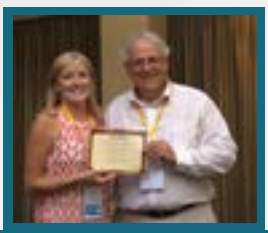
8th Annual Conference and Expo on

Biomaterials

May 10-11, 2023

Zurich, Switzerland






Posters

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A telmisartan nano-formulation regulates multidimensional complications associated with type 2 diabetes mellitus

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Diabetes Mellitus (DM), diagnosed by the presence of high blood glucose levels, is associated with insulin resistance/insufficiency and pancreatic β cell death. The hallmarks of diabetes include Reactive Oxygen Species (ROS) formation, Advanced Glycation End products (AGEs) deposition, chronic low-grade inflammation and pancreatic β cell apoptosis originating from the abundance of free fatty acid and hyperglycemia. Telmisartan (TEL), an angiotensin II type 1 receptor antagonist, has been reported to restore fatty acid-induced oxidative balance, reduce insulin resistance, promote anti-inflammatory macrophage phenotype and maintain pancreatic islet morphology. However, TEL is associated with low solubility, short plasma half-life, limited bioavailability and non-specificity. These limitations of free TEL can be addressed by encapsulating it into a nano-sized delivery system. Exosomes are naturally derived extracellular nano vesicles that have been reported for the delivery of various drugs including doxorubicin, curcumin, paclitaxel, etc. Thus, Mouse Insulinoma cell (MIN6) derived Exosomes (Exo) were exploited as the delivery vehicle to package TEL. Further, Exo is known to protect and induce the proliferation of insulin-secreting pancreatic β cells by reducing macrophage infiltration and enhancing angiogenesis. To this end, TEL-loaded Exo (Exo-TEL) was prepared and it showed excellent *in vitro* cytocompatibility on murine MIN6 and C2C12 cell lines. *In vitro* study showed that Exo-TEL nano-formulation can effectively modulate oxidative balance by lowering the ROS level and increasing the NAD+/NADH ratio. Additionally, Exo-TEL treatment increased the expression of Glucose Transporter (GLUT4) and promoted the uptake of glucose analog, 2-NBDG. Further, to overcome the arduous, low-yield process of exosome isolation, Exosome-Inspired Nanovesicle (EIN), mimicking the lipid profile of the naturally derived exosomes, was developed. EIN-loaded TEL (EIN-TEL) nano-Formulation depicted similar efficacy *in vitro* as compared to Exo-TEL. Hence, in conclusion, Exo-TEL and EIN-TEL successfully regulated multidimensional complications associated with diabetes to improve the therapeutic potential of TEL [Figure 1].

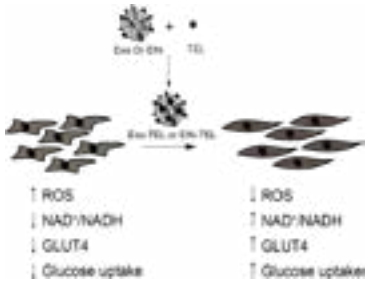

Figure 1. Graphical abstract.

Biography

Anjali Singh is currently a PhD student at the Centre for Biomedical Engineering, Indian Institute of Technology Delhi, New Delhi, India. She has been working in the Centre since 2018 under the supervision of Dr. Jayanta Bhattacharyya. She has been working towards the development of effective therapy for Diabetes Mellitus.

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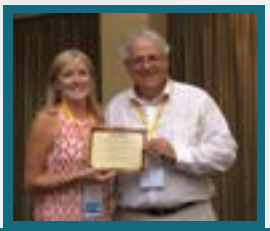


Accepted Abstracts

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The convergence of technologies, generates convergence in the regulations

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The convergence of nanotechnologies generates synergies among different technologies to say, nanotechnologies, neurotechnology, computers and biotechnology, these technologies must converge their regulations, the application of medical devices in nanotechnologies should lead us to a link between the technical committee TC 210 and ISO technical committee 229 link that does not exist in our work in this moment In this do an analysis of the management of risk from an optical NC-ISO 14971. Studying the global trend in this respect as imported for manufacturers medical Devices worldwide. The convergences of technologies are a consequence of atomic precision, where the boundary between the biotic and abiotic mute blur the interaction. The interaction between Nanotechnologies, Biotechnology and Informatics and Communications (NBIC) generates a synergy of unusual consequences of all is known that the industry of semiconductors is the one of greater precision that is atomic, the new medical devices that will be applied in the teranocis will dose Physical principles that will be governed under the laws of quantum mechanics, but there are two problems that have not been solved even though they are one the non-existence of quantum biology and the transition from quantum to classical mechanics. On the other hand, the redefinition of the international system of units based on the universal constants that will be implemented by 2018 has a deficiency that is the second that redefirms implies redefinition of the meter the chain of traceability proposed for nanometrology presents a serious difficulty when putting the microcopy of atomic force wing of effect tunnel situation that is changing the verification of the Wiedemann-Franz law at atomic level yields a result where the phononic component is taken into account, a result that launches STM to the cusp of the chain of traceability above inclusive of interferometry.

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Processing and characterization of egg shell derived Hydroxyapatite (HAp) and HAp reinforced AZ91 alloy composite

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An economical laboratory procedure to synthesize powder Hydroxyapatite (HAp) from bio-waste, eggshells, is developed. This technique entails crushing of eggshell, firing the eggshells at elevated temperature in furnace, mixing chemical compound and then again keeping the mixture at higher temperature. The produced HAp is then crushed to produce the finishing product in powder form which is then characterized by X-Ray Diffraction (XRD) technique. The produced Hydroxyapatite (HAp) is then reinforced into AZ91 alloy powder following powder metallurgy technique to produce a Metal Matrix Composite (MMC) to obtain a composite with adjustable mechanical and corrosion properties. In this study, we utilized AZ91 alloys as the matrix and the HAp powder particles as the reinforcement and the MMCs were studied for mechanical and corrosion resistance property. MMCs with 18% HAp showed 2 times higher hardness than the MMCs with 0% HAp. The MMCs with 0% HAp showed 4 times higher weight gain and 3 times higher weight loss than that of the 18% HAp MMC samples in simulated marine water. In summary, HAp reinforced AZ91 alloy composites exhibit adjustable mechanical and corrosive properties.

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Possible mechanisms of the inhibitory effect of the allogeneic dispersed biomaterial upon fibrosis of different etiology

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Statement of the problem: At present allogeneic decellularized biomaterials are successfully used to replace defects of different tissues. When properly selected, the collagen synthesis, somewhat stretched in time, being correlated with the gradual resorption of the biomaterials by macrophages results in the formation of the structurally complete collagen fibers with the adequate architectonics and prevention of scarring. The macrophages were established to play the main role not only in the lysis of the biomaterial fibers but also in building newly formed collagen fibers (matrix-formed macrophages). We have developed technology to obtain Dispersed Allogeneic Biomaterials (DAB), which allows inserting them in the form of suspension, which significantly expands the scope of their application to stimulate regeneration of different tissues.

Purpose: The purpose of this study is to reveal possible effect mechanisms of the macrophage population upon the development of the degenerative-dystrophic changes in tissues and the possibility to correct them using the allogeneic dispersed biomaterial.

Methodology & theoretical orientation: There have been carried out the experiments (on rats and rabbits) with pathology modelling leading to fibrosis and scarring (liver cirrhosis, corticosteroid glaucoma, myocardial infarction) and followed by the DAB insertion. After 3,7,14,30 and 90 days the material was investigated using the histological, electron microscopic, histochemical (Hale) and immunochistochemical methods (TGF-ß1, TNF-α, IL-1α, CD 68, Vimentin, Thy1, C-kit, GATA-4) and also by means of flow cytometry (CD 45, CD 90).

Conclusion: The results of the experiments showed that in case of fibrosis, the population reduction of macrophages and high TGF-ß1 expression were observed. Upon the DAB insertion, there was observed a substantial macrophage concentration increase of the haemopoietic and mesenchymal origin with pro-inflammatory M1 phenotype which led to the predominance of TNF-α expression in comparison of TGF-ß1 one. Against this background, cardio myoblasts (GATA-4+) which were then differentiated as cardio myocytes were revealed in the experiment with the infarction model. Thus the macrophage activity prevents fibrosis and contributes to its reduction. Under this condition the stem cells exhibit activity.

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Ethically sourced materials with nanobio-technology towards affordable health

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BioMaterials and Tissue Engineering (BMTE) was formed in the year 2007 at School of Medical Science and Technology with the main emphasis on product development research based on fundamental understanding of cell–material interactions and *in vivo* response with preclinical model. BMTE is working on the development of customized implants through various top-down and bottom-up fabrication techniques. Primarily, the group is developing permanent implants for rehabilitation and biodegradable implants for tissue regeneration.

In this context, metal and ceramic-based permanent implants like mandible, dental crown, cortical bone etc. are manufactured by near net shape fabrication (direct casting and green state machining) approach. Bio-activation/ surface modification of implants for biological fixation is another important area of research. Different kinetically driven processes like microwave irradiation and electro-spinning are utilized for quantum dots and nano/micro-fibrous mat fabrication for live-cell and tissue imaging, tissue regeneration, wound healing applications.

Under the regenerative medicine approach, this group is developing biodegradable/bioactive materials with nano-micro architecture for skin, bone and cartilage tissue engineering. Different factors like scaffold architecture, chemistry, dynamic and static conditions are studied to improve cell-material interactions toward stem cell differentiation into native tissue phenotypes. Also, the group is exploring diverse natural resources for isolation of bioactive molecules, biopolymers and materials for better healthcare delivery. The group has activities from materials development, the study of cell biology and biochemical assays *in vitro* and *in vivo* towards final product development. Some of the products are already used for clinical case studies and some of them and in the intermediate stage of technology transfer.