

# 多孔beta-磷酸三钙与磷灰石复合材料的制备及其细胞相容性研究

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综合运用三维凝胶叠层法和发泡法制备了多孔beta-磷酸三钙支架。将多孔支架在1.5倍模拟体液中浸泡14天,得到材料1;或者,在氢氧化钠溶液中浸泡4天,再在1.5倍模拟体液中浸泡14天,得到材料2。测定了材料的物理性能,讨论了类骨磷灰石层对材料矿物组成及其显微结构等的影响。将两组材料分别与成骨前体细胞在体外复合培养,观察和测定了细胞的形态和增殖情况。结果表明复合材料的主要成分为beta-磷酸三钙,表面具有结构不完整的含有碳酸磷灰石的类骨磷灰石,成骨细胞能在两组材料上正常粘附和增殖,而且样品2上的细胞粘附情况更好,说明多孔beta-磷酸三钙与磷灰石的复合材料是一种有发展前途和应用前景的骨修复材料和骨组织工程支架材料。

## PREPARATION AND OSTEOLAST AFFINITY OF beta-TRICALCIUM PHOSPHATE /APATITE COMPOSITES

A biomimetic process was developed to prepare two groups of beta-tricalcium phosphate/ apatite composites, sample 1 and sample 2. First, porous beta-tricalcium phosphate scaffold material was prepared by a multiplex method, which integrated foam technique in porous ceramics preparing and three-dimensional gel-lamination technique in rapid prototyping. Subsequent immersion in a solution with ion concentrations 1.5 times those of simulated body fluid (1.5 SBF) led to the formation of sample 1. Different from sample 1, the preparation of sample 2 involved a pre-soaking of sodium hydroxide (NaOH) solution before immersion in 1.5 SBF.

They were characterized by scanning electron microscopy (SEM), mercury intrusion porosimetry, wide angle X-ray diffraction (XRD) and fourier transform infrared spectroscopy (FT-IR). Further, MTT assay was used to investigate the attachment and proliferation of mouse preosteoblastic cells cultured on the composites. The cells morphology on the materials was observed by SEM.

XRD and FT-IR measurements showed that two composites consisted of a normal beta-tricalcium phosphate structure and bone-like apatite formation on their surface. When cells were cultured on two scaffolds, no proliferation inhibition was found. Osteoblasts attachment was significantly better on sample 2 than on sample 1 after 1 and 3 days of culture.

These results suggest that two composites are promising materials for bone repairing and provide further basis for the use of beta-tricalcium phosphate/ apatite composite as the scaffold in bone tissue engineering.

### 关键词

beta-磷酸三钙; 类骨磷灰石; 结构特征; 生物相容性(beta- tricalcium phosphate; Bone- like apatite; Characterization; Biocompatibility)