An *in vitro* study of induced dental caries using FT-Raman and photoacoustic spectroscopies

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Dental caries are chemical-parasitic process, in which the bacteria present in the oral cavity metabolize dietary sugars and produce weak acids which demineralize the dental tissues. The most common caries detection and treatment methods used by dental surgeons are based on visual inspections and radiographic examinations. The researches for new caries detection methods aim to increase the reliability of diagnosis and the detection at initial caries stages. Therefore, if the detection methods present features such as the ability to detect caries at an early stage the dental treatment can be more effective to eliminate the whole dental caries. In this point of view spectroscopic methods can be useful for detection and analysis of dental caries processes, providing information about the structural and molecular changes in the infected dental tissues. This *in vitro* study aims to evaluate structural and molecular changes in dentin tissue induced by experimental dental caries using the of photoacoustic and FT-Raman spectroscopies. Photoacoustic results, at ultraviolet-visible spectral region, indicated demineralization in dentin caries induced with greater exposure of the organic matrix mainly composed of collagen. The same behavior was observed in the phase-resolved photoacoustic method, showed initial process of demineralization of dental tissue analyzed. At mid-infrared region, FT-Raman spectroscopy results showed demineralization of dentin corroborating with photoacoustic, furthermore, the technique also showed that the collagen denaturation had not occurred yet, a common process in advanced caries. The obtained results showed the proposed techniques are promising for investigation of early stages in the dentin induced caries.