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POSTER

Oxygen carrier containing microparticles for prolonged cell survival and effective bone regeneration

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Abstract

The organ transplantation is considered as an effective therapeutic method for organ failure. However, the shortage of donor organ and the immunological rejection are still remained as a big huddle in clinical fields. As an alternative, the tissue-engineering approach for functional organ replacement is extensively studied. The 3D porous scaffolds which guide growth and differentiation of cells are widely utilized as a vital factor with autologotic cells and growth factors for tissue engineering. However, cell necrosis in the center of 3D cell scaffold, due to the insufficient oxygen diffusion is considered as critical limitation for the formation of 3D tissues. Recently, various oxygen delivering/releasing materials have been studied to overcome this limitation. In this study, we developed a perfluorooctane (PFO)-loaded hollow microparticles (PFO-HP) which can allow sustained oxygen delivery for sufficient period, and thus provide appropriate environment for cell survival even in hypoxia. Cell (human periosteum-derived cell, hPDC) behaviors (proliferation, apoptosis, protein synthesis, etc.) in hypoxia (1% O_2 and 5% CO_2) were evaluated for 28 days. And osteogenic differentiation of cell [alkaline phosphatase (ALP activity), calcium deposition, immunocytochemistry, and RT-PCR (RUNX2, collagen type I, osteocalcin, osteonectin)] after 10 days exposure in hypoxic condition was also investigated. New bone formation (histology, CT) of the cell-loaded PFO-HP and PBS-HP was also investigated using a miniature pig (mandibular defect model).

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