

Raman Microscopy for the Chemometric Analysis of Tumor Cells

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Raman spectroscopy is recognized as a tool for chemometric analysis of biological materials due to the high information content relating to specific physical and chemical qualities of the sample. Thirty cells belonging to two different prostatic cell lines, PNT1A (immortalized normal prostate cell line) and LNCaP (malignant cell line derived from prostate metastases), were mapped using Raman microscopy. A range of spectral preprocessing methods (partial least-squares discriminant analyses (PLSDAs), principal component analyses (PCAs), and adjacent band ratios (ABRs)) were compared for input into linear discriminant analysis to model and classify the two cell lines. PLSDA and ABR were able to correctly classify 100% of cells into benign and malignant groups, while PLSDA correctly classified a greater proportion of individual spectra. PCA was used to image the distribution of various biochemicals inside each cell and confirm differences in composition/ distribution between benign and malignant cell lines. This study has demonstrated that PLSDAs and ABRs of Raman data can identify subtle differences between benign and malignant prostatic cells in vitro.