## Compositional and crystallographic changes on dental hard tissues induced by ND:YAG laser irradiation aimed at caries prevention

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This in vitro study evaluated the effects of Nd:YAG laser irradiation, when used at parameters aimed at caries prevention, on inducing chemical and crystalline changes on dental enamel and dentin. For that, twenty enamel and twenty dentin slabs were obtained from crowns and roots, respectively, of bovine teeth, and were randomly distributed into four groups (n = 10): G1- untreated enamel; G2- enamel irradiated with Nd:YAG laser ($\lambda$ = 1064 nm, 84.9 J/cm$^2$); G3- untreated dentin; G2- dentin irradiated with Nd:YAG laser ($\lambda$ = 1064 nm, 84.9 J/cm$^2$). After treatments, the composition of samples was analyzed by ATR-FTIR (Attenuated total reflection - Fourier transformed infrared spectroscopy) at range of 4000-650 cm$^{-1}$ and resolution of 4 cm$^{-1}$. The ratios of the peak´s heights were analyzed and the relative changes in organic and inorganic components after laser irradiation were compared using the ratio content/phosphates; after that all data were subjected to statistical analysis at 5% significance level. The crystalline changes of samples were determined by X-ray diffraction at a synchrotron beamline. The ATR-FTIR profiles of enamel and dentin irradiated with Nd:YAG laser were similar to those from untreated samples, showing a significant decrease on carbonate (883 cm$^{-1}$ to 1070 cm$^{-1}$) and organic contents (amides I and II - 1200 cm$^{-1}$ to 1600 cm$^{-1}$) of both enamel and dentin tissues when compared to untreated samples. X-ray diffraction showed that Nd:YAG laser irradiation promoted the formation of α-tricalcium phosphate and tetracalcium phosphate on both enamel and dentin, evidenced by several peaks that match with these crystallographic structures. Also, it was demonstrated a significant increase on the crystal diameter of the enamel apatite after laser irradiation (ANOVA, $p<0.05$). It can be concluded that Nd:YAG laser changes the microstructure of enamel and dentin, reducing the carbonate and organic contents and inducing the formation of new crystalline phases on these tissues, which can be the mechanism for the anticaries potential of this laser already reported in the literature. Supported by FAPESP (CEPID-CEPOF Proc. 05/51689-2) CAPES (Procad 0349/05-4), INFO/CNPq (Proc. 573916/2008-0) and Nanophoton/CNPq (Proc. 555170/2005-5).