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[Intervention Review]

# Irrigants for non-surgical root canal treatment in mature permanent teeth

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## ABSTRACT

### Background

Root canal treatment is carried out on teeth in which irreversible pulpitis has led to necrosis of the dental pulp. As a treatment option it is an alternative to dental extraction. Mechanical preparation and irrigation with antiseptic or antibacterial solutions destroys bacteria and cleans the infected root canal. Irrigants should be effective in deactivating bacteria in the entire root canal space without causing any adverse tissue reactions. Sodium hypochlorite (NaOCl) and chlorhexidine are commonly used but there is uncertainty as to which solution, concentration or combination is the most effective.

### Objectives

To assess the effects of irrigants used in the non-surgical root canal treatment of mature permanent teeth.

### Search methods

We searched the Cochrane Oral Health Group's Trials Register (to 5 July 2012), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2012, Issue 4), MEDLINE via Ovid (1950 to 5 July 2012), EMBASE via Ovid (1980 to 5 July 2012), LILACS via BIREME (1980 to 5 July 2012). There were no restrictions regarding language or date of publication.

### Selection criteria

Randomised controlled trials in single or multi-rooted permanent teeth with pulpal or periapical pathology or both, which require root canal treatment. Irrigants either against each other or against inactive irrigant or placebo. Combinations of irrigants were allowed and if used in conjunction with EDTA (ethylenediaminetetra-acetic acid) or similar chelating agents.

### Data collection and analysis

Two review authors independently assessed risk of bias of included trials and extracted data.

## Main results

We included 11 trials involving 851 participants with 879 teeth which had undergone root canal treatment and involved the use of irrigants. Two trials were assessed as being at low risk of bias, with six unclear and three high. Four trials compared sodium hypochlorite versus chlorhexidine, however, no primary outcomes and only one secondary outcome, bacterial growth cultures, was reported for two of these trials (20% and 50% of teeth in the control group had positive bacterial culture). The meta-analysis indicated no strong evidence of a difference in the existence of bacterial growth between the interventions (risk ratio 0.73; 95% confidence interval 0.34 to 1.56;  $P = 0.41$ ).

The seven remaining trials each compared different interventions and only two of these trials included useable data on the primary outcomes of swelling and pain. One trial compared sodium hypochlorite 5.25% alone versus sodium hypochlorite 5.25% combined with hydrogen peroxide 3%, and versus normal saline and reported pain at 3 to 14 days after the procedure. There was no evidence of a difference in pain between the three groups. The other trial compared sodium hypochlorite 5% versus sodium hypochlorite with 'proteolytic enzyme', and there was no evidence of a difference in swelling between the groups. Two further trials reported bacterial growth, and three trials failed to report any data which could be used in the review. None of the included trials reported any data on adverse effects nor radiological changes in periapical radiolucency.

## Authors' conclusions

Although root canal irrigants such as sodium hypochlorite and chlorhexidine appear to be effective at reducing bacterial cultures when compared to saline, most of the studies included in this review failed to adequately report these clinically important and potentially patient-relevant outcomes. There is currently insufficient reliable evidence showing the superiority of any one individual irrigant. The strength and reliability of the supporting evidence was variable and clinicians should be aware that changes in bacterial counts or pain in the early postoperative period may not be accurate indicators of long-term success. Future trials should report both clinician-relevant and patient-preferred outcomes at clearly defined perioperative, as well as long-term, time points.

## PLAIN LANGUAGE SUMMARY

### Irrigating solutions for use in root canal treatment of teeth

Root canal treatment may be carried out as an alternative to dental extraction on a tooth in which the nerve has been injured or has died. Root canal treatment is carried out because the offending canal is infected or the pulp severely inflamed. The aim of root canal treatment is to eliminate bacteria from, and prevent their further entry to the root canal system. The technique involves cleaning and removal of any remaining bacteria and nerve canal contents. Elimination of any remaining infection improves the chance of success, and irrigation of the canal with certain types of solutions during the procedure can be helpful in achieving this. A range of antiseptic and antibacterial irrigating solutions are available. Sodium hypochlorite (NaOCl) in a variety of strengths has been used by dentists for many years, but concerns have been raised about its toxicity and the occasional report of pain when higher concentrations are used. Chlorhexidine, an antimicrobial, has also been used in a variety of concentrations as either a solution or gel. Combinations of antibiotic and a detergent (MTAD) have been recently developed and are being used increasingly.

This review evaluated 11 studies which included 851 participants with 879 front and back teeth which had undergone root canal treatment. Sodium hypochlorite in a range of strengths was the most commonly used irrigating solution, followed by chlorhexidine as a solution or a gel. The amount of pain experienced immediately after treatment and between appointments did not appear to differ either between some of the irrigants or between the different strengths of individual irrigants. Limited data suggested that higher strength concentrations of sodium hypochlorite solution and a final rinse with chlorhexidine may be more effective than other irrigants at destroying bacteria.