# CF-04 Bioengineered Alveolar Bone and Tooth Constructs

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**Statement of Purpose:** The goal of our study is to fabricate biphasic, biodegradable scaffolds to facilitate the repair and regeneration of functional alveolar jaw bone, and coordinated alveolar jaw bone and teeth. Craniofacial jaw and dental defects represent a serious health issue, since proper function and aesthetics of the craniofacial complex is required for eating, communication, and psychosocial interactions.  Since craniofacial injuries account for 80% of all battlefield injuries, these studies address an important unmet medical need for the military.  The purpose of our study is to devise improved methods for repair of craniofacial jaw and tooth defects in a timely and highly functional manner.   The scope of our study is to devise improved methods for efficient and effective repair and regeneration of craniofacial jaw and tooth defects incurred in the line of duty.

**Methods:** In this study we used human dental pulp cells (hDPC) seeded onto E1001(1k)/β-TCP scaffolds, a specific tyrosine-derived polycarbonate polymer [E1001(1k)] containing beta-tricalcium phosphate (β-TCP). hDPC-seeded, BMP-loaded, and acellular scaffolds were implanted in a critical sized rat mandibular ramus bone defect and grown for 3 and 6 weeks. Live micro-CT imaging revealed robust hard tissue regeneration in the hDPC-seeded and BMP-loaded implant group, while the acellular group exhibited sparse areas of mineralized tissue formation.

**Results:** Histological and immunofluorescent analyses revealed dentin and bone differentiation marker expression in hDPC-seeded scaffolds, while in contrast, acellular scaffold implants expressed only bone differentiation markers.

**Conclusions:**  Together, these results showed that hDPC seeded E1001(1k)/β-TCP scaffolds support the rapid regeneration of osteo-dentin like mineralized jaw tissue, suggesting a promising new therapy for eventual coordinated alveolar jaw bone and tooth regeneration. Current efforts focus on scaffolding fabrication methods to regenerate alveolar bone and teeth.

**References:**
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