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International Conference on
Stem Cells and Regenerative Medicine
&
2nd World Congress on
Pediatrics and Child care

November 06-07, 2019 | Tokyo, Japan

Scientific Tracks & Abstracts

30 YEARS
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Sessions

Stem Cells | Regenerative Medicine | Biomaterials

Session Chair
Andrzej Lange
Lower Silesian Center for Cellular Transplantation with National Bone Marrow Donor Registry | Poland

Session Introduction

Title: Mesenchymal stem cells in transplantation: Effect of immunosuppressive drugs
Magdalena Krulova | Charles University | Czech Republic

Title: Pentaisomaltose- a promising new cryoprotectant
Jesper Dyrendom Svalgaard | University of Copenhagen | Denmark

Title: Molecularly targeted therapy for spinal muscular atrophy (SMA) and duchene muscular dystrophy (DMD): Kuwait experience
Laila Bastaki | Kuwait Genetic Center | Kuwait

Title: Nanohydroxyapatite coatings doped with nanocopper particles on Ti13Zr13Nb titanium alloy for biomedical application
Michal Bartmanski | Gdansk University of Technology | Poland

Title: Identification and pattern analysis of SNPs involved in colorectal cancer
Jyoti Bhojwani | DAVV/Indore University | India

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Mesenchymal stem cells in transplantation: Effect of immunosuppressive drugs

Magdalena Krulova
Charles University, Czech Republic

Mesenchymal stem cells (MSCs) due to their immunosuppressive and regenerative properties offer a great potential for the application in the clinic, including the transplantation medicine. It was documented that co-transplantation of grafted tissue with MSCs attenuated rejection reaction. In the therapy of various pathological conditions, applied MSCs interact with different drugs, which can influence their action. And vice versa, MSCs can modulate the effect of such treatment. Our results demonstrated that the therapy combining immunosuppressive agents with MSCs favourably influenced immune balance, attenuated the adverse effects of immunosuppressive drugs and prolonged the survival of transplanted allogeneic cells. Mechanisms involved in the anti-inflammatory effect of the interactions between MSCs, immunosuppressive drugs and the immune system included switch in the macrophage phenotype, as well as changes in the subpopulations. As a result, the inflammation was attenuated and a regenerative environment promoted in the presence of MSCs. We also documented that MSCs isolated from different sources are differently affected by the immunosuppressive drug treatment. All these findings should be taken into accounts before preparing strategies combining the use of immunosuppressive drugs and MSCs or the administration of MSCs into an immunosuppressed organism.

Biography

The aim of research of Krulova is to characterize the molecular and cellular mechanisms of specific immunity which can be consequently applied in targeted immunoregulation for both the experimental work and the clinical practice. In recent years, her research has focused on the study of mesenchymal stem cells and Sertoli cells, their characterization, possibilities of differentiation, interaction with cells of the immune system and their use in transplant medicine.

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Pentaisomaltose- a promising new cryoprotectant

Jesper Dyrendom Svalgaard
University of Copenhagen, Denmark

Cell and tissue therapy for medical and scientific use has during the past decades expanded extensively and hold promises for being an important platform for future treatment modalities. A major feature and pre-requisite for several cell products, both autologous and allogeneic off-the shelf, is the possibility of safe and efficient cryopreservation during production/treatment.

Successful cryopreservation requires effective cryoprotectants (CPAs). Classical and CPAs like glycerol and especially dimethyl sulfoxide (DMSO) have been widely used. However, the well-established side-effects and undesirable cellular effects of e.g. DMSO, has led to an increasing demand from health care professionals, patients and authorities for a reduction in the concentration of CPAs like DMSO and/or the development of safe and effective alternatives. Most development in the past decades has focused on optimizing freeze media, by combining existing CPAs and optimizing the carrier media, but new alternative CPAs have not been introduced.

Pentaisomaltose, a low-molecular-weight carbohydrate, is a new and promising CPA. Our work during the past years has proven that pentaisomaltose can replace DMSO for cryopreservation of hematopoietic stem cells and, also to significantly reduce the required concentration of DMSO needed for successful cryopreservation of other cell types (ASC, T-Cells). Pentaisomaltose, thus, could prove a promising new addition to the CPA repertoire, solving some of the problems faced by the field today.

Biography

Jesper Dyrendom Svalgaard is MSc, PhD and research fellow in the stem cell facility, at the Department of Clinical Immunology, Rigshospitalet, University of Copenhagen. In his research Jesper D Svalgaard is focusing on the development and testing of alternative cryoprotectants for cryopreservation of hematopoietic stem cells products and other cell types. Lately, part of his research interests has been testing how to reduce the DMSO concentration in mesenchymal stem cells and T cells.

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Molecularly targeted therapy for spinal muscular atrophy (SMA) and duchene muscular dystrophy (DMD): Kuwait experience

Laila Bastaki
Kuwait Genetic Center, Kuwait

Spinal muscular atrophy (SMA) is an autosomal recessive, motor neuron disease caused by progressive degeneration of motor neurons in the entire spinal cord and in select brainstem motor nuclei (nuclei of cranial nerves V, VII, IX and XII). The disorder causes weakness and wasting of the voluntary muscles. Duchenne muscular dystrophy (DMD) is a severe degenerative muscle disease that affects young males. It is an X-linked recessive disease caused by a mutation in DMD gene on chromosome Xp21. These mutations prevent the production of a connective protein dystrophin. A lack of this connective protein results in severely weakened muscle cells and loss of muscle functions accompanied by muscle tissue replacement by fat and connective tissue. In September and December 2016, FADA approved the first precise molecularly targeted therapy for DMD (Exondys 51) and SMA (nusinersen). Shortly after the approval of these drugs we, at Kuwait Medical Genetic Center, started treatment of patients fulfilling's the inclusion criteria for therapy. Since then we are now treating 65 patients with SMA and 20 patients with DMD. In my talk I will discuss our experience in this field in more details.

Biography

Laila Ali Bastaki completed PhD and currently working as a director of Kuwait Medical Genetic Center at State of Kuwait.

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Nanohydroxyapatite coatings doped with nanocopper particles on Ti13Zr13Nb titanium alloy for biomedical application

Michal Bartmanski
Gdansk University of Technology, Poland

Introduction: Nowadays, the most commonly used titanium alloys for long-term implants are Ti6Al4V and less Ti6Al7Nb. The negative effect of Al (may cause Alzheimer's disease and softens bone process) and V (may provoke cytological responses and damage neurological disorders in the nervous system) was reported. To ensure proper connection between human bone and implants surface, improve biocompatibility and mechanical properties, many types of surface modifications were used, such as the calcium phosphate-based coatings (e.g., hydroxyapatite), laser treatment, anodization and etching. Unfortunately, these modifications do not fully meet the requirements set for them; hydroxyapatite coatings are usually thick and with poor mechanical properties, which may damage the coating during the implantation process preventing primary stabilization.

Methodology: In presented research the new generation Ti13Zr13Nb alloy, without toxic elements and with mechanical properties (~E = 79 GPa) closer than Ti6Al4V (~E = 110 GPa) to the human bone (~E = 10-30 GPa) were proposed. The nanohydroxyapatite coatings with nanocopper particles were deposited using the electrophoretic method in a one-way process. To study properties of obtained coatings, the scanning electron microscopy, atomic force microscopy, energy-dispersive X-ray spectroscopy, nanoindentation and nanoscratch-test techniques were used.

Results: The study confirmed that it is possible to obtain homogenous nanohydroxyapatite coatings with nanocopper particles in a way electrophoretic deposition process. The positive effect of presents nanocopper in coatings on thickness, topography and nanomechanical properties was obtained.

Future plans: Based on the positive results of preliminary tests, the authors plan to perform tests on the rate of release of nanocopper particles into SBF solutions as well as cytotoxicity and bactericidal properties tests.

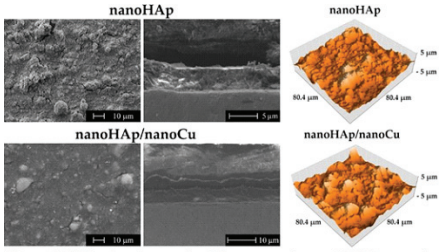

Figure 1: SEM surface topography (left), cross-sections and AFM topography of the coatings

Biography

Michal Bartmanski has his expertise in biomaterials and nanobiomaterials engineering, surface engineering and nanotechnology. The main achievements include deposit of nanohydroxyapatite coatings, nanoHAp coatings with nanometals with bactericidal properties and smart coatings on titanium alloys for biomedical applications and characteristic their mechanical (e.g., nanoindentation technique), chemical (e.g. release of elements to simulated body fluids), physical (e.g. surface topography) and biological (e.g. cytotoxicity) properties. Research-based on new modifications of biomaterials surface will allow in the future to develop more biocompatibility long-term implants.

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Identification and pattern analysis of SNPs involved in colorectal cancer

Jyoti Bhojwani
DAVV/Indore University, India

Colorectal cancer (CRC) is the second leading cause of cancer related deaths globally posing a lifetime risk of 80-100% in every individual. Genetics and relevant mechanisms underlying some key signaling pathways like Wnt, TGF, p53, K-ras etc. play a detrimental role in governing the predisposition for CRC. A high percentage of colorectal tumors (adenomas and carcinomas) show activating mutations in beta-catenin or axin, whereas, loss of certain tumor suppressor genes (TSGs), like APC cause the initiation of random polyps in the colon. All of these molecules incidentally are critical components of an evolutionarily conserved Wnt signaling pathway, which is instrumental at various time points in the development of this disease. Differences in SNP profiles amongst sample groups in the genomic landscape can be recognized through a smart and efficient use of machine learning techniques. The statistics and pattern analyses of these SNP profiles interestingly provides us with a concrete and logical platform upon which, relative contributions of each unique SNP, ranging "from cause to effect" can be significantly assessed. The biological relevance of these SNP variations with respect to cancer prediction and predisposition, however, remains to be resolved, pending a better understanding of the impact of rational control design in SNP studies. Our results emerging from the analyses of significant SNP's reported here, demonstrates the utility of relevant bioinformatics tools and machine learning techniques in discriminating diseased populations based on realistic SNP data. In this study, we have primarily targeted critical members of Wnt signaling pathway, which play important developmental roles during different stages of colorectal cancer, depicting a classical "multigene-multistep nature" of cancer. We have identified and related common genetic variants for the "early-acting" and "late-acting" members of this pathway, that are most prevalent in patients with CRC disease. Complex relationships and correlations hidden in large data sets have been dug and analyzed here, by deploying various data-mining techniques.

Biography

Jyoti Bhojwani is presently a Faculty of Genetics/Bioinformatics/ principal investigator of the M.Tech research programs (Bio-Informatics) at University of Indore, India. She obtained her BSc (Bachelor's degree) in Biological Sciences/Chemistry/Physics, MSc (Master's degree) in Life-Sciences and Doctoral degree (PhD) at School of Life-Sciences, University of Indore. She pursued her post-doctoral ventures at Max-Planck Institute for Biophysical Chemistry (FRG), University of California-Irvine and University of Pittsburgh (USA). Currently, her projects mainly focus on translational-research and extrapolation of basic developmental mechanisms from model-systems like fruitfly (Drosophila) to human. Apart from this, her thrust areas of research interest include; cancer Biology, stem-cell biology and homeotic-gene regulation. She is keen on studying in detail the genetic factors, which presumably aid in understanding of mechanism by which "cancer stem cells" function in transforming a tissue from normal to cancerous states. Her research has a motive to further facilitate the perception of stem cell potential/mechanistic in areas of regenerative medicine, translational research and anti-cancer therapy. Being involved in clinical informatics, her students are also training a cancer model and a stem cell model, deploying systems biology approach and other gene networking bioinformatics tools. This novel area of research will hopefully lead to further understanding the tipping of balance from a stem cell/normal cell to a transformed cancer cell. Owing to her immense interest in science journalism and writing potential, she is now on the editorial board of several international journals.

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Young Research Forum

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The effect of surface modification on adhesive strength between 3-D printed titanium alloy and bone cement in orthopedic application

Magda Dziaduszewska
Gdansk University of Technology, Poland

Statement of the Problem: A properly prepared surface plays a vital role in the successful application of various biomedical solutions. In case of revision surgery, it is advisable to use the spacer as a temporary implant, usually made of metal rod covered by antibiotic-loaded bone cement, used for the local treatment of postoperative infection. One of the main limitations of spacers is their aseptic loosening, caused, i.e. by debonding effect at the metal–bone cement interface. In numerous studies it has been suggested that implant-cement fixation properties might be improved by the appropriate manufacturing method, material selection, as well as surface treatment of spacers.

The Purpose of this study: In this study the effect of the surface treatment of Ti13Zr13Nb specimens produced by selective laser melting (SLM) on bone cement coating adhesion was evaluated.

Methodology & Theoretical Orientation: Ti13Zr13Nb alloy specimens were manufactured by selective laser melting (SLM) method and subjected to the following surface treatments: sandblasting, grinding and etching. Subsequently, the printed specimens were covered by bone cement. For each condition, the surface evaluation of titanium alloy specimens, as well as the assessment of cement adhesion to the surface, was carried out. The results of each test were compared to the two control groups, consisting of commercially available Ti13Zr13Nb and untreated SLM-made specimens.

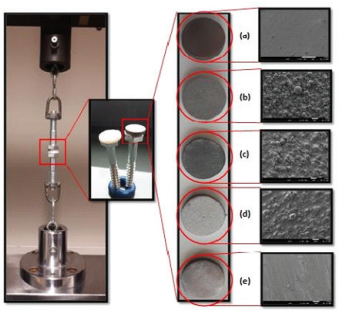

Figure 1: Adhesion strength test and titanium alloy specimens with SEM images (x100) after different surface treatments (a) Solid bar; (b) Untreated selective laser melting (SLM); (c) Sandblasted SLM; (d) Etched SLM; and, (e) Ground SLM

Conclusion & Significance: Surface treatment and method of fabrication of titanium affected surface parameters that had a significant impact on cement-titanium fixation. The highest adhesion bone cement to the titanium alloy was obtained for specimens with high nanohardness and roughness. Sandblasting or etching were the best alloys treatments in terms of the adhesion. Overall, the higher adhesion strength of bone cement coating to the SLM specimens is a good precondition for the SLM application in the production of metal-polymer implants for tissues with heavy loads.

Biography

Magda Dziaduszewska, PhD student and research assistant at the Gdansk University of Technology, Department of Materials Engineering and Bonding, Biomaterials Division. Her main interests are connected with development and surface modification of porous titanium structures for orthopedic applications, including selective laser melting manufacturing of scaffolds or titanium implants with the porous surface layer, surface modification as well as the development of bioactive and biocompatible coatings.

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Stem cells in diabetes: Unspoken risks and uncomfortable questions

Ewa Kozłowska
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According to the world health organization's statistics published in 2018, The number of people with diabetes has increased from 108 million in 1980 to 422 million in 2014 and still growing. Only in Poland the number of deaths attributable to high blood glucose in 2016 was estimated at 25800.

Type 1 diabetes can be treated and its consequences avoided or delayed, but still, a reliable method of complete recovery remains undiscovered.

Cell-based therapies for beta-cell replacement are now under intensified investigation. Researchers have been advancing methods to generate insulin-producing beta cells from pluripotent stem cells (PSC) for the clinical treatment of diabetes. Although American researchers say, that once taken stem cells can be multiplied indefinitely, the use of stem cells from human embryos still raises ethical resistance.

Apart from the stem cell ethical factors, physicians and scientists have more moral dilemma connected with the selection of patients for the treatment and possible risks. Mostly mentioned risks are tumors, the growth of the stem cells into unwanted cell types and taking immunosuppressive drugs that suppress the activity of the immune system. Other than that, the scientists tend to present the matter in bright colors. Patients physical and psychological reaction to a sudden "miracle cure" could be difficult to predict. Stem cell treatment may become harmful to the good habits worked over the years. To some patients it may cause some kind of "breaking the leash" syndrome, especially those of type 2 diabetics, for who the cause of the disease was poor eating habits. Obvious priority is given to the type 1 diabetes children, in whom the disease has not yet caused significant changes in the body and way of thinking, but many unobvious risks still need to be discussed.

Biography

Ewa Kozłowska has a Masters in Mechanical-Medical Engineering, an inter-academic field of study run cooperatively by Gdansk University of Technology and the Medical University of Gdansk, Poland. She has started working on effective interdisciplinary online collaboration methods to be used by engineers and physicians in May 2015 by volunteering in ERASMUS+ projects and taking part in Moodle MOOCs. She is currently working on her PhD in the topic of material engineering and medical devices designing with the use of computer collaboration tools by multidisciplinary specialists.

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