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Polymeric coating for dental restoration

A photopolymerizable coating material that improves soft tissue attachment to restored dental surfaces.

IP Status: US Patent Pending; **Application #:** 17/339,243

Applications

- Dental restoration coating
- Coating material for soft tissue attachment to implants

Key Benefits & Differentiators

- Does not require any alteration to existing materials; only an additional coating step
- Leverages innate immune response; no harsh antimicrobial drugs are used
- Photopolymerizable coating offers a familiar application procedure to dental hygienists
- Leverages innate immune response; no harsh antimicrobial drugs are used

Overview

Class V restorations – dental procedures performed to treat caries (cavities) on the lower third of the tooth – fail at a higher rate than any other class of restoration. Clinical trials demonstrate restoration failure rates of 27.8% (5 years) to 53.0% (13 years). Replacing failed dental restorations takes up approximately 70% of a dentist's effort and contributes nearly $5 billion to health care costs in the US alone. Despite this significant need, no reliable technology or material currently exists to prevent this high rate of failure. Changing the bulk chemical nature of dental restorative materials, bonding agents and/or composites is the most common approach. These approaches attempt to use antimicrobial agents to prevent bacterial initiation of recurrent caries leading to failure, hydrophobic materials to repel water to prevent degradation of restorative materials, anti-enzymatic materials to neutralize enzymes that degrade restoration materials, and buffering materials to prevent the lowering of pH that results in demineralization and recurrent caries leading to restoration failure.

Researchers at the University of Minnesota have developed a novel, photopolymerizable coating material that could improve the outcome of dental restoration by promoting the attachment of gingiva to restored teeth. Specifically, this polymeric material acts on the surface of restoration materials and its interface with soft tissue to mediate better attachment of junctional epithelium (JE) to the restored surface. The underlying mechanism of action relies on the fact that JE is the first line of defense in the teeth-gingiva interface and prevents subgingival plaque. However, restorations can break the existing teeth-gingiva seal; and the JE does not reform on currently available restorative materials, which then leads to subgingival plaque accumulation, further apical migration, more exposed root and restoration surface, and contribute to restoration failure. With the application of this newly formulated material, the natural preventive mechanism of JE could be leveraged to extend the lifetime of restorations.

When cultured on this formulation, keratinocytes are found to upregulate hemidesmosome formation and proliferation with no effects to fibroblast. In addition, the researchers have found that this forumation can guide oral keratinocyte function that is reminiscent to native JE. This is

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in sharp contrast to currently available restorative materials that harm oral keratinocyte function. Lastly, this material could also be used to enhance soft tissue attachment, reduce infection rates and overall failure rates, in other percutaneous devices such as dental implants, orthopaedic implants, dialysis catheters, etc., where high infection rates due to improper tissue attachments cause failure.

Phase of Development

TRL: 3
Material has been synthesized and characterized in vitro.

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

- **Conrado Aparicio, PhD, MSc Eng** Professor, Department of Restorative Sciences