ABSTRACT SUBMISSION

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Priming Dental Pulp Stem Cells from Human Exfoliated Deciduous Teeth with Fibroblast Growth Factor-2 enhances mineralization within tissue-engineered constructs implanted in craniofacial bone defects.

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ABSTRACT

INTRODUCTION: The craniofacial area is prone to trauma or pathologies often resulting in large bone damages. One potential treatment option is the grafting of a tissue-engineered construct seeded with adult mesenchymal stem cells (MSC). The dental pulp appears as a relevant source of MSC as dental pulp stem cells display strong osteogenic properties, and are efficient at bone formation and repair [1]. FGF-2 and/or hypoxia primings were shown to boost the angiogenesis potential of dental pulp stem cells from human exfoliated deciduous teeth (SHED) [2]. Based on these findings, we hypothesized here that these primings would also improve bone formation in the context of craniofacial bone repair.

METHODS: SHED were seeded in dense collagen matrices [3] and cultured in osteogenic medium for 21 days after FGF-2 or hypoxia priming. The level of mineralized nodule formation was assessed by alizarin red and von Kossa staining, micro-CT analysis. The osteogenic differentiation was evaluated by immunohistochemistry and Western blotting. Calvaria implantation approach was used to assess *in vivo* bone formation.

RESULTS: We found that both hypoxic and FGF-2 primings enhanced SHED proliferation and osteogenic differentiation into plastically compressed collagen hydrogels, with a much stronger effect observed with the FGF-2 priming. After implantation in immunodeficient mice, the tissue-engineered constructs seeded with FGF-2 primed SHED mediated faster intramembranous bone formation into critical size calvarial defects than the other groups (no priming and hypoxia priming).

DISCUSSION & CONCLUSION: This study reveals that FGF-2 priming of tissue engineered constructs formed by dental pulp stem cells from human exfoliated deciduous teeth seeded within plastically compressed collagen scaffolds strongly enhances craniofacial bone regeneration.

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