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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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