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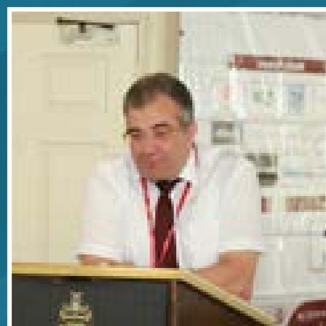
3rd International Conference on

BIOMATERIALS, CELLULAR AND TISSUE ENGINEERING

June 19-20, 2019 | Dublin, Ireland

BIOMATERIALS CONGRESS 2019



SCIENTIFIC TRACKS & ABSTRACTS

DAY 1

DAY 1 SESSIONS

JUNE 19, 2019

Biomaterials in Tissue Engineering | Bio-Nanotechnology

SESSION CHAIR

Asha Srinivasan
JSS Academy of Higher Education and Research, India

SESSION INTRODUCTION

Title: Frontiers of biomaterial cryopreservation for banking

Kelvin Brockbank, CEO and Founder of Tissue Testing Technologies LLC, USA

Title: Harnessing biomaterials in nanomedicine

Asha Srinivasan, JSS Academy of Higher Education and Research, India

Kelvin GM Brockbank, Mater Sci Nanotechnol 2019, Volume 3

FRONTIERS OF BIOMATERIAL CRYOPRESERVATION FOR BANKING

Kelvin GM Brockbank
Tissue Testing Technologies LLC, USA

Effective improved tissue banking methods for natural and engineered tissues, complex allotransplants and organs are desperately needed for transplantation. Banking of living cellular tissues using current tissue banking practices employing conventional cryopreservation by freezing is not feasible due to the well documented damage caused by ice formation. An alternative ice-free cryopreservation approach is vitrification. Formation of ice is prevented by the presence of high concentrations of cryoprotectants with preservation of extracellular matrix components and optional preservation of cells. Ice-free vitrification works for a variety of natural and engineered tissues using a formulation consisting of DMSO, formamide and propylene glycol known as VS55, but has been unsuccessful at sample volumes over a few mLs. The major constraints for scale-up of cryopreservation by ice-free vitrification have been avoidance of ice nucleation during warming and mechanical forces generated by glasses at low temperatures. In this presentation author will focus on strategies for avoidance of ice nucleation. His first successful strategy for large tissue samples was an 83% formulation based upon the same cryoprotectants, known as VS83. This formulation can be used to retain viable chondrocytes in large osteochondral grafts or for non-viable cardiovascular grafts with retention of extracellular matrix integrity, depending upon the way in which the formulation is added and removed before and after vitrification. Non-viable cardiovascular grafts with intact matrix have been a major research focus for the last 10 years and both *in vitro* and *in vivo* results demonstrated significantly reduced immunogenicity in heart valves (Figure), including reduced memory T-cell proliferation and most recently modulation of TGF-β1 from latent to active form among other statistically significant effects. They has recently been successful in scaling up the viable preservation of large tissue samples using either nanowarming, inductive heating of iron nanoparticles or convection warming using improved ice-free vitrification formulations.

BIOGRAPHY

Kelvin GM Brockbank is Chief Executive Officer and Founder of Tissue Testing Technologies LLC, USA. He was a Research Professor of Bioengineering at Clemson University and Adjunct Professor of Regenerative Medicine and Cell Biology at the Medical University of South Carolina. His research interests include cell, tissue and organ cryopreservation for test systems and transplantation and manufacturing methods for cell-based bioengineered therapy products. His work has led to the establishment of two successful publicly traded low temperature technology platform companies, CryoLife Inc. and Lifeline Scientific Inc. He has over 500 publications and presentations at national and international conferences including more than 30 patents related to hypothermic, frozen and vitrified biomaterial preservation.

kgbrockbankassoc@aol.com

Asha Srinivasan, Mater Sci Nanotechnol 2019, Volume 3

HARNESSING BIOMATERIALS IN NANOMEDICINE

Asha Srinivasan
JSS Academy of Higher Education and Research, India

Biomaterials are substances that are engineered to make them suitable for interaction with a biological system. Biomaterial constructs and self-assemblies have been explored for drug and protein carriers, cell engineering and tissue scaffolds or to manage the interactions between artificial devices and the body, just to make some examples of the more recent developments. Biomaterials involve not only synthetic materials (polymers, ceramics and composites) but also biological materials such as proteins, cells and tissues. The potential range of applications for biomaterials is rapidly increasing with different physical, mechanical and medical properties required for different applications. The appeal of protein-based fibers for biomedical applications stems from the fact that many proteolytic enzymes capable of degrading commonly used natural polymers are already present in the body. In the case of protein-based biomaterials, degradation of these materials leads to the production of amino acids that pose no risk and can be reabsorbed by the body. One of research interest is in fabricating protein nanofibers for medical purposes. They have developed protein nanofibers using electrospinning method for wounds induced in mice. These interesting studies in biomaterials will be presented during the presentation.

BIOGRAPHY

Asha Srinivasan completed her MSc and PhD from University of Bradford, UK. She was worked at Max Plank, Germany followed by her Postdoctoral Research at Thomas Jefferson University, USA. Currently, she heads PG program in Nanoscience and Technology at Department of Nanoscience and Technology, Faculty of Life Sciences, JSS Academy of Higher Education and Research, Mysore, India. Her area of research involves in the development of aerosol formulations for pulmonary delivery, development of nanoformulation of biologics especially antibody, harnessing biomaterials in nanomedicine and endocytosis of nanomedicine.

asha.srinivasan@jssuni.edu.in

Note:

DAY 1 SESSIONS

JUNE 19, 2019

Biomaterials in Tissue Engineering

SESSION CHAIR

Christophe Pellegrino
Aix Marseille University, France

SESSION INTRODUCTION

Title: Functional sodium alginate nano fibrous scaffold for wound healing

Shiny P John, Guru Nanak College, India

Shiny P John, Mater Sci Nanotechnol 2019, Volume 3

FUNCTIONAL SODIUM ALGINATE NANO FIBROUS SCAFFOLD FOR WOUND HEALING

Shiny P John
Guru Nanak College, India

Wound healing is a complex process involving several biological factors. Although the body's defense mechanism aids in healing, several biomaterials are designed to promote faster healing and preventing infection. Tissue engineering has advanced incredibly to address major problems in wound healing. Electrospinning of polymers to form a scaffold is one such sophisticated technology. So, sodium alginate a natural polymer was found to be a good material owing to its inherent properties to function as a potent wound dressing material. Sodium alginate (SA) was electro spun along with the water soluble polymer polyvinyl alcohol (PVA). Polyhydroxybutyrate (PHB), another biodegradable polymer was co-electrospun along with SA-PVA; PHB formed the core of the fiber while SA-PVA formed the outer shell of the fiber. To further improve the functionality of the scaffold, silver nanoparticles were loaded in the alginate solution which proved to act as an effective antibacterial agent. On controlling infection and progress the healing of wound, arginine- a vital amino acid was loaded and spun in the polymer solution with PHB. This formed a complete biomaterial for cutaneous wound healing. Thus this scaffold was found to be a multi-functional dressing material with control over the infection and advancing the process of wound healing.

BIOGRAPHY

Shiny P John has completed his Doctorate in Nano biotechnology, where he fabricated silver and platinum nanoparticles for anti-cancer application. After his Doctorate, he joined CSIR-CLRI for his Post-Doctoral work funded by the Department of Science and Technology, India. His research in the Biological Materials Laboratory in CLRI was on the development of a dual functioning scaffold for skin regeneration. He has published 12 research articles in peer-reviewed international journals and also presented papers in several conferences. His areas of interest include nano biotechnology and nanotechnology for tissue engineering.

shinyjoh@gmail.com

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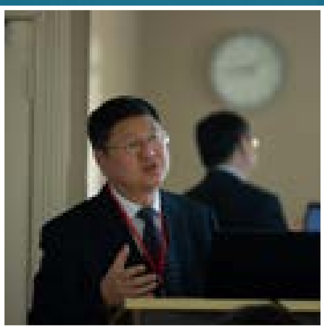

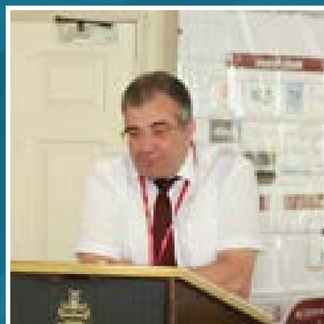

SCIENTIFIC TRACKS & ABSTRACTS
DAY 2

DAY 2 SESSIONS

JUNE 20, 2019

Wound Healing | Tissue Engineering and Regenerative Medicine | Biomaterials in Drug Delivering

SESSION CHAIR

Preeti Makkar
Soonchunhyang University, South Korea

SESSION INTRODUCTION

Title: PEGDA and PETA as potential materials for drug delivery system development

Natalia Rekowska, University Medical Center Rostock, Germany

Title: Surface modification of magnesium alloys for hard tissue applications

Preeti Makkar, Soonchunhyang University, South Korea

Title: Smart single dose nanobandage for appropriate skin regeneration and wound healing monitoring

Isra H Ali, Center of Material Science, Egypt

Natalia Rekowska, Mater Sci Nanotechnol 2019, Volume 3

PEGDA AND PETA AS POTENTIAL MATERIALS FOR DRUG DELIVERY SYSTEM DEVELOPMENT

Natalia Rekowska
University Medical Center Rostock, Germany

In this study we investigated the biocompatibility and thermodynamic properties of two photopolymerisable compounds: poly(ethylene glycol) diacrylate (PEGDA) and pentaerithritol tetraacrylate (PETA). These compounds are intended to be used for the manufaturing of drug delivery systems (DDS) by a novel additive manufacturing (AM) process. This novel AM process combines stereolithography (SLA) and inkjet printing (IJP). While SLA creates the basic body of the DDS layer by layer, IJP is used to selectively print drug depots inside the DDS. The positioning of drug depots as well as the combination of these two co-monomers can create the possibility to develop a DDS with highly controlled drug release. An initial study focused on biocompatibility of conventionally cured specimens with the use of photoinitiators (PI) as radical starters for photopolymerisation. Eluate tests were performed after two different washing procedures of the samples. It is shown that the samples with the addition of PETA require washing at 50^{0}C. After glass transition temperature (Tg) measurements it appears clear, that Tg increases with the increasing PETA concentration in the sample. It is known, that the lower Tg is, the faster occurs the drug release. The biocompatibility was tested via direct contact tests. They reveal that most of the samples average cell vitality is between 70%-90% regardless of the photoinitiator concentration and PETA concentration. All of the samples show contact angles under 90°. Some differences of the samples morphology were observed after the washing procedure. What is more, samples with the addition of 10% PETA, especially the ones also with lower PI concentration seem to be smoother and more homogenous than the samples without the PETA addition.

BIOGRAPHY

Natalia Rekowska studied pharmacy at the Medical University of Gdansk (Poland). During the studies she was an active member of the students' scientific circles. She prepared her master thesis at the Ludwig Maximillian University in Munich (Germany) at the Department of Pharmaceutical Chemistry. Afterwards she began PhD studies at the Pharmaceutical Department of the Medical University of Gdansk and worked as a pharmacist in a pharmacy. Since September 2018 she is a PhD student at the Institute of Biomedical Engineering of the University Medical Center Rostock under lead of Prof. Niels Grabow. Within the framework of the DFG project "3D printed drug delivery systems with the ability of time controlled drug release" she is involved in the development of novel, photopolymerisable drug delivery systems with time-controlled release of high and low molecular weight drugs.

natalia.rekowska@uni-rostock.de

Note:

Preeti Makkar, Mater Sci Nanotechnol 2019, Volume 3

SURFACE MODIFICATION OF MAGNESIUM ALLOYS FOR HARD TISSUE APPLICATIONS

Preeti Makkar
Soonchunhyang University, Cheonan, South Korea

Biodegradable implants have been extensively studied for hard tissue regeneration. Magnesium seems as a potential candidate due to its unique combination of bone-like mechanical properties and being degradable in vivo. However, the rapid corrosion of magnesium and its alloys in physiological environment limits their clinical applications. Alloying and Surface coatings are the reliable ways to improve corrosion resistance by preventing its contact with the environment. The present paper details the state of the art in coating and surface modification technologies, applied to magnesium alloys for improved corrosion resistance and biocompatibility. The efficiency of single layered bioactive ceramic based coatings and dual layered ceramic-polymer based coatings are studied in this regard. The morphology, phase, chemical composition, wettability and performance in terms of in-vitro corrosion and biocompatibility using pre-osteoblast MC3T3 cells were discussed and compared with uncoated samples. In-vivo performance using rabbit model was also evaluated for the coatings with respect to magnesium substrate.

BIOGRAPHY

An experienced researcher, an avid learner, team worker with project management skills. Currently working as Assistant Research Professor at Institute for Tissue Regeneration (ITR), Soonchunhyang University, cheonan-city, South Korea since April 2018. Prior to this position, worked as a post-doctoral research fellow (Biomaterials) at ITR from March 2016-2018. The prime project is based on surface coatings of magnesium based alloys for hard tissue applications. Earlier, worked as a Women Scientist under WOS-A, Department of Science and Technology (DST) scheme, at Department of Metallurgical and Materials Engineering (MMED), Indian Institute of Technology Roorkee (IITR), INDIA. Handled research project as Principal Investigator. PhD (Material Science) from MMED, IITR, M.Tech (Materials Science) from Thapar University, INDIA.

preeti.materials@gmail.com

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Isra H Ali, Mater Sci Nanotechnol 2019, Volume 3

SMART SINGLE DOSE NANOBANDAGE FOR APPROPRIATE SKIN REGENERATION AND WOUND HEALING MONITORING

Isra H Ali
Nanomaterials Lab, Center of Material Science, Egypt

Skin is considered to be the soft organ covering the whole human body in order to protect its anterior organs. Naturally, the skin has the ability to restore itself after being damaged due to injuries or burns. However, a scaffolding material is required for restoring and organizing the newly regenerated tissues especially in complicated diabetic injuries and burns. Although, a newly developed single dose nanofiberous bandages have been developed and proven to satisfy proper wound healing, some monitoring criteria could be added using smart materials to monitor the healing progress especially in diabetic wounds. The aim of study is to develop an external layer that changes its color from purple to blue after being applied over the wound. Then the color changes gradually according to the healing stage before returning back to its original color after complete healing. This smart material responds to the change in moisture content of the wound during the healing process. This will help the physician and the patient to monitor the healing process underneath the bandage without being removed and consequently minimize the possibilities of infection incidence. In addition, another adhesive layer containing smart liposomes incorporating antibiotic is added as the layer adhering to the wound. This layer has two fundamental functions. The first is that it is an adhesive layer that contains a neutralizing material for the high alkalinity of the diabetic wounds thus it will help in enhancing the rate of healing process. Additionally, the smart liposomes respond actively towards the presence of bacteria (*S. aureus*) by releasing the incorporated antibiotic. This is advantageous in that the antibiotic will not be released or consumed unless the bacterial infection was detected so this will help in prohibiting development of bacterial resistance.

BIOGRAPHY

Isra H Ali is currently working as a Research Associate at Center for Material Science (CMS) and Assistant Lecturer at material science and nanoscience programs in Zewail City of Science and Technology, Egypt since June 2014. Her research focuses on designing and fabricating smart Bionanomaterials for drug delivery and regenerative medicine especially in bone and skin regeneration. Some of the results obtained from her "Smart wound dressing" project have been published in ACS materials and Interfaces (IMF 8). Also, she has been working in a project for development of biodegradable drug loaded Ocuserts. The preliminary results have just been accepted in Nanomedicine Journal (IMF 5). Both projects have been presented in a number of conferences and exhibitions where they got prizes and certificates of recognition such as Best Poster award during 10th Biomaterials Congress, Canada in 2016 and a Gold Medal in 46th Inventions Exhibition, Geneva in 2018.

Isra.ali45@gmail.com

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