

# An in vitro study comparing caries detection readings of Canary, Diagnodent and Soprocure on SDF treated teeth

## Introduction

Dental caries is the most common chronic disease in pediatric populations.<sup>(1)</sup>New diagnostic tools have been introduced which help in early detection which results in cost effective health care.<sup>(2)</sup>Canary(C) uses a 660nm pulsed laser and combines photothermal radiometry and modulate luminescence amplitude. Numbers range from 0-100.<sup>(5)</sup> Diagnodent (DD) is a fluorescence tool which transmits 655nm laser energy. Numbers range from 0-99.<sup>(4)</sup> Soprocure(S) uses a light induced fluorescence evaluator for diagnosis and treatment.<sup>(3)</sup> It uses a scale of 0-5. SDF is a non-invasive cariostatic agent used to arrest caries.

**Aim of the Study:** The aim of this study was to determine, if the caries detection ability of Canary, Diagnodent and Soprocure were affected by SDF application in extracted teeth and to analyze if these systems could detect untreated caries under SDF treated caries lesions.

**Null Hypothesis:** SDF application does not change the caries detection ability of the 3 systems.

## Materials & Methods

The study was approved by the Rutgers University Institutional Board(IRB Pro0120050074) Extracted human third molar teeth were collected, debrided and placed in 1% phenol and were later stored in distilled water. Teeth with open caries with ICDAS score of 3-6 were included. Selected teeth were mounted in a dappen dish with wax and were numbered. Teeth were placed upright in a storage box with distilled water. Each caries detection system was calibrated and readings were taken using the site of the maximum reading on the tooth surface as a baseline. The location was identified for purposes to reproduce the readings. Then 1 drop of SDF was applied for 1 minute and air dried. Post SDF readings were taken immediately and after immersing the tooth sample in distilled water for 3 minutes. All samples are being stored for 30 days in distilled water and an additional reading will be collected with all the caries detection systems to check if there is an affect on the readings. Histological sectioning of the samples will be performed and the depth of SDF penetration will be recorded with a probe. Scanning Electron Microscopic imaging will be performed to check the extent of SDF penetration and to detect any untreated caries.

## Figures and Tables

**Figure 1** Equipment and supplies



**Table 1** A comparison of the caries detection readings among different systems-Repeated Measures ANOVA

CARIES DETECTION TOOL	READINGS	N	MEAN	STANDARD DEVIATION	P VALUE
CANARY	PRELIMINARY	50	64.06	21.13	0.975
	POST SDF IMMEDIATE	50	63.40	22.37	
	POST SDF 3MINUTES	50	64.10	23.75	
DIAGNODENT	PRELIMINARY	50	87.12	16.95	<0.001
	POST SDF IMMEDIATE	50	83.66	19.70	
	POST SDF 3MINUTES	50	69.46	23.95	
SOPROCARE	PRELIMINARY	50	3.14	0.85	0.762
	POST SDF IMMEDIATE	50	3.10	1.14	
	POST SDF 3MINUTES	50	3.22	1.32	

## Results

- 1.SDF treatment did not affect the caries detection readings of Canary immediately or 3 minutes post application.
- 2.Diagnodent caries detection readings changed after SDF treatment immediately and after 3 minutes. This was found to be statistically significant. Therefore, SDF treatment does affect the ability of Diagnodent to detect caries.
- 3.Soprocure showed minor changes after SDF treatment immediately and after 3 minutes. These results were not statistically significant which indicates that SDF does not significantly affect Soprocure.

## Discussion

This study evaluated the ability of 3 caries detection systems to detect caries before and after SDF placement. SDF having large silver particles may affect the ability of the systems to detect caries .The findings suggest that the Canary system and Soprocure system both were not adversely affected by initial SDF placement. Diagnodent however was affected and the current results indicate that SDF prevented accurate caries detection using the Diagnodent system. The continuation of the study will include re- evaluation of all carious SDF treated teeth with the 3 systems 30 days post SDF treatment. The final portion of the study will be to section the teeth and use scanning electron microscopy to evaluate both the depth of caries and of SDF penetration. This final piece of the puzzle will better inform us of the caries detection ability of each system.

**Limitations:** The study was done in vitro which does not perfectly simulate the oral cavity. Future studies will need to be done on patients.

## Conclusion

SDF placement affected Diagnodent's ability to detect caries immediately and 3 minutes after SDF application. Canary and Soprocure were not affected by SDF placement.

## References

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