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A nanofibrous hydrogel for bone tissue engineering

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Therapeutic management of bone loss in craniofacial region as a consequence of trauma, tumor surgery or congenital malformation presents clinical challenge. Biomaterials play a role in interacting with cells in the formation of tissue. PuraMatrix™ is a commercially available self-assembled synthetic peptide hydrogel that is amphiphilicin nature. Under physiological conditions PuraMatrix™, can instantly polymerize forming matrices providing three-dimensional architecture that facilitate cells growth.The objective of the study is to investigate the ability of this hydrogel to support the cell growth and osteogenic differentiation of human gingiva derived stem cells. Mesenchymal stem cells obtained from human gingival tissue were culture expanded. Proliferation of the cells encapsulated in PuraMatrix™ scaffold was observed at 1- 7 days. *In vitro* osteogenic differentiation of these cells was investigated at 1 and 2 weeks. The *in vivo* bone regeneration ability was analyzed by using anectopic bone formation in a rat model. PuraMatrix™ embedded cells were viable during the entire period of study. Significant increase in osteogenic marker-alkaline phosphatase (ALP) activity was observed in cell- gel constructs when compared with monolayer cultures. Notably cells in PuraMatrix™ showed significant up regulation of other marker genes such as collagen type 1 and osteopontin at 2 weeks of culture. Within four weeks after implantation, osteoid like structures were observed in rats. The study revealed that PuraMatrix™ scaffold enhances the ability of HGMSCs for bone regeneration.

Biography

Umadevi Kandalam is an Assistant Professor in Department of Pediatric Dentistry, College of Dental Medicine, Nova Southeastern University, Fort-Lauderdale, FL. She obtained her Doctoral degree in biology and has been pursuing her research in the niche areas of stem cell biology, signaling mechanisms and tissue engineering. Recipient of several internal and external grants, she is currently engaged in establishing an injectable cell-scaffold system for the repair of the craniofacial defects.

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