

Evaluation of Nd:YAG and Er:YAG irradiation and antibacterial photodynamic therapy on  
*Enterococcus faecalis* biofilms

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**Summary:**

Current chemomechanical root canal preparation techniques cannot always predictably sterilize canals. Therefore, new root canal disinfection methods are continuously being investigated. The specific characteristics of laser light together with the possibility that light can better reach the intricacies of the root canal system have raised interest in its use for root canal disinfection. Several laser systems have been introduced into dentistry and most have been attributed disinfecting properties.

The aim of this study was to compare the antimicrobial efficacy of two high power lasers (Nd:YAG and Er:YAG) and two commercial antimicrobial photodynamic therapy (aPDT) systems with the traditional root canal irrigant on *Enterococcus faecalis* biofilms grown on dentine disks in vitro.

To this end, *E. faecalis* biofilms were grown on dentine disks in a microtiter plate, incubated for 24 h and subjected to the following treatment or control groups: aPDT using the Denfotex system, aPDT using the Helbo system, Er:YAG and Nd:YAG laser irradiation and immersion in sodium hypochlorite 0.5%. Surviving bacteria were harvested and the number of CFU per disk was determined by plate count.

Significant differences in viable counts compared to untreated controls were observed for: aPDT (Helbo) (2 log<sub>10</sub> reduction), Er:YAG irradiation using 100mJ pulses (5 log<sub>10</sub> reduction) and all NaOCl treatments (>6 log<sub>10</sub> reduction). aPDT (Denfotex), Er:YAG irradiation using 50mJ pulses and Nd:YAG treatment caused a (statistically insignificant) reduction in the viable counts of < 1 log<sub>10</sub>.

In conclusion, NaOCl outperformed all other treatments. Er:YAG laser treatment resulted in high reductions in viable counts. The fact that no direct contact with the biofilm is required is a possible advantage over NaOCl. A weak reduction in *Enterococcus faecalis* cell number was observed with aPDT. Nd:YAG irradiation was the least effective.

**Summary of my career to date:**

1997 - 2002: DDS, Ghent University, Belgium

2002 - 2005: Master in Endodontology, Ghent University, Belgium

2005 - present: part-time faculty at the Department of Operative Dentistry and Endodontology, Ghent University:

- Clinical activities: endodontic treatment (surgical and non-surgical) of referred patients and patients within the department.
- Research:  
PhD topic: Use of laser technology in disinfection and sealing of root canals.  
2005: ESE annual research Grant.
- Participation in student education and postgraduate courses (Endodontology).

2006 - present: part-time private practice limited to endodontics, Antwerpen, Belgium