PTR-LUM ("The Canary System") Clinical Trial Results for Caries Detection

K. SIVAGURUNATHAN[1], S. ABRAMS[2], R. JEON[1], J. GARCIA[1], A. MANDELIS[1], B.T. AMAECHI[3], and Y. FINER[4], [1]University of Toronto, Toronto, ON, Canada, [2]Quantum Dental Technologies, Toronto, ON, Canada, [3]University of Texas Health Science Ctr at San Antonio, San Antonio, TX, [4]University of Toronto, Faculty of Dentistry, Toronto, ON, Canada

Objective: Based on Photothermal Radiometry (PTR) and Modulated Luminescence (LUM) diagnostics, Quantum Dental Technologies, Inc., (QDT) has developed and successfully tested a portable PTR-LUM instrument (The Canary™ Dental Caries Detection System) for detection of artificial dental caries in several in-vitro studies. The aim of the present clinical trial was to study safety issues of The Canary prototype and to explore sensitivity and limitations during in-vivo applications of the technology. Methods: As dental caries develops, optical and thermal properties of dental tissue change and corresponding changes can be found in the combined PTR-LUM response. In this study, PTR and LUM amplitude (A) and phase (P) responses at various modulation frequencies from healthy and carious teeth (ICDAS 0-6) were measured. A clinical trial was done using The Canary™ (prototype 1), with the approval of Health Canada. Over 500 regions on healthy teeth of 50 subjects were probed to construct a healthy baseline for each output channel. While PTR-A and PTR-P were used to detect near-surface and subsurface lesions, LUM-A and LUM-P were used to detect near-surface lesions. Results: The Canary™ did not cause any adverse events or soft or hard tissue trauma. There was little or no difference in signal from wet or dry tooth surfaces; anterior and posterior healthy tooth surfaces provided the same signal, and the presence of surface stain and biofilm did not affect the signal from healthy tooth surfaces. In selected carious lesions, we observed a shift from the baseline in PTR, LUM or both signals depending upon the type, depth and nature of the lesion. Conclusion: Results from this first clinical trial showed that the Canary™ is safe and discriminates between healthy and carious enamel with little or no tooth preparation.

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