mPOC and Hydroxyapatite Implant for Bone Tissue Regeneration

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Bone defect repair following trauma, tissue resection, or congenital abnormalities has posed a challenge for patients around the world. While bones have inherent renewal abilities, the repair of large defects, especially in older adults is limited. Existing procedures include autologous, allogenic, and xenogenic bone graft transplantation or the insertion of metal rods or plates. The promise of tissue engineering has led to new approaches to bone repair, including polymer scaffold development to facilitate guided tissue regeneration. Properties such as cell attachment, biodegradability, mineral release, and mechanical structure are crucial to a successful implant. The investigated hypothesis was combining a citrate-based biomaterial, methacrylated poly(1,8-octanediol co-citrate) (mPOC), with hydroxyapatite (HA) and a micropillar scaffold structure, would cause an increase in nuclear deformation and osteogenic differentiation efficiency. To test the hypothesis, implant scaffolds consisting of 60% HA and 40% mPOC were developed and tested. Preliminary characterization has shown successful pillar structure development, degradation, and calcium release. When tested in vitro with human bone marrow-derived mesenchymal stem cells, the implants did not appear toxic to cells, and successful nuclear deformation was visualized. These results have shown that micropillar mPOC/HA implant scaffolds can potentially be used as bone regeneration therapeutics.

Awards Won:
Fourth Award of $500