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Evaluation of Collagen Synthesis in Macrophages/Fibroblasts Co-Culture Using Polylactic Acid Particles as Stimulants

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Abstract : Polylactic acid is a synthetic polymer with good biocompatibility and degradability, is widely used in clinical applications. In this study, we utilized Polylactic acid particles as stimulants for macrophages and the collagen synthesis of co-cultured fibroblasts was evaluated. The results indicated that Polylactic acid particles were nontoxic to cells from 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide. No obvious inflammation effect was observed (under the PLLA concentration of 1 mg/mL) after 24-h co-culture of Raw264.7 and NIH3T3 cells (from TNF-α assay). The addition of PLLA particles to the Raw264.7 and NIH3T3 co-cultures increased the synthesis of collagen, the highest collagen synthesis from the fibroblast was the 0.2 mg/mL (approximately 60% increased as compared with without addition Polylactic acid particles). Moreover, a co-axial atomization delivery device was used to percutaneously introduce Polylactic acid particles into the dermis layer and stimulating macrophages to secrete growth factors promoting fibroblasts to produce collagen. The preliminary results demonstrated the synthesis of collagen was increased mildly after the introduction of Polylactic acid particles for 28-d post implantation. The Polylactic acid particles could be successfully introduced into the dermis layer from H&E staining examination, however, the optimum concentration of Polylactic acid particles and the time-period for collagen synthesis still need to be evaluated.

Keywords : collagen synthesis, macrophage, NIH3T3 cells, polylactic acid particles
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