**Title:** Estimation of Enamel and Dentin Mineral Content from Refractive Index  


**Abstract:** Objectives: Recent advances in the optics has enabled accurate and localized measurement of optical properties of biological substrates. This work aimed to elucidate the relationship between local refractive index (n) and mineral content (MC) of enamel and dentin. Methods and Materials: De- and remineralized lesions in bovine enamel and dentin blocks were sectioned into 300-400 µm-thick slices, and placed on a metal plate to capture images of sound, de- and remineralized regions transversely by optical coherence tomography (OCT). Mean n at each depth level of the lesion (20-µm or 40-µm step for enamel or dentin) was measured by optical path-length matching method, and used to plot n through lesion depth. The specimens were further polished and processed for transverse-microradiography for analysis of MC. Results: The n and MC ranged 1.52-1.63 and 50-87 (vol.%) in enamel, and 1.43–1.57 and 11–48 (vol.%) in dentin, respectively. Strong positive linear correlations were found between n and MC (Pearson's r = 0.95 and 0.91 for de- and remineralized enamel, and r = 0.94 and 0.91 for dentin respectively, p<0.001). The experimental data were validated with a theoretical calculation of n from MC. Conclusion: De- and remineralization of enamel and dentin resulted in measurable changes of n, and in turn, MC changes of the tissue could be estimated with good accuracy form this long-known optical property by the new analytical approach. Compositional changes of enamel crystallites after remineralization affect n.

**Presentation:** Oral