic equilibrium established inside the wells, where collect and aggregate forming spheroids after few minutes. The spherical shape acquired by these cell aggregates arises in the resulting 3D radiation force vectors generated by the relationship between the geometrical dimensions and acoustic wavelength of the incident wave. These aggregates show a stable behaviour over time during at least 48h after the acoustic actuation in the wells. The experiments were made on tumour cell samples immersed in in liquid suspension of their culture medium. In particular, PANC-1 cell lines were used, providing highly efficient results of cell aggregation in approximately 2 minutes of ultrasound irradiation. The devices described represent a technological advance in terms of the actuation required times, their low manufacturing cost and simple design. In addition, they present other added advantages such as their low manufacturing cost, simple design and easy handling in the laboratory.

Audience Take Away Notes

- This technological approach is protected in a patent licence process. Therefore, this presentation may be of interest to audiences from different disciplines who want to obtain aggregates of cells, bacteria or microelements in general from liquid suspensions.
- In particular, groups related to tissue regeneration laboratories may be stakeholders in the technological development presented in this work as it presents time-advances in the performance of cell spheroids for tissue regeneration o tumor microenvironment models.

Biography

Dr. Itziar Gonzalez studied Physics and developed her Doctoral Thesis at the Complutense University of Madrid, Spain and received her PhD degree in 1998. She then joined the research group of High Power Ultrasounds at the Institute of Acoustics of the National Research Council of Spain CSIC. Since then, she has open new research transdisciplinar lines, leading different bio and technological disciplines. She has coordinated more than 6 national and international research projects published more than 30 papers and currently she is Deputy Director of the Institute of Prof. James at the Institute of General and Inorganic Chemistry, Bulgarian Academy of Sciences (IGIC-BAS). She received her PhD degree in 2004 at the same institution. After one year postdoctoral fellowship supervised by Dr. Williams at the Catalysis and Spectrochemistry Laboratory, France she obtained the position of an Associate Professor at the IGIC. She has published more than 70 research articles in SCI (E) journals.

Jin-Ku Lee MD, PhD
Department of Biomedical sciences, Anatomy and Cell Biology, Seoul National University College of Medicine, Seoul 03080, Korea, Republic of

Genomics of drug sensitivity in cancer

Outcomes of anticancer therapy vary dramatically among patients, which may be caused by the specific molecular alterations in each patient's tumor. The development of ex vivo drug test-guided clinical response prediction platform has elicited clinical and industrial interests for precision cancer therapy. We have established a resource reporting the genomic and transcriptomic profiles of 462 patient tumor-derived cells across 14 cancer types, together with responses to 60 targeted agents. We identified molecular factors to induce resistance to EGFR inhibitors, and suggested repurposing ibrutinib for EGFR-specific therapy in gliomas. In addition, we discovered lineage-specific drug sensitivities based on subcategorization of gynecologic tumors. We also have manufactured an automated organo-spotter-integrated high Throughput Organo-on-Pillar (High-TOP) drug test platform, demonstrating considerable robustness, consistency, reproducibility and clinical relevancies in three-dimensional drug sensitivity analyses.

Audience Take Away Notes

- The audience will learn that drug screening using patient-derived tumor cells could guide the precision drug treatment.
- Pharmacogenomic approaches can identify the biomarkers for predicting the particular drug responses.
- High-TOP drug testing platform is one of the most robust and reproducible ex vivo drug screening system in three-dimensional manner.

Biography

Jin-Ku Lee is an associate professor at Seoul National University College of Medicine (SNUCM), Korea. He achieved both M.D. (2003) and Ph.D. (2013) at SNU. His research fields of interests were cancer genomics and pharmacogenomic analysis using patient-derived tumor models for precision oncology. In respect to these research areas, he has published many SCI(E) articles, including Nature genetics (2017, 2018), Genome Biology (2019) and Biomaterials (2023). In particular, his lab is focused on developing cutting-edge technologies in patient tumor organoid cultures and 3D-based drug screening accompanied with systemic identification of genomic biomarkers for drug sensitivity.

Jong Seung Kim
Department of Otorhinolaryngology-Head and Neck Surgery, Jeonbuk National University Medical School, Jeonju, Republic of Korea
Department of Medical Informatics, Jeonbuk National University Medical School, Jeonju, Republic of Korea

Ursodeoxycholic acid is associated with better clinical outcome in COVID-19 patients: A population based cohort study

Background: Several studies have investigated the relationship between Ursodeoxycholic Acid (UDCA) and coronavirus disease 2019 (COVID-19). However, complex and conflicting results have caused confusion in the application of these results. We aimed to investigate whether the association between UDCA and COVID can also be demonstrated through analysis of a large-scale cohort.

Methods: This retrospective cohort study used internal and external validation cohorts: the Jeonbuk Common Data Model (CDM) cohort (JBUH-CDM) and the Korean National Health Insurance claim-based database (NHIS), respectively. We investigated UDCA intake and its relationship with COVID-19 susceptibility and severity using validated Propensity Score (PS) matching.

Results: Regarding the COVID-19 susceptibility UDCA intake is associated with being significantly lowered to 0.71 in JBUH-CDM (hazard ratio; HR) (95% Confidence Interval (CI): 0.52-0.98) value was significantly lowered to 0.93 (95% CI: 0.90-0.96) in the NHIS. Regarding the COVID-19 severity, UDCA intake was analyzed to be significantly lowered to 0.21 (95% CI: 0.09-0.46) in JBUH-CDM. It was also found that the HR value was significantly lowered to 0.77 in NHIS (95% CI: 0.62-0.95).

Discussion: Using a large-scale local cohort and an external validation cohort, we confirmed that UDCA intake was significantly associated with the reduction of COVID-19 susceptibility and severity. These trends remained consistent regardless of UDCA dosage. This suggests the potential of UDCA as a preventive and therapeutic agent for COVID-19.

Audience Take Away Notes

- The relationship between the UDCA intake and COVID-19 susceptibility and severity.
- Based on internal and external validation cohorts, UDCA intake is associated with lower susceptibility (internal cohort: HR 0.71, external validation cohort: HR 0.93) and lower severity (internal cohort: HR 0.21, external validation cohort: HR 0.77).
- Using a large-scale local cohort and an external validation cohort, we confirmed that UDCA intake was significantly associated with the reduction of COVID-19 susceptibility and severity. These trends remained consistent regardless of UDCA dosage. This suggests the potential of UDCA as a preventive and therapeutic agent for COVID-19.

Biography

The professional timeline for Jong Seung Kim: 2014.5-2016.4: Fellowship of Dep. Otorhinolaryngology in Jeonbuk National University Hospital. 2016.5-2018.8: Clinical Assistant Professor of Dep. Otorhinolaryngology in Jeonbuk National University Hospital. 2018.9-2022.9: Assistant Professor of Dep. Otorhinolaryngology in Jeonbuk National University Medical School. 2018.9-2022.9: Associate Professor of Dep. Otorhinolaryngology in Jeonbuk National University Medical School. 2020.2-Present: Chief Professor of Medical Informatics in Jeonbuk National University Medical School.

Hoda Arab Zadeh[1], Maria Mendoza[2], Kara E. McCloskey[3*]

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Induction and characterization of human tip-specific endothelial cells

Defects in vascular cells can contribute to peripheral vascular disease, stroke, atherosclerosis/thrombosis, diabetes, insulin resistance, chronic kidney failure, tumor growth, metastasis, dementia, and some severe viral infectious diseases. However, the recognition of ECs as distinct subphenotypes exhibiting distinct functions has been somewhat controversial. The dominant paradigm previously viewed tip-specific ECs as ECs that temporarily took up their unique behavior while leading migration of a sprouting blood vessel. Newer studies show that tip ECs, as well as ECs subpopulations from different tissue/organs, exhibit phenotypic stability with distinct functional and gene expression profiles, suggesting that these are unique subpopulations of ECs. Our laboratory uses mouse and human Embryonic Stem Cells (ESC) and human induced Pluripotent Stem (iPS) cells and Human Umbilical Vein Endothelial Cells (HUVECs) to study endothelial cell functions and vascular development. We have identified soluble signals and unique surface markers that direct and purify tip-specific ECs from stem cells and primary endothelial cells, characterized these cells using a variety of cell markers, and conducted functional assays. Here, we will report on our induction strategies and highlight the differences that we found between mouse and human tip-specific induction and identification. The generation and identification of these specific angiogenic cells are critical in studies aimed at controlling or directing angiogenesis or anti-angiogenesis.

Biography

Dr. Kara E. McCloskey, PhD, is a Founding Full Professor at the University of California, Merced in the Chemical and Materials Engineering (CME) Department. Dr. McCloskey is the current Program Director for a Training Program in Undergraduate Stem Cell Engineering and Biology (TUSCEB) as well as Program Director for a UC Merced facility developing Resources for Expanding Stem cell-derived Tissues and Organs for Regenerative Engineering (RESTORE), both funded by the California Institute of Regenerative Medicine. She has been Founder and Chair of the Graduates Program in Biological Engineering and Small-scale Technologies (BEST) and Materials and Biomaterials Science and Engineering (MBSE), as well as the program lead developer for a new B.S. degree in Chemical Engineering. She is well-known for her work in directing endothelial cell (EC) fate from both human and mouse ESCs and induced-pluripotent stem (iPS) cells, including a pioneering publication to identify and characterize the derivation of stable angiogenic and non-angiogenic ECs from stem cells. She has 14 publications in this specific area and has authored or co-authored over 50 peer-reviewed journal articles in areas from magnetic cell separation, stem cell differentiation, and tissue assembly. She is currently focusing her efforts examining cell-material interactions for developing functional tissues. Dr. McCloskey earned a highly competitive $1.7 million New Faculty Award from the California Institute for Regenerative Medicine (CIRM) for studies on fabricating cardiac tissue models from stem cells; this was followed by a Basic Biology Award from CIRM on directing endothelial subphenotypes from embryonic stem cells (ESCs). Dr. McCloskey's experience as a leader in the NSF-funded Science and Technology Center (STC) on Emergent Behavior in Integrated in Cellular Systems (EBICS, MIT, UIUC, and GT) for 10 years helped develop the appropriate expertise to successfully apply for the CREST Center for Cellular and Biomolecular Machines (CCBM), the first NSF-funded research center at UC Merced – a Hispanic serving institution. She now participates in another NSF-funded STC on Cellular Engineering in MechanoBiology (CEMB, UPenn) and an NSF-funded Engineering Research Center (ERC) on the Transformation of American Rubber through Domestic Innovation for Supply Security (TARDISS).

Kinjal Kulshrestha
Anand Agricultural University, Anand, Gujarat, India

NGS-based transcriptome analysis for nematode resistance in tomato

The research work includes the transcriptome analysis of tomato genotypes viz., AT-3 (S. lycopersicum), SL 12s0 (S. lycopersicum), LA 1777 (S. habrochaites) and LA 2157 (S. arcanum) under nematode, M. incognita (nematode) stress. The sequencing was done on the Illumina MiSeq platform and yielded 5.24 GB of raw data. Overall alignment with reference sequences of Solanum lycopersicum assembly SL3.0 was found at 85.60% and with M. incognita V3 was 9.80%. AT-3 (S. lycopersicum), SL 120 (S. lycopersicum), LA 1777 (S. habrochaites), and LA 2157 (S. arcanum) aligned with tomato reference genome with a similarity of 75.37%, 82.05%, 73.04%, and 69.24% respectively. The BlastX result showed that 80.76% of blasted sequences got mapped and 73.07% were annotated. Maximum sequences (up to 94%) were mapped with UniProtKB. The top Blast hit was for S. lycopersicum followed by S. pennellii. The highest evidence code distribution was found for IEA (Inferred from Electronic Annotation). The highest enzyme code distribution was obtained for hydrolases. Gene ontology is acquired for defense response, response to stress, response to fungus, and response to biotic stimulus. PC1 captured 41.3% variance and PC2 represented 31.2%. Differential gene expression was illustrious for chitinase activity, PAL, SAM, BURP, and peroxidases. All the transcripts of nematode-infected tomato samples had 85 KEGG pathways. The validation of the defense-related genes through real-time PCR was attained for genes of chitinase, pathogenesis-related, LeHSP, SAM, LYC WRKY, and MYB TF.

Biography

Born and brought up on the land of Sri Krishna, Uttar Pradesh and Gujarat, India, respectively. A science enthusiast, an author to various scientific as well as blog publications. Have attained graduation in Biotechnology, masters in Agricultural biotechnology and a Ph.D. in Plant molecular biology and biotechnology. Have a research experience in molecular biology of tomato, and cotton, have supported the research projects on chilly. Currently supports a prestigious publication house as a QC Editor. She often conducts free workshops for women empowerment and volunteers for educating children. Her hobbies include painting, and singing. She appreciates the rich heritage of India and like to visit places of archeological importance such as Rajasthan and Humpi. A strong supporter of water conservation, 'no racialism policy', free education for all, and an animal lover.

Laura Pérez Sánchez[1*], Maialen Zelaia Amilibia[1], Daniel Mejia-Parra[2], Camilo Cortés[1], Tania Ferre[3], Cristina Del Amo[4]

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Integrating planar and non-planar layers for optimized bioprinted scaffold structures with controlled porosity

Bioprinting has emerged as an attractive technology to treat tissue injuries. The most common approach in 3D printing is performed based on plane layering. When the bioprinted implant slides over other tissue (e.g. when the injury is in a joint), the stair-step effect of a typical planar layering may introduce additional friction and wear the contact surface. Therefore, non-planar layering methods could be useful to improve the tissue interactions. However, most of the methods in the literature are not adequate to achieve a desired internal porosity of the implant. Hence, our methodology is based on the planar and non-planar layers integration to ensure a smoother implant finish while preserving an adequate internal structure with controlled porosity, allowing oxygen and nutrients transmission, as well as cells proliferation. For this purpose, our approach consists of dividing a given lesion according to the curvature of the surface: planar trajectories are applied to the bottom part, while non-planar trajectories are used in the surface. The Poisson method is employed to reconstruct the surface of the model, then the parametrization of the surface, which consists of an area-preserving mapping, is utilized to generate non-planar trajectories. The developed algorithm can be used on conventional 3D bioprinters and has been evaluated on a model representing a bone defect, showing robust results. In addition, since there are no gold standard metrics to compare non-planar algorithms performance and usually their evaluation is based on qualitative aspects, in this study different metrics are proposed to evaluate the resulting trajectories of our methodology and a similar work in the context of bioprinting: number of interruptions when printing the model and number of collisions detected when printing non-planar layers. The comparison between this method and an existing non-planar trajectory method has revealed advantages, since it allows an improved control in collisions and to lessen the waste of material and path interruptions, therefore, reducing the number of fabrication defects. Thereby, this approach presents a novel method for generating non-planar layers capable of optimizing scaffold structure with a controlled internal porosity to ensure that adequate requirements for tissue regeneration are fulfilled.

Audience Take Away Notes

- Our approach gives new insights into the development of non-planar bioprinting methodologies.
- This work achieves reducing the stair-step effect and improving mechanical properties of models while preserving an adequate scaffold configuration for the targeted application.
- Our research could be used as a starting point to develop an extensive quantitative evaluation when developing non-planar bioprinting algorithms.

Biography

Laura Pérez studied Biomedical Engineering at the University of Pompeu Fabra, Barcelona and graduated as MS in Computational Biomedical Engineering in 2022. She then joined the Biomedical Devices & Simulation group in Vicomtech, Donostia-San Sebastián, a research centre. She has been working since then in the development of a bioprinting software and in the processing of 3D models and the generation of trajectories in projects based on wound-healing and cartilage lesions.

Luigi Di Stolfo[1*], Wang Sik Lee[1], Alke Petri-Fink[1,2], Barbara Rothen-Rutishauser[1]

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Bioprinted cell gradients to analyze nanoparticle uptake variability

Physical and chemical gradients in the human body are crucial for tissue development, function, and pathology. Replicating these gradients in in-vitro designs is essential to tissue engineering and disease research.

The aim of this study is to design cell gradients using a bioprinting approach for investigating how different cell densities affect the interactions with nanoparticle-based drug delivery systems.

A cell gradient system using a 3D bioprinter (3DDiscovery, RegenHu) was produced by "Drop-on-Demand" (DoD) technology using lung epithelial cells (A549). After two days in culture, these cells were exposed to fluorescent silica nanoparticles (SiO_2-NPs, 20µg/ml, 119±10 nm in diameter) for different time points. The level of NP uptake, cell dimensions, i.e., surface and volume, and cell density were assessed at 6h, 24h, and 48h using confocal Laser Scanning Microscopy (cLSM) and subsequent data analysis with Imaris software.

Live/dead cell imaging confirmed that lung epithelial cells remained viable across the gradients. The gradients maintained a stable correlation between cell number and spatial distribution during the observation time with ongoing cell division. Results indicated a 1.5- to 2-fold increase in SiO_2 NP uptake by cells grown at low density relative to those at high density across all time points. Additionally, our study showed both cell surface area and cell volume varying proportionally with NP uptake, indicating that cell surface and volume significantly influence the behavior of cells in relation to NP endocytosis. These results have shown that lung epithelial cell gradients can be reproducibly fabricated by 3D bioprinting technology. Moreover, cell density significantly impacts NP uptake, emphasizing the significance of accounting for varying cell densities at the intended site of nanoparticle delivery. This consideration is crucial when evaluating the efficacy of nanoparticle-based therapies in pathological conditions such as in tumor microenvironments, during infections, and in cases of chronic inflammation.

Audience Take Away Notes

- Standard cell seeding methods (e.g., pipetting) do not allow the precise control of cells' density and distribution in a plastic well or cell culture inserts.
- The design of bioprinted cell gradients provides the opportunity of replicating the microenvironment in situ with applications in tissue engineering and nanomedicine.
- Exploiting the benefits of precise cell arrangement in biological research setups will support the design of physiologically relevant tissue systems, thus producing more translatable results.

Biography

Luigi Di Stolfo studied Pharmaceutical Chemistry and Technology at the University of Chieti-Pescara and obtained his Master's degree in July 2022. He then joined the BioNanomaterials Group at the Adolphe Merkle Institute in February 2023 as a PhD student, where he is working on his project within the framework of the National Center of Competence (NCCR) Bio-Inspired Materials.

Mariam Taib[1*], Siti Athirah Mohamad Jamali[2], Nor Afiqah-Aleng[2], Kamalrul Azlan Azizan[3], Nisha Govender[3], Zairul Fazwan Md Zainordin[1], Sarahani Harun[3], Noraznawati Ismail[2], Zeti-Azura Mohamed Hussein[3], Syarul Nataqain Baharum[3]

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Transcriptomic and metabolomic comparison of a mangrove fungus response to heavy metal cadmium stress

Mycoremediation has become an important approach for managing heavy metal pollution. Cadmium (Cd) is a well-known global contaminant, listed among the most hazardous inorganic substances, but there are few reports about its remediation by mangrove fungi, the highly potential mycoremediation agent. Here, the Cd remediation mechanism of Trichoderma atroviride isolated from the mangroves of Terengganu, Malaysia, was explored. The fungus was shown to be highly tolerant to Cd-contaminated medium. In the present study, to reveal the Cd tolerance mechanism of T. atroviride, transcriptomic analyses of differentially expressed genes was carried out, followed by metabolite profiling using multiplatform analysis: Gas Chromatography–Mass Spectrometry (GC-MS), proton Nuclear Magnetic Resonance (1H NMR), and Liquid Chromatography Quadrupole Time-of-Flight Mass Spectrometry (LC-QTOF-MS). The transcriptomic results revealed 2232 upregulated and 3289 downregulated differentially-expressed genes, with metabolic pathways as the most significantly enriched. Amino acids metabolism, biosynthesis of amino acids, glyoxylate and dicarboxylate metabolism and glutathione metabolism are the key metabolic pathways detected in the response to Cd stress by the fungus. Moreover, metabolomic analyses identified 127 metabolites, with amino acids, carbohydrates and organic acids having the most significant roles in the Cd stress response. Eleven metabolic pathways were significantly enriched including seven amino acid metabolisms, indicating their important roles in the fungal defense response. A total of 39 potential biomarkers were identified with three biomarkers–taurine, glutamine, and citrate - can be selected for further validation of their roles in response to Cd stress. These results increase our understanding of the coping mechanisms of T. atroviride in response to Cd stress and provided a reference for the application of T. atroviride in the bioremediation of heavy metals pollution.

Keywords: Mangrove Fungus, Heavy Metal Stress Response, Metabolic Pathways, Metabolites, Biomarkers.

Audience Take Away Notes

- The audience will be able to explore the response mechanism to heavy metal stress by other fungi with bioremediation potentials
- This will help the audience to recommend new bioremediators of heavy metal pollutants
- Other faculty could use to expand their research or teaching in identifying specific biomarker(s) that detects heavy metal pollutants
- The biomarkers can be used in biosensors that could provide rapid and efficient detection of heavy metal pollutants

Biography

Dr. Taib studied biochemistry and microbiology at the Universiti Putra Malaysia and graduated with a MSc. in 1999. She received her PhD degree in 2005 in Microbial Biochemistry at the University of Leeds, United Kingdom. She obtained the position of an Associate Professor at the Universiti Malaysia Terengganu in 2012. Her research interest includes identification and isolation of fungi from marine sources, and biochemical reactions & bioactive compounds in fungi with high potential for environmental and industrial purposes. She is a member of the Biological Security and Sustainability (BIOSES) Research Interest Group (RIG) UMT.

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Sensor assisted smart agriculture for futuristic hunger free world

By 2050, it is expected that there will be 9.7 billion people on the planet, which would provide a serious threat to food security. The increasing need for food has made traditional agricultural practices insufficient, so innovative technology must be adopted to increase production and sustainability. In this sense, it seems that the application of biosensors in agriculture is forging new ground, revolutionizing conventional farming methods and paving the way for precision farming (Gangopahyay et al, 2024). Biosensors—which are unique in that they can identify specific biological components and translate that information into quantifiable signals—have drawn a lot of interest from the agricultural community, with a focus on their potential applications in precision farming in the future. This study offers a thorough discussion of sensor-assisted smart agriculture's present situation as well as its potential going forward to achieve a hunger-free world. Moreover, we also discuss about how sensor data is processed using data analytics and machine learning to give farmers predicted insights and decision help. The presented paper will also address a case study-based approach is employed to demonstrate the practical implementation of sensor-assisted smart agriculture (An IoT enabled Aeroponics system: Application number- 20243100915) which showcase successful deployments of sensor networks in vertical farming management. The adoption of sensor-assisted smart agriculture strategies where basic farming system is meet with application of engineering for making agriculture more profitable not only promote increasing food production and reducing waste which may contribute to food security and poverty alleviation also presents a viable pathway towards a futuristic hunger-free world.

Audience Take Away Notes

- By using sensor-assisted smart agriculture approaches, the audience will be able to maximize crop productivity, enhance resource efficiency, and help create a world free of hunger in a sustainable manner.
- By enabling precise crop monitoring and management, sensor-assisted smart agriculture will support the audience in their work and ultimately contribute to a future without hunger by increasing yields, reducing resource consumption, and improving food security.
- In order to promote creative approaches to sustainable agriculture and food security, other faculty members can benefit from the insightful and useful applications that this sensor-assisted smart agriculture research offers. These faculty members can then use these insights and applications to further their own research or improve their curricula.
- Sensor-assisted smart agriculture offers a workable solution that streamlines and increases the effectiveness of a designer's job by providing accurate data and automated systems for the best possible crop management and resource use.
- Sensor-assisted smart agriculture will increase design accuracy by giving designers access to real-

time data and analytics, which will help them make better judgments and more successfully handle agricultural problems.

- Additionally, sensor-assisted smart agriculture can help with early pest and disease detection, support precision farming methods, improve crop quality, minimize labor costs, lessen environmental impact, and promote sustainable agricultural practices.

Biography

Dr. Moumita Gangopadhyay working as Associate Professor, Department of Biotechnology, Adamas University, WB, India. She has completed her MSc in Agriculture, MTech in Biotechnology and MBA in Agriculture and Rural Management from reputed Indian Universities or Institutes. She was awarded her PhD from J C Bose Institute, Kokata 2009 in Medicinal Plant Biotechnology. She was awarded many prestigious post-doctoral fellowships, like CSIR, DAE from India, DAAD (Germany), Endeavour (Australia). She has published 34 research papers with 5 book chapters and she has 2 patents. Her citations are 1938 with 25 i10 and 19 H index.

Obakeng Jona[1*], Marijke A. Fagan-Endres[1], Anna Happel[2], Brian Kullin[2], Hoyman Gamieldien[2], Jo-Ann Passmore[2], Susan T.L. Harrison[1]

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The scale-up and culturability of live biotherapeutics for reproductive health in South Africa

Bacterial vaginosis is a highly prevalent inflammatory condition, characterised by the absence of protective *Lactobacillaceae* commensal species and their replacement by vaginal pathogens such as *Gardnerella vaginalis*. It is known to increase HIV infection rates and thus presents a significant health risk to South African women. Traditional treatment is with antibiotics, but this does not support reestablishment of the natural protective vaginal species and thus recurrence rates of the condition are high.

Treatment with probiotics that are endemic to South African women is proposed as an alternative to antibiotics. Screening of over 100 vaginal clinical isolates has been performed to identify the most promising *Lactobacillaceae* species. Desired characteristics included ability to adhere to vaginal epithelial cells, production of lactic acid [D and L] and H_2O_2, ability to lower pH, and inhibition of common vaginal pathogen growth.

This work concerns characterising the production potential of the top five novel South African probiotic vaginal *Lactobacillaceae* isolates, for the treatment of bacterial vaginosis. The project investigates the cultivation and scale-up requirements of the isolates. Five *Lactobacillaceae* were cultured in MRS Broth at 37°C and 140 RPM, scaling up from 100 mL serum bottles to 5000mL bioreactors. pH control was also investigated in the bioreactors. Culture pH and cell density were also measured. Substrate and product concentrations were quantified via HPLC. The strains' performances were quantified with respect to their maximum specific growth rate, biomass and bioproduct yields, ability to lower pH, and their substrate to biomass, substrate to bioproduct, and bioproduct to biomass yield coefficients, and these were all compared to currently established over-the-counter probiotic strains.

The work seeks to establish an understanding and proof of concept to cultivate, at scale, the top performing live cultures to produce probiotics to treat bacterial vaginosis, adjunctively with antibiotics, in South Africa.

Audience Take Away Notes

- The research highlights issues involved with scaling up processes, especially where biomass is the key product.
- This study brings an understanding of physicochemical factors that limit and inhibit the growth of probiotic products, particularly Lactobacillaceae strains.
- The audience will learn which bioprocessing parameters are key to consider upon designing a biotherapeutic whose primary product is biomass.
- The work demonstrates how the novel South African probiotic strains compare to currently established over-the-counter probiotic strains.

- The work interrogates the feasibility of currently existing growth media that are used in industry, from an economic and fit-for-application standpoint.

Biography

Obakeng Jona is a Lecturer and PhD candidate in Chemical Engineering at the University of Cape Town (UCT). His research specializes in bioprocess engineering, particularly bioproduct/biotherapeutics development (probiotics) for female health. He focuses on bioprocess scale-up, growth medium design, and bioprocess design. Obakeng's research contributes knowledge applicable to the pharmaceutical, biopharmaceutical, and drug development industries.

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Governing the pubertal onset regulators of HPG axis in teleost: An application for aquaculture industry

Abstract: Puberty in teleost is characterized by the development and maturation of the gonads. It is a multifaceted complex process and involves different molecules, for instance, it is now known that Kisspeptin a key upstream regulator of the Hypothalamus-Pituitary-Gonadal axis (HPG) which initiates the GnRH release and hence downstream process of further hormonal release is directed. However, the interaction of Kisspeptin with hormones like melatonin (a regulator of puberty) is not well deciphered. In lieu of this, the study was intended to understand a hormonal interaction of Kisspeptin and Melatonin in common carp, using different photoperiod regimes. Common carp was exposed to different photoperiod regimes of Control (12h:12h), Long day-LD (18:6h), Short Day-SD (6:18h). The results obtained showed that there was an increase in the gene and protein expression of Kisspeptin 1 (Kiss1), Kisspeptin receptor 1 (Kiss1R), GnRH2, while decrease in Melatonin receptor (Mtnr1a), Gonadotropin inhibitor hormone (GnIH) in LD group compared to SD and control during the onset of puberty. Similarly, the gene expression of transcriptional factors like *gata1*, *gata2*, *cdx1*, *sp1*, *plc*, *n-myc*, and *hoxc8* was also found to be increased in the LD group, while *hdac1*, *fli1* was found to be up-regulated in SD group compare to control. Together, the study illustrates that long day photoperiod has resulted in the early pubertal markers and thus, applications of Kisspeptin need to be initiated in the aquaculture industry to increase the yield of the common carp.

Audience Take Away Notes

- **Understanding Hormonal Interactions**: The audience will gain insights into the hormonal interactions between melatonin and kisspeptin during the pubertal onset in common carp. This knowledge can be directly applied to similar studies in other teleost species or even broader vertebrate studies involving the hormonal regulation of puberty.
- **Application in Aquaculture**: The findings can be used to optimize breeding conditions for common carp by manipulating photoperiods and understanding hormonal changes to control and enhance the reproductive process.
- **Enhancing Breeding Programs**: Aquaculture professionals can utilize the findings to manipulate environmental conditions (like light exposure) to optimize the timing of puberty and reproduction, improving efficiency and yield in fish farming.
- **Research Expansion**: Researchers in endocrinology, neurobiology, or reproductive biology can build on these findings to explore similar mechanisms in other species, potentially leading to cross-species comparisons and new discoveries in hormonal regulation.
- Other faculty members can use this research to expand their own studies on hormonal regulation and puberty in vertebrates. It provides a solid foundation for further exploration into the roles of environmental factors and hormonal cues in biological processes.

- By understanding the specific hormonal pathways and environmental triggers, breeders can more accurately predict and control breeding times, improving the overall productivity and health of fish populations.

List Of Benefits

- **Improving Fish Health and Quality**: Knowledge of hormonal regulation can help in developing strategies to maintain fish health and quality by ensuring that breeding occurs under optimal conditions, thereby reducing stress and improving survival rates.
- **Cross-Disciplinary Applications:** The findings could also be relevant to researchers studying circadian rhythms, neuroendocrine functions, and even broader ecological impacts of hormonal regulation in wildlife.

Biography

Dr. Parth Pandya is a graduate in Biochemistry and has earned his doctorate in Zoology (Toxicology and Neuroendocrinology) from The Maharaja Sayajirao University of Baroda, Vadodara. To Parth Pandya credit, Parth Pandya has around 5 projects from reputed agencies DST-NSERB, GSBTM, GUJCOST, etc. In his lab, people are working in the field of Neuroendocrinology, Toxicology, Cancer Biology, and Entomology. Dr. Parth Pandya has more than 10 years of experience and has published more than 20 research articles in reputed journals and is also the editor and reviewer in different journals.

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Implementation of microfluidic phase separation methods and supramolecular host-guest interactions for rapid detection of allergies

Microfluidic Phase separation exploits the manipulation of fluid flow and the interaction of different phases to isolate and concentrate the target analytes from complex biological samples. In this paper, we review the recent progress in phase separation microfluidics for allergy detection, focusing on three main aspects: (1) blood plasma separation, (2) magnetic, electrophoretic, or acoustic separation methods, and (3) geometric structure design. We first discuss the microfluidic geometries and mechanisms involved in effective blood plasma separation, which is a vital step for eliminating substrate interference and cross-reactivities of components other than IgE with the allergens (remove or reduce the influence of other substances that could interfere with the detection of specific antigens (allergens) by the IgE antibodies). We then describe the microfluidic magnetic, electrophoretic, and acoustic separation methods to enhance the separation efficiency and reduce the size range of particles. Additionally, we highlight the geometric structure design of passive label-free microfluidic systems for biological micro-object separation, which can alter particle trajectories and improve overall chip performance by achieving high-throughput and high-purity separation of IgE from the plasma components. Finally, we discuss the rapid detection process of allergies by transferring the highly concentrated solution of IgE into the allergen-immobilised microfluidic chamber, where a reaction with the allergen occurs if the individual is allergic. After the allergen chamber, a supramolecule chamber is designed where calixarenes assemble to imprison the allergen-IgE complex, forming a carcerand. The carcerand undergoes self-functionalization during the trapping process, providing an azide functional group after the assembly of the carcerand is finished. A key feature of our proposed method involves click chemistry, where the azide group on the carcerand undergoes a rapid click reaction with the DBCO-based dyes, forming a highly stable triazole ring, resulting in distinctive colouration. Notably, for non-allergic individuals, the reaction ceases as the calixarenes do not form carcerands, ensuring accurate discrimination between allergic and non-allergic cases. We summarise the main results and findings of each aspect and compare them to existing methods in terms of performance, cost, and feasibility. We conclude by discussing the challenges and opportunities of a collaboration of phase separation microfluidics with host-guest chemistry for rapid detection of allergies and other potential applications.

Audience Take Away Notes

- The knowledge imparted by this paper offers a nuanced understanding of microfluidic phase separation techniques, empowering the audience with practical applications in allergy detection. Researchers and practitioners gain insights into optimizing allergy diagnosis through innovative methodologies. By delving into microfluidic geometries and mechanisms, they can refine blood plasma separation techniques, crucial for eliminating interference in allergen detection. Additionally, comprehension of magnetic, electrophoretic, and acoustic separation methods enables the enhancement of separation efficiency and particle size range reduction, vital for improving sensitivity and specificity in allergy testing. The paper's

emphasis on geometric structure design fosters the development of passive label-free microfluidic systems, facilitating precise particle trajectory alteration and achieving high-throughput, high-purity allergen isolation from plasma components. Furthermore, the elucidation of rapid detection processes, involving carcerand formation and click chemistry, equips practitioners to devise rapid, reliable allergy testing devices. Comparative analysis of results aids decision-making, allowing informed adoption of phase separation microfluidics for allergy diagnosis. Ultimately, this knowledge empowers the audience to advance allergy detection methodologies, develop innovative diagnostic tools, and enhance patient care through more accurate and efficient allergy diagnosis and management.

- Improved Allergy Detection Accuracy: By employing microfluidic techniques, the method promises more accurate allergy detection by eliminating interference and cross-reactivities present in traditional detection methods. This is crucial for healthcare professionals tasked with diagnosing allergies accurately.

- **Enhanced Efficiency:** The use of microfluidic magnetic, electrophoretic, and acoustic separation methods improves the efficiency of separation processes, allowing for quicker and more reliable detection of allergens. This can save time and resources for healthcare providers, potentially leading to faster diagnoses and treatments.

- **High-throughput and High-purity Separation:** The geometric structure design of microfluidic systems aims for high-throughput and high-purity separation of IgE from plasma components. This can streamline laboratory workflows and improve the quality of allergy testing results.

- **Rapid Detection Process:** The proposed rapid detection process expedites the identification of allergies by efficiently trapping allergen-IgE complexes and utilizing click chemistry for distinctive coloration. This speed can be invaluable in emergency situations or in clinics with high patient volumes.

- **Accurate Discrimination Between Allergic and Non-Allergic Cases:** The ability to accurately discriminate between allergic and non-allergic individuals based on the cessation of reaction for the latter ensures precise diagnoses, preventing unnecessary treatments or interventions for non-allergic individuals.

- **Cost-effectiveness and Feasibility:** By comparing the performance, cost, and feasibility of the proposed method with existing techniques, healthcare professionals can make informed decisions about adopting this innovative approach, potentially leading to cost savings and improved resource allocation.

- **Research Expansion:** Faculty members working in the fields of microfluidics, biomedical engineering, analytical chemistry, or allergy detection could find this research valuable for expanding their own investigations. They could build upon the methodologies and techniques described in the paper to further explore related topics or to develop new technologies for allergy detection or other bioanalytical applications.

- **Teaching Enhancement:** This research could also serve as a valuable educational resource for faculty members teaching courses in microfluidics, analytical techniques, or biomedical engineering. They could incorporate the concepts, methodologies, and findings discussed in the paper into their curriculum to provide students with real-world examples and applications of the principles being taught.

- Interdisciplinary Collaboration: The interdisciplinary nature of the research, combining microfluidics with host-guest chemistry for allergy detection, presents opportunities for collaboration among

faculty members from different departments or research areas. Faculty members with expertise in microfluidics, chemistry, biology, and biomedical engineering could collaborate to further advance the field and explore new research directions.

- **Practical Applications:** Faculty members could also explore the practical applications of the research findings in various industries, such as healthcare, biotechnology, or diagnostics. They could work with industry partners to translate the research into commercial products or technologies that have real-world impact.
- **Improved Sensitivity and Specificity:** The microfluidic phase separation method allows for the isolation and concentration of target analytes (such as IgE allergens) from complex biological samples, which can enhance the sensitivity and specificity of allergy detection compared to conventional methods.

- **Miniaturization and Integration:** Microfluidic devices enable the miniaturization and integration of various processes, including sample preparation, separation, and detection, into a single platform. This integration streamlines the design process and reduces the complexity of the overall system.

- **High Throughput and Automation:** The geometric structure design and passive label-free microfluidic systems described in the abstract suggest the potential for high-throughput and automated operation. This can increase efficiency and reduce the need for manual intervention, making the designer's job more efficient.

- **Rapid Detection:** The rapid detection process described, involving the use of click chemistry for colorimetric detection, offers the possibility of quick results compared to traditional methods, which often require longer processing times.
- **Selective Detection:** The ability to discriminate between allergic and non-allergic cases based on the cessation of reaction for non-allergic individuals demonstrates a selective detection capability, which is crucial for accurate diagnosis.
- **Improved Accuracy of Design:** By utilizing microfluidic phase separation techniques, the design aims to enhance the accuracy of allergy detection by isolating and concentrating target analytes (specifically IgE antibodies) from complex biological samples.
- The use of microfluidic geometries, magnetic, electrophoretic, or acoustic separation methods, and passive label-free microfluidic systems with specific geometric structures all contribute to refining the accuracy of the separation process.
- The incorporation of click chemistry for rapid detection provides a reliable means to distinguish between allergic and non-allergic cases, thus improving accuracy in diagnosis.
- **New Information for Design Problem Solving:** The abstract introduces novel techniques such as the formation of carcerands using calixarenes and the utilization of click chemistry for rapid detection, which may provide innovative solutions to existing design problems in allergy detection.
- Additionally, the discussion of collaboration between phase separation microfluidics and host-guest chemistry suggests new avenues for improving detection methods beyond allergies, potentially addressing a broader range of design challenges in biosensing and diagnostics.
- Comparative analysis of the proposed methods with existing techniques offers valuable insights into their performance, cost-effectiveness, and feasibility, aiding in informed decision-making during the design process.
- **Enhanced Sensitivity:** The use of microfluidic phase separation techniques can potentially enhance the sensitivity of allergy detection by concentrating target analytes, such as IgE, from complex biological samples, thus improving the signal-to-noise ratio.

- **Reduced Sample Volume:** Microfluidic systems often require smaller sample volumes compared to traditional methods, which can be advantageous when dealing with limited sample volumes or when conducting high-throughput screening.
- **Faster Analysis:** Microfluidic systems are known for their rapid analysis capabilities due to the small length scales and efficient fluid manipulation, leading to quicker results compared to conventional techniques.
- **Automation:** Microfluidic devices can be designed for automation, reducing the need for manual intervention and potentially improving the reproducibility of allergy detection assays.
- **Integration:** Microfluidic platforms allow for the integration of multiple functions (e.g., sample preparation, separation, detection) within a single device, simplifying the overall workflow and reducing the risk of sample contamination.
- **Portability:** Microfluidic devices can be designed to be portable and compact, making them suitable for point-of-care testing or field applications, thus enabling rapid allergy detection in various settings.
- **Cost-Effectiveness:** While initial setup costs may be involved, microfluidic systems can potentially offer cost savings over time due to reduced reagent consumption, lower sample volumes, and increased efficiency.
- **Customization and Flexibility:** Microfluidic platforms are highly customizable, allowing researchers to tailor the system to specific applications and experimental needs, leading to improved performance and versatility.

Biography of Parth Shinde

Parth Shinde, a researcher and entrepreneur, leads Tvashtr Biotech, merging science with accessible healthcare solutions. He is pursuing his Masters in Biological Sciences at BITS Pilani K K Birla Goa Campus. As Chief Coordinator at BITSAA-funded Innovations Lab, he oversees team operations. Collaborating with scholars, professors, and the young, talented generation, Tvashtr advances in Immunology and BCI. Their patented Rapid Allergy Testing Kit, supported by grants from SISFS powered by BiRAC and SOLVE from BITS Pilani K K Birla Goa Campus, promises inclusive healthcare. Ongoing MVP development, partnerships with Merck Life Sciences and IIT Bombay, and global forum participation demonstrate Tvashtr's dedication to innovation and impactful collaboration.

Biography of Yash Saini

Yash Saini has a wealth of experience in project management, team leadership, and entrepreneurship. Yash is a 2024 BITS Pilani K K Birla Goa Campus graduate. He has successfully led two funded projects and founded an alumni-funded engineering facility, “Innovations Lab”. His entrepreneurial venture, Tvashtr Biotech, has secured grants and filed a provisional patent on their product.

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Isolation and enzymatic characterization of microorganisms associated with municipal organic solid waste decomposition

Municipal organic solid waste is a rich source of carbohydrates, proteins, fats and lignocellulosic waste which provides an environment for the growth of different waste decomposing microbes. In Indian scenario huge amount of waste is being generated per day. It becomes a huge environmental problem to dispose of this waste in big cities. Also it develops serious health issues among citizens in dumping areas. In the present study, the municipal organic solid waste decomposing microorganisms were isolated from three different waste dumping and processing sites from pune, Maharashtra. The waste degrading microbes were isolated by serial dilution method on nutrient agar and potato dextrose agar. 118 bacterial isolates and 20 fungal isolates were screened for extracellular enzyme production at different pH (5.5 and 9), temperature (370C and 500C), and desiccator conditions. Based on the primary screening 40 bacterial isolates and 6 fungal isolates were selected for in vitro relative enzyme activity of amylase, protease, cellulase and lipase using various growth mediums like starch agar, casein agar, tween-80 agar and carboxy methyl cellulose agar. The 16 bacterial and 6 fungal isolates showing relative enzyme activity of minimum 2 and producing multienzymes were studied for enzymatic characterization. Enzyme assay of selected microbes were performed at different pH, temperature and aeration conditions. The optimal growth conditions, morphological characters, antagonistic effect and biochemical characterization were performed for the selected isolates. The isolates showed significant enzyme production and absence of antagonistic effects among each other. Thus, these results have increased the scope of finding most suitable waste decomposing microbial consortium. From the present investigation, it can be concluded that the extracellular multienzyme producing microbial consortium can be served as an ecofriendly source for bioconversion of municipal organic solid waste.

Keywords: Municipal Organic Solid Waste, Waste Decomposition, Microbial Consortium, Enzymatic Characterization.

Audience Take Away Notes

- Composition of solid municipal waste.
- It becomes a huge environmental problem to dispose of this waste in big cities.
- Microbes can degrade the solid waste in to simple nutrients.
- The extracellular multienzyme producing microbial consortium can be served as an ecofriendly source for bioconversion of municipal organic solid waste.

Biography

Dr. Sunil T Pawar studied Microbiology at the Shivaji University, Kolhapur, MS, India and graduated in 1989. he then joined the research group of Prof. Puranik Pravin at the School of Life Sciences North Maharashtra university Jalgaon MS India. He received his PhD degree in 2009 at the same institution. He has completed three major and two minor research projects funded by Govt. of India. He has more than 25 research publications on his own credit. He has guided three PhD students successfully and presently five students are working under his guidance. Presently He is a Chairman of Microbiology board of studies of Savitribai Phule Pune University, Pune (SPPU) and T C College, Baramati (Autonomous) He is a member of Academic council (SPPU). He is a member of College development committee at T C College Baramati Dist Pune India he obtained the position of Professor at the T C College (SPPU).

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Exploring the untapped potential of African fermented foods as a source of novel fibrinolytic enzymes

Cardiovascular diseases are increasingly prevalent globally, with thrombosis being a major contributor. Current thrombolytic drugs, while effective, are associated with significant side effects, including immune responses, haemorrhages, and stability issues. In contrast, microbial fibrinolytic enzymes, such as nattokinase derived from fermented foods, offer a promising alternative for therapeutic development. Despite numerous efforts to isolate nattokinase-like enzymes from Asian fermented foods, there has been limited exploration of fermented foods from other regions, such as Africa, Europe, and South America for their fibrinolytic potential. This study represents the first systematic attempt to screen various African fermented foods, for their fibrinolytic potential. Through various screening processes, potent fibrinolytic enzyme-producing microorganisms were identified and selected for further analyses. The best performing isolate was subjected to fibrinolytic enzyme production and N-terminal sequencing of the purified enzyme revealed it to be novel. Subsequent biochemical and biophysical characterizations further elucidated the enzyme's properties. This research highlights the potential of African fermented foods as sources of novel fibrinolytic enzymes and provides valuable insights into their potential applications.

Audience Take Away Notes

- Researchers can apply screening and characterisation techniques to their own studies on microbial enzymes or other bioactive compounds from fermented foods. Pharmaceutical researchers and developers can use the findings to explore alternative therapeutic agents for cardiovascular diseases.
- The presentation will provide researchers with novel ideas and methodologies that can be applied to their own work. Pharmaceutical professionals can leverage the knowledge to develop safer and more effective thrombolytic drugs, thereby improving patient outcomes.
- The presentation will provide faculty/researchers with novel ideas and methodologies that can be applied to their own work. Faculty members can enhance their teaching materials with real-world examples of cutting-edge research, enriching the learning experience for students.
- While not directly related to design, the research provides practical solutions in the field of biotechnology and pharmaceuticals by identifying novel enzymes that could simplify and enhance the development of safer thrombolytic therapies.
- The research offers new information on microbial enzymes that can be used to design more effective and safer therapeutic agents.
- The discovery of novel fibrinolytic enzymes from African fermented foods could lead to the development of new therapies with fewer side effects, improving patient care and outcomes.
- Highlighting the potential of African fermented foods not only contributes to scientific knowledge but also promotes cultural appreciation and the value of traditional foods.

Biography

Dr. Bhagwat earned his MSc in Microbiology from Shivaji University, India, in 2011 and completed his PhD there in 2018 under Prof. Dandge. Following five years of postdoctoral research with Prof. Pillai at Durban University of Technology's Biotechnology and Food Science Department (Enzyme Technology Group), he received the prestigious GOOT (Grow Your Own Timber) fellowship. His research focuses on developing innovative enzyme solutions for efficient biomass utilization to enhance the market share of bio-based products. With over 50 publications in high-impact journals, his work aligns with DUT's ENVISION2030 strategy, promoting sustainability, innovation, and societal impact through knowledge that supports sustainable practices and policies.

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Efficient clone selection and enhancement of recombinant protein yield in CHO cells using FACS-Based strategy and UCOE

In the biopharmaceutical industry, the quest for approaches to accelerate the generation of high-producing cell lines has always been challenging and crucial. In this regard, exploring novel techniques and combining them can assist in achieving this objective. One of the most challenging problems in this field is the random integration of vectors in the host genome. So, applying genetic regulatory elements such as ubiquitous chromatin-opening element (UCOE) can reduce the influence of vectors' heterochromatin insertion and gene silencing effects. Also, utilizing a high-throughput fluorescent-activated cell sorting technique and EGFP as a reporter gene can facilitate and speed up the high-producing cell selection. In this sense, we applied UCOE to prevent the expression cassette random integration effect and performed FACS to isolate high-producing cells. Then, the impact of UCOE, FACS, and the combination of these two technologies was assessed. To this end, two expression cassettes, pOptiVEC and UCOE-containing plasmid, CET1019HD, entailing DPO-LoxP-IRES-EGFP-LoxP-IRES-DHFR, were engineered. The LoxP sequences were applied to excise IRES-EGFP fragment after high-yield cell line development. The cloning process was confirmed by enzymatic digestion and PCR, followed by Sanger sequencing. Afterward, for the purpose of stable cell line development, both cassettes were linearized and transfected to the CHO DG44 cells through the FreeStyle™ Max reagent. The DHFR was used as a selection marker, and transfected cells were screened by changing the medium to an HT-deficient one. Subsequently, the integration of expression vectors in the host genome was assessed by PCR-Sanger sequencing. Then, the EGFP was utilized as an enrichment indicator in both populations to isolate high-producing cells through FACS. Ultimately, to evaluate the impact of UCOE and FACS on developing efficient cell lines, the DPO and EGFP expression levels were evaluated by qRT-PCR, western blotting, and ELISA. The present research data demonstrated that UCOE highly influences on targeted protein transcription levels and protein synthesis. Isolating high-producing cells by FACS led to obtaining a cell pool with about 1.5-fold improvement of desired protein production. Combining these two approaches resulted in a population with approximately 9-fold increases in Darbepoetin alfa expression level. Our results highlighted the potency of an EGFP-FACS-based approach for isolating high-producing

cells in the shortest possible time, explored the straight relation between the gene of interest and EGFP expression level, which makes this fluorescent protein a valuable enrichment reporter, and underscored the UCOE's substantial effect on productivity. This dual strategy, which simplifies the clonal selection process and boosts the desired protein yield, promises the strength of this method for industrial biotechnology applications.

Keywords: Cell line development, High-producing cell line, FACS, Cell sorting, UCOE

Audience Take Away Notes

- The audience will gain the insights into the key challenges of recombinant protein production, particularly in cell line development and gene expression stability.
- This dual approach offers a scalable, practical solution for enhancing target protein production and high-yield cell selection, which can be directly applied to the biopharmaceutical industries.

Biography

Reyhane Lohrasbi holds a Master's degree in Genetics from Royan Institute. Reyhane Lohrasbi currently works as a researcher in the Department of Reproductive Biomedicine at the same institute. Reyhane Lohrasbi research focuses on biotechnology, genetic engineering, cell line development, and molecular genetics.

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Exploration of nanoformulated phytocompound against fibrogenic mineral dust-induced pneumoconiosis

Nanoparticular drug delivery is widely studied system to transport a broad range of synthetic drugs, bio-molecules, and natural compounds into the body. However, constant intake of the occupational dose of mineral-rich dust is dangerous, often leading to one of the diseases such as pneumoconiosis. It is a group of fibrotic lung disease such as coal workers' pneumoconiosis (CWP) and silicosis. Coal is a heterogeneous compound contain many trace elements which has major role in the toxicity assigned towards the lungs. The bioavailable iron (BAI) is an active agent associated with CWP. Moreover, work-place silica dust exposure may lead to progressive lung inflammation culminating in the silicosis development. Pneumoconiosis has no cure and the treatment options are also limited. Our work suggested that coal dust BAI and respirable silica dust (RSD) inhalation exposure can probably impair oxygen diffusion and induce inflammation in the lungs. Therefore, adverse effects of exposure to BAI and RSD on the lung cells were investigated regarding epithelial layer integrity, cytotoxicity, and pro-inflammatory responses. However, based on fibrogenic mineral dust toxicity we further investigated nanoencapsulated herbal compound on *in vivo* silicosis model. We initiated with submerged exposure of human alveolar epithelial cell line (A549) to coal dust BAI content with low (275 ppm), moderate (4650 ppm) and high (9065 ppm) and RSD exposed to male wistar rats at dose 100mg/kg to gain a basic understanding of their toxicity. However, particulate poly-lactic-co-glycolic acid (PLGA) as drug carrier used for nanoencapsulation of herbal steroidal sapogenin Diosgenin (DN) and anthraquinone Emodin (EN). Cytotoxic effects were evaluated using various parameters which include oxidative stress markers and genotoxicity parameters. We observed a dose dependent increase in cellular cytotoxicity after induction with fixed coal concentration with varying BAI content. Among the cytotoxicity markers, oxidative stress markers and genotoxicity parameters showed dose dependent increase with increase in concentration of BAI in coal dust. Moreover, the cell counts in lung lavage fluid from nanoencapsulated DN and EN treated rats suggest that it has decrease the cytotoxic effects in lungs. We demonstrated that nanoencapsulated DN and EN treatment inhibit inflammation, and decreased production of collagen, which may be attributed to its regulation of cytotoxicity, collagen deposition and antioxidants enzyme concentration in tissue homogenate. This study results corroborate findings in the human exposure study that inhalation of BAI coal dust and RSD may induce lung toxicity, reflecting the potential health hazards. Moreover, this work represents the first effective use of nanoencapsulated DN and EN treatments promote the environmental mineral-rich dust exposure to lung and the alleviation of inflammation in cases of pneumoconiosis.

Audience Take Away Notes

- The contents of the presentation will be able to provide the audience with the necessary information regarding bioavailable iron in coal mine dust and environmental respirable silica dust induced lung fibrosis.

- This study will helpful not only to biotechnologist engaged in research and teaching but also to those industries to produce new drugs or reposition some existing ones.
- This study will be able to provide the necessary tools to understand the needs of clinician assisting them by designing and producing diagnostic and treatment tools to be applied in nanomedicine.
- The audience will be also able to see the usefulness of characteristics and pharmacokinetics data reveal the efficacy of phytocompounds to be suitable nano-drug delivery modalities with improved bioavailability and pharmacological strength.

Biography

Dr. Sanvidhan G Suke is graduate B.Pharm., M.Pharm. from RTM Nagpur University; and post graduate M.Tech. in Biotechnology from Jadavpur University, Kolkata. Sanvidhan G Suke obtained Ph.D. from University of Delhi. Sanvidhan G Suke research interests are Toxicology, Nanotechnology, Biotechnology, Pharmacology. Sanvidhan G Suke guided number of graduates; post graduate students and supervising to Ph.D. fellow for their research activities and published number of papers in high impact journals and conference proceedings. Sanvidhan G Suke also editorial board member and reviewer of many international scientific journal. Sanvidhan G Suke chaired scientific session and delivered guest lecturers in various scientific events. Sanvidhan G Suke current projects are Toxicology, drug technology and delivery.

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The promising future of the unique translational tool to manage cardiac self-renewal and regeneration to secure the post-infarction period

The approaches securing cardiac regeneration in post-infarction period are not available to be practiced. The key problem is the identity of cells be born to generate functionally active cardiac myocytes replenishing those being lost during ischemia. With identification of resident Cardiac Stem Cells (CSCs), it has been supposed that the latter may be a crucial source to initiate and prompt myocardial self-renewal and regeneration.

In the last years, the focus has been moved towards a concept of the new wave of Cardiac Myocyte (CM) formation via a scenario of dedifferentiation and proliferation of mature CMs. The observation that CSCs can be developed inside a pool of immature cardiac cells by formation of "Cell-In-Cell Structures" (CICSs) has enabled us to conclude that CICSs being encapsulated are implicated into mammalian cardiac myogenesis over the entire lifespan. It had been demonstrated before that new CMs are generated through formation of CSC-derived Transitory Amplifying Cells (TACs) either in the CM colonies or in a process of intracellular development of CICSs being encapsulated.

The analysis of adult rat cardiac cell suspension 1-5, 10, and 14 days after permanent coronary occlusion and ischemia/reperfusion has gifted a researcher a unique phenomenon of TAC release from mature CMs with clear sarcomeric structure. In this case a development of the intracellular CSC occurs within the vacuole pre-formed by CSC-driven sarcolemma-induced invagination. The comparison of TACs exiting the CICS with capsule with TACs just released from non-encapsulated CICS showed that non-encapsulated CICS-derived TACs are characterized by increased expression of cardiac markers and decreased expression of stemness-related markers. Those data for the first time suggest that the development of CSCs inside the encapsulated CICSs is important for cardiac self-renewal and maintenance of CSC-based pool. At the same time, the development of CSCs inside a population of mature CMs is resulting in the formation of pre-cardiac myocytes, which are able to substitute for irreversibly injured CMs, representing the major mechanism of myocardial regeneration. And that, in turn, would open up a green light to secure the targeted management of regenerative cardiac myogenesis.

SC therapies are viable alternatives to conventional treatments with substantial therapeutic potential and market opportunities. And the lessons learned from our studies would yield fundamental biological insights in the repair of ischemic and other myocardial diseases whilst securing the therapeutic resources with the unique future.

Meanwhile, translational research & applications are keeping success in the field elusive in terms of return on investment and in terms of attractiveness to investors within and outside of biopharma and clinical market as well. The SC market itself is predicted to grow to around $12.1 billion by 2024, whilst the development of the SC therapy into further applications has not yet become common practice, and the true potential of regenerative medicine has yet to be demonstrated fully. For instance, the allogeneic or 'off-the-shelf' business model for SC-based therapies is far more akin to current biopharmaceuticals, where the product maintains long-term stability.

Moving forward, we must better characterize SC-based therapy and clinical trials, facilitating decision making across the sector. More basic science investigation is required to elucidate the specific mechanism(s) by which SC promote cardiac regeneration and/or repair, and how cells can be optimally delivered and engineered. As our understanding of SC therapy increases, it becomes more likely that clinical trials can produce truly meaningful results with implications for clinical practice.

Based on the new mechanisms and unique phenomenon, we are developing improvement strategies to boost the potency of SC repair and to generate the "next generation" of SC-based and regulatory biomolecules-based (***bimodal***) therapeutics. Moreover, our strategies should aim at more personalized SC therapies in which individual disease parameters influence the selection of optimal cell type, dosage and delivery approach. And encouraging pre-clinical and clinical studies as one and solid entity reporting significant SC-mediated cardiac regeneration would rapidly pave the way for clinical translation. So, a desire to discover innovative SC-based technologies of the next-step generation would encourage governments and companies to focus directly on regenerative medicine as a future potential economy and social insurance booster.

Thus, prospective research should focus on the development of specific responder scores and the identification of prognostic SC- and cardiac damage-related biomarkers to identify patient cohorts who benefit most from distinct SC treatments. Thereby, a higher standardization of study designs and the establishment of a global open-access database for the registration and publication of pre-clinical and clinical trials would greatly improve the comparability and access of obtained data. The worldwide SC therapy market is still in an early stage. And the developing translational pipelines for rising applications will build the competition among merchants amid the conjecture time frame.

Biography

Sergey Suchkov was born in the City of Astrakhan, Russia, in a family of dynasty medical doctors. In 1980, graduated from Astrakhan State Medical University and was awarded with MD. In 1985, Suchkov maintained his PhD as a PhD student of the I.M. Sechenov Moscow Medical Academy and Institute of Medical Enzymology. In 2001, Suchkov maintained his Doctor Degree at the National Institute of Immunology, Russia. From 1989 through 1995, Dr. Suchkov was being a Head of the Lab of Clinical Immunology, Helmholtz Eye Research Institute in Moscow. From 1995 through 2004 - a Chair of the Dept for Clinical Immunology, Moscow Clinical Research Institute (MONIKI). In 1993-1996, Dr. Suchkov was a Secretary-in-Chief of the Editorial Board, ***Biomedical Science***, an international journal published jointly by the USSR Academy of Sciences and the Royal Society of Chemistry, UK. At present, Dr Sergey Suchkov, MD, PhD, is: Professor, Dept for Clinical Allergology & Immunology of the Russian University of Medicine, Moscow, Russia. Member of the Russian Academy of Natural Sciences, Moscow, Russia. Dr. Suchkov is a member of the: New York Academy of Sciences, USA. American Chemical Society (ACS), USA; American Heart Association (AHA), USA; European Association for Medical Education (AMEE), Dundee, UK; EPMA (European Association for Predictive, Preventive and Personalized Medicine), Brussels, EU; ARVO (American Association for Research in Vision and Ophthalmology); ISER (International Society for Eye Research); Personalized Medicine Coalition (PMC), Washington, DC, USA. Secretary General, United Cultural Convention (UCC), Cambridge, UK.

Dr. Shweta Gupta
School of Technology, Woxsen University, India

AI based Robots for treatment of Cognitive Diseases

With the advent of Artificial Intelligence in all facets of life, the advent of AI based Clinical psychologist robot and NLP chatbot simulating actual Clinical psychologist that would talk to patient in their own mother tongue and counselling can be taken as and when required. Besides that, a psychiatrist can to maximum extent be replaced by AI machine which can prescribe medicines and go into the remote areas where not even proper medical facilities are available. These AI based robotic clinical psychologists and psychiatrist can be implemented using generative AI or Azure AI using features such as Natural Language Processing (NLP) and speech processing and computer vision. These inventions are very useful for remote areas where ample medical facilities are not available. In parallel to that, Artificial Intelligence based ATM type medicine dispensing machine can be installed that can provide medicines immediately as a first aid before patient can be taken to hospital. Thus, Artificial Intelligence based machines can work wonders in Cognitive treatment of different Cognitive Diseases which will be further discussed. So, the implementation of the same using AI and various Bioinformatics techniques and various AI techniques for detection of the Cognitive Disease would be incorporated during the talk.

Audience Take Away Notes

- The talk will be able to discuss about practical AI solutions like websites, AI based Apps and Chatbots, Robots which will help the Cognitive Patients for the self-diagnosis and treatment of Cognitive Diseases like Seizophernia and Depression using Computer Vision, Natural Language Processing, Speech Processing that could further help the Biomedical and Bioengineering audience to apply these innovative, novel and practical AI techniques for treatment of various biomedical diseases.
- This talk will give an deep insight into development of Artificial Intelligence based Medical solutions like NLP Chatbot using Azure AI and Generative AI. Each and every aspect regarding development will be clearly discussed and which would further help the audience to get post–doc opportunities, job in AI medical solutions field and even entrepreneurship could be thought of for opening your own start–up because it would cater to development of AI software which is innovative solution for treatment of Cognitive Diseases like Seizophernia and detection of depression for which no software or datasets are available across the world are available.
- I would be discussing specifically about AI based NLP Chatbots for helping in diagnosis and psychoeducation of Seizophernia and Depression that would not only help in immediate psychiatric help for the affected patients but this kind of discussed AI based softwares can be emulated for diagnosis and treatment of various other biomedical diseases and those can be discussed by other researchers and faculties during the talk.
- The aforementioned practical AI solution will make designer's job more efficient.
- It will give a breakthrough in the designing of medical solutions whether they are chatbots, robotic medical device because it would be discussing latest AI techniques for the treatment of Cognitive

Diseases and various AI based Cognitive medical tests would be discussed.

- There are no Cognitive medical tests available for Cognitive Diseases and it is mainly left to diagnosis of psychiatrists and psychoeducation of Clinical Psychologists and such medical facilities are not available in various parts of world so my these AI Chatbots and Robotic Clinical Psychologists and Psychiatrists will go in different parts of world even Covid affected areas and places like Hiroshima Nagasaki which would further prevent death off human doctors and at the same time provide psychiatric help.
- All the related Artificial Intelligence Techniques like Computer Vision, Natural Language Processing, Speech Processing would be discussed in context of providing successful medical solutions and development and establishment of high–end robotic lab.

Biography

Dr. Shweta Gupta holds a B.E. from Pune University, M.S. from Bits Pilani, Executive Global Business Management Programme from I.I.M. Lucknow. She earned her Ph.D. in "Neurostimulators used in Brain for Parkinson's Disease and Epilepsy using Bionics". She served as a Senior Scientist under International Travel Support Scheme, Government of India to ICBBT2015, Singapore. Dr. Gupta was awarded Certificate of Merit for Outstanding academic performance. Senior Member of CBEES series of HONGKONG Conferences. She is an Expert member as Validator and reviewer in NPTEL -SWAYAM Courses, AICTE, Govt. of India for Java. She is an Expert member as Reviewer for INSPIRE Awards MANAK (Start -UP India), Department of Science and Technology (DST), Government of India. Her presentation video in ICCBB 2023, Malaysia on Chinese BiliBili platform.

Sinem Durmus
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Unraveling cancer's genetic tapestry: The pivotal role of mirnas in tumorigenesis and future therapeutic horizons

miRNAs are noncoding RNAs that regulate gene expression, inducing degradation or translational repression of mRNA. They are functionally involved in the process of carcinogenesis such as cell differentiation, proliferation, and apoptosis. However, it is important to keep in mind that they possess dual functions in cancer and hence must be evaluated accordingly. Briefly, oncomiRs generally trigger tumor growth and development through downregulating Tumor Supressor Genes (TSG). The most prominent example in this family is miR-21, which was overexpressed in several cancers, including breast, colorectal and lung cancer, and where it showed downregulation of TSGs, like PTEN and PDCD4, leading to cell survival and proliferation stimulation. Opposite to that, miRNAs of a tumor suppressor type act as onco-gene repressors, blocking oncogenes and preventing cancer development. In that light, some miRNAs become promising biomarkers in early diagnosis and prognosis prediction and also valued tools in the struggle against cancer. Genetic and epigenetic changes at the level of mutations, deletions, gene amplification, and promoter methylation normally cause these changes in miRNA expression that lead to the development of cancer. Furthermore, it is supposed to be influenced by the tumor microenvironment as well. This represents another layer of complexity in the role of miRNA expression in cancer regulation. The interplay among miRNAs, the tumor microenvironment, and the immune response is a complexity that, once understood, may let researchers discover new strategies to enhance the body's defenses against cancer. Moreover, the study of miRNA interactions with other molecules involved in cancer pathways can reveal new opportunities for personalized medicine approaches. Since miRNAs are such powerful modulators of cancer pathogenesis, they become good therapeutic targets. Some of these therapeutic strategies using miRNAs include the induction of miRNA mimics, which replace the activity of tumor-suppressing miRNAs, and miRNA inhibitors, the antimiRs, which inhibit oncomiR activity. Studies are currently underway to use of nanoparticles and viral vectors for the delivery of such therapeutic miRNAs. Several miRNAs are currently undergoing preclinical and clinical evaluation. However, the biggest challenge to be overcome in these studies is to direct them to the right target since one miRNA can target more than one gene. The other is the exact delivery of the tissues and cells. Nevertheless, advancement in nanotechnology gives hope that these obstacles in miRNA therapies will be overcome. It's also claimed that miRNAs play a role in the development of drug resistance. It is supposed to gain from the implementation of miRNA-based therapeutics in the reversal of development of drug resistance in cancer cells and improvement of the survival rate of patients with existing treatment options. In summary, research on miRNA in cancer could help significantly in having a future of personalized medicine and more effective cancer therapy. A new approach of this kind could be the key to the pathway for the development of more effective and individually personalized treatment solutions for cancer-affected patients.

Audience Take Away Notes

- Participants will learn about the history of miRNA and cancer studies from the past to the present. They will also learn about current preclinical and clinical applications and how these applications can be further developed. This information will guide the participants on the open areas that can be studied in miRNA research in the future.
- Clinicians and researchers can use this knowledge to develop personalized and effective cancer therapies.
- Educators and faculty can integrate this cutting-edge research into their teaching, inspiring new projects and collaboration.
- The presentation offers educational value, collaboration opportunities, and inspiration for innovation in cancer research and treatment.

Biography

Dr. Durmus earned her Ph.D. in Medical Biochemistry from Istanbul University-Cerrahpasa, where she investigated the relationship between disease severity, miRNA-21, and Cathepsin B in patients with Familial Mediterranean Fever. She completed her Master's at Istanbul University, focusing on RAGE gene polymorphisms in endometrial cancer. Dr. Durmus has held research positions at Izmir Katip Çelebi University and Istanbul University-Cerrahpasa. Her research interests include miRNA expression in diseases, gene polymorphisms, and the molecular mechanisms of cancer and other pathologies. She has published extensively in international peer-reviewed journals and has received several awards for her work.

Sreevidya CP*, Jayesh P
National Centre for Aquatic Animal Health, Cochin University of Science and Technology, Cochin-16, Kerala, India

Impact of multiple environmental stressors on the survival of Daphnia magna

Ecotoxicological investigations often subject test organisms to optimal environmental conditions. However, these organisms rarely encounter such ideal circumstances in their natural habitats. Instead, they typically contend with sub-optimal conditions and periodic exposure to environmental stressors. The interaction between natural stressors and toxicants can result in synergistic effects, wherein the combined impact exceeds the sum of individual stressors. We investigated the responses of Daphnia magna, specifically focusing on the dormant egg stage, ephippia, to multiple stressors including cold snaps, dehydration, and selected Contaminants of Emerging Concern (CECs). Our study aimed to understand the short-term implications of these stressors on species survival, emphasizing the importance of functional trait perspectives in ecological research and making them useful in determining the ecological consequences of environmental stressors.

Through experimental testing, we assessed various physiological and reproductive parameters including hatching efficiency, maturation, fecundity, ephippia formation, and mortality rates under different environmental conditions. Surprisingly, we found that stressors had both positive and negative impacts on species survival.

Sudden dehydration events led to a significant increase in hatching efficiency compared to ambient conditions, suggesting a potential adaptive response to sporadic stressors. Conversely, gradual decreases in temperature had detrimental effects on ephippia, resulting in failed hatching or significantly reduced hatching rates over the course of a one-month experiment.

Furthermore, our results indicate that contaminants of emerging concern such as Bifenthrin (insecticide), 4-Octylphenol (pesticide), Atrazine (herbicide), Bisphenol A (raw material used for the manufacturing of plastic), and Sertraline (pharmaceutical) exhibited varying degrees of negative effects on species survival. Significantly, these effects were observed within the relatively short timeframe of our study, highlighting the potential for even greater impacts over the long term.

Extrapolating our findings to a broader ecological context, it becomes evident that the cumulative effects of these stressors could lead to significant declines in biodiversity and ecosystem health. Therefore, understanding the functional traits and responses of organisms to multiple stressors is crucial for predicting and mitigating the long-term consequences of environmental changes.

In conclusion, our study underscores the complex interplay between environmental stressors and species survival, emphasizing the need for integrated approaches to ecosystem management and conservation.

Audience Take Away Notes

- **Real-World Environmental Conditions:** How test organisms, like Daphnia magna, typically face sub-optimal and stressful environmental conditions in their natural habitats, as opposed to the ideal conditions often used in laboratory settings.
- **Synergistic Effects of Stressors:** The concept of synergistic effects, where the combined impact of natural stressors and toxicants can exceed the sum of their individual effects, leading to greater ecological consequences.
- **Focus on Ephippia:** The significance of studying the dormant egg stage (ephippia) of Daphnia magna to understand species survival under multiple stressors, including cold snaps, dehydration, and Contaminants of Emerging Concern (CECs).
- **Experimental Findings:** Specific physiological and reproductive parameters measured in the study, such as hatching efficiency, maturation, fecundity, ephippia formation, and mortality rates under different environmental conditions.
- **Adaptive Responses:** Insight into how sudden dehydration events can increase hatching efficiency, suggesting adaptive responses to sporadic stressors, and how gradual decreases in temperature can negatively impact ephippia.
- **Impact of CECs:** The varying negative effects of different Contaminants of Emerging Concern (CECs) on species survival, including specific chemicals like Bifenthrin, 4-Octylphenol, Atrazine, Bisphenol A, and Sertraline.
- **Short-Term vs. Long-Term Effects:** The potential for even greater long-term impacts of environmental stressors on biodiversity and ecosystem health, based on the short-term findings of the study.
- **Functional Trait Perspectives:** The importance of understanding functional traits and organism responses to multiple stressors for predicting and mitigating the long-term consequences of environmental changes.
- **Integrated Ecosystem Management:** The need for integrated approaches to ecosystem management and conservation to address the complex interplay between environmental stressors and species survival.

Biography

Sreevidya is a dedicated research scholar at the Cochin University of Science and Technology (CUSAT), National Centre for Aquatic Animal Health (NCAAH), India. She is currently pursuing her doctoral research, focusing on various aspects of Daphnia maintenance standardization, primary cell culture from Daphnia, and induced Pluripotent Stem Cell (iPSC) development. Her research aims to bridge the gap between in vivo and in vitro studies, particularly in the context of toxicity testing. Her current research is centered around understanding the ecological impacts of environmental stressors on Daphnia magna, particularly focusing on the dormant egg stage, ephippia. By investigating the effects of multiple stressors such as cold snaps, dehydration, and contaminants of emerging concern, she aims to provide valuable insights into species survival and ecosystem health. Sreevidya has presented her work at various national and international conferences, and she is keen on contributing to the field of aquatic toxicology and cell culture research. Her dedication to integrating functional trait perspectives in ecological studies highlights the importance of comprehensive approaches to environmental conservation and management.

Stefanie Kurtz[1*], Antje Frenzel[1], Andrea Lucas-Hahn[1], Petra Hassel[1], Roswitha Becker[1], Maren Ziegler[1], Monika Nowak-Imialek[1], Brigitte Schlegelberger[2], Gudrun Göhring[2], Heiner Niemann[1], Björn Petersen[1], Claudia Klein[1]

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Sex determination in pigs by using gene editing

Sexing by gene editing in pigs is an alluring alternative to the surgical castration of piglets as the male-specific boar taint remains a major obstacle in pork production.

In mice, the SRY-gene was first described as a genetic developmental switch for the male phenotype. The knockout of the murine SRY-gene by TALEN suppressed testis development in the fetal gonadal ridges and generated a female phenotype. In addition, the knockout of the 5' flanking region of the rabbit SRY gene results in a similar phenotype as in mice. In our study, we aimed to generate a knockout of the porcine SRY gene to investigate its role in sex determination in pigs.

For the first time, we successfully generated a knockout of the SRY gene in pigs by microinjection of two CRISPR/Cas9 complexes targeting the centrally located "High Mobility Group" domain (HMG) of the SRY gene. Frameshift mutations within the porcine HMG domain resulted in the development of complete female external and internal genitalia in genetically male piglets. Moreover, we further confirmed the function of the HMG box as the main functional domain for male sex development, as the introduction of a deletion within the 5' flanking region of the HMG domain was not associated with sex reversal in the resulting offspring. These results pave the way to generate boars that produce female offspring only and provide a potential solution to avoid surgical castration.

Audience Take Away Notes

- The role of the porcine SRY gene in sex determination.
- Use of intracytoplasmic microinjection of CRISPR/Cas system and/or cloning to induce sex reversal in pigs.
- Concept to generate female-producing boars.

Biography

Stefanie Kurtz studied Veterinary medicine at University of Veterinary Medicine Hannover, Germany and graduated in 2017. She then joined the research group of Prof. Dr. Heiner Niemann at the Institute of Farm Animal Genetics, Friedrich-Loeffler-Institute (FLI) in Mariensee, Neustadt am Rübenberge, Germany. She received her PhD degree in 2020 at the same institution investigating sex determination in pigs. From 2021 to 2023 she worked at the Lower Saxony State Office for Consumer Production and Food safety for animal welfare in animal testing. Since 2023 she is back in FLI Mariensee as scientist for gene editing in pigs.

Vidhi Mathur[1*], Ashwini Kumar[2], Raviraja N S[1], Kirthanashri S V[1]

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A novel technique for decellularization of human esophagus for 3D bioprinting

The clinical treatment for esophageal defects is a huge challenge as it leads to poor quality of patient life, where the conduit tissue taken from the patients' stomach, jejunum or colon is implanted in the damaged region. The treatment comes along with many post operative complications including fistula, leakage and bleeding. The aim of this study was to optimize a technique for decellularization of human esophagus to remove cellular components and utilize the decellularized human Extra Cellular Matrix (dhEM) proteins for fabrication of 3D bioprinted scaffolds that promises to be a potential alternative to existing implants. Full length of human esophagus was obtained from cadaveric samples and cleaned with phosphate buffer saline to remove the blood components. About 100 mg of the esophagus is homogenized for 5 minutes using EGTA-EDTA buffer, proteases inhibitors and sodium dodecyl sulphate. Further the esophagus is centrifuged and the supernatant containing dhEM was characterized for DNA content (using fluorometer), sulphated Glycosaminoglycans (sGAGs) and Elastin (ELISA), and the retention of proteins was analyzed by Bicinchoninic acid assay and SDS-PAGE. Further, the dhEM was mixed with gelatin methacrylate along with mouse fibroblasts and 3D bioprinted into tubular scaffolds. The retention of major ECM proteins like sGAGs and elastin are essential to influence cell adhesion and proliferation that enhances the regenerative potential of 3D bioprinted scaffold. The optimized decellularization process was found to be successful by removing cellular contents and retaining the major ECM proteins in human esophagus. This technique confirms the feasibility of dhEM for 3D bioprinting.

Keywords: 3D Bioprinting, Esophagus, Bioinks, Regeneration.

Biography

Ms. Vidhi Mathur is currently working as Doctoral fellow at Manipal Centre for Biotherapeutics Research, Manipal Academy of Higher Education, Manipal, India. She has completed her Masters in Cellular and Molecular Oncology and bachelor's in biotechnology from Amity University, Noida, India. She then worked as Junior Research Fellow at Amity University, Noida, India. Currently, her work is mainly focused on developing 3D bioprinted scaffolds for oesophageal regeneration. Vidhi has 5 publications, filed for 03 Indian patents and is a team member in NIDHI-PRAYAS, DST funded project under government of India.

Vyacheslav Shulunov
Institute of Physical Materials Science of the Siberian Branch of the Russian Academy of Science, Ulan-Ude, Russia

Advanced roll porous scaffold 3D bioprinting technology

Improvements in the Roll Porous Scaffold 3D bioproduction technology will increase print density of 10–15 μm cells by ~20% up to ~1.5×10^8 cells/mL and clarity by >10%. The analogues of the proposed solution are only indirect, much more expensive and less technologically advanced. Now in 3D bioprinting, biodegradable collagen and gelatin hydrogels are usually used as a scaffold to keep cells at a given point in space from leaking away or nanofibers. When printing a large organoid in a gel, it tends to spread, the collagen does not have time to solidify, and to maintain the shape of the organoid during solidification, acoustic or magnetic waves are used, which greatly complicates the design of the printer. Nanofiber substrates, which take a long time to produce on high-voltage equipment using the electrospinning method, allow them to retain their shape, but are used mainly for the production of fragments of non-branching vessels, pieces of cartilage, connective, muscle and even nervous tissue. The porous bioresorbable scaffold for Roll Porous Scaffold technology is designed to solve the problems of precise placement, leakage and increase in the number of cell types immediately used in one printer and by orders of magnitude exceed all currently dominant 3D bioprinting methods in speed, volume, and printing density without using expensive equipment and components.

Audience Take Away Notes

- The upgrade of the Roll Porous Scaffold is designed to 1) Simplify parallel testing of new substances not on animals, but using generated 3D “organ on a chip” biomodels, 2) Personalized medicine with simultaneous testing of multiple treatment methods and drugs, targeted therapy for a specific patient in vitro on the 3D composition of his personal cells and selection of the most effective with low toxicity, 3) Overcoming the shortage of organs for implantation and personal hormone replacement therapy for everyone using printed endocrine glands from their cells.
- The use of ribbon porous scaffolds will significantly increase the productivity of 3D bioprinters due to the use of hundreds of thousands of nozzles operating at a frequency of 64-80 kHz instead of 1 laser or 5 syringes and will significantly reduce the cost of bioprinting without launching printers into space.
- The use of new methods make possible to regulate the density of the porous scaffold depending on the vell type multilayer tissues, blood vessels, nerves, etc.

Biography
In 1992 Vyacheslav Shulunov entered the Buryat Branch of the Novosibirsk State University. In 1997 graduated from the Buryat State University, Ulan-Ude Russia and joined a junior-researcher at the Institute of Physical Materials Science of the Siberian Branch of the Russian Academy of Science. He received his Ph.D degree in Thermal Physics and Theoretical Heat Engineering in 2002 from the East Siberia State University of Technology and Management. The author of 3 patents of the Russian Federation, 4 certificate of state registration of the program, 12 Web of Science and Scopus articles – Scopus h-index: 5 (1 co-author in 2 publications).

Qin Xiang, Xiaoqian He, Junhao Mu, Haixi Mu, Dishu Zhou, Jun Tang Qian Xiao, Yu Jiang, Guosheng Ren, Tingxiu Xiang, Weiyan Peng*

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The phosphoinositide hydrolase phospholipase C delta1 inhibits epithelial-Esenchymal transition and is silenced in colorectal cancer

In this study, we found that the Phospholipase C Delta1 (PLCD1) protein expression is reduced in colorectal tumor tissues compared with paired surgical margin tissues. PLCD1-promoted CpG methylation was detected in 29/64 (45%) primary colorectal tumors, but not in nontumor tissues. The PLCD1 RNA expression was also reduced in three out of six cell lines, due to PLCD1 methylation. The ectopic expression of PLCD1 resulted in inhibited proliferation and attenuated migration of colorectal tumor cells, yet promoted colorectal tumor cell apoptosis in vitro. We also observed that PLCD1 suppressed proliferation and promoted apoptosis in vivo. In addition, PLCD1 induced G1/S phase cell cycle arrest. Furthermore, we found that PLCD1 led to the downregulation of several factors downstream of □-catenin, including c-Myc and cyclin D1, which are generally known to be promoters of tumorigenesis. This downregulation was caused by an upregulation of E-cadherin in colorectal tumor cells. Our findings provide insights into the role of PLCD1 as a tumor suppressor gene in Colorectal Cancer (CRC), and demonstrate that it plays significant roles in proliferation, migration, invasion, cell cycle progression, and epithelial-mesenchymal transition. On the basis of these results, tumor-specific methylation of PLCD1 could be used as a novel biomarker for early detection and prognostic prediction in CRC.

Audience Take Away Notes

- Colorectal Cancer (CRC), one of the top three most common cancers, has a high incidence of mortality. It is of great significance to find an effective biomarker for diagnosis of CRC. Previous studies indicate that abnormal promoter methylation is an excellent biomarker for the early diagnosis of multiple malignancies, including CRC. Recent reports indicate that the main mechanism for Tumor Suppressor Gene (TSG) silencing through epigenetic disruption, such as prompter methylation, during cancer process results in the inhibition of TSG expression. Therefore, identification of other silencing TSGs by epigenetic modifications is urgently needed.
- This study demonstrates that PLCD1 is down-regulated in colorectal cells by hypermethylation at the first time.
- Restoration of PLCD1 expression in CRC cells results in strong cytotoxicity due to the inhibition of proliferation and the induction of apoptosis.
- We also found that PLCD1 suppressed cell proliferation, metastasis, and tumorigenicity through inhibiting the Wnt and EMT signaling pathway in CRC. We speculate that the activation of PLCD1, which ultimately inhibits cancer malignancy, could be used as a novel biomarker for CRC prognosis.

Biography

Weiyan Peng, a Ph.D. from Chongqing University, graduated from the Biomedical Engineering program at Chongqing University in December 2011. From November 2008 to June 2010, I received funding from the China Scholarship Council and received a joint doctoral program in Biomedical Engineering at the University of California, San Diego in the United States. I have been working in the Molecular Oncology and Epigenetics Laboratory since July 2011, dedicated to research on tumor epigenetics and protein post-translational modifications. Hosted one National Natural Science Foundation project, participated in multiple major international cooperation research projects and National Natural Science Foundation general projects. Received one second prize for scientific and technological progress from the Chongqing Municipal Government. Published over 33 SCI papers, including 6 SCI papers by first author and corresponding author, with a highest impact factor of 9.5.

Dr. Yingwei Hou*, Tao Liu, Yong Pang
School of Engineering and Materials Science, Queen Mary, University of London, UK

Experimental measurement of three-dimensional responses of marine mussel plaques anchoring to wet substrates under directional tensions

The adhesive structures of marine mussel plaques have attracted significant attention owing to their remarkable adhesive properties. In this paper, we experimentally investigated the Three-Dimensional (3D) responses of marine mussel plaques anchoring to wet Polydimethylsiloxane (PDMS) substrates under directional tensions (15°, 45° and 90°). We employed a novel traction force microscopy system based on 3D digital image correlation to measure 3D displacements and force distributions at the interface between the PDMS substrates and mussel plaques under aqueous environment. The results show that both the displacement and the traction forces at an interface concentrated at the projection of the mussel thread on the substrate and distributed along the pulling directions. For 90° tension, debonding at the interface initiated at the location underneath the thread; the traction forces at the interface kept increasing until catastrophic failure occurred when the debonding propagated to the boundary of the mussel plaque. The experimental findings were compared with full scale 3D finite element simulations, in which cohesive elements were employed to model the interfacial behaviours. The comparison suggests that the adhesive model might not accurately explain the traction force distribution and debonding process. Other effects such as suction might take place and therefore a modified model combining adhesive and suction mechanisms need to be developed.

Audience Take Away Notes

- The 3D distributions of displacements and traction forces at the interfaces between a substrate and a mussel plaque.
- The adhesive mechanisms of marine mussel plaques under directional tensions.
- A novel traction microscopy technique based on 3D digital image correlation which can accurately measure the 3D distribution of displacements force distribution in an aqueous environment.
- Potential design and applications of bio-inspired adhesives structure.
- This will help the audience develop adhesion solutions from biomimicry.
- The experimental method described in the presentation can be expanded to characterize interfacial behaviors in an aqueous environment.
- Our research method provides a practical solution to analysis the traction forces at wet adhesions.
- It assists the design of innovative bioinspired adhesive materials with applications in fields such as medical adhesives, underwater technologies, and industrial bonding.

Biography
Dr. Hou obtained his PhD degree in the Department of Aeronautics at Imperial College London in 2022 and then he worked at Bath University as a research assistant. He is currently working at Queen Mary, University of London as a post-doctoral research associate. Yingwei's research specializes in materials, experimental characterization, and numerical simulation.

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Comparison of clinical efficacy of platelet rich plasma combined with double-layer artificial dermis in the treatment of bone or tendon exposed wounds

Introduction: The exposed wound of bone and tendon caused by trauma has always been the focus and difficulty in clinical work. The traditional treatment scheme is skin flap transplantation to repair the wound after debridement. However, this kind of technique not only solves the problem of the affected area, but also brings some damage to the donor area, and once the debridement is not complete, serious soft tissue crushing and other reasons will lead to poor treatment effect, which may cause secondary injury to the patients. In recent years, double-layer artificial dermis and platelet-rich plasma have been used to treat wounds, especially the former has achieved certain results in bone or tendon exposed wounds. The purpose of this study was to compare the clinical efficacy of PRP combined with double-layer artificial dermis and simple double-layer artificial dermis in the treatment of bone or tendon exposed wounds.

Methods: From June 2021 to August 2023, 30 patients with bone or tendon exposure were randomly divided into control group (n=15) and observation group (n=15). After debridement, the observation group was evenly smeared with PRP and then covered with double-layer artificial dermis, while the control group was only covered with double-layer artificial dermis. The granulation tissue coverage at 2 weeks after operation and Vancouver Scar Score (VSS) at 3 months after operation were compared between the two groups.

Results and Discussion: All patients were followed up for 3 months. The wounds of 30 patients healed well and the bone or tendon exposure of all patients were covered effectively, but the granulation tissue coverage rate of the observation group was significantly higher than that of the control group in the second week ($P<0.05$). After granulation tissue coverage, 8 patients in the control group were treated with conservative treatment, 7 patients were treated with skin grafting, 4 patients in the observation group were treated with conservative treatment, 11 patients were treated with skin grafting, and all patients healed well. The scar score in the observation group was significantly lower than that in the control group ($P<0.05$).

PRP combined with double-layer artificial dermis can promote the growth of granulation tissue of bone or tendon exposed wound, shorten the healing time, reduce the degree of scar in a short time, reduce the trauma of patients, and avoid the secondary injury caused by regional necrosis after skin grafting. When the patients' economic conditions permit, it can be used as one of the treatment methods for bone or tendon exposed wounds, which is worthy of clinical application.

Audience Take Away Notes

- Skin defects with exposed tendons and bones often occur after hand trauma. It is very important to repair skin defects in a timely manner and perform hand function exercises at an early stage. In the past, the main treatment method was flap transfer and repair. However, this treatment method is more damaging to the patient and takes a long time to recover. It also requires the surgeon to

have certain treatment experience. Moreover, once complications such as infection or flap necrosis occur, it will have a great impact on the patient's injury and confidence in treatment.

- Double-layer artificial dermis is a membrane-like artificial skin developed in 1980. Its main component is collagen and it has a double-layer structure. The upper layer is a silicone membrane, also known as the epidermis, which can block the invasion of bacteria and other microorganisms in the early stage and prevent the evaporation of water. The lower layer is a sponge with collagen properties and has little tissue immune rejection. Its structure provides a regenerative mesh framework for wound healing, which can induce the crawling of capillary networks and granulation tissue and complete the dermis reconstruction of the wound. Double-layer artificial dermis has been used for wound repair in some clinical situations, such as burns, chronic ulcers and trauma. It can provide a platform for structural support and cell migration to promote wound healing and regeneration.
- Platelet rich plasma (PRP) is a biological therapy widely used in tissue regeneration and wound treatment. Double-layer artificial dermis is a material that can be used for wound repair and regeneration. At present, there are relatively few clinical studies on the treatment of exposed bone or tendon wounds with PRP combined with double-layer artificial dermis, so there is no clear conclusion on the efficacy and effect of this treatment method. However, this study explored the efficacy of PRP combined with double-layer artificial dermis and simple artificial dermis in the treatment of exposed bone or tendon wounds.
- This study is a comparison of the early treatment effects of exposed bone or tendon wounds. The results show that PRP combined with double-layer artificial dermis can promote the growth of granulation tissue on exposed bone or tendon wounds, shorten the healing time, reduce the degree of scarring in patients in the short term, reduce the trauma suffered by patients, and avoid secondary damage caused by regional necrosis after skin grafting. If the patient's economic conditions allow, it can be used as one of the treatment methods for exposed bone or tendon wounds, and it is worthy of clinical promotion and application.

Biography

ZiAng Zheng is a PhD candidate in orthopedics. He started to study and work in the clinic in 2018 and received a master's degree in orthopedics from Dalian Medical University in 2022. He has published 1 SCI paper and 2 Chinese articles.

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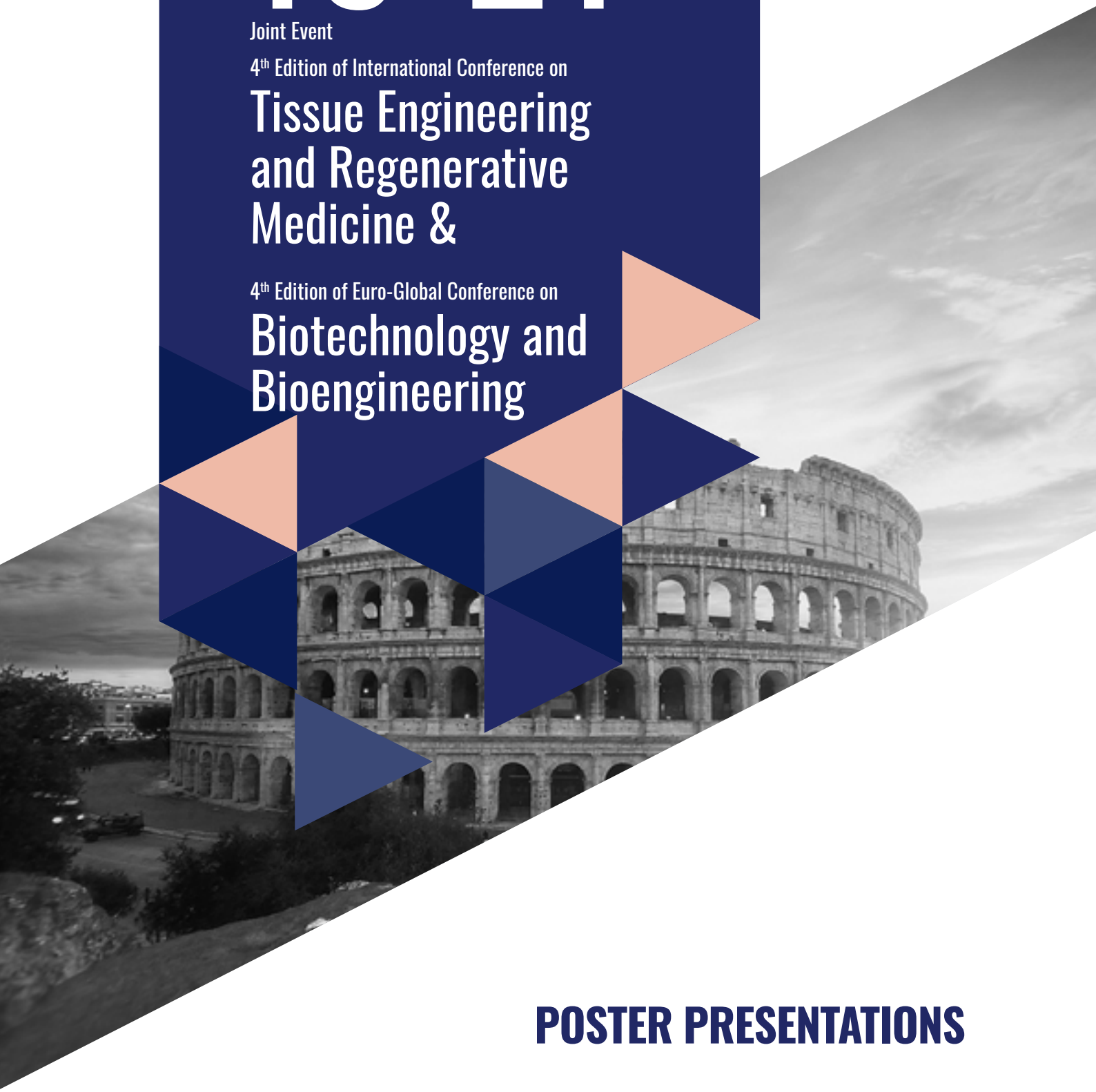

POSTER PRESENTATIONS

Fawzia Juma Ramadan
Ministry of Municipality Genetic Engineering Department

Variety of novel species in Qatar marine ecosystem

The Arabian Gulf surrounding Qatar is distinct from other marine ecosystems due to its high salinity, limited rainfall, extreme water temperature fluctuations and furthermore, in the last decade, Qatar has been witnessing an industrial boom as well as extensive infrastructure construction activities. This study was undertaken to study the microbial diversity in Qatar marine environment.

Marine micro-organisms, including bacteria and fungi, remain largely unexplored in the Arabian Gulf. During studies, we investigated the diversity of marine bacteria and fungi in coastal waters around Qatar.

Water samples were collected during two seasons from 14 different sites along the coast of the Arabian Gulf surrounding Qatar. To reveal the microbial diversity of this environment, we isolated bacteria and fungi from water samples collected at the Inland Sea and the isolation and identification of microorganisms were identified by sequence analyses using phenotypic, biochemical, and molecular barcoding methods.

As a result, A variety of bacteria and fungi were isolated from the Qatari marine Environment and then the isolation of Novel microorganism from Qatari Marine Environment.

Biography
Fawzia Ramadan graduated from Qatar University with a BA in Biomedical physics. He works as a biological researcher at the Ministry of Municipality in the Biotechnology center, Microbiology and genetic engineering department.

Diego Martín-González[1], Daria Kudriatzeva[1], Carlos de la Fuente[1], Andrea De Lucas Alonso[1], Fabio de Santos Casado[1], Sergio Bordel[1,2], Dr. Fernando Santos-Beneit[1,2*]

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Valorization of wastes via a one-step microbial fermentation process

Pollution from plastic waste represents one of the most relevant environmental problems that our society currently faces. Most conventional plastics are extremely recalcitrant, with estimated decomposition times of decades to centuries. However, the production of plastics increases every day due to the great versatility and performance of these polymers in their different applications. The main source of plastic pollution originates from product packaging. Only 10% of this plastic waste is currently recycled worldwide, 30% in developed countries. Current recycling systems are largely thermo-mechanical and are limited to Polyethylene (PE), Polyethylene Terephthalate (PET) and Polypropylene (PP).

Biotechnology represents an interesting alternative to the treatment of plastics. In particular, plastic polyesters (whose bonds can be hydrolyzed by different types of enzymes; e.g. cutinases, lipases, proteases, etc.) are the most susceptible to being eliminated or transformed into other chemical products through biological processes. Among the most used polyesters, in addition to PET (8% of total plastics of any type of origin), are PBAT (polybutylene adipate co-terephthalate), PBS (polybutylene succinate), PCL (polycaprolactone), PLA (poly lactic acid) or PHA (polyhydroxyalkanoate). These polyesters are biodegradable to a greater or lesser extent (although their biodegradation processes are extremely slow in some cases and are limited to composting and anaerobic digestion). Previous work, carried out in our group, has revealed that the denitrifying bacteria, Paracoccus denitrificans, is capable of using as carbon and energy sources practically all of the monomers that constitute the most used commercial plastic polyesters, in addition to C1 compounds. Moreover, this bacterium can produce PHAs in a wide range of environmental conditions However, one of the main obstacles for using PHAs as commercial products is their high production cost when compared with conventional plastics. Any cost-competitive alternative for PHA production should display fast growth with cheap carbon sources and high conversion efficiency of substrate into product. These cheap carbon sources can be bioplastic wastes, thus allowing bio-recycling of mixed bioplastics. In this study, a method to directly produce PHAs via a one-step microbial process, using different genetic modified P. denitrificans strains and a wide variety of polyester polymers as a sole carbon and energy source, was developed. Mechanically and chemically pretreated polyester waste was also shown to be a suitable substrate for the production of PHA using P. denitrificans. Optimization of the medium by reducing the nitrogen concentration allowed PHA contents of 30 % of the cell biomass with some of the carbon sources tested. In summary, a direct and renewable method for producing PHAs from polyester waste was herein developed and validated.

Audience Take Away Notes

- Design routes of valorization via microbial platforms
- Use genetic engineering tools to enhance the benefit features of the strains
- Solve problems occurring during the optimization of the fermentation process

Biography

Dr. Fernando Santos-Beneit holds a PhD in Biology from the University of León, where he was awarded with the PhD Extraordinary Prize for the best thesis in Biology. He currently works as a distinguished researcher at the University of Valladolid (Spain). Previously, he has worked in different research institutions either in Spain or abroad, where he has published 45 research articles (40 of those indexing in Scopus and 37 in PubMed); being the first and/or last author in 30 of them (including a highlighted publication in Nature Communications). The publications have been funding with budget from different national and international funding bodies, including private companies such as Nestle. Actually, the researcher has filled an international patent with Société des Produits Nestlé S.A. (Switzerland) under number 22202651.0 (18750-EP-EPA) on 20.10.2022.

Jia Pei
The People's Hospital of Nanchuan Chongqing

Prognostic significance of serum inflammatory markers for patients with nasopharyngeal carcinoma

Background and Purpose: Nasopharyngeal Carcinoma (NPC) is a squamous cell carcinoma arising from the epithelial lining of the nasopharynx. Inflammation has significant effects on the prognosis of NPC patients. The inflammatory reaction stimulated by cancer is beneficial to its growth, progression, and immunosuppression. This study aimed to study the prognosis value of baseline inflammatory cytokines on the survival outcomes for NPC patients, which might contribute to providing new strategies for the diagnosis and treatment of NPC.

Patients and Methods: We retrospectively collected pre and post treatment serum of 262 candidates who were all confirmed to be stage I to IVa nasopharyngeal cancer by pathological examination. All patients received radiotherapy and chemotherapy, and nimotuzumab was given during radiotherapy. We examined the concentrations of interleukin (IL)-1, IL-4, IL-6, IL-10, IL-13, IL-17, Tumor Necrosis Factor (TNF)-□, Interferon Gamma (IFN)-□, Transforming Growth Factor-Beta (TGF) □, Monocyte chemoattractant protein (Mcp)-1 in the serum by Cytometric Bead Array and analyze on Progression-Free Survival (PFS) using the Cox regression model. Associations of those cytokines with clinical pathological factors, treatment response, and overall survival were analyzed.

Results: The 5-year overall survival rate of the entire group of patients was 70.6% (185/262), and the 5-year disease-free survival rate was 64.9% (170/262). The levels of IL-1, IL-6, TNF-□ and IFN-□ were significantly elevated in patients with NPC pretreatment compared post treatment. However, TGF□ were reduced in I-II stage NPC, but elevated in III-IVa stage NPC. Pretreatment serum levels of IL-1, IL-6, TNF-□ were closely and independently associated with overall survival. Compared to patients with high IL-6 expression, those with low expression had less risk of death (Hazard Ratio (HR)=0.31, 95% confidence interval (CI) 0.13–0.75, p=0.009). Patients with high TNF-□ expression had a more than 2-fold increase in risk of death than those with low levels (HR=2.66, 95% CI 1.04–6.78, p=0.041). Post treatment serum levels of IL 1□ showed less response to treatment (hazard ratio (HR)=0.69, 95% confidence interval (CI) 0.74–1.83, p=0.026). All HRs were adjusted for age, sex, stage, histology, and treatment. Kaplan-Meier survival analysis showed similar survival differences between these three groups.

Conclusion: High pre treatment serum IL 6 and high serum TNF-□ concentrations was a significant specific predictor for high mortality rate. Increased post treatment serum levels of IL 1□ indicated good therapeutic response and most probably a high survival rate.

Keywords: Prognostic Significance, Serum Inflammatory Markers, Nasopharyngeal Carcinoma.

Biography

Jia Pei, Graduated from the Department of Clinical Medicine of Southwest Medical University in 2012, otolaryngology, engaged in clinical treatment and teaching for more than 10 years, has a comprehensive understanding of the clinical diagnosis and treatment of otolaryngology head and neck surgery of vocal cord polyps, epiglottic cyst, adenoids, tonsils and other throat diseases; especially in endoscopic correction of nasal septum, sinusitis, nasal polyps, nasal tumor and other diseases; and has his own unique insights in the clinical diagnosis and treatment of ear vertigo. At present, it mainly focuses on ear and nose direction diseases. He studied in the First Affiliated Hospital of Chongqing Medical University; studied in the young and high-end talents of Chongqing Health Commission; and has published many papers in various national journals.

Komal Vig*, Mohammad Zafaryab
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Generating scaffolds with antimicrobial properties for tissue regeneration using Low Temperature Plasma (LTP)

Bypass surgery, using the autologous vein has been one of the most effective treatments for cardiovascular diseases. More recently tissue engineering including engineered vascular grafts to synthesize blood vessels is gaining usage. Dacron and ePTFE has been employed for vascular grafts, however, these does not work well for small diameter grafts (<6 mm) due to intimal hyperplasia and thrombosis. In the present study PTFE was treated with LTP to improve the endothelialization of intimal surface of graft. Scaffolds were also modified with polyvinylpyrrolidone coated silver nanoparticles (Ag-PVP) and the antimicrobial peptides, p753 and p359. Human umbilical vein endothelial cells (HUVEC) were plated on the developed scaffolds and cell proliferation was determined by the MTT assay. Cells attachment on scaffolds was visualized by microscopy. mRNA expressions levels of different cell markers were investigated using quantitative real-time PCR (qPCR). X ray photoelectron spectroscopic confirmed the introduction of oxygenated functionalities from LTP air plasma. Microscopic and MTT assays indicated increase in cell viability in LTP treated scaffolds. Gene expression studies shows enhanced expression of cell adhesion marker Integrin- ▫ 5 gene after LTP treatment. The KB test displayed a zone of inhibition for Ag-PVP, p753 and p359 of 19mm, 14mm, and 12mm respectively. To determine toxicity of antimicrobial agents to cells, MTT Assay was performed using HEK293 cells. MTT Assay exhibited that Ag-PVP and the peptides were non-toxic to cells at 100$\mu g/mL$ and 50$\mu g/mL$, respectively. Live/dead analysis and plate count of treated bacteria exhibited bacterial inhibition on develop scaffold compared to non-treated scaffold. SEM was performed to analyze the structural changes of bacteria after treatment with antimicrobial agents. Gene expression studies were conducted on RNA from bacteria treated with Ag-PVP and peptides using qRT-PCR. Based on our initial results, more scaffolds alternatives will be developed and investigated for cell growth and vascularization studies.

Acknowledgements: This work is supported by the NSF EPSCoR RII-Track-1 Cooperative Agreement OIA-2128653 and by NSF EIR award 1831282.

Keywords: Low Temperature Plasma, Vascular Graft, HUVEC cells, antimicrobial

Biography

Dr. Komal Vig is a Professor at Alabama State University, Montgomery AL USA. Komal Vig received PhD in 1999 from University of Delhi, India. Komal Vig research interest includes tissue regeneration, Plasma medicine, Nanobiotechnology, Stem cells, microbiology etc.

Marina Malić[1,2*], Martina Doubková[1], Antonín Brož[1], Lucie Bačáková[1]
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In vitro model of endochondral ossification based on collagen-hyaluronic acid hydrogel with embedded chondrocytes

Hydrogels are widely investigated biomaterials due to their potential to mimic the structure and function of the native extracellular matrix.

We wanted to prepare a 3D in vitro model of endochondral ossification with focus on the cellular and material composition. To mimic the native cartilage in which ossification occurs, we based our model on a mixed collagen-hyaluronic acid hydrogel containing embedded human chondrocytes. This hydrogel was supported by an underlying poly-□-caprolactone membrane. We seeded human bone marrow Mesenchymal Stem Cells (hMSCs) and Human Umbilical Vein Endothelial Cells (HUVECs) onto the membrane, allowing them to migrate into the hydrogel. After a 3-day incubation, we induced hMSCs to differentiate towards osteoblasts, hypothesizing that embedded chondrocytes would enhance cell migration into the hydrogel and promote vascularization and ossification compared to the hydrogel without chondrocytes. Additionally, we exploited the synergistic effect between hMSCs and HUVECs to enhance osteogenic differentiation and induce a capillary-like network formation within the model.

To accomplish this, we first optimized the conditions for simultaneous osteogenic differentiation of hMSCs and capillary-like formation by HUVECs by evaluating various cell ratios, seeding densities, media combinations (including signaling molecules), and hydrogel compositions. We then assessed our model by measuring the expression of genes and proteins related to bone and cartilage formation.

Our results indicated that a 1:2 ratio of HUVECs: hMSCs in a 50:50 mixture of endothelial growth and osteogenic media was optimal for osteogenic differentiation and capillary-like network formation. Co-cultured hMSCs exhibited increased alkaline phosphatase activity compared to monoculture, while HUVECs formed capillary-like networks only in the presence of hMSCs. The addition of collagen II to the hydrogels significantly enhanced the production of chondrogenic protein SOX9 by the embedded chondrocytes, compared to pure collagen I hydrogels. However, no significant difference in the production of SOX9 was observed in collagen I hydrogels mixed with varying concentrations of hyaluronic acid.

Immunofluorescence staining indicated that the co-culture successfully migrated from the membrane into the hydrogel. The results of real-time PCR showed that the mRNA expression of a chondrogenic marker SOX9 was higher only in the hydrogels with embedded chondrocytes. However, the presence of chondrocytes in hydrogels did not increase the mRNA expression of other osteogenic markers, including collagen I, alkaline phosphatase and osteonectin.

Our findings provide important insights for the ongoing construction of our 3D model.

Audience Take Away Notes

- A 1:2 ratio of HUVECs to hMSCs appears to be optimal to simultaneously support the osteogenic differentiation of hMSCs and the formation of capillary-like networks by HUVECs.
- The addition of collagen II to hydrogels significantly enhances the production of chondrogenic protein SOX9 by chondrocytes.
- Collagen-hyaluronic acid hydrogels are successfully gelating and supporting the cell migration from the poly-□-caprolactone membrane and osteogenic activity of hMSCs.
- The addition of chondrocytes to the hydrogels does not enhance the mRNA expression of osteogenic markers by hMSCs.

Biography

Marina Malić obtained her M.Sc. in Analytical Chemistry at the University of Maribor in Slovenia in 2021. After graduation, she enrolled in a doctoral study of Cell Biology and Pathology at the First Faculty of Medicine of Charles University in Prague. She is doing her research at the Institute of Physiology in the Laboratory of Biomaterials and Tissue Engineering. Her dissertation is focused on the construction of artificial connective tissues based on composite biocompatible scaffolds. In 2023, she obtained her own grant focused on creating a 3D in vitro model of endochondral ossification, which will be presented at the conference.

Palak Gupta[1,2*], Malik Zainul Abdin[2], Kishor Gaikwad[1]
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Interplay between the JA pathway genes and bHLH may play an important role in regulating cleistogamy in pigeon pea

Pigeonpea is an often cross-pollinated grain legume with high nutritional value making it an important blend in a cereal-dominated diet. It is an annual diploid (2n=22) with a typical 9+1 diadelphous stamen in a chasmogamous flower which opens before fertilization often leading to cross-pollination. We investigated a cleistogamous genotype where the flower opens after fertilization in an effort to identify the molecular factors governing this trait, as it can help in maintaining seed purity. A set of transcription factors were investigated for its association with the hormonal networks. Jasmonic Acid (JA) pathway genes have been reported to play an important role in inducing cleistogamy in chasmogamous flowers, among which basic Helix Loop Helix (bHLH) is one of the key regulators. A genome-wide survey led to the identification of 176 bHLH genes distributed randomly across the genome and were categorized into 21 subfamilies based on phylogenetic analysis. The promoter, gene ontology, and protein-protein interaction network analyses revealed that the bHLH protein family in pigeonpea is involved in multiple biological pathways. Expression analysis in the floral tissue of chasmo- and cleistogamous genotypes for the key players of the jasmonic acid pathway including MYC2 (Cc_bHLH135) and its interacting partners TIFY/JAZ indicated their probable role in flower opening. Further, JA and its bioactive form JA-Ile were quantified through UPLC-MS/MS, expression analysis and hormone profiling results were in congruence and supported the participation of the JA pathway for cleistogamy in pigeonpea.

Audience Take Away Notes

- The audience will gain insights into the value of cleistogamy as a trait in agricultural systems, recognizing its potential to enhance seed purity and ensure effective pollination in the absence of pollinators.
- For plant breeders, understanding cleistogamy as a trait facilitates the development of self-pollinating crop varieties, which can help maintain consistent crop yields even in environments with limited pollinator availability.
- The genome-wide methodology detailed in this study offers a robust framework for researchers to replicate similar analyses in other crops, enabling the identification of genes associated with other agriculturally important traits.
- The genome-wide analysis approach presented in this research provides a valuable model for teaching advanced genetic analysis techniques, including gene identification and functional characterization, within educational programs.

Biography

Palak Gupta is a PhD scholar at Jamia Hamdard, New Delhi, India, currently affiliated with the ICAR-National Institute of Plant Biotechnology (ICAR-NIPB), New Delhi, India. Her research focuses on elucidating the molecular mechanisms underlying cleistogamy in pigeonpea (Cajanus cajan), utilizing a comprehensive multi-omics approach that integrates transcriptomics, metabolomics, and proteomics. Her work aims to enhance the understanding of self-pollination mechanisms and seed purity in leguminous crops. Palak Gupta's academic achievements including clearing the CSIR-NET exam in 2021, which has bolstered her expertise in plant biotechnology and genomics.

Reem Al-Haidose
Dr Vesselin N. Paunov, Surfactant & Colloid Group, Department of Chemistry University of Hull, UK

Fabrication of symbiotic multicellular assemblies by using a novel "Gel Layer-by-Gel Layer" Technique

The research on biofilms has skyrocketed in recent years due to increased awareness of the pervasiveness and impact of biofilms on natural and industrial systems, as well as human health. A biofilm is a well-organized, cooperating community of microorganisms. Microbial cells attach to the surfaces and develop a biofilm. The yeast species *Saccharomyces cerevisiae* is capable of forming biofilms on a variety of inert and biological surfaces. Cells in biofilms display phenotypic properties that are radically different from their free-floating planktonic counterparts, including their recalcitrance to antimicrobial agents. In this study, we described a simple, fast, inexpensive and highly reproducible formation of substrate based yeast biofilms by employing a novel "gel layer-by-gel layer" method based on the gelling properties of alginate gels. We combined two different types of cells, i.e. yeast and Chlorella (algae) cells to produced symbiotic two-layered biofilms by using a similar technique. We also include some preliminary results on free standing biofilms in solution which were produced by cleaving of patterned biofilms from the substrate. We demonstrate that the cells preserve their viability upon preparation and manipulation of these artificial biofilms.

Biography

Reem Al-Haidose has Bachelor of Science in plant microbiology from the University of Qatar, Doha. Reem Al-Haidose finished MSc of Biological Chemistry in the university of Hull, UK on 2011, and MScRes in Evolutionary Biology in the university of Hull, UK in 2022. Worked as specialist at the Plant Tissue Culture 1996-2010. Currently work as a senior biological expert in the Genetic engineering department, Ministry of Municipality, Doha, Qatar since 2011.

Raquel Herrero-Lobo[1,2], Nuria Fernández-González[1,2], Eva Marcos[1,2], María Alejandra Martínez[3,4], Pedro García-Encina[1,2], Raúl Muñoz[1,2], Sergio Bordel[1,2*]

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Production of hydroxyectoine with an engineered strain of Methylomicrobium alcaliphilum

Methylomicrobium alcaliphilum is a halotolerant methanotroph, which produces ectoine under high salinity conditions. Ectoine is an osmoprotector and protein stabilizer that allows microorganisms to survive at high salt concentrations (up to 9% in the case of M. *alcaliphilum*) and has a high market price (>1000 €/kg). Ectoine synthesis is coded in the Ect operon, which also contains a gene annotated as ectoine hydroxylase. However, the protein coded by this gene has been shown to be catalytically inactive. Hydroxyectoine, a derivate of ectoine, is more common among gram-positive halotolerant bacteria and shows additional protective properties including resistance to heat stress. The market prize of hydroxyectoine is 40% higher than that of ectoine, which makes it an interesting product with high added value. Here we integrated a catalytically active ectoine hydroxylase from Pseudomonas *stutzeri* into the chromosome of M. *alcalyphilum*. The gene was inserted under the control of the Ect promoter, but separately from the natural Ect operon.

The potential of the modified strain to be used as an industrial producer of hydroxyectoine, using methane as substrate, was tested at pilot scale. One major challenge for the efficient utilization of methane as an industrial feedstock, is its low water solubility, which limits the gas-liquid mass transport. A promising bioreactor configuration are Taylor flow reactors, in which elongated gas bubbles circulate in capillary tubes. Using Taylor flow systems, we were able to obtain hydroxyectoine concentrations over 100 mg per gram of dry cellular weight. These results open the way to the utilization of methane as a feedstock for the production of high value chemicals.

Audience Take Away Notes

- Researchers will get familiar with the potential of methane as a feedstock for industrial biotechnology.
- Our research will be of interest for microbiologists interested in methanotrophs and halotolerant microorganisms.
- Researchers working in the field of gas fermentation will be introduced to the use of Taylor flow bioreactors.

Biography

Dr. Bordel studied Chemical Engineering at the University of Valladolid (Spain) and graduated as MS in 2003. He received his PhD degree in 2007 at the same institution. He was a Postdoc (for two years) and an assistant professor (for four years) at the Chalmers University of Technology (Sweden), where he worked at the Systems Biology group, led by Professor Jens Nielsen. where he specialized in Genome Scale Metabolic Models. After three years working in industry (ThermoFisher scientific), he came back to the University of Valladolid in 2017, with a Marie Curie individual fellowship. From the mentioned date he focused his research on the metabolism of methanotrophs. Sergio Bordel has currently published 62 peer reviewed articles: 62 and has an h-factor of 25.

Xiaojuan Ding
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Clinical study on the expression of serum miR-202 and miR-34a and nosocomial infection in patients with primary liver cancer after TACE

Objective: To analyze the relationship between the expression of serum microRNA (miR) -202 and miR-34a and nosocomial infection after transcatheter arterial chemoembolization (TACE) in patients with primary liver cancer.

Methods: A total of 125 patients with primary liver cancer who underwent TACE in our hospital from February 2020 to August 2023 were selected. The clinical data of patients were collected, and the relative expression levels of serum miR-202 and miR-34a were measured before operation by real-time PCR. According to whether nosocomial infection occurred after TACE, the patients were divided into infection group and non-infection group. The relative expression levels of serum miR-202 and miR-34a and clinical data were compared between the two groups. Multivariate Logistic regression model was used to analyze the influencing factors of nosocomial infection after TACE for primary liver cancer. The receiver operating characteristic curve (ROC) was drawn to analyze the value of serum miR-202, miR-34a and their combination in predicting nosocomial infection.

Results: There were 18 cases of nosocomial infection in 125 cases of primary liver cancer, the incidence rate was 14.40% (18/125). The relative expression levels of serum miR-202 and miR-34a in the infected group were lower than those in the uninfected group ($P<0.05$). The proportion of patients aged ≥60 years old, combined with diabetes, ascites, no preventive use of antibiotics and intervention time ≥120min in the infected group was higher than that in the uninfected group, and the proportion of preventive use of antibiotics was lower than that in the uninfected group ($P<0.05$). Multivariate Logistic regression showed that the patients aged ≥60 years old, complicated with diabetes, complicated with ascites, and intervention time ≥120min were the risk factors for nosocomial infection in patients with primary liver cancer after TACE ($OR>1$, $P<0.05$), and the relative expression levels of serum miR-202 and miR-34a were the protective factor ($OR<1$, $P<0.05$). The ROC curve showed that the AUC (95%CI) of serum miR-202, miR-34a and their combination in predicting nosocomial infection after TACE in patients with primary liver cancer were 0.852(0.825-0.879), 0.737(0.686-0.787) and 0.909 (0.885-0.999), respectively.

Conclusion: The low serum expression of miR-202 and miR-34a in patients with nosocomial infection after TACE for primary liver cancer will increase the risk of nosocomial infection, and the combination of them can effectively predict the occurrence of nosocomial infection.

Keywords: Primary liver cancer; miR-202; miR-34a; Hepatic arterial infusion chemotherapy and embolization; Hospital infection

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The SpACE-CCM: A facile and versatile cell culture medium-based biosensor for detection of SARS-CoV-2 spike-ACE2 interaction

The COVID-19 pandemic is an ongoing global public health threat. COVID-19 is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection, and binding of the SARS-CoV-2 spike to its receptor, Angiotensin-Converting Enzyme 2 (ACE2), on host cells is critical for viral infection. Here, we developed a luminescent biosensor that readily detects interactions of the spike Receptor-Binding Domain (RBD) and ACE2 in Cell Culture Medium ('SpACE-CCM'), which was based on bimolecular complementation of the split nano luciferase-fused spike RBD and ectodomain of ACE2 and further engineered to be efficiently secreted from cells by adding a heterologous Secretory Signal Peptide (SSP). Screening of various SSPs identified 'interferon-□+alanine-aspartate' as the SSP that induced the highest activity. The SpACE-CCM biosensor was validated by observing a marked reduction of the activity caused by interaction-defective mutations or in the presence of neutralizing antibodies, recombinant decoy proteins, or peptides. Importantly, the SpACE-CCM biosensor responded well in assay-validating conditions compared with conventional cell lysate-based NanoLuc Binary Technology, indicating its advantage. We further demonstrated the biosensor's versatility by quantitatively detecting neutralizing activity in blood samples from COVID-19 patients and vaccinated individuals, discovering a small molecule interfering with the spike RBD-ACE2 interaction through high-throughput screening, and assessing the cross-reactivity of neutralizing antibodies against SARS-CoV-2 variants. Because the SpACE-CCM is a facile and rapid one-step reaction biosensor that aptly recapitulates the native spike-ACE2 interaction, it would be advantageous in many experimental and clinical applications associated with this interaction.

Audience Take Away Notes

- If audiences want to know efficient secretion signal peptide, we will tell you how to use it.
- The audience will learn the highly efficient secretion signal peptide from my presentation.
- This research will help other researchers and companies to improve the secretion of secretory proteins in mammalian cells.

Biography

Youngwook Ham is currently a PhD student in the Department of Biomolecular Science at Korea National University of Bioscience and Technology. His research focuses on nucleic acid therapeutics and biosensor development. He has researched at the Nucleic Acid Therapeutics Research Center, Korea Research Institute of Bioscience and Biotechnology. In 2023, He published the SpACE-CCM biosensor in the Journal of Biosensor and Bioelectronics. He received the 'Wunbong' Young Scientist Award for this work at the 2023 International Conference KSBMB.

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Pre-vascularized skin model in vitro

Animal models have been used for decades in various physiological, pathophysiological, pharmaceutical, toxicological and other biomedical studies. However, significant obstacles of these models are ethical issues, considerable costs, and limited translatability of study outcomes to actual human diseases. Herein, developing 3D in vitro tissue models, using knowledge of stem cell biology, biomaterials, and tissue engineering, has been considered as a potential replacement for animal models. A pre-vascularized dermal-epidermal construct could serve not only as an in vitro skin tissue model, but also as a skin substitute for repair and regeneration of skin defects. Human Dermal Fibroblasts (NHDFs) and human Adipose Stem Cells (ASCs) have very similar cell markers and properties. NHDFs have been widely used to construct skin grafts, and ASCs have recently become popular for cell therapy applications due to their stem cell properties and convenient resources.

In this study, electrospun polycaprolactone nanofibrous membranes were used as supportive structures for skin constructs, and these membranes were further modified with fibrin and fibronectin to increase their attractiveness for cell adhesion and growth. Different densities of NHDFs and ASCs were seeded on the fibronectin-coated nanofibrous membranes, and then covered with fibronectin-enriched collagen hydrogels loaded with Human Umbilical Vein Endothelial Cells (HUVECs). The initial results showed that both constructs formed capillaries after 21 days in culture. However, more branched and longer capillaries and with denser tubular capillary-like networks were formed in ASC-based skin constructs compared to NHDFs-based skin constructs. The properties of these two pre-vascularized constructs will then be further analyzed. To construct more simulated skin constructs, ASCs-based NHDFs with HUVECs skin constructs were fabricated, and keratinocytes will be the last added to reconstruct the epidermis for future skin and transplantation applications.

Audience Take Away Notes

- Higher amount of NHDFs or ASCs with HUVECs form more capillaries.
- ASCs-based skin constructs form better capillary networks.

Biography
M.Sc. Yu-Chieh studied for her master's degree at the Institute of Biochemical and Biomedical Engineering in Taiwan and finished in 2013. She started her PhD degree in 2022 in the Czech Republic in the Department of Biomaterials and Tissue Engineering, Institute of Physiology, Czech Academy of Science.

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