Enhanced *in vitro* Biological Response of a Chitosan-*graft*-Poly(e-caprolactone) Copolymer for Bone Repair

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One of the main challenges of biomaterial's science is the utilization of novel biodegradable and biocompatible scaffolds. Part of this effort focuses on the formation of scaffolds to be used for bone regeneration both *in vitro* and *in vivo*. Scaffolds for osteogenesis should mimic bone morphology, structure and function in order to optimize integration into the surrounding bone. MC3T3-E1 cells are pre-osteoblasts that have the capacity to differentiate into osteoblasts and osteocytes and have been demonstrated to form calcified bone tissue *in vitro* [1]. Based on the above, we synthesized a copolymer comprising poly(e-caprolactone) (PCL) that is chemically modified and grafted onto a chitosan (CS) backbone (CS-*g*-PCL) [2], and evaluated the biological behavior of MC3T3-E1- cells on this material. First, we showed that CS-g-PCL promotes cell adhesion and proliferation as assessed by cell viability studies. Moreover, by means of scanning electron microscopy we observed that the morphology of MC3T3-E1 cells on CS-*g*-PCL is identical to that on tissue culture treated polystyrene used as a control sample. In addition, the CS-*g*-PCL material allowed for cell differentiation assessed by measuring characteristic biological markers for early and late stages of bone morphogenesis, such as collagen type I production, alkaline phosphatase activity, and calcium biomineralization, respectively. Overall, our results suggest that the CS-*g*-PCL copolymer is an attractive candidate for use in osteoblastic cell growth and differentiation.

References

[1] N. J. Peterson, K. H. Tachiki and D. T. Yamaguchi, Cell proliferation **37**, 325 (2004).

[2] M. Chatzinikolaidou, M. Kaliva, A. Batsali, C. Pontikoglou and M. Vamvakaki, Current Pharmaceutical Design **20**, 2030 (2014).

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