Generating Tissue-Engineered Organs and Controlling Cell Behaviour

HEALING TRAUMA, REBUILDING LIVES

Regenerative Medicine research is emerging as a challenging field as it addresses the unique requirement of Defence medical services in the management of combat-related trauma.

The speciality of this field is coupling the unified approaches of various trans-disciplinary research into a single window to meet Defence medical needs.

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To address this issue, a multi-institutional network project on "**3D Nanoengineered Constructs to Control and Pattern Cellular Behaviour**" between ***IIT Kanpur, University of California-Los Angeles (UCLA)*** and ***Texas A&M University*** has recently been funded by the Indo–U.S. Science and Technology Forum.

The outcome of this project would certainly be a major achievement and will provide promising therapeutic options in the field of plastic surgery and wound management in a cost-effective way which shall be highly beneficial for advantageous to countries like India and the United States. The study will not only be helpful to the scientists working on materials science, but also to the researchers working in the biomedical field. A unique electrospinning technique, which allows the production of a large number of organic and inorganic nanofibers scaffolds for repairing tissue with good biocompatibility and conformability will be explored. It is expected that the electrospun nanofiber scaffolds for repairing and regenerating orthopaedic tissue enables the recovery of functional loss along with the capability of mimicking their microstructures, compositions, and mechanical properties.

The current need for an ideal bone substitute is a material that can promote the survival, migration, proliferation and *in-situ* differentiation of encapsulated human stem cells without the addition of growth factors. In this project, it is aimed to improve the mechanical strength and bioactivity of nanoclay enriched polymeric materials using electrospinning (ES) technique. This technique has advantages towards enhanced control over diameter, composition, structure, alignment, order and porosity as compared to other fabricating methods, that produce fibres. Another advantage is the simplicity of the process that does not require any complicated and expensive equipment and can be easily up scaled for mass productions. ES fibre dimensions and spatial organization resemble the fibrous component of extracellular matrix, making ES a technology to produce morphologically biomimetic scaffolds. Therefore, this kind of scaffolds

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