

Antimicrobial Photodynamic Action on Dentin Using a Light-Emitting Diode Light Source

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Abstract

Objective: The aim of this study was the evaluation of two different photosensitizers activated by red light emitted by light-emitting diodes (LEDs) in the decontamination of carious bovine dentin.

Materials and Methods: Fifteen bovine incisors were used to obtain dentin samples which were immersed in brain-heart infusion culture medium supplemented with 1% glucose, 2% sucrose, and 1% young primary culture of *Lactobacillus acidophilus* 10^8 CFU/mL and *Streptococcus mutans* 10^8 CFU/mL for caries induction. Three different concentrations of the Photogem solution, a hematoporphyrin derivative (1, 2, and 3 mg/mL) and two different concentrations of toluidine blue O (TBO), a basic dye (0.025 and 0.1 mg/mL) were used. To activate the photosensitizers two different light exposure times were used: 60 sec and 120 sec, corresponding respectively to the doses of 24 J/cm² and 48 J/cm².

Results: After counting the numbers of CFU per milligram of carious dentin, we observed that the use of LED energy in association with Photogem or TBO was effective for bacterial reduction in carious dentin, and that the greatest effect on *S. mutans* and *L. acidophilus* was obtained with TBO at 0.1 mg/mL and a dose of 48 J/cm². It was also observed that the overall toxicity of TBO was higher than that of Photogem, and that the phototoxicity of TBO was higher than that of Photogem.

Conclusion: Based on our data we propose a mathematical model for the photodynamic effect when different photosensitizer concentrations and light doses are used.