Fibrin Scaffold for Dentin-Pulp Regeneration with DPSCs

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Regenerative endodontics aims to combat the critical issue of dental trauma by preserving and maintaining a functional dentin-pulp complex. However, current pulp revascularization methods involving blood clot induction are plagued with multiple problems, including the formation of non-pulp-like tissues and low success rates. In this study, we simulated blood clotting in vitro to investigate the ability of fibrin gel scaffolds to support the proliferation and differentiation of dental pulp stem cells (DPSCs). After analyzing the elastic modulus of the scaffolds, we plated AV1 DPSCs on fibrin gels made with 4 mg/mL, 8 mg/mL, and 15 mg/mL fibrinogen. Half of the samples were treated with differentiation-inducing medium containing dexamethasone (DEX). In a novel finding, RT-PCR demonstrated that DEX significantly inhibited the upregulation of differentiation markers. DEX also prevented fibrinolysis on certain scaffolds. On the other hand, fibrin gels were discovered to independently support the differentiation of DPSCs and degrade without external inducers. Furthermore, we could control gel dissolution time by varying DEX treatment and fibrinogen concentration. These developments involving the novel combination of DPSCs and fibrin-based scaffolds are crucial to future cell delivery studies in vivo and ultimately present a promising solution for the replacement of injured dental tissues and the restoration of biological function.