



Stem cell-based Regenerative Endodontics

Clinical Need

Dental trauma and caries are leading causes of pulp tissue necrosis and premature loss of immature permanent teeth. Indeed, approximately 5.4 million children and young adults suffer pulp necrosis associated to caries and/or dental trauma yearly in USA. The current standard of care for these patients is calcium hydroxide treatment with mineral trioxide aggregate (MTA) apical plug and root canal filling with gutta-percha. This approach does not allow for completion of vertical and lateral root formation in necrotic immature permanent teeth, and as a result, these teeth are structurally weak and highly susceptible to root fracture and premature tooth loss.

Solution

To revitalize necrotic immature teeth, enabling completion of root formation in these pediatric population, a team of researchers led by Jacques Nör, DDS, MS, PhD, at the University of Michigan is developing a stem cell-based strategy for regenerative endodontics.

Competitive Advantage

The current standard of care is conceptually based on tooth restoration, where a vital tissue (dental pulp) is replaced by an inert plastic (gutta-percha) which does not enable protective responses. The stem cell-based strategy proposed here is fundamentally based on tissue regeneration, to enable the engineering of functional dental pulp and strengthening of tooth structure through new tubular dentin deposition. With completion of root formation, the long-term outcome of the tooth is expected to be significantly improved.



Jacques Nör, DDS, MS, PhD
University of Michigan

"Here, we propose autologous transplantation of stem cells from the dental pulps of permanent (or primary) teeth as a strategy to engineer a new, functional, pulp for the treatment of young immature necrotic permanent teeth."

<http://www.dent.umich.edu/about-school/department/crse/nor-lab>

How the ITP Program Supports this Project

With the eventual goal of conducting a first-in-human clinical trial on dental pulp stem cell transplantation for the regeneration of dental pulp tissue, the ITP program support is focused on exploring potential strategies for the clinical adoption and commercialization of this stem cell-based regenerative endodontics therapy.

Clinical Translation Pathway

Publications:

Dental pulp tissue engineering in full-length human root canals. Rosa V, Zhang Z, Grande RH, Nör JE. J Dent Res 92(11):970-975, 2013. (<https://www.ncbi.nlm.nih.gov/pubmed/24056227>)

A hydrogel scaffold maintains viability and supports differentiation of dental pulp stem cells. Cavalcanti BN, Zeitlin BD, Nör JE. Dent Mat 29(1):97-102, 2013. (<https://www.ncbi.nlm.nih.gov/pubmed/22901827>)

Intellectual Property:

In development

Commercialization Strategy:

In development with the MPWRM Commercialization/Market Needs Core

Regulatory Pathway:

In development with the MPWRM Regulatory Core

Product Launch Strategy:

In development with the MPWRM Commercialization/Market Needs Core

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