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Tailoring microenvironments for *in situ* regeneration

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At present, tissue engineering for bone regeneration seeks to obtain scaffolds that mimic the cell microenvironment to recruit stem and progenitor cells to recapitulate the development of target tissues. Herein, we have explored the use of citric acid related to bone nanostructure and mechanical performance, to develop scaffolds resembling the extracellular matrix of developing bone. Elastin-like recombinamers (ELRs) hydrogels were achieved through a one-step chemical crosslinking reaction with citric acid, a molecule currently considered to be essential for the proper performance of bone tissue. We were able to control the architecture and stiffness of citric acid-crosslinked hydrogels while preserving the integrity of adhesion sequences in ELRs. Interestingly, the use of citric acid conferred so-produced hydrogels the ability to nucleate calcium phosphate. *In vivo* implantation of both mechanically-tailored and non-tailored citric acid-crosslinked hydrogels demonstrated to be able to mineralize the new formed tissue and to integrate into bone in critical size defects in mouse calvaria. Both types of hydrogels showed bone tissue formation by intramembranous ossification. The non-mechanically tailored scaffold showed higher cellular activity (in terms of osteoblasts and osteoclasts presence) related to a lower density of the matrices that allowed higher cell penetration.

Biography

Elisabeth Engel is an Associate Professor at Technical University of Catalonia since 2010. She received her PhD in 2003 in Bone Metabolism Diseases from a Medical School. She was appointed as PI at the Group of Biomaterials for Regenerative Therapies since September, 2012 at the Institute for Bioengineering of Catalonia. Her research interests include the preparation and design of materials and scaffolds for *in vitro* and *in vivo* fundamental studies, and a further focus is the provision of useful tools to assess mechanisms that govern cell behaviour in regenerative medicine.

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