



EBD spotlight: Antibiotic resistance in secondary endodontic infections



Manas Dave¹
reflects on
topics in
our sister

journal *Evidence-Based Dentistry*.

Introduction

'What role does antibiotic resistance play in secondary endodontic infections' by A. Nehra and M. Sin was published in *Evidence-Based Dentistry* in 2024.¹

Background

The Global Oral Health Status Report (2022) highlighted that 2 billion people are affected by dental caries in permanent teeth and 514 million children are affected by caries in primary teeth.² Dental caries results from the demineralisation of tooth tissue by organic acids which are released as a by-product of bacterial metabolism of fermentable

Author information

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carbohydrates. The continual breakdown of tooth tissue and bacterial ingress can eventually lead to pulpal infiltration and irreversible pulpitis.³ Root canal treatment involves chemo-mechanical debridement of the infected root canal system and placement of a filling material that fills the root canal space. The role of antibiotics is limited in endodontic treatment unless patients have signs of cellulitis, spreading infection or systemic involvement.⁴ The bacteria *Enterococcus faecalis* (*E. faecalis*) has been identified in secondary endodontic infections (infections persistent post-endodontic treatment) and have been associated with antibiotic resistance. Therefore, the aim of this systematic review was to investigate the antimicrobial resistance of this bacteria from root canals of teeth with failure of endodontic treatment.⁵

(n = 1), Sweden (n = 1), the United States of America (n = 1) and Japan (n = 1)

- Risk of bias: five studies lacked information in one or more domain, the rest showed no risk of bias
- Resistance profile over time: There are fluctuating changes in *E. faecalis* resistance over time
 - ◆ Azithromycin had a 6% resistance profile in 2003 which increased to 18% in 2004 and then dropped to 8% in 2015
 - ◆ Erythromycin increased from 1% in 1975 to 2% in 2003, then increasing to 15% in 2004 before dropping to 3% in 2014
 - ◆ Clindamycin decreased its resistance from 44% in 1975 to 12% in 2016
- *E. faecalis* isolated from endodontic retreatment was shown to have intermediate resistance to 16 antibiotics

Whilst this review captures resistance trends, there is limited longitudinal follow-up of individual studies which are only available at certain time points.'

Methods

An electronic database search of PubMed, Scopus, EMBASE, Web of Science and Medline were conducted in November 2023. Additionally, the grey literature (Google Scholar and Open Grey) were searched. Risk of bias was conducted using the Revised Cochrane risk of bias tool for randomised trials (RoB2). Only clinical trials investigating resistance profiles of *Enterococci* bacterial strains in permanent teeth with post-treatment apical periodontitis were included. Animal studies and non-English language articles were excluded.

Results

- Studies included: 11 clinical trials were included in this review from a range of countries including Brazil (n = 5), Lithuania (n = 1), Poland (n = 1), Germany

with 39 strains showing resistance to penicillin. Other strains showed resistance to common antibiotics such as metronidazole, erythromycin, tetracycline and clindamycin. Overall, *E. faecalis* showed the most resistance to gentamicin (n = 62; 14.0%) and clindamycin (n = 56; 12.7%).

Conclusions

The authors stated:

'The antibiotics with the highest pattern of resistance against *E. faecalis* are clindamycin, gentamicin, metronidazole, rifampicin and are therefore contraindicated in cases of SPEIs [secondary persistent endodontic infection]. In general, the most effective drugs remain amoxicillin + clavulanate followed by amoxicillin and benzylpenicillin...'

Commentary

This systematic review addresses an important issue of antibiotic resistance with a specific enquiry into *E. faecalis* resistance in secondary/persistent endodontic infections. Whilst this review captures resistance trends, there is limited longitudinal follow-up of individual studies which are only available at certain time points. Furthermore, there are differences in antibiotic susceptibility testing methods. Whilst *E. faecalis* is a common endodontic pathogen, the exclusion of other microorganisms is likely to have limited the number of studies included in this review. The authors' recommendations on antibiotics need to be interpreted in the correct clinical context, ie antibiotics should only be used when there is evidence of spreading bacterial infection. Eg systemic involvement, facial cellulitis etc.

References

1. Nehra A, Sin M. What role does antibiotic resistance play in secondary endodontic infections? *Evid-Based Dent* 2024; **25**: 194–195.
2. World Health Organization. Global oral health status report: towards universal health coverage for oral health by 2030. 18 November 2022 Available at <https://www.who.int/publications/i/item/9789240061484> (accessed January 2025).
3. Coulthard P, Thomson P, Dave M, Coulthard F P, Seoudi N, Hill M. The COVID-19 pandemic and dentistry: the clinical, legal and economic consequences – part 2: consequences of withholding dental care. *Br Dent J* 2020; **229**: 801–805.
4. Scottish Dental Clinical Effectiveness Programme. Drug Prescribing for Dentistry. 2024. Available at <https://www.sdcep.dentalprescribing.nhs.scot/guidance/> (accessed January 2025).
5. Barbosa-Ribeiro M, Gomes B P F A, Arruda-Vasconcelos R, de Albuquerque I, Costa M J F, Sette-de-Souza P H. Antibiotic resistance profile of clinical strains of enterococci from secondary/persistent endodontic infections: What do we know? A systematic review of clinical studies. *J Endod* 2024; **50**: 299–309.

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