The Comparative Susceptibility of Oral Biofilms to Photodynamic Therapy

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Abstract

The prevalence of periodontal diseases, such as periodontitis, is widespread, and their advanced forms affect approximately 11% of the global population. Through recent treatment and analysis of periodontal pathologies, it has become evident that there is a need for more innovative treatment strategies than traditional scaling and root planning alone or the use of antimicrobial agents. This review assesses the role of photodynamic therapy in the management of periodontitis by comparing its ability to eradicate multispecies biofilms of known periodontal pathogens.

Objectives & Methods

The objective of this project was to test the efficacy of photodynamic therapy with various PSs on different biofilms of known periodontal pathogens. This was performed by a literature review of various in vitro studies.

- This project reviewed biofilms of the following six periodontal pathogens: Streptococcus mutans, Streptococcus sanguinis, Streptococcus oralis, Fusobacterium nucleatum, Aggregatibacter actinomycetemcomitans, and Porphyromonas gingivalis.
- Species in green represent Gram-positive pathogens while the red represent Gram-negative species.
- Multispecies biofilms were also reviewed.
- Biofilms were eradicated using one of the following photosensitizers:
  - Chlorin e6
  - Rose Bengal
  - Radachlorin

Results

- The high doses required to inactivate S. mutans and S. sanguinis when using erythrosine and rose Bengal are due to the very low concentration of PS used, as shown in Fig. D.
- Delivering a higher concentration of photosensitizer to the biofilm resulted in a lower light dose needed to reduce the CFU count.
- Chlorin e6 (Ced) is the exception, as higher concentrations are required to eradicate biofilms. This is due to greater activity at a shorter wavelength, as seen in Fig. E.

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References


Future Research

- Inducing Periodontitis in Rat Models
- Developing new PSs with higher efficacy and lower toxicity
- Evaluating the long-term effects of photodynamic therapy on periodontal tissues

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