

Visible Spectrum Light Selectively Kills Black-pigmented Bacteria of Human Dental Plaque

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Objectives: To test the hypothesis that *Prevotella* and *Porphyromonas* species in human dental plaque can be selectively killed by exciting their naturally synthesized endogenous porphyrins with visible light. **Methods:** Suspensions of bacteria obtained from the subgingival plaque of 20 periodontal patients were exposed to 380-520 nm visible light from a high intensity light source (irradiance: 160 mW/cm²) for 1, 5 and 10 min. Suspensions of 4 strains of black-pigmented periodontopathogens (*P. gingivalis*, *P. nigrescens*, *P. intermedia*, *P. melaninogenica*) were also exposed to light from the same source. After illumination serial dilutions were prepared in brain heart infusion broth and 100 ml aliquots were spread over the surfaces of blood agar plates. Survival fractions were calculated by counting the colonies on the plates and dividing by the number of colonies from dark controls kept at room temperature for period equal to irradiation times. Differences between means were analyzed for statistical significance by Student's t test. In case of dental plaque, microbial analysis was performed using a colony lift method and a DNA checkerboard assay using whole genomic probes to 40 oral microorganisms. Proportions of each organism were computed by dividing the numbers for each species by the sum of all bacteria. **Results:** Light produced >99.99% killing of strains of *P. gingivalis*, *P. nigrescens*, *P. intermedia* and *P. melaninogenica* within 5 min. In dental plaque, the effect of light resulted in >80% reduction in proportions of the same species. **Conclusions:** This study provides evidence that visible light can selectively eliminate oral strains of *Prevotella* and *Porphyromonas*.