



## The effect of irrigant activation on the rate of bacterial biofilm removal from the wall of a simulated root canal model

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### Abstract

**Aim:** Root canal irrigation is an essential step to control microbial infection. This study aimed to investigate the real time *Enterococcus faecalis* biofilm removal of biofilm using passive or active irrigation solution. Also to compare the change in values of the available chlorine and pH of the outflow irrigant before and after irrigation protocol.

**Methodology:** Forty root canal models ( $n = 10$  per group) were manufactured using 3D printing and resin materials. Each model consisted of two halves of an 18 mm length root canal with apical size 30 and taper .06. *E. faecalis* biofilms were grown on the apical 3 mm of the models for 10 days in Brain Heart Infusion broth. Biofilms were stained using crystal violet for visualisation. The model halves were reassembled, attached to an apparatus and tested under a fluorescence microscope. Syringe and needle irrigation protocol was performed using 9 mL of 2.5% NaOCl irrigant. Then the irrigant was either left stagnant in the canal or activated for 30 seconds using manual (gutta-percha), sonic and ultrasonic methods. Images were then captured every second using an external camera. The percentages of residual biofilm were measured using image analysis software. The data were analysed using Kruskal-Wallis test and generalised linear mixed model.

**Results:** The greatest biofilm removal was associated with ultrasonic agitation (90.13%) followed by sonic (88.72%), manual (80.59%), and passive irrigation group (control) (43.67%) respectively. All agitation groups reduced the available chlorine and pH of NaOCl more than that in the passive irrigation group.

**Conclusion:** Manual and automated (sonic, ultrasonic) agitation methods of NaOCl enhanced the efficacy of NaOCl irrigant to remove bacterial biofilm within the root canal system. Significant evidence that ultrasonic agitation technique left the least amount of residual biofilm in comparison to sonic and manual agitation methods of NaOCl.

### Biography

Saif alarab Mohmmmed is an assistant Professor in the Department of Conservative Dentistry at the College of Dentistry/University of Baghdad where he has been a faculty member since 1999. Saif completed his Master degree at College of Dentistry/University of Baghdad since 2002. His research interests lie in the area of root canal treatment. In recent years, he has focused on better techniques for root canal irrigation and antibacterial action of irritants. He has collaborated actively with researchers in several other disciplines of dentistry, particularly oral surgery and periodontal diseases. He currently lives in London, and studying a PhD programme at Eastman Dental Institute/UC.



28<sup>th</sup> Global Summit Expo on Dental Science and Oral Hygiene  
Webinar | June 08-09, 2020

**Citation:** Saif alarab Mohmmmed, *The effect of irrigant activation on the rate of bacterial biofilm removal from the wall of a simulated root canal model*, Dental Science 2020, 28<sup>th</sup> Global Summit Expo on Dental Science and Oral Hygiene, Webinar, June 08-09, 2020, pp. 03