

# In-vitro Assessment of the Cleaning Efficacy of Integrated Electric Toothbrush from Sonicare and Crest

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## ABSTRACT

**Objective:** The IntelliClean System, the Integrated Electric Toothbrush (IETB) from Sonicare and Crest, combines the benefits of Sonicare's patented high speed bristle motion, with Crest gel to deliver beyond the bristles cleaning that is one step closer to the results of daily flossing. The objective of this *In-vitro* test was to quantitatively assess and visualise the benefit of using the Crest IntelliClean gel, versus existing dentifrice chemistry, e.g. Crest Decay Prevention paste. **Method:** A constant depth film fermenter was used to grow multispecies salivary biofilms on hydroxy apatite discs. These discs with 72 hr old biofilm were placed in a plastic model of the mouth, simulating inter-proximal plaque. The biofilms were then subjected to treatment with the IETB using either IntelliClean gel or Crest Decay Prevention paste. The Rapid Automated Bacterial Impedance Technique (RABIT) was used to quantify the treatment effect on biofilms. Wilcoxon Rank sum test was used for the treatment comparison. In addition to this, confocal microscopy was used to visualise the benefit. **Results:** When measured using RABIT, Crest IntelliClean gel showed superior bacterial removal ( $p < 0.05$ )\*compared to Crest Decay Prevention paste. Confocal laser scanning microscopy images supported this finding further. **Conclusion:** When used in combination with the specially designed IETB, Crest IntelliClean gel provides superior interdental cleaning compared to existing dentifrice chemistry.

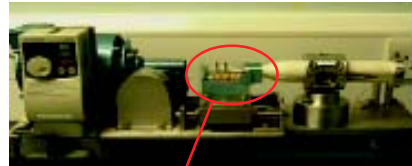
## INTRODUCTION AND PURPOSE

The Intelliclean system, consists of a sonic toothbrush and an integrated replaceable cartridge containing liquid dentifrice. This system uses a unique bristle motion of 31,000 strokes per minute, to create a fluid action which drives the formulation into the 'hard to reach' places. Our aim here is to assess the benefit of using the IntelliClean gel in the system, versus existing dentifrice chemistry, i.e. Crest Decay Prevention. An *in-vitro* biofilm model was used for this purpose.



## MATERIALS AND METHODS

A Constant Depth Film Fermenter (CDFF) developed by the University of Wales; Cardiff was used for growing biofilms, with 5mm hydroxy apatite chips (Clarkson Chromatography) as a substrate for biofilms. Pooled saliva collected from N=6 volunteers was used as a inoculum to seed the fermenter, followed by continuous supply of artificial saliva (Sissons *et al.*, 1991) at a flow rate of 20 mL/hr. Biofilms were harvested at 72 hrs period.



Philips Typodont Chamber (Developed in collaboration with Eastman Dental Institute) – Two of the teeth are removable and have recesses for the Hydroxyapatite chips (HA) with CDFF-produced biofilms. These biofilms are positioned in the recesses 'between the teeth' to allow assessment of inter-dental cleaning.

Philips' Typodont Chamber was incorporated into a Brushing Machine, which allowed control of force at the brush head, angle of brushing and no. of strokes per min. The chamber was filled with 7ml of 1:4 dentifrice slurry during treatment.



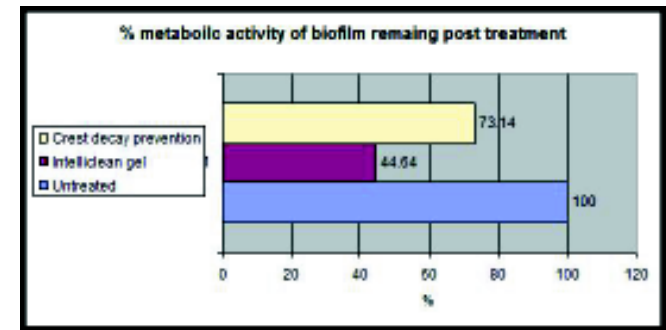
RABIT

Treated biofilm samples were added to the tube containing brain heart infusion broth and incubated in Rapid automated bacterial Impedance technique system (RABIT) for 16 hrs. RABIT system (indirect mode) measured release of carbon dioxide due to bacterial metabolism. The carbon dioxide produced was trapped in a KOH –Agar Bridge prepared at the base of the conductometric cell. This resulted in the formation of potassium carbonate, which has lower conductivity than potassium hydroxide. This reduction in conductivity was monitored over the incubation time to measure bacterial growth.

### Data Analysis

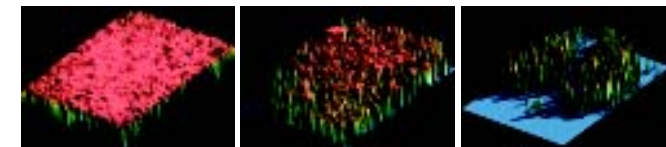
Area under the curve was calculated for each biofilm using the trapezoidal rule. The areas were compared using the Wilcoxon rank test, and adjusted for multiple comparisons using Bonferroni corrections.

## RESULTS



There was significantly less biofilm present (as indicated by reduced metabolism) post treatment with Crest Intelliclean gel when compared with standard dentifrice Crest decay prevention. (Crest decay prevention > Intelliclean gel  $p = 0.0420$ ).

Extended focus image using confocal laser scanning microscopy (reflection mode) : Biofilms treated with sonic toothbrush (0.5 cm away from surface) in presence of dentifrice slurry



Untreated

Crest Decay Prevention

Crest Intelliclean Gel

## CONCLUSION

When used in combination with the specially designed IETB, Crest IntelliClean gel provides superior interdental cleaning compared to existing dentifrice chemistry.