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Investigating Cellular Structure via Optical Scattering Profiles from a Near-Infrared Laser Diode[1] VERN HART, JAMES GRAHAM, RYAN BEVAN, DUNCAN REEVES, ELLIE EVANS, CHRIS BERNEAU, DANIEL BLUMEL, DIANA TURCIOS, Utah Valley University — In the earliest stages of certain cancers, cell nuclei tend to enlarge and elongate. This process occurs at the sub-cellular level, on scales too small to be visible in a CT or MR image, and months before a tumor is visible. The nucleus accounts for a significant amount of the optical scattering which occurs in a cell and recent efforts in diffuse optical tomography have investigated the feasibility of early detection for these sub-cellular changes, "so-called" micro-cancer. However, the ability to distinguish these cells requires sufficient understanding of the involved scattering mechanisms. In this study, we investigated optical scattering patterns for five different cancer cell lines, which were irradiated in vitro by diode lasers at wavelengths of 532, 635, and 850 nm. The resulting patterns were collected with a laser beam profiler and were then analyzed in MATLAB using a 2D Fourier transform. Significant differences were observed in the appearance and spectral distributions for the various cell lines. Spherical WEHI-3 cells were used as a control and compared with MIE scattering simulations for spherical particles. Accurate quantification of these patterns could lead to the detection of cancerous cells at low concentrations in otherwise healthy tissue.

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Vern Hart
Utah Valley University

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