

# Comparative Efficacy Of Endodontic Medicaments Against *Enterococcus Faecalis* Biofilms

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## Abstract

It is well established that bacteria cause pulpal and periradicular disease (Kakehashi *et al.* 1965). Of the bacteria recovered from failing root canals, *Enterococcus faecalis* is one of the most prevalent species (Molander *et al.* 1998; Sundqvist *et al.* 1998). Many laboratory studies have investigated the effectiveness of root canal irrigants and medicaments against *E. faecalis*. Most used planktonic cultures, which are not representative of the *in vivo* growth conditions of an infected root canal system, where bacteria grow as a biofilm adhering to the dentinal wall (Nair 1987). Organisation of bacteria within biofilms confers a range of phenotypic properties that are not evident in their planktonic counterparts, including a markedly reduced susceptibility to antimicrobial killing (Wilson 1996).

**Objectives:** The aims of this study were: 1) To compare the efficacy of commonly used endodontic medicaments against *E. faecalis* cultured as a biofilm. The medicaments tested were Ledermix paste, calcium hydroxide, Odontopaste, 0.2% chlorhexidine gel and 50:50 combinations of Ledermix/calcium hydroxide and Odontopaste/calcium hydroxide. 2) To compare the antimicrobial effect achieved through exposure to endodontic medicaments with that achieved by exposure to a constant concentration of sodium hypochlorite for varying times.

**Methods:** A biofilm was established using a continuous flow cell. *E. faecalis* inoculum was introduced into the flow cell and allowed to establish on human dentine slices over

4 weeks. Each test medicament was introduced into the flow cell for a period of 24 or 48 hours, while sodium hypochlorite was evaluated after 1, 10, 30 and 60 minutes. Biofilms were harvested by sonication in sterile PBS. Cellular protein levels were measured to quantitate the amount of biofilm harvested.

Cellular viability was determined using serial plating. The number of colony forming units was then adjusted for cellular protein levels to allow treatment protocols to be compared. Qualitative SEM analyses of the biofilm was performed following exposure to each test agent.

**Results:** Sodium hypochlorite was the only agent that achieved total bacterial elimination. Ledermix and Odontopaste had no significant effect on the *E. faecalis* biofilm, while calcium hydroxide and 50:50 combinations of calcium hydroxide with either Ledermix or Odontopaste were able to reduce viability by > 99%.

**Conclusion:** When used in isolation, antibiotic containing medicaments had no appreciable effect on the viability of *Enterococcus faecalis*. Sodium hypochlorite remains the gold standard for bacterial elimination in root canal therapy.

## **Declaration**

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution, and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Barbara Plutzer

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