Fiber optic probe for early detection of lung cancer

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Abstract: Low-coherence enhanced backscattering spectroscopy is an angular resolved backscattering technique that is sensitive to sub-diffusion light transport length scales for which information about scattering phase function is preserved. Our group has shown the ability to measure the spatial backscattering impulse-response function along with depth resolved optical properties in tissue with LEBS. We have also shown that these optical properties have capability to detect field carcinogenesis in colon at very early stages. Here, we present the implementation of a fiber optic probe with capability to detect lung cancer by measuring changes in buccal micro architecture by using Low-Coherence Enhanced Backscattering Spectroscopy (LEBS) and vasculature using diffuse reflectance spectroscopy in field of carcinogenesis. The fiber optic probe was validated by performing experiments with scattering phantom consisting of polystyrene microspheres in water alongwith Monte Carlo Simulations. We evaluated the performance of this probe in a study of 68 patients (34 Smokers, 34 Lung Cancer). We present parameters that are sensitive to field effect can be used as diagnostic markers for predicting pre-cancers elsewhere in lung by interrogation of buccal mucosa. Our vision is that buccal LEBS analysis can represent a pre-screen (triage) tool performed by primary care physicians or dentists. If the buccal LEBS is positive, then patients would be offered a more expensive/invasive screening such as low dose CT or bronchoscopy.