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The role of nanotopography on the design of an optimum nanohydroxylapatite/polyhedral oligomeric silsesquioxane poly (carbonate-urea) urethane nanocomposite scaffold for bone tissue engineering

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As the majority of the biological reactions in human body occur on the surface or interference of a biomaterial or device, surface properties such as nanotopography can play critical role in determining the success of their implantation. As a result, the emerging fields of tissue engineering and regenerative medicine can greatly benefit from manipulation of nano-surface characteristics of implants and devices in order to guide and control the growth and differentiation of various cell types. For instance, it has been shown that the function of mesenchymal stem cells, multipotent stromal cells with the ability to differentiate to various cell types, could be regulated through physical interactions with specific nanotopographical cues such as surface roughness or stiffness. Polyhedral oligomeric silsesquioxane poly(carbonate-urea)urethane (POSS-PCU), a new breed of novel nanocomposite material, developed by researchers at the University College London, has shown enhanced biocompatibility, superior mechanical engineering properties and augmented resistance. This novel polymer has already been successfully tested *in vitro*, *in vivo* and in human as a scaffold for bioartifical organs as well as a coating for medical devices. Here, we report of an investigation on the role of nano-surface characteristics of nanohydroxyapatite/POSS-PCU nanocomposite scaffolds for the purpose of bone tissue engineering. Our results indicate that by etching the surface of our scaffolds and/or introducing porosity, we are able to design surfaces with optimum roughness, stiffness and structure, which could then be used to guide and control cell attachment, growth and differentiation for the purpose of repairing or regenerating large bone defects.

Biography

Shima Salmasi is currently a PhD Student and Research Associate at the Centre of Nanotechnology and Regenerative Medicine, University College London. She has completed her Master of Science in Nanotechnology & Regenerative Medicine and as a part of her PhD; she is working on an innovative translational project with the aim of improving the current standards of spinal fusion surgery.

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