

Label-free Imaging of Subcellular Organelles and Distribution of Molecular Targeted Agent in Cancer Cells

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Spontaneous Raman and coherent anti-Stokes Raman scattering (CARS) are emerging biophotonics tools for label-free imaging of cells and tissues. Here, we have applied a combination of CARS, immunofluorescence, hierarchical cluster analysis (HCA), and random forest in an attempt towards automatic label-free annotation of subcellular organelles of MIA PaCa-2 pancreatic cancer cells. HCA of the CARS spectral data sets were performed and index colour images were obtained. These images were identified by comparison with immunofluorescence staining. With these data a supervised algorithm based on random forest as a classifier, was trained and used to automatically annotate the subcellular organelles such as nucleus, lipid droplets, endoplasmic reticulum, and Golgi apparatus.

Furthermore, we have shown the distribution of a molecular targeted agent erlotinib in colon cancer cells by Raman microscopy, where erlotinib is an epidermal growth factor receptor inhibitor. Raman results indicated that erlotinib has strong C≡C stretching vibration, which is located in a Raman silent region of cells. Thus, it can be used as a label-free marker band for erlotinib. In addition, the Raman results indicated that the drug is metabolized to desmethyl-erlotinib in cells.