

## In Vivo Killing of *Porphyromonas gingivalis* by Toluidine Blue-Mediated Photosensitization in an Animal Model

N. Kömerik,<sup>1,2</sup> H. Nakanishi,<sup>2,3</sup> A. J. MacRobert,<sup>2</sup> B. Henderson,<sup>4</sup>  
P. Speight,<sup>5</sup> and M. Wilson<sup>1\*</sup>

Department of Microbiology,<sup>1</sup> Cellular Microbiology Research Group,<sup>4</sup> and Department of Oral Pathology,<sup>5</sup>  
Eastman Dental Institute for Oral Health Care Sciences, and Department of Surgery, National Medical  
Laser Centre,<sup>2</sup> University College London, London, United Kingdom, and Department of Oral  
and Maxillofacial Surgery, University of Tokushima, Tokushima, Japan<sup>3</sup>

Received 19 August 2002/Returned for modification 23 October 2002/Accepted 10 December 2002

*Porphyromonas gingivalis* is one of the major causative organisms of periodontitis and has been shown to be susceptible to toluidine blue-mediated photosensitization in vitro. The aims of the present study were to determine whether this technique could be used to kill the organism in the oral cavities of rats and whether this would result in a reduction in the alveolar bone loss characteristic of periodontitis. The maxillary molars of rats were inoculated with *P. gingivalis* and exposed to up to 48 J of 630-nm laser light in the presence of toluidine blue. The number of surviving bacteria was then determined, and the periodontal structures were examined for evidence of any damage. When toluidine blue was used together with laser light there was a significant reduction in the number of viable *P. gingivalis* organisms. No viable bacteria could be detected when 1 mg of toluidine blue per ml was used in conjunction with all light doses used. On histological examination, no adverse effect of photosensitization on the adjacent tissues was observed. In a further group of animals, after time was allowed for the disease to develop in controls, the rats were killed and the level of maxillary molar alveolar bone was assessed. The bone loss in the animals treated with light and toluidine blue was found to be significantly less than that in the control groups. The results of this study show that toluidine blue-mediated lethal photosensitization of *P. gingivalis* is possible in vivo and that this results in decreased bone loss. These findings suggest that photodynamic therapy may be useful as an alternative approach for the antimicrobial treatment of periodontitis.