Hadasit הדסית

Enterprising Biomedical Technology

Dentistry/Oral Medicine

Phototoxic Effect of Non-Coherent Light on Perio-pathogens

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Background

Porphiromonas gingivalis and Fusobacterium nucleatum are strongly linked to the etiology of adult periodontitis. Periodontal diseases are widespread; affecting 80% to 90% of the adult population. The diseases range from simple gingivitis to advanced periodontitis, resulting in tooth loss. Population surveys show that over 50% of adults have gingivitis, while an additional 30% suffer from periodontitis. After the age of 70, 86% of these adults have at least moderate periodontitis with over 25% of them having lost some teeth. The size of the population at highest risk for periodontal disease has increased and will continue to do so. Periodontal disease is believed to increase the occurrence of such serious health problems as heart disease, diabetes, respiratory disease, and is a strong predictor of premature birth. As the population has become more affluent and educated, there is a constant demand for new preventive options to improve periodontal health.

The Need for Improved Treatment of Periodontal Diseases

Traditional procedures for reducing existing bacterial load include mechanical removal and chemotherapy. The effectiveness of these methods is compromised by the limited penetration of chemotherapeutic agents into bacterial biofilm and the development of resistant species. One of the major advantages of visible light therapy is the effect on bacteria in the deep layers of biofilm associated with gingivitis and periodontal diseases, thus, overcoming the diffusion obstacle of the conventional chemical agents.

OTC products for gingivitis control are frequently based on chlorhexidine, which works by eliminating non-specific oral bacteria, thus, disrupting the natural balance of oral microorganisms. In contrast, visible light therapy may target the specific periodontal pathogens and does not bear side effects such as tooth staining and change in taste, associates with chlorhexidine.

The proposed visible light therapy will be designed to meet the challenge of treating and preventing periodontal diseases. The visible light therapy will be non-invasive, inexpensive, and without side effects.

Market

US Oral care market is estimated to reach $8.5 Billion in 2007, including toothpaste, mouthwash, oral care gums, breath fresheners, toothbrushes, floss, denture care products and electric dental appliances. The total expenditure on periodontal and periodontal preventive procedures was $14.3 billion in 1999 (American Dental Association, 1999 Survey of dental services rendered). The majority of the expenditure was spent on periodontal preventive procedures, amounting to $9.8 billion out of $14.3 billion.

The Innovation

The team has shown that non-coherent, non-laser, visible light sources at wavelengths of 400-500 nm, had a phototoxic effect mainly on periopathogenic bacteria, such as *P. gingivalis* and *F. nucleatum*, without the need for exogenous photosensitizers. Moreover, the use of visible light was shown to cause reduction in malodor production in exposed mixed salivary microflora.

R&D Program

- Definition of safe and efficient dose thresholds for light treatment on mucosal tissue contaminated with *Porphyromonas gingivalis* in mice
- Evaluation of the efficacy of the defined dose level of light for reducing experimental periodontitis in alveolar bone loss model in mice
- Prototype build-up for further clinical studies

Contact

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