Bone grafts cultured with bone marrow stromal cells for the repair of critical bone defects: An experimental study in mice

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Mots-clés	bone defect [6], bone marrow stromal cells [7], GFP [8], osteoblast [9], tissue engineering [10], xenograft [11]
Résumé en anglais	Tissue engineering of autologous bone combined with osteoprogenitor cells is a suitable strategy for filling large bone defects. The aim of this study was to evaluate the osteogenicity of a xenogenic bone graft cultured with allogenic bone marrow stromal cells (BMSC) in a mouse critical size craniotomy. Bovine trabecular bone grafts were made free of bone marrow cells or debris and were delipidated. BMSC were harvested from C57BL/6-Tg(ACTbEGFP)1Osb/J mice (GFP+ cells) and were cultured 14 days on bone grafts in control or osteogenic medium. Engineered grafts were implanted in calvarial defect in C57BL/6 mice. Four groups were studied: graft with BMSC differentiated in osteoblasts (G-Ob), graft with BMSC (G-BMSC), graft without cells (G) and no graft. Calvariae were studied 2 and 8 weeks after implantation by radiographic and histomorphometric analyses. G group: the bone ingrowth was limited to the edges of the defect. The center of the graft was filled by a fibrovascular connective tissue. G-BMSC or G-Ob groups: bone formation occurred early in the center of the defect and did not increase between 2 and 8 weeks; the newly formed woven bone was partially replaced by lamellar bone. The preoperative osteoblastic differentiation of BMSC did not allow faster and better bone regeneration. After 2 weeks, GFP+ cells were observed around the grafted bone but no GFP+ osteocyte was present in the newly formed bone. No GFP+ cell was noted after 8 weeks. However, pre-implantation culture of the biomaterial with allogenic BMSC greatly enhanced the bone regeneration.

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