

## Effect of CO<sub>2</sub> Laser Irradiation on Caries Lesion Progression of Bovine Enamel Covered by Biofilm.

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### Abstract

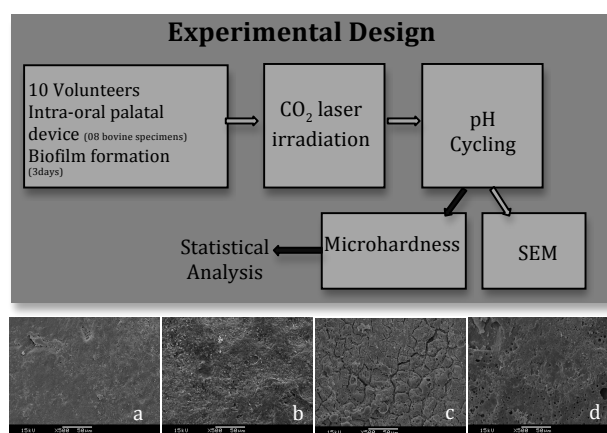
This research aimed to evaluate the effects of CO<sub>2</sub> laser ( $\lambda$ 10.6  $\mu$ m) on caries lesion progression (mineral loss) of bovine tooth enamel coated with biofilm. For biofilm formation, during a three-day in situ study, 10 volunteers wore palatal appliances containing 08 slabs of bovine enamel each. To provide a cariogenic challenge, the volunteers were instructed to remove the appliance and drip one drop of 20% sucrose solution onto each mesh that was above the enamel slab, 3 times per day. On the 3<sup>rd</sup> day, the slabs were removed from the palatal appliances and irradiated with CO<sub>2</sub> laser according to the following groups: 1) 16 specimens of bovine enamel without biofilm; 2) 16 specimens of bovine enamel, + pH cycling 3) 16 specimens of bovine enamel with biofilm only + pH cycling; 4) 16 Bovine enamel specimens, with biofilm followed by irradiation with CO<sub>2</sub> laser + pH cycling 5) 16 Bovine enamel specimens, biofilm removed by prophylaxis followed by irradiation of CO<sub>2</sub> laser + pH cycling. After pH cycling, 12 enamel specimens of each group were submitted to microhardness analysis and 4 specimens evaluated by scanning electron microscopy analysis (SEM). The microhardness data was statistically analysed by ANOVA followed by t test. The results showed statistically significant difference between control and all treatments groups ( $p < 0.05$ ). However there was no difference among laser groups ( $p > 0.05$ ). SEM observations showed evidences of melting, fusion (Fig. c and d). In conclusion, this study showed that biofilm covering enamel surface did not enhance the effect of CO<sub>2</sub> laser irradiation in inhibiting lesion progression of bovine dental enamel surface.

*Key words: CO<sub>2</sub> laser, biofilm, enamel.*

### Introduction

The CO<sub>2</sub> laser has been used to morphologically and chemically modify the surface of the dental enamel and render it more resistant to demineralization. The objective of this research was to evaluate the effects of biofilm and CO<sub>2</sub> laser ( $\lambda$ 10.6  $\mu$ m) in progression of caries lesion of bovine tooth enamel (mineral loss).

### Results and Discussion



**Image 1.** SEM micrograph on enamel surface x500. (a).Control + pH cycling (b) Biofilm + pH cycling (c) Biofilm Removal + Laser +pH cycling (d) Biofilm + Laser + pH cycling.

**Table 1.** Enamel Mineral loss, according to the groups (mean  $\pm$  SD; n = 12)

Groups	$\Delta S$ , kg/mm <sup>2</sup> x $\mu$ m
Control (baseline)	8,585.8 $\pm$ 1,129.9 <sup>a</sup>
Control +pH cycling	14,477.6 $\pm$ 2,090.6 <sup>b</sup>
Biofilm +pH cycling	12,956.4 $\pm$ 2,098.5 <sup>b</sup>
Biofilm + Laser +pH cycling	9,892.6 $\pm$ 1,789.8 <sup>a</sup>
Biofilm Removal + Laser +pH cycling	8,598.4 $\pm$ 1,897.1 <sup>a</sup>

Means followed by distinct letters are statistically different by ANOVA followed by Tukey test ( $p < 0.05$ ).

### Conclusions

This study demonstrated for the first time that biofilm covering enamel surface did not enhance the effect of laser irradiation in inhibiting lesion progression of bovine dental enamel surface.

### Acknowledgement

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