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Nanohydroxyapatite/polyhedral oligomeric silsesquioxane poly (carbonate-urea) urethane (nHA/POSS-PCU): Applications in bone tissue engineering and regenerative medicine

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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 been extensively tested in terms of its physiochemical, *in vitro*, and *in vivo* properties, all of which have shown that its enhanced biocompatibility, superior mechanical engineering properties, and augmented degradative resistance renders POSS-PCU capable of functioning as a scaffold for bio-artificial organs, nanoparticles for biomedical applications, and a coating for medical devices. The novelty of POSS-PCU further arises from the fact that it has been used in 3 first-in-human studies as a bypass graft, lacrimal duct, and the world's first synthetic trachea. Bone, as a living tissue, has the ability to constantly remodel, renew and regenerate to repair itself. However, large bone defects are considered as major problem for the clinician and society. Recently, we have investigated incorporation of different ratios of nanohydroxyapatite, the main inorganic component of the natural bone, into POSS-PCU nanocomposite for bone tissue engineering applications. This nanocomposite material could be used to better mimic the mineral component and the micro- & nano-structure of the natural bone and so far we have found promising results in terms of the scaffold supporting and enhancing material-cell interaction; i.e. attachment, proliferation and bone mineralisation of oestrogenic cell lines as well as osteo inductive properties for bone deposition and regeneration.

Biography

Shima Salmasi is a PhD student and Research Associate at the Centre of Nanotechnology and Regenerative Medicine, University College London. She completed her Master of Science in Nanotechnology & Regenerative Medicine and now, as part of her PhD, is researching on an innovative translational project with the aim of improving the current standards of spinal fusion surgery. This is a very interesting project with great potentials to provide a clinically effective solution to overcome the shortcomings of the currently available techniques of spinal fusion surgery using tissue engineering and nanotechnology.

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