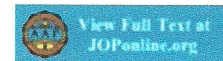


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## Antimicrobial photodynamic therapy may promote periodontal healing through multiple mechanisms.

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### Abstract

**BACKGROUND:** Antimicrobial photodynamic therapy (aPDT) as an adjunctive treatment in addition to scaling and root planing for the treatment of periodontitis has been shown to be clinically useful. Its beneficial effect is reported to be due to its potent bactericidal activity. However, aPDT treatment has the potential to inactivate bacterial and host factors that contribute to disease. In this report, we demonstrate that aPDT treatment can simultaneously kill *Porphyromonas gingivalis* and inactivate its virulence-associated protease. It also inactivates host destructive cytokines tumor necrosis factor-alpha (TNF-alpha) and interleukin (IL)-1 beta.

**METHODS:** We developed a 96-well-based bacterial killing and protease inactivation assay that determined aPDT bactericidal and protease inactivation from the same sample. A cytokine inactivation assay that measured E-selectin expression in response to TNF-alpha and IL-1 beta was developed to measure the ability of aPDT to inactivate cytokine function.

**RESULTS:** A single aPDT treatment in vitro potently inactivated protease activity and resulted in a 4-log(10) reduction in the viability of *P. gingivalis*. Dose and time-of-exposure experiments revealed that protease inactivation occurred at lower concentrations of photosensitizer and less time of light exposure. Also, aPDT treatment potently and functionally inactivated IL-1 beta and TNF-alpha.

**CONCLUSIONS:** aPDT treatment may augment periodontal treatment by increasing bacterial killing, inactivating bacterial virulence factors, and inactivating host cytokines that impair periodontal restoration. Therefore, aPDT treatment may provide a more favorable healing environment.

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**Publication Types, MeSH Terms, Substances**

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