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学位論文内容の要約

学位論文題目

Fabrication and characterization of osteoconductive scaffold of recombinant peptide based on human collagen type I and β -tri calcium phosphate nanoparticles.

(ヒト I 型コラーゲン様リコンビナントペプチドと β -リン酸三カルシウムナノ粒子からなる骨形成スキャフォールドの作製および特性評価)

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Recombinant peptide based on human collagen type I has been introduced as a xeno-free polymer material for various tissue engineering approach. In this study, we fabricated the recombinant human collagen-peptide based scaffold (RCP) applied with β -TCP nanoparticles (RCP-TCP) and assessed the osteoconductive capability of RCP-TCP in cell-culture test and rat bone-forming test.

RCP-TCP was prepared by mixing the RCP granules and nanoparticulated β -TCP aqueous dispersion (0, 0.01, 0.1, 1 and 10 wt%). Subsequently, RCP-TCP was characterized using scanning electron microscopy (SEM), energy dispersive X-ray spectrometry (EDX), cyto-compatibility testing and real-time RT-PCR. In addition, RCP-TCP was implanted into the defect of rat cranial bone. Radiographic and histological evaluation was carried out at 2 and 4 weeks.

In SEM and EDX analyses, RCP-TCP showed β -TCP nanoparticles aggregated on the RCP surface and exhibited the elements of P and Ca. In cell culture tests, RCP-TCP remarkably promoted the proliferation of osteoblastic MC3T3-E1 cell and the expression of osteogenic markers, such as anti-runt-related transcription factor 2, alkaline phosphatase and bone sialoprotein resulted in osteoblastic differentiation. In the rat bone forming test, RCP-TCP significantly stimulated the new bone formation at 2 and 4 weeks, when compared to RCP and no application groups. Therefore, RCP-TCP would be anticipated for application to bone tissue engineering therapy.