3rd International Conference on

BIOMATERIALS, CELLULAR AND TISSUE ENGINEERING

June 19-20, 2019 | Dublin, Ireland

BIOMATERIALS CONGRESS 2019



KEYNOTE FORUM
DAY 1

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Rita Kappel, Mater Sci Nanotechnol 2019, Volume 3

Rita Kappel

Dr. Kappel Institute, Netherlands

BIOGRAPHY

Rita Kappel wrote her thesis on the development of the primate cerebellum, giving her insight into neuroanatomy. Then next became a board-certified plastic and reconstructive surgeon and ultimately added a certification in preventive healthcare. All these three qualifications relate to different aspects of "Silicone gel bleed disease" and together have made it possible to do research on it. This disease affects many women around the world. Apart from the abovementioned study, she has authored or co-authored for four other scientific studies on this subject. She is the Director of the Dr. Kappel Institute in Netherlands.

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SILICONE GEL BLEED DISEASE, ANOTHER STEP TOWARDS EXPLANATION OF THE PATHOGENESIS

When it comes to silicone breast implants, author already know that *in vitro* they bleed their content through an intact shell, thanks to the work of Barker *et al*. in 1978. The common conception was that although the bleeding occurred, regardless of the brand of the breast implant, the bleeding material was too inert chemically to cause any harm and would probably be contained within the capsule surrounding the breast implant. That is still the common professional opinion until today, emphasized by the idea that a Bleed Retardation Layer in later and future generations of silicone breast implants will stop the bleeding altogether. This is of course not what the name suggests. They also know that there are women with these products who develop a variety of chronic health issues, which should preferentially be described under the heading "Silicone gel bleed disease", as they learn more about it. Interestingly these complaints improve upon explanation surgery. Is there a link between the ever present gel bleed and this disease? With the study that will be presented, they have employed three separate methods to demonstrate unequivocally, the *in vivo* dissemination of silicone polymer molecules everywhere throughout the body. They are getting closer to the next step of the scientific explanation of how the accumulated Silicone molecules in the various organs and tissues cause the variety of health complains, pertaining to silicone gel bleed disease.

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Annalisa Tirella, Mater Sci Nanotechnol 2019, Volume 3

Annalisa Tirella

The University of Manchester, United Kingdom

BIOGRAPHY

Annalisa Tirella received her PhD in Materials for Environment and Energy from the University of Roma II developing a 3D printing system for cells and hydrogels. As Research Fellow, her research developed on engineering physiological *in vitro* systems using biomaterials with mechanical and physico-chemical properties similar to human tissues. She joined the University of Manchester within the Division of Pharmacy and Optometry as a Lecturer in 2014. Her research group works at the interface with multiple disciplines, with the main research areas being: manufacturing of nano/micro-technologies for drug delivery and design of (bio) engineered *in vitro* 3D models. She established a solid network of academic/industrial collaborations and she recently joined the North-West Centre for Advanced Drug Delivery. Through her career, she has made significant contributions to the advancement of hydrogel manufacturing and their physical characterization, as well as use of colloidal nanoparticles for targeted drug delivery (>25 research papers with >350 citations).

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TUMOUR 3D *IN VITRO* MODELS: ADVANTAGES OF BIOENGINEERING FOR THE RECAPITULATION OF EARLY STAGES OF TUMOUR DEVELOPMENT AND CHEMOTHERAPIES DELIVERY

In vitro models are useful tools for understanding many pathophysiological states, as well as being used for testing drug delivery and efficacy. Traditionally they are depicted as a monolayer of a single cell type, however *in vitro* models should better mimic the complex biological scenario-which is not flat (2D), but intricate and dynamic (3D, different cell types and dynamic). To better predict the efficacy of therapies it is necessary to re-think drug testing towards more relevant models. The combination of biomaterials in 3D structures, the control of biomaterials properties and their perfusion in a dynamic cell culture system is hence essential. Tissue engineering approaches and biomaterials can be used to better model tumours and their microenvironment *in vitro*. This can enable more precision to unravel molecular mechanisms and identify basic biological findings as well as better predict drug delivery mechanism and efficacy. The use of more relevant systems will help to bridge the gap between *in vitro/in vivo* models and help to translate findings. Insights on the design and characterization of biomaterials to mimic the tumour microenvironment and its dynamic will be discussed. Examples of engineering approaches to fabricate tumour models at early stages will be discussed, comparing expression of relevant biomarkers between traditional and engineered *in vitro* models. Final case study will describe the use of nanoparticles for target delivery; and differences between traditional and engineered models will be discussed. The importance of using biomaterials and tissue engineering approaches to better predict chemotherapeutics delivery will be discussed, evidencing how engineered *in vitro* models can be used to speed up the pre-clinical phase in the testing of medicines.

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PV Mohanan, Mater Sci Nanotechnol 2019, Volume 3

PV Mohanan

Sree Chitra Tirunal Institute for Medical Sciences and Technology, India

SAFETY AND CHALLENGES OF SCAFFOLD USED IN TISSUE ENGINEERING

Tissue Engineering is a rapidly growing area having multidisciplinary science and expertise. This interdisciplinary engineering has attracted much attention as a new therapeutic means that may overcome the drawbacks involved in the current artificial organs and organ transplantation, that have also aiming at replacing lost or severely damaged tissues or organs. The Tissue Engineered Medical Products (TEMP) comprise the biological components such as the cells, tissue, cellular products, biomaterials, biologics or synthetic materials used in combination. Typically the cells are seeded onto a substrate and allowed to proliferate until an adequate amount of tissue or cells are available for transplant to the patient and the 'device' is generally considered as a combination product. *In vitro* and *in vivo* models to evaluate the safety or compatibility of the cellular materials are very specialized and specific. The evaluations include assessment of cytotoxicity, cell adhesion, growth and proliferation, expression of functional phenotype of the cells under consideration etc. However, the combination products need more evaluation on its biocompatibility aspect. The substrate or matrix materials used to 'seed' the cellular materials are subjected to routine materials/device evaluations. Typically these products are considered as implants that may degrade or absorb, leaving only the cellular component behind. Or in other cases, the substrate or protective polymer is considered a permanent implant that allows the cells to function without rejection. The polymer matrix or substrate is subject to biological/safety evaluations. The types and degree of *in vitro* and *in vivo* assays depend on the nature of the product. The safety from contamination by potentially infectious adventitious agents, toxicity, genotoxicity, biomaterials compatibility, immunogenicity and inflammatory responses are typical for tissue engineered products. The ASTM is making a concerted effort to establish standards and guidelines for the entire field of tissue-engineered medical products. Safety, consistency and functionality of biomaterials used as matrices, scaffolds and immobilizing agents in tissue-engineered medical products are of concern. The evaluation of cellular materials fall outside the range of ISO 10993, EU and other international standards. The details of the safety and challenges will be discussed during the presentation.

BIOGRAPHY

PV Mohanan obtained BSc, MSc from Calicut University and PhD from Kerala University. He was a JSPS Post-Doctoral Fellow at the University of Tsukuba, Japan in the field of Neurotoxicity. He joined at Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) in 1989 and has spent 30 years of professional life here. As a toxicologist he has been intimately associated with all the medical devices/technologies developed at SCTIMST. Currently he heads the Division of Toxicology. He is a Visiting Professor and Visiting Researcher at Tokyo University, Japan and a Certified Biological Safety Specialist. He received lifetime achievement award from the Society of Toxicology, India for the outstanding contribution in the field of toxicology. He has been teaching toxicology to Postgraduates and guiding research scholars. Development of Human-on-a-chip is a new mega project, apart from several other funded research projects. He got a Patent for an ELISA kit for the measurement of pyrogenicity. He made significant contributions for the development of medical device regulations in India.

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KEYNOTE FORUM
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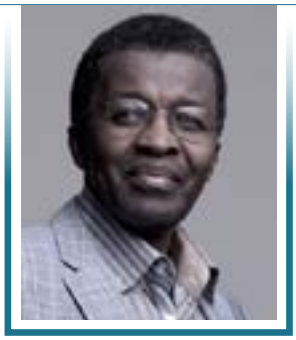
R Cuero, Mater Sci Nanotechnol 2019, Volume 3



R Cuero[1,2]

[1]BioCapital Holdings, USA

[2]International Park of Creativity, USA

ENHANCED DNA CONSTRUCTS FOR THE EARLY DIAGNOSIS OF ALZHEIMER'S IN BLOOD OR DIABETES IN SALIVA USING PHOTONICITY

BIOGRAPHY

R Cuero did his PhD in Microbiology from University of Strathclyde, UK and MSc in Plant Pathology from Ohio State University, USA and BSc from Heidelberg University, USA and Biology Degree from Universidad del Valle, Colombia. He is a former Distinguished Professor and Research Scientist of Texas A&M University system on the Campus of Prairie View, Texas. Currently, he is Chief Scientific Advisor of BioCapital Holdings LLC., USA and he is Founder/Scientist/Mentor of the International Park of Creativity, which main aim is invention/discovery. He is former Research Associate for USDA. He has many scientific inventions, patents and publications in different scientific and technological fields including biotechnology, microbiology, molecular biology, synthetic and integrated biology, environmental and energy biotechnology, microbiology and astrobiology. His most recent inventions are production of light without electrical cord or battery and also development of DNA sensor for early detection of Alzheimer's in blood as well as DNA sensor for early detection of diabetes in saliva. He has received numerous scientific recognitions such as the Hispanic Scientist of the year 2013, USA and he has received several honorary doctor degrees. He has received the NASA Brief Technology award for his inventions to NASA.

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Unpredictability is the major limitation to the diagnosis and/or cure of degenerative diseases such as Alzheimer's and diabetes. In most of the cases these diseases are only detected after the onset of the disease has occurred. The combination of very sensitive methods with high expression of inherent molecules will offset these limitations. Molecules such as DNA, proteins, and other compounds can be ideal markers for detecting diseases such as Alzheimer's and diabetes by non-invasive techniques because of the inherent biophotonic characteristics. Therefore, researchers have developed two different DNA sensors using synthetic biology to detect Alzheimer's and diabetes prior to the onset of these diseases. The DNA sensor was constructed in bacteria or yeast using natural and/or synthetic sequences. The efficacy of the DNA sensor was tested based on fluorescence intensity when mixed with human blood plasma using a fluorescence detector at different wavelengths. The level of fluorescence intensity determines the degree of the disease; thus, they were able to enhance the photon expression of the detection by conjugation using a natural dye at a wavelength similar to the amyloid protein. The intensity of the fluorescence was correlated to clinical parameters, tomographic images and glycaemia results from patient blood samples. The expression of amyloid protein was confirmed using standard techniques including biochemical assays such as ELISA and Western Blot. The results of these correlations allowed us to establish three different groups of patients. In the case of Alzheimer's, patients were divided into the following groups: Alzheimer's diagnosed, pre-Alzheimer's and normal groups. For diabetes, patients were divided into the following groups: diabetic, pre-diabetic and normal groups. Results were analyzed through statistical methods as well as using neuronal network computational modeling. This investigation provides a much needed non-invasive diagnostic approach for developing proper therapy and treatment for these diseases.

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Dong-An Wang, Mater Sci Nanotechnol 2019, Volume 3

Dong-An Wang
City University of Hong Kong, China

BIOGRAPHY

Dong-An Wang is a Professor of Biomedical Engineering in City University of Hong Kong. His research interests include biomaterials, tissue engineering and gene delivery. He has done significant research work in his research areas and published over 100 high quality journal papers including nature materials, advanced functional materials and biomaterials etc. He has been often invited as a theme Editor and Reviewer for a number of top journals. He has been conferred with various research/academic awards.

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DECELLULARIZED HYALINE CARTILAGE GRAFT (DLHCG) FOR CARTILAGE REPAIR

In this study, author has developed a continuous methodology to directly set up a scaffold-free macro-scaled three-dimensional living hyaline cartilage graft (LhCG) with the aid of a biomaterial-based interim scaffolding system. The practical performance of decellularized LhCG (dLhCG) is evaluated in the knees of large animal models with full-thickness chondral defects beyond critical sizes for six months. Hyaline cartilage based neo-tissue fulfills the desired in situ reconstruction. LhCG is also employed as an engineered biomimetic/pathological tissue platform for anti-arthritis drug evaluation *in vitro*. Arthritic disease models are created with LhCG by replicating the inflammatory environment of an arthritic joint via co-culturing LhCG with lipopolysaccharide (LPS)-activated macrophages, after which the accuracy of this model for *in vitro* drug-testing was validated using a popularly applied non-steroidal anti-inflammatory drug (NSAID). The results suggest that this new arthritic model is able to adequately mimic the native arthritic cartilage and is suitable to be used as an *in vitro* model for predicting native cartilage response to drug treatment.