

Using The Canary System® to Evaluate the Resistance of Resin Infiltration to Demineralization Abstract #138

B. Wong¹, S. H. Abrams¹, J. D. Silvertown¹, K. Sivagurunathan¹, B. T. Amaechi², H.-D. Hohnk³

¹Quantum Dental Technologies Inc, Toronto, ON, Canada; ²University of Texas Health Science Center, San Antonio, TX, USA; ³DMG Dental Material Gesellschaft mbH

The Canary System®

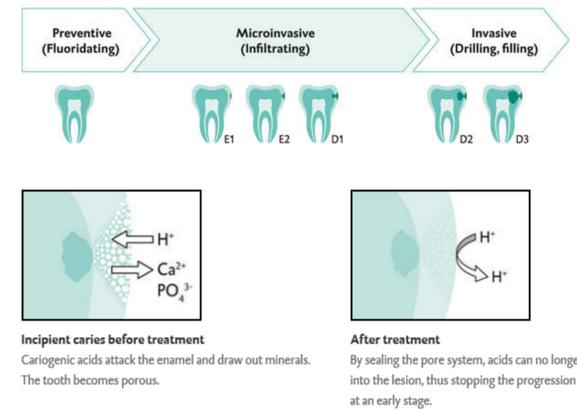


- Pulses of laser light (660 nm) generate four signals during a 5s scan:
 - 1) The strength of the converted heat (PTR Amplitude);
 - 2) The time delay of the converted heat (PTR Phase);
 - 3) The strength of the converted luminescent light (LUM Amplitude);
 - 4) The time delay of the converted luminescent light (LUM Phase).
- The resulting Canary Number indicates the status of the tooth crystal structure. Changes due to caries, result in a PTR-LUM response.



DMG ICON

Caries infiltration with Icon fills the gap between prophylaxis and filling. In addition, this treatment optically blends in the lesion with the healthy enamel. This innovative method can therefore be used for esthetic treatments of front teeth, where appearance plays an important role.



Objective

This *ex vivo* study evaluated the ability of Resin Infiltration (RI) to resist enamel breakdown by acid demineralization as monitored by The Canary System.

Materials & Methods

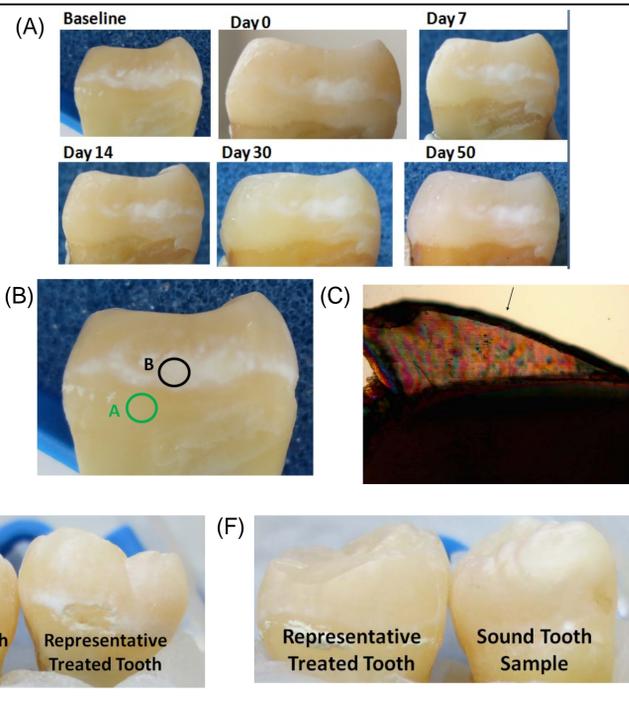
- Teeth (with sound and early caries sites) were randomly assigned to two experimental groups:
 - (1) Treatment Group (examination sites treated with Resin Infiltration (DMG ICON));
 - (2) Control Group (examination sites were not infiltrated).
- The Canary System scans (triplicates); sound examination sites (n = 60); early carious examination sites (n = 75).
- DMG ICON preparation & application: 1) 35% phosphoric acid gel applied to the demineralized surface for 5 seconds and then washed off with water; 2) The surface was then dried with Dry It for 30 seconds using at least ½ syringe per tooth; 3) Dried with air; 4) Applied infiltrant and left in place for 3 minutes; 5) Light cured for 40 seconds; 6) Wiped the surface.

- Follow-up scans of all sites at: Day 0 (after RI application & prior to demineralization treatment); Days 7, 14, 30, and 50 of demineralization.
- Teeth were stored in demineralization solution (acidified gel (pH 4.5)) for 50 days.
- Polarized Light Microscopy (PLM) performed at University of Texas at San Antonio histologically confirmed the presence/absence of caries at Day 50.
- Statistically significant differences in Canary Numbers vs. baseline by Related-Samples Wilcoxon Signed Rank Test (p < 0.05).

Results

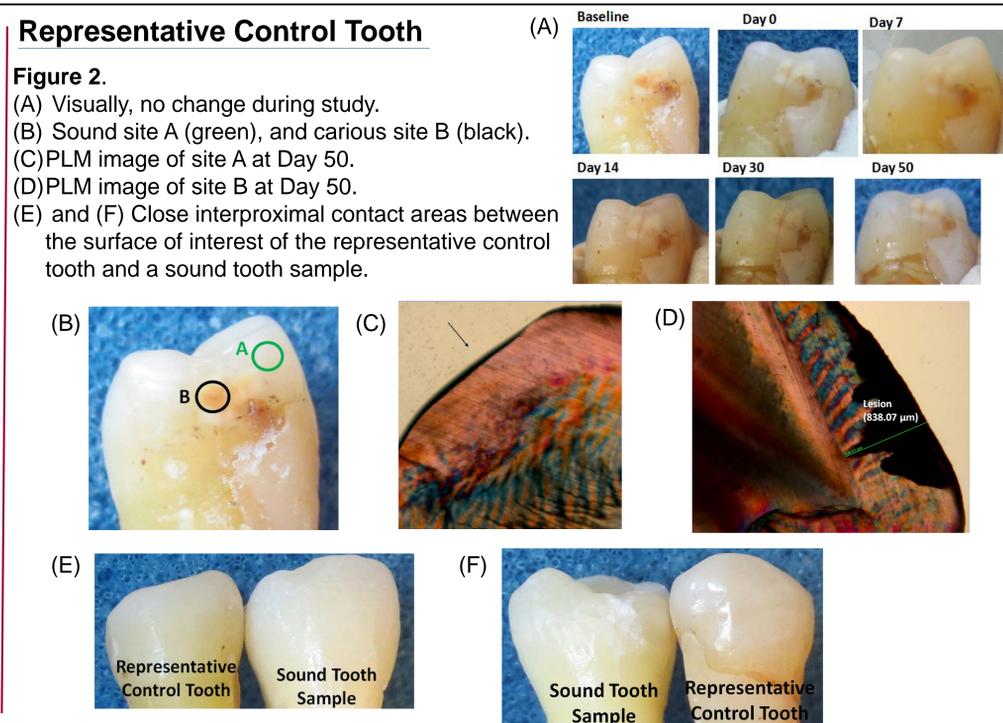
Representative Treated Tooth

- Figure 1.**
- (A) Visually, white spots became less apparent after application of the Resin Infiltration and remained less apparent throughout the duration of the study.
 - (B) Sound site A (green circle), and carious site B (black circle).
 - (C) PLM image of site A at Day 50
 - (D) PLM image of site B at Day 50.
 - (E) and (F) Close interproximal contact areas between the surface of interest of the representative treated tooth and a sound tooth sample.



Representative Control Tooth

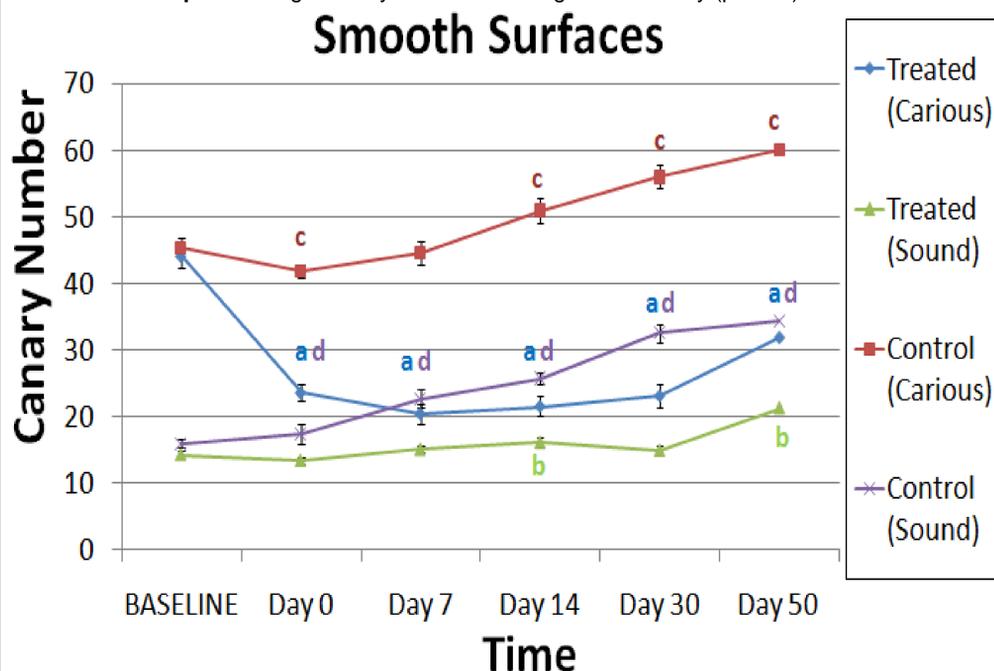
- Figure 2.**
- (A) Visually, no change during study.
 - (B) Sound site A (green), and carious site B (black).
 - (C) PLM image of site A at Day 50.
 - (D) PLM image of site B at Day 50.
 - (E) and (F) Close interproximal contact areas between the surface of interest of the representative control tooth and a sound tooth sample.



Findings

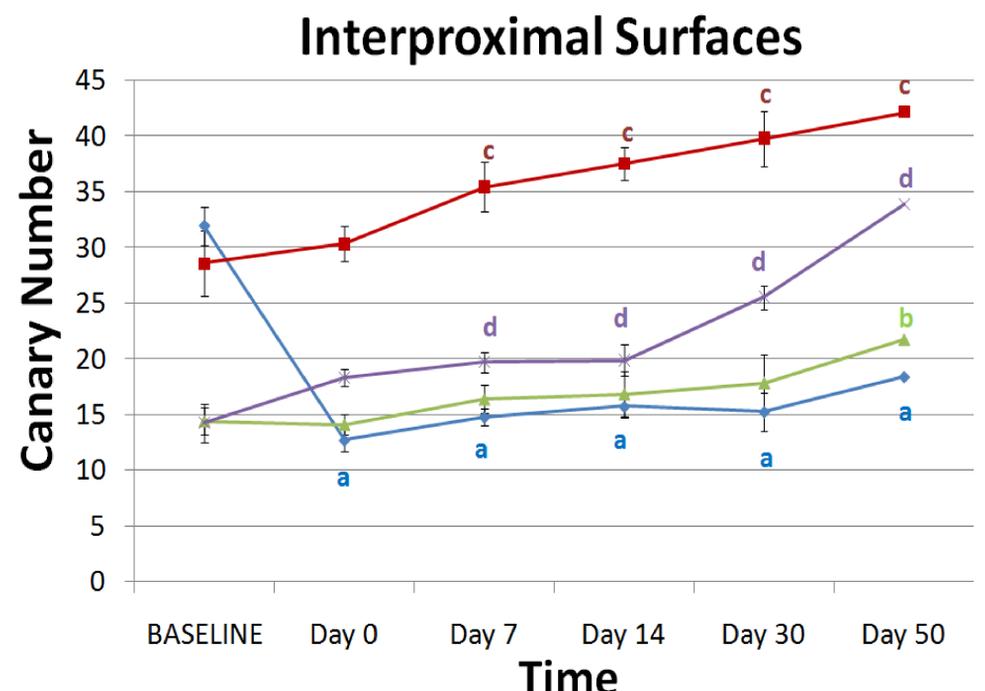
Smooth Surfaces

- **Treatment Group Caries Sites** – Significant decrease of Canary Number (Δ CN: -20; Related-Samples Wilcoxon Signed Rank Test; p<0.05) from baseline CN following treatment on Day 0. CN remained significantly lower (p<0.05) throughout the remainder of the study.
- Significant increases in CN only on Days 14 and 50 for **Treatment Group Sound Sites**.
- **Control Groups** – CN significantly increased throughout the study (p<0.05).



Interproximal Surfaces

- **Treatment Group Caries Sites** – Significant decrease of Canary Number (Δ CN: -19; Related-Samples Wilcoxon Signed Rank Test; p<0.05) from baseline CN following treatment on Day 0. CN remained significantly lower (p<0.05) throughout the remainder of the study.
- Significant increase in CN only on Day 50 for **Treatment Group Sound Sites**.
- **Control Groups** – CN significantly increased throughout the study (p<0.05).



PLM Findings at Day 50:

- Sensitivity = 1.00
- Positive Predictive Value (PPV) = 0.80
- Specificity = 0.76
- Negative Predictive Value (NPV) = 1.00

Conclusions

This study demonstrated that **lesion infiltration with DMG ICON is able to significantly delay progression of existing caries**, and that the status of an infiltrated caries lesion can be **monitored using The Canary System**.