Research Behind The Canary System®

The Canary System is an evidence-based caries detection system built upon a solid foundation of peer-reviewed lab and clinical research. This includes:

- 2 Health Canada approved clinical trials that met FDA 21 CFR standards for clinical trials.
- A clinical trial on accuracy of detecting interproximal lesions compared to x-ray radiographs.
- 70+ peer-reviewed primary journal publications.
- 50+ presentations at international dental conferences.
- 8+ dental schools around the world conducting research using Canary as a tool to detect and monitor caries.

Research has demonstrated that Canary’s energy conversion technology (PTR-LUM) can be harnessed to help oral health professionals detect, measure, monitor, record, and diagnose:

- Lesions and defects ≤ 5 mm. below the enamel surface\(^{1-11}\)
- Occlusal pit and fissure caries\(^{3, 7, 8, 12}\)
- Smooth surface caries\(^{5, 13}\)
- Acid erosion lesions\(^{14-20}\)
- Root caries\(^{21, 22}\)
- Interproximal caries lesions\(^{23-30}\)
- Caries beneath fissure sealants\(^{31-34}\)
- Caries around margins of restorations and crowns\(^{30, 35-40}\)
- Caries beneath the intact margins of composite resins\(^{41, 42}\)
- Caries beneath intact margins of amalgam restorations\(^{43-46}\)
- Caries beneath the intact margins of resin modified glass ionomer & compomer restorations\(^{47-49}\)
- Demin- and remineralization of early caries lesions\(^{22, 40, 49-60}\)
- Detect and monitor white spot lesions\(^{2, 53, 61-66}\)
- Caries beneath clear resin infiltrants\(^{67}\)
- Caries Around orthodontic brackets\(^{49, 65, 66, 68, 69}\)
- Lesions and teeth treated with SDF (silver diamine fluoride)\(^{50}\)
- High inter and intra-examiner repeatability\(^{28, 34, 48, 65, 66, 71 72}\)
- Detect & diagnose caries more accurately than radiographs\(^{25-27, 30, 40, 60, 73}\)
- Detect & diagnose caries more accurately than fluorescence devices such as DIAGNOdent or SPECTRA\(^{3, 13, 31, 44, 47, 67, 74-76}\)
- Strong correlation between MicroCT and Canary System in secondary caries detection and measuring demineralization and lesion volume\(^{40, 60}\).

Clinical Trials

The Canary System has been investigated in three clinical trials. The first Health Canada-approved investigational study was completed in December 2009. The trial involved 50 patients using the first prototype in a number of clinical situations and found no safety issues.\(^{77, 78}\) The second Health Canada clinical trial was a follow-on study designed primarily to help QDT define the Canary Scale and determine how to best integrate the system into a dental practice. The study involved 98 patients among four trial sites with 38 patients involved in multiple visits for monitoring the effects of remineralization therapy.\(^{63, 79-81}\) The third clinical study was performed in 2014 at the University of Texas to investigate interproximal caries detection. The investigators found Canary was able to detect 92% of the lesions while radiographs only found 62%.\(^{27}\) The Canary System was the diagnostic device in a clinical trial to detect and monitor demineralization and white spot lesions around orthodontic brackets and was able to accurately detect and monitor lesions\(^{65, 66}\).

Canary Study Design Ensures Unbiased Results

Canary research at QDT is divided into two parts: 1) Canary scans are performed at the University of Toronto followed by visual ranking using ICDAS II; and then 2) Polarized light microscopy (PLM) analyses are conducted in a blinded-fashion in the lab of Dr. Ben Amaechi at the University of Texas to measure the size and shape of the lesions.


38. Kim J. In vitro examination of secondary caries using infrared photothermal radiometry and modulated luminescence [Toronto Ontario Canada: University of Toronto (Canada); 2012.


49. Herman B. The effectiveness of Resin-Modified Glass Ionomer Varnish in Preventing White Spot Lesions During Fixed Appliance Orthodontic Therapy: An In Vitro Study [Thesis]. University of Nebraska Medical Center; 2019.


