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Comment

Regenerative Endodontics and the promise beyond dental pulp disease repair.

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The dental pulp is a multi-structural soft tissue composed of fibroblasts, odontoblasts, lymphocytes, endothelial cells, amongst others; with prominent formative, sensorial, and protective functions. Pulpitis is a painful inflammatory (necrotic) disease caused by untreated dental decay/caries, trauma and multiple restorations; often irreversible/unrecoverable, due to insufficient vascularization, mainly because of the anatomy of the pulp chamber: a small root canal in volume and a narrow apical foramen.[1]

Recently, endodontic regenerative approaches, strategies and biomaterials for treating dental pulp diseases have been receiving ample attention.[3] While regenerative medicine concepts are clear (*i.e.* stem cells/growth factors/scaffold complex transplantation into the pulp chamber), the main obstacle seems to be associated with identifying the "ideal" scaffold suitable for biologically-functional pulp tissue regeneration; providing a 3-D spatio-temporal structure and a *mimicked* extracellular matrix (ECM) environment (space:time) for the stem cells to survive, migrate, proliferate and differentiate, within the prepared pulp canal.[1,2]

Indeed, we witness the design, development and utilization of various scaffolds/bio-scaffolds for dental pulp regeneration, primarily based on prominent natural/synthetic polymers and co-polymers (biocompatible/biodegradable) including collagen and poly(lactic acid).[1,2] Yet, the literature concludes extant limitation in ability to form dentin, mainly ascribed to lack of dental pulp ECM. Hence, there is a need to construct a regenerative scaffolding matrix containing dental pulp ECM, basically to: (1) selectively bind/localize cells; (2) contain dose-responsive vital cytokines with release-controlled pharmacokinetics; (3) promote odontoblast differentiation; (4) control/regulate dental pulp stem/progenitor cell fate and metabolism; and (5) facilitate correct/functional spatio-temopral dentin formation (undergo safe and timely biodegradation). Consequently, consider scaffold porosity and pore-size (high, *preferred*) facilitating cell seeding/diffusion and effective transport of nutrients, oxygen, and waste; whilst maintaining an adequate physico-mechanical strength.[2-4] So, it is critical to master thorough biomaterial and pharmaceutic knowledge.

Soon, owing to advancements in *biomimetic* scaffold fabrication technology; whether via combining materials or through utilizing CAD/3-D printing, clinicians shall witness inductive matrices with well-controlled complex behavior; a promising future in completely-functional regenerative endodontics.

Keep an eye on acellular (de-cellularized) natural ECM scaffolds combined with human-derived dental pulp stem cells for bio-active pulp tissue regeneration.

REFERENCES.

1. Liu G, Xu G, Gao Z, Liu Z, Xu J, Wang J, Zhang C, Wang S. Demineralized Dentin Matrix Induces Odontoblastic Differentiation of Dental Pulp Stem Cells. Cells Tissues Organs. 2016;201(1):65–76.
2. Yang JW, Zhang YF, Sun ZY, Song GT, Chen Z. Dental pulp tissue engineering with bFGF-incorporated silk fibroin scaffolds. J Biomater Appl. 2015;30(2):221–9.
3. Narang I, Mittal N, Mishra N. A comparative evaluation of the blood clot, platelet-rich plasma, and platelet-rich fibrin in regeneration of necrotic immature permanent teeth: A clinical study. Contemp Clin Dent. 2015;6(1):63–8.
4. Tan L, Wang J, Yin s, Zhu W, Zhou W, Cao Y, Cen L. Regeneration of dentin-pulp-like tissue using an injectable tissue engineering technique. RSC Adv. 2015;5:59723–37.