The most commonly used irrigant in endodontics is sodium hypochlorite. This is a highly alkaline disinfectant that can dissolve pulpal tissue and kill most of the bacteria found in infected root canal systems. However, it is a highly caustic solution that can cause tissue damage, especially if forced into the periapical tissues, and can also damage instruments and clothes. Sodium hypochlorite has many undesirable side effects and an alternative is always being sought. One of the causative agents in failure of root-filled teeth is Enterococcus faecalis, which is resistant to the alkaline solutions. Consequently, endodontists encourage the use of chlorhexidine not only as an endodontic irrigant but also as a final rinse to give long-term protection to root canals before obturation.

Chlorhexidine itself is a chemical antiseptic that has been used at a low concentration of 0.2 per cent as a mouthwash for many years, primarily to reduce plaque and gingivitis. Prolonged use can cause marked tooth discoloration as well as altered taste sensation. Higher concentrations have been used as a skin wash, although there are case reports of urticaria and contact dermatitis.

Chemically chlorhexidine is a cationic bisguanide which is highly lipophilic and interacts with cell membrane phospholipids and lipopolysaccharides and is consequently bactericidal. It is active against a wide spectrum of bacteria especially gram positives, less so on gram negatives and is also active against fungi. It has proved very effective against E. faecalis which has proved resistant to sodium hypochlorite and calcium hydroxide and is found in failing root-filled teeth.

Much research has been done on the ideal concentration of chlorhexidine for use as an irrigant and the results are often conflicting. A few studies have shown 0.12 per cent Chlorhexidine (ie chlorhexidine mouthwash) as effective as 2.5 per cent sodium hypochlorite. As an anti-bacterial the majority indicate that the optimal concentration is two per cent. At low concentrations it can take many hours to kill bacteria in a tooth. This can be shortened to minutes at a higher concentration.

Interestingly (for endodontists) chlorhexidine has a prolonged bacteriostatic action. This is an action termed ‘substantivity’. Following irrigation the chlorhexidine binds to surrounding tissues and has a slow release affect over an extended period. This can therefore in...
hibit initial bacterial adherence and accumulation of biofilms, giving longer term immunity to bacterial leakage. Although this time period is unknown, some research has indicated that a five minute rinse may give up to 12 weeks immimmunity. How- ever ever researchers think that this period is too short and suggest one week is required for dentine adsorption.

Further research has shown a synergistic effect when mixed with calcium hydroxide as an inter-appontmentation dressing and it is especially effective against E. Faecalis.

This all may appear to suggest that we should swap sodium hypochlorite for chlorhexi-idine. However there is always a downside.

Firstly not only is sodium hypochlorite very effective against most bacteria but it is also able to act as a tissue solvent, effectively disrupting and dissolving pulpal tissue which is ideal in those places our instruments can- not reach. It can also disrupt biofilms. Unfortunately, chlorhexidine has neither of these actions. Secondly, just like so-

with sodium hypochlorite, the tissue toxicity increases with higher concentrations. However, the effect of chlorhexidine can be increased by heating it in a similar fashion to sodium hy- poclorite. There are also cost implications as sodium hy- poclorite is very cheap and can be bought for 50p per litre, whereas although chlorhexi- dine mouthwash is cheap, the higher concentrations are very expensive and can retail at £50 for the same amount. Clearly it is impractical to swap the large volumes of bleach for chlor- rhexidine.

Most endodontists, there- fore, use a combination of sodi- um hypochlorite and chlorhexi- dine to have a broad a kill as possible and to take advantage of the dissolution properties of sodium hypochlorite. However, when combined, an orange/brown precipitate of an insoluble neutral salt is formed. This precipitate, para-chloro- alamine, is carcinogenic, can cause tooth discoulouration and can occlude dentinal tubules. The precipitate can be mini- mised by thoroughly drying the canal and using saline as a rinse between irrigants.

A suggested regime may be therefore to use sodium hy- poclorite exclusively in all vital and hyperaemic canals. This takes advantage of its tissue dissolution properties. Chlorhexidine and sodium hy- poclorite should be used in non-vital teeth and especially in re-treatment cases. Sodium hypochlorite is the key irrigant but, as a final rinse, chlorhexi- dine can be used to kill specifi- cally the micro-organisms im- mune to sodium hypochlorite and to confer longer-term im- munity.

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