

ORIGINAL RESEARCH

Antimicrobial efficacy of hydrophilic sealants

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ABSTRACT

Background: One of the main reasons for long-term restorative failure and replacement is caries recurrence. Research has been done on the addition of antibacterial agents to restorative materials in an effort to create medicinal materials with better biological characteristics. The present study evaluated antimicrobial efficacy of hydrophilic sealants. **Materials & Methods:** The antibacterial effect of both sealants was tested both through planktonic growth inhibition test – 96-well microtiter plates and agar disk diffusion assay. **Results:** Even at its lowest dose (10 µl), Embrace™ demonstrated a greater and more comprehensive efficacy against all tested bacterial strains ($P < 0.05$) in the planktonic growth inhibition test, with inhibition rates consistently exceeding 90%. UltraSeal XT® does not show growth inhibition activity against Streptococcus species. **Conclusion:** Prescribing oral probiotics first and putting off the Embrace™ sealant application to the end of probiotic treatment.

Key words: Embrace™, Probiotic, UltraSeal XT

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INTRODUCTION

One of the main reasons for long-term restorative failure and replacement is caries recurrence. Research has been done on the addition of antibacterial agents to restorative materials in an effort to create medicinal materials with better biological characteristics. Pit and fissure resin sealants, which are used to stop non-cavitated lesions and stop new caries lesions, deteriorate and separate with time, causing biofilm to build around the sealant/enamel interface and raising the risk of recurrent caries.¹

Enterococcus faecalis is the bacteria most frequently found in endodontic failures. Group D streptococci, or facultative anaerobes, include E. faecalis. Because they have a propensity to create biofilms, they can survive in very severe environments. It is most likely the species that can adapt to and thrive in the biologically challenging conditions in the filled root canal, since it has been proved to be very invulnerable once established in the system.² Numerous E. faecalis virulence factors include adherence to host cells and extracellular matrix, tissue invasion, effect on immunomodulation, and toxin-mediated harm. Most of the germs in the root canal system may be eliminated by cleaning and shaping the root canal space. Due to anatomical complications such as dentinal tubules, ramification, deltas, and fins, bacteria may

persist in these challenges even after the root canal system has been shaped and cleaned. One of the recalcitrant candidates for the cause of unsuccessful endodontic therapy is E. faecalis.³

Pits and fissures sealing is one of the most effective operations from the standpoint of primary prevention, and it is highly advised. In actuality, food retention and the growth of bacterial biofilm are likely to occur in deep, narrow groves and fissures on the occlusal surfaces of permanent molars, raising the possibility of caries formation.⁴ These specific hydrophilic sealants are light-curing, fluoride-releasing resin materials that can cling to the tooth surface without the need for a dental dam even when damp and wet. Actually, water activates the polymer, causing it to form a chemical bond with the tooth surface.⁵ The present study evaluated antimicrobial efficacy of hydrophilic sealants.

MATERIALS & METHODS

The present invitro study was conducted in the department of Endodontics. ATCC25175 S. mutans strain M18 DSM 14865 S. salivarius strain, also known as BLIS M18 and a mixture of DSM17938 and ATCC PTA5289 strains of L. Reuteri were used as test microorganisms. Brain hearth

infusion broth (BHIB) was used as nonselective culture medium.

The sealants UltraSeal XT® hydro™ and Embrace™ WetBond™ Pit and Fissure Sealant (Pulpdent, USA) were utilized. Four 96-well microtiter plates containing light-cured Embrace™

(10 µl) and UltraSeal XT® (20 µl), respectively were used for the study. Inhibition of bacterial growth was observed by the formation of halos with no visible bacteria. Results thus found were assessed statistically, where p value less than 0.05 was considered significant.

RESULTS

Table I: Embrace™ WetBond™ pit and fissure sealant optical density resulting Planktonic growth inhibition test

Sample	10µl	Inhibition rate (%)	P value
S. mutant + Sealant	0.094	96	0.05
S. mutans	0.735		
S. Salivarius+ Sealant	0.091	97	0.01
S. Salivarius	0.815		
BHIB+ Sealant	0.089	95	0.05
BHIB	0.065		

Table I shows that even at its lowest dose (10 µl), Embrace™ demonstrated a greater and more comprehensive efficacy against all tested bacterial strains ($P < 0.05$) in the planktonic growth inhibition test, with inhibition rates consistently exceeding 90%.

Table II: Assessment of UltraSeal XT® Hydro™ optical density resulting from planktonic growth inhibition tests

Sample	20µl	Inhibition rate (%)	P value
S. mutant + Sealant	0.85	-6	0.04
S. mutans	0.72		
S. Salivarius+ Sealant	0.87	-7	0.02
S. Salivarius	0.72		
BHIB+ Sealant	0.092		0.01
BHIB	0.062		

Table II shows that UltraSeal XT® does not show growth inhibition activity against Streptococcus species.

DISCUSSION

The greatest available scientific data now supports the application of fluoride, and preventive or early reparative techniques are predicated on remineralization.⁶ Although fluoridated water has been shown to lower the population's general decay rate, applying fluoride through toothpaste, gel, or varnish is the most efficient method. Numerous research back up xylitol's anti-inflammatory properties, particularly when used in conjunction with fluoride treatments. In fact, studies have shown that xylitol can enhance fluoride, even in trace concentrations.⁷ The focus of current remineralization research is on calcium phosphate in several forms, including casein phosphopeptides, amorphous calcium phosphate complexes, and nanoparticle hydroxyapatite, a biomimetic substance that encourages the natural assembly of enamel blocks and inhibits the production of biofilms.⁸ Appropriate root canal therapy results in three-dimensional obturation and total canal disinfection. Miller noted that dentinal, pulpal, and periapical disease were caused by microorganisms and their byproducts.⁹ Endodontic microflora, which is regulated by obligate anaerobes, is the common polymicrobial flora comprising Gram-positive and Gram-negative bacteria. In addition to gutta-percha obturating techniques, a variety of

sealers have been used to seal all microchannels and dentinal tubules.¹⁰ The present study was evaluated antimicrobial efficacy of hydrophilic sealants.

We found that even at its lowest dose (10 µl), Embrace™ demonstrated a greater and more comprehensive efficacy against all tested bacterial strains in the planktonic growth inhibition test, with inhibition rates consistently exceeding 90%. Veneri et al¹¹ examined the antibacterial efficacy of probiotics and specific oral bacteria against Embrace™ WetBond™ Pit and Fissure Sealant (Pulpdent, USA) and UltraSeal XT® Hydro™ (Ultradent, USA). The antibacterial properties of both sealants were evaluated using an agar disk diffusion assay with light-cured Embrace™ and UltraSeal XT® against Streptococcus mutans and two oral probiotics (Lactobacillus reuteri and Streptococcus salivarius) as well as a planktonic growth inhibition test using 96-well microtiter plates. Even at its lowest dose (10 µl), Embrace™ demonstrated a greater and more comprehensive efficacy against all tested bacterial strains ($P < 0.05$) in the planktonic growth inhibition test, with inhibition rates consistently exceeding 90%. Against L. Reuteri, UltraSeal XT® Hydro™ demonstrated a modest antibacterial action, with growth inhibition rates of 19% and 23%.

We observed that UltraSeal XT[®] does not show growth inhibition activity against *Streptococcus* species. Vibha et al¹² assessed the antimicrobial efficiency of three root canal sealants against *Enterococcus faecalis*: bioceramic [BC] sealer, Epiphany self-etch sealer, and AH-Plus sealer. Utilizing an agar well diffusion assay technique, the root canal sealer's effectiveness against *E. faecalis* (ATCC 29212) was assessed. Three groups of root canal sealers—BC, AH-Plus, and Epiphany self-etch sealers—were created, with a control group consisting of a conventional antibiotic disc containing cotrimoxazole. At 24 and 48 hours, the diameters of the growth inhibition zones against *E. faecalis* were measured and compared for each group. In comparison to BC sealer and Epiphany self-etch sealer, AH-Plus sealer demonstrated a greater zone of inhibition against *E. faecalis* after 24 and 48 hours. At 24 and 48 hours, the antibiotic disc containing cotrimoxazole, which served as the control, showed the strongest antibacterial efficacy against *E. faecalis*. The sealant called Epiphany self-etch has the least antibacterial action.

CONCLUSION

Authors found that recommending oral probiotics initially and delaying the application of EmbraceTM sealant until the conclusion of the probiotic regimen.

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