

牛煨烧骨的表征及其对成骨细胞的作用

高媛¹、孔丽君¹、王晨²、公衍道¹、田杰谟²、赵南明¹、张秀芳*¹

1 清华大学生物科学与技术系, 生物膜与膜生物工程国家重点实验室

2 清华大学核能技术研究院

以天然牛骨为原料, 经过加工处理, 分别在1120 和1250° C 烧结得到牛煨烧骨H1 和H2。测定了材料的物理性能, 讨论了烧结温度对材料孔隙率及其结构等的影响。将煨烧骨H1 和H2 分别与MC3T3-E1 在体外复合培养, 通过对细胞生长和分化情况的观察和测定, 对两种多孔材料与成骨细胞的亲和性作出了评价。结果表明牛煨烧骨的主要成分为HA, 保留了天然骨的网状孔隙结构, 成骨细胞在H1 和H2 上均能正常生长和分化, 而且H1 比H2 具有更好的成骨细胞亲和性, 牛煨烧骨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 BOVINE HYDROXYAPATITE

HA derived from nature bone has the characteristics of good biocompatibilities, suitable surface chemistry and three dimension porous-network systems. In this study, two groups of porous HA ceramics, H1 and H2 were prepared by sintering of bovine bone at 1120°C and 1250°C, respectively. 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 proliferation of MC3T3-E1 cultured on the HA scaffolds, and the activity of alkaline phosphatase (ALP), which is a marker for osteoblast differentiation, was quantitatively detected. The cells attachment on the materials were observed by SEM.

The HA materials of high purity consisted of a unique normal HA structure as confirmed by XRD and FT-IR measurements. When MC3T3-E1 cells were cultured on the HA scaffolds, 1.0×1.0×0.2 cm³ size, no proliferation inhibition was found. Osteoblasts proliferation was significantly greater on H1 group than on H2 group after 1, 3, 7 and 10 days of culture. There was significant difference on ALP activity of osteoblasts cultured on H1 group in comparison with H2 group after 7, 14, 21 and 28 days.

Compared to H2, H1 turned to be excellent scaffold materials. These results suggest bovine hydroxyapatite is a promising material for bone repairing. This study provides further basis for the use of natural bones as the scaffold in bone tissue engineering.

关键词