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Differing self-similarity in light scattering spectra: A potential tool for pre-cancer detection

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The fluctuations in the elastic light scattering spectra of normal and dysplastic human cervical tissues analyzed through wavelet transform based techniques reveal clear signatures of self-similar behavior in the spectral fluctuations. Significant differences in the power law behavior ascertained through the scaling exponent was observed in these tissues. The strong dependence of the elastic light scattering on the size distribution of the scatterers manifests in the angular variation of the scaling exponent. Interestingly, the spectral fluctuations in both these tissues showed multi-fractality (non-stationarity in fluctuations), the degree of multi-fractality being marginally higher in the case of dysplastic tissues. These findings using the multi-resolution analysis capability of the discrete wavelet transform can contribute to the recent surge in the exploration for non-invasive optical tools for pre-cancer detection.

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