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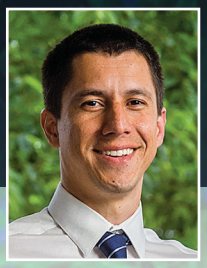
Regenerative Medicine Resource Center

RegendoGEL: A Bioinspired Hydrogel System for Endodontic Therapy



Luiz Bertassoni, DDS, PhD
Oregon Health & Science University

Pamela Yelick, PhD
Tufts University

Clinical Need

Dental caries is the most prevalent chronic infectious disease in humans. If not treated, virtually all caries lesions will progress to affect the dental pulp, eventually requiring some form of root canal therapy. The current standard of care using polymeric/ceramic-like materials can elicit tertiary dentin formation in vital young teeth, but fail to mimic the composition, physical properties, and regenerative/ biological capacity of the native pulp.

Solution

A research team led by Luiz Bertassoni, DDS, PhD, of Oregon Health and Science University and Pamela C. Yelick, PhD of Tufts University has developed a photocurable biodegradable hydrogel system for endodontic regeneration that can be injected into the root canal. The hydrogel alone exhibits strong regenerative capacity, which is enhanced with combination with dental pulp cells and/ or natural dentin matrix molecules. The product can be used for direct pulp capping and pulpotomy.

Competitive Advantage

As compared to the existing synthetic rigid silicate or calcium hydroxide-based products, RegendoGEL is a soft hydrogel system that more closely resembles the natural pulp tissue. With the ability for photo-crosslinking and incorporation of cell-adhesive ligands, the product can be stiffened to instruct cell response via mechanotransduction and durotaxis. In addition, RegendoGEL is designed as a ready-to-use system with the dental light curing, for integration into routine dental procedures in the clinic.

"This technology will allow for much more predictable and successful outcomes in regenerative endodontics, and can be integrated into routine dental procedures with ease."

http://www.bertassonilab.com

https://dental.tufts.edu/people/faculty/pamela-yelick

How the ITP Program Supports this Project

With a focus on direct pulp capping and pulpotomy, the support from the ITP program will be used to complete *in-vivo* validation and optimization of the RegendoGEL system to enable FDA submission.

Clinical Translation Pathway

Publications:

A Novel Strategy to Engineer Pre-Vascularized Full-Length Dental Pulp-like Tissue Constructs. Bertassoni LE et al. Sci Rep. 2017 Jun 12;7(1):3323. *(https://www.ncbi.nlm.nih.gov/pubmed/28607361)*

Photopolymerization of cell-laden gelatin methacryloyl hydrogels using a dental curing light for regenerative dentistry. Bertassoni LE et al. Dent Mater. 2018 Mar;34(3):389-399. *(https://www.ncbi.nlm.nih.gov/pubmed/29199008)*

Engineering Microvascular Networks in LED Light-Cured Cell-Laden Hydrogels. Bertassoni LE et al. ACS Biomater. Sci. Eng., 2018, 4 (7), pp 2563–2570 *(https://pubs.acs.org/doi/full/10.1021/acsbiomaterials.8b00502)*

GelMA-Encapsulated hDPSCs and HUVECs for Dental Pulp Regeneration. Yelick PC et al. J Dent Res 2017 96(2), pp192-199 *(https://www.ncbi.nlm.nih.gov/pubmed/28106508)*

Intellectual Property:

US 62/512,675
Dental pulp construct

US 15/777,304
Pulp regeneration compositions and methods of forming and using the same *(https://patents.google.com/patent/WO2018102750A1)*

Commercialization Strategy:

In development with commercialization partner

Regulatory Pathway:

In development with commercialization partner

Product Launch Strategy:

In development with commercialization partner

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Contact Information: **Michigan-Pittsburgh-Wyss Regenerative Medicine Resource Center** ***www.doctrc.com***

Mutsumi Yoshida, PhD
Managing Director, U-M site
yoshidam@umich.edu
(734) 764-4622