

SENSITIVITY AND SPECIFICITY OF THE CANARY SYSTEM FOR CARIES DETECTION

Sensitivity and Specificity

SENSITIVITY: Ability of a caries detection method to correctly identify true positives (presence of caries).

SPECIFICITY: Ability of a caries detection method to correctly identify true negatives (absence of caries)

Therefore, a caries detection method aims to achieve 100% sensitivity and 100% specificity.

Three in vitro studies were conducted to determine the sensitivity and specificity of The Canary System™ for caries detection. The aim of the first study was to evaluate the ability of The Canary System to detect decay of all stages in caries formation on all tooth surfaces compared to visual examination. A total of 121 extracted tooth surfaces were selected. Three dentists, experienced in caries detection and diagnosis, conducted the visual examination on the tooth surfaces for the presence or absence of caries and recorded a consensus value for each surface. An operator, experienced with the use of The Canary System, conducted examination on the same surfaces using The Canary System. A histological method, Polarized Light Microscopy (PLM), was performed at the University of Texas as the 'gold standard' to confirm the presence or absence of a carious lesion on each tooth surface (Table 1). In addition, overall sensitivity and specificity of The Canary System were determined to be 97% and 82%, respectively.

Table 1. Sensitivities and specificities of The Canary System and visual examination on caries detection in general and three representative tooth surfaces.

Tooth Surface	Overall	Occlusal	Buccal	Mesial
<i>The Canary System</i>				
Sensitivity	97%	100%	100%	100%
Specificity	82%	80%	100%	75%
<i>Visual Examination</i>				
Sensitivity	80%	88%	64%	88%
Specificity	91%	80%	100%	75%



The aim of the second in vitro study was to compare the sensitivity of The Canary System for pit and fissure caries detection on the occlusal surface to two other caries detection methods: DIAGNOdent, and ICDAS II visual scoring. Extracted human molars and premolars composed of 103 potential healthy and carious pits/fissures on their occlusal surfaces were used. After scanning the marked pits/fissures with The Canary System and DIAGNOdent, PLM was used (University of Texas) to allow investigators to score the examined sites as 'carious' or 'non-carious' (Table 2).

Table 2. Sensitivities of The Canary System, DIAGNOdent and ICDAS II visual scoring of pit and fissure caries detection on occlusal surfaces.

Caries detection method	The Canary System	DIAGNOdent	ICDAS II (visual ranking system)
Sensitivity	92%	41%	77%

The third in vitro study compared the sensitivity of The Canary System with DIAGNOdent for caries detection on all tooth surfaces. A total of 20 examination sites from a group of extracted human molars and premolars were selected. The examination sites represented a range of clinical appearances from apparently sound to incipient caries (white and brown spots). After scanning the marked sites with The Canary System and DIAGNOdent, PLM was used (University of Texas) to allow investigators to score the examined sites as 'carious' or 'non-carious' (Table 3).

Table 3. Sensitivities of The Canary System and DIAGNOdent on caries detection on all tooth surfaces.

Caries detection method	The Canary System	DIAGNOdent
Sensitivity	100%	18%
Correlation with lesion depth	84%	21%

Conclusion

These three studies demonstrated that The Canary System exhibits a greater sensitivity compared to the other caries detection methods, including DIAGNOdent, visual examination and ICDAS II visual scoring. With an overall sensitivity and specificity of 97% and 82%, The Canary System gives dental professionals the confidence that this device is a powerful aid in the detection of early caries.