

## CHX-Plus™

**J Endod. 2009 Jul;35(7):981-5.**

### **Evaluation of the effect of two chlorhexidine preparations on biofilm bacteria in vitro: a three-dimensional quantitative analysis.**

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**INTRODUCTION:** Microorganisms are essential in the development of periradicular diseases and are the major causative factors associated with endodontic treatment failures. Microbial biofilms are communities of bacteria that attach to surfaces and form heterogeneous three-dimensional structures. The purpose of this study was to develop a biofilm model that closely mimicked in vivo biofilm and to determine its susceptibility to endodontic antimicrobial irrigants by three-dimensional quantitative analysis.

**METHODS:** Collagen-coated hydroxyapatite (C-HA) and uncoated hydroxyapatite (HA) disks were inoculated with dispersed subgingival plaque for 3 weeks. Thick biofilms rich in spirochetes were formed on both substrates. Biofilms were subjected to 1-, 3-, and 10-minute exposures to CHX-Plus (Vista Dental Products, Racine, WI) and 2% chlorhexidine (CHX). After treatment, the volume ratio of dead bacteria to all bacteria in biofilms, indicated by the ratio of red and (red + green) fluorescence, was analyzed by confocal laser scanning microscopy for each medicament.

**RESULTS:** The proportion of killed bacteria was dependent on the type of irrigant and the time of exposure in both C-HA and HA biofilm models ( $p = 0.00$ ). CHX-Plus showed higher levels of bactericidal activity at all exposure times than 2%CHX ( $p < 0.001$ ). The C-HA biofilm was thicker than the HA biofilm. Less bacteria were killed in C-HA biofilm than in the HA model. **CONCLUSIONS:** This multispecies biofilm model and quantitative analysis methodology may be useful for the evaluation of the antimicrobial effectiveness of endodontic disinfecting agents.

PMID: 19567319 [PubMed - indexed for MEDLINE]



*Multiple Patents Pending*

**J Endod. 2010 Jan;36(1):100-4.**

### **The synergistic antimicrobial effect by mechanical agitation and two chlorhexidine preparations on biofilm bacteria.**

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**INTRODUCTION:** Irrigation of the root canal with antibacterial solutions is considered an essential part of root canal treatment in endodontics. The purpose of this study was to investigate whether mechanical agitation (ultrasonic or sonic) improves the effectiveness of chlorhexidine against biofilm bacteria in vitro. **METHODS:** Collagen-coated hydroxyapatite (CHA) disks were exposed to dispersed subgingival plaque for 3 weeks at 37 degrees C. The multispecies biofilms established were subjected for 1 and 3 minutes to CHX-Plus (Vista Dental Products, Racine, WI) and 2% chlorhexidine (CHX), with or without mechanical agitation. After treatment, the amount of dead bacteria in biofilms was analyzed by viability staining and confocal laser scanning microscopy (CLSM). The morphology of biofilms, with or without mechanical agitation, was also examined by CLSM.

*(Continued)*

**RESULTS:** The structure of the biofilm did not show any obvious change when the solutions surrounding the biofilm were exposed to continuous ultrasonic or sonic agitation. The combined use of mechanical agitation and chlorhexidine had a more pronounced antimicrobial effect against the biofilms than either one alone. Sonic activation (EndoActivator; Advanced Endodontics, Santa Barbara, CA) showed the highest levels of bactericidal activity with CHX-Plus after both exposure times. The proportion of killed bacteria also depended on the type of irrigant ( $p < 0.001$ ) and the time of exposure ( $p < 0.001$ ). **CONCLUSIONS:** The low-intensity ultrasonic or sonic agitation that does not disrupt biofilm or disperse the biofilm bacteria improves the action of disinfectants against biofilm bacteria.

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## **J Endod. 2011 May; 37 (5):657–661.**

### **Antimicrobial Efficacy of Chlorhexidine against Bacteria in Biofilms at Different Stages of Development**

Shen Y, Stojicic S, Haapasalo M

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**INTRODUCTION:** Detailed knowledge on the nature of the physiological and metabolic phases of biofilm development is important in combating resistant, disease associated biofilms. The aim of this study was to examine the susceptibility of multispecies biofilms at different phases of growth to root canal irrigants.

**METHODS:** The multispecies biofilms were grown from plaque bacteria on collagen-coated hydroxyapatite discs in brain-heart infusion broth for time periods ranging from 2 days to several months. Biofilms of different age were subjected to 1-, 3-, or 10-minute exposure to 2% chlorhexidine (CHX) or CHX-Plus. After treatment, the volume ratio of dead bacteria in biofilms was assessed by confocal laser scanning microscopy by using a LIVE/DEAD viability stain. The thickness of biofilms increased during biofilm development. The proportion of killed bacteria in mature biofilms (3 weeks) was lower than in young biofilms.

**RESULTS:** CHX-Plus showed higher levels of bactericidal activity at all exposure times and biofilm age than 2% CHX ( $P < .01$ ).

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**Catalog Information:**

<b>Description</b>	<b>Quantity</b>	<b>Item#</b>	<b>Price</b>
<b>CHX Plus™ Endo Refill:</b> (20) 1.2mL prefilled syringes	20 / Box	503930	<b>\$18.95</b>
<b>CHX Plus™ Endo Bulk Syringe Kit</b> Includes: (1) 30mL prefilled bulk syringe, (20) 27ga side-vent irrigating tips, (20) 1.2cc syringes and (1) docking port	1 Kit	503400	<b>\$33.30</b>
<b>CHX Plus™ Endo 30mL Bulk Syringe</b> Includes: (1) 30mL prefilled bulk syringe and (1) docking port	1 Syringe	503650	<b>\$23.75</b>
<b>CHX Plus™ Endo 16 oz (480mL) Bottle</b>	1 Bottle	503900	<b>\$56.20</b>
<b>CHX Plus™ Endo Kit</b> Includes: (4) 1.2mL prefilled syringes and (20) 27ga side-vent irrigating tips	4 / Kit	502925	<b>\$12.10</b>
<b>CHX Plus™ Endo Prefilled Syringes Refill</b> Includes: (4) 1.2mL prefilled syringes	4 / Pack	502455	<b>\$6.45</b>
<b>CHX Plus™ Endo Unit Dose</b> Includes: (30) 0.6mL prefilled syringes and (30) 27ga side-vent irrigating tips	30 / Box	503925	<b>\$30.30</b>
<b>CHX Plus™ Restorative Kit (Does not include surface modifiers)</b> Kit Includes: (4) 1.2mL prefilled syringes and (40) Sol-u-Flo™ tips	4 / Kit	502450	<b>\$26.10</b>
<b>CHX Plus™ Restorative Bulk Syringe Kit (Does not include surface modifiers)</b> Includes: (1) 30mL prefilled bulk syringe and (1) docking port	1 Kit	503750	<b>\$23.75</b>