

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.
- A clinical trial on detecting & monitoring early caries around orthodontic brackets.
- 80+ peer-reviewed primary journal publications.
- 55+ presentations at international dental conferences.
- 25+ publications in the “popular dental press”, including Dentistry Today, Dentistry IQ, Oral Health and Dental Tribune.
- 8+ dental schools around the world conducting researching 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 surface¹⁻¹¹
- Occlusal pit and fissure caries^{3, 7, 8, 12}
- Smooth surface caries^{5, 13}
- Acid erosion lesions¹⁴⁻²¹
- Root caries^{22, 23}
- Interproximal caries lesions²⁴⁻³²
- Caries beneath fissure sealants³³⁻³⁶
- Caries around margins of restorations and crowns^{31, 37-43}
- Caries beneath the intact margins of composite resins^{31, 44, 45}
- Caries beneath intact margins of amalgam restorations⁴⁶⁻⁵⁰
- Caries beneath the intact margins of resin modified glass ionomer & compomer restorations⁵¹⁻⁵³
- Demin- and remineralization of early caries lesions^{23, 42, 53-65}
- Detect and monitor white spot lesions^{2, 57, 65-71}
- Caries beneath clear resin infiltrants⁷²
- Caries Around orthodontic brackets^{53, 70, 71, 73, 74}
- Lesions and teeth treated with SDF (silver diamine fluoride)⁷⁵
- High inter and intra-examiner repeatability^{29, 36, 52, 70, 71, 76 77}
- Detect & diagnose caries more accurately than radiographs^{26-28, 31, 32, 42, 64, 78}
- Detect & diagnose caries more accurately than fluorescence devices such as DIAGNODent or SPECTRA^{3, 13, 33, 36, 45, 47, 51, 72, 79-81}
- Detect cracks not seen on radiographs^{5, 82, 83}
- Detect cracks and monitor structural integrity over time.⁸³
- Strong correlation between MicroCT and Canary System in secondary caries detection and measuring demineralization and lesion volume.^{42, 64}

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.^{84, 85} 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.^{68, 86-88} 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%.^{28, 32} The paper on this trial was published in December 2021 and also outlines a new approach to using visual exam in a clinical trial³². 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^{70, 71}.

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.

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