

## Human jaw periosteal cells display reduced and delayed in vitro osteogenic differentiation as compared to bone marrow stromal cells

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**INTRODUCTION:** Human bone marrow stromal cells (BMSC) can differentiate toward the osteogenic lineage in vitro, generate bone tissue in vivo <sup>(1)</sup> and support the repair of large segmental defects in clinical cases <sup>(2)</sup>. Human jaw periosteal cells (JPC), more easily available than BMSC, have also been proposed for cell-based bone repair <sup>(3)</sup>. We compared the in vitro osteogenic differentiation of BMSC and JPC from the same individuals.

**METHODS:** Iliac crest marrow aspirates and jaw periosteum biopsies were taken from 6 healthy donors (21-69 years). BMSC and JPC were expanded using dexamethasone and FGF-2, previously shown to enhance proliferation and commitment of osteogenic cells <sup>(4)</sup>. Subsequently they were cultured in medium promoting osteogenic differentiation, containing dexamethasone, beta-glycerophosphate and ascorbic acid. After 1, 7, 14 and 21 days cultures were assessed for: DNA amount, alkaline phosphatase activity (AP), calcium deposition and mRNA expression of bone sialoprotein (BSP) and osteopontin (OP) using Real-Time RT-PCR <sup>(5)</sup>. Differences assessed by parametric (T-Tests) or non-parametric tests (Mann-Whitney, Wilcoxon) were considered statistically significant with  $p < 0.05$ .

**RESULTS:** Large variability was observed in both JPC and BMSC cultures from different donors. JPC proliferated faster, but had significant lower AP activity than BMSC (*figure 1a*). Calcium deposition by JPC was lower than by BMSC up to day 14 and similar at day 21 (*figure 1b*). The expression of BSP (*figure 1c*) and OP was significantly lower by JPC than by BMSC up to day 7.

**DISCUSSION & CONCLUSIONS:** JPC proliferate faster but have a delayed and overall reduced capacity to differentiate toward the osteogenic lineage in vitro. Therefore, methods used to induce bone formation by BMSC might

need to be adapted for JPC. Ongoing in vivo studies will help determine whether JPC are a valuable alternative to BMSC for cell-based bone repair.

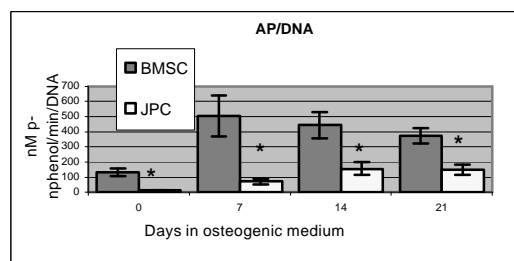


Figure 1a: alkaline phosphatase activity normalized to DNA amount

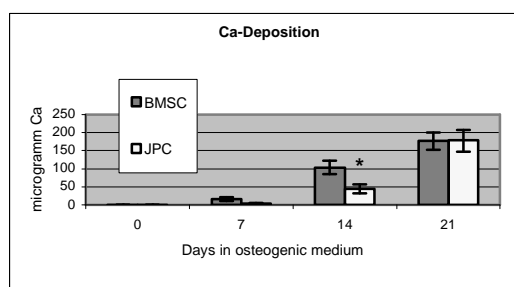


Figure 1b: Calcium deposition

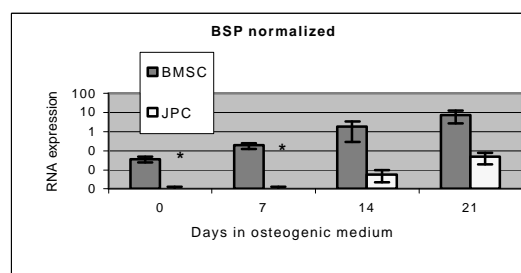


Figure 1c: BSP expression normalized to 18s and the expression level of osteoblasts <sup>(5)</sup>  
(\* ) asterisks indicating statistical significance

**REFERENCES:** (1) Haynesworth et al. Bone 1992; 13(1):81-88. (2) Quarto et al. N Engl J Med 2001; 344(5):385-386. (3) Arnold U et al. Biomaterials 2002; 23(11):2303-2310. (4) Martin I et al. Endocrinology 1997; 138(10):4456-4462. (5) Frank O et al. J Cell Biochem 2002;85(4):737-746.