Detection of remineralization of early caries with The Canary System®

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

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

*Faculty of Dentistry, Biomaterials Discipline, and Institute of Biomaterials and Biomedical Engineering, University of Toronto, Toronto, ON, Canada.

**The Canary System® and The Canary Lab were developed by Quantum Dental Technologies Inc, Toronto, ON, Canada.

**Curodont™ Repair includes a self-assembling peptide, that diffuses into the caries lesion body, forming a 3D matrix, around which, new hydroxyapatite crystals form (remineralization).

Materials & Methods

- This in vitro study evaluated the ability of: 1) The Canary System® and The Canary Lab to detect natural early caries on smooth surfaces; 2) Curodont™ Repair (Credentis AG, Windisch, Switzerland) to induce in-depth remineralization of enamel structure in natural early caries; and 3) The Canary System and Canary Lab to detect and monitor remineralization of teeth treated with Curodont™ Repair.

- Teeth were extracted from human teeth with natural early caries lesions on smooth surfaces were selected. Teeth were randomly assigned to three experimental groups (5 teeth/group): (1) Treatment Group (teeth treated with CR), (2) Control Group (teeth were left untreated), and (3) Placebo Group (teeth were treated with CR placebo).

- Prior to treatment, sound, and carious sites on one smooth surface of each tooth were selected and scanned with CS (baseline). A total of 102 sound and 84 carious sites were scanned using CS with three repeat measurements taken per site. A region 0.8mm x 0.8mm on each smooth surface of interest was scanned using CL (baseline). A total of 305 sound sites and 936 carious sites were scanned using CL.

- CR was applied to Treatment Group and CR placebo was applied to Placebo Group. All examination sites were re-scanned with CS and CL after CR application (Day 0).

- Polarized Light Microscopy (PLM) was performed at University of Texas in San Antonio as validation.

- Representative Treated Tooth

  - PLM validation showed that in the: 1) Control Group (Sound Sites), 100% (n = 30/30) of the examination sites were found to be sound. 2) Control Group (Carious Sites), 100% (n = 27/27) of the examination sites were found to be carious. 3) Treatment Group (Sound Sites), 93% (n = 38/42) of the examination sites were found to be sound, and 7% (n = 3/42) to be carious. 4) Treatment Group (Carious Sites), 100% (n = 30/30) of the examination sites were found to be carious.

- Average Canary Number (CN) of carious sites on treated samples decreased significantly (Related-Samples Wilcoxon Signed Rank Test; p < 0.05) from 44 at baseline to 24 after 50 days of remineralization.

- No significant decreases in average CN of carious sites on control samples were observed. No significant decrease in average CN of carious sites on placebo samples were observed up to Day 14 of remineralization treatment.

- Average numbers of Sound sites of all three sample groups <20 throughout the treatment period (up to Day 14 for placebo group).

Conclusions

- This study demonstrated the potential of The Canary System and Canary Lab to detect natural early carious lesions on smooth surfaces and monitor remineralization of caries lesion treated with Curodent Repair.

- Placebo group study is still under progress but has shown no remineralisation up to day 14.