Measurement of Human Cancerous and Noncancerous Tissues by Advance Synchrotron FTIR

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Vibrational microscopy is an important tool for biology investigation, and is particularly well established for chemical mapping of cells or tissues. The spectra allow the study and identification of vibrational mode. And higher signal-to-noise ratio is often considered as fundamental measure for a achieving a better detection and spectra quality. Synchrotron radiation-based Fourier-transform infrared (SR-FTIR) microspectroscopy, i.e. the combination of FT-IR spectroscopy, optical microscope, and utilizes the semi-coherent infrared radiation from synchrotron as light source, is proving an invaluable technique that provides ultra-spatially resolved spectroscopic information and a higher signal-to-noise ratio (SNR) on minute quantities of microscopic structure within a given sample. This facility has been widely used in various biological studies including investigation of cell membranes, proteins and nucleic acids, as well as tissues engineering.

5 tissue liver samples were obtained from biopsy of liver tumor (from Macky Memorial Hospital) specimens. FTIR spectra of tissue specimens, were collected by using SR-FTIR (Thermo Nicolet, Magna-IR spectrometer) on BL14A, NSRRC. Every 5μm step takes one spectrum and scans at the same thickness to ensure individual discrepancy on the sample.

Our result demonstrated that Amide I peak in normal region exhibits a red shift compared to that in cancerous region. In addition, a small vibrational peak at 1150 cm^{-1} only appears in the spectra of the normal area. Since the spectra of 5 liver tissues show almost the same absorption peaks (energy and intensity), indicating that the SRFTIR shows high reliability in this study. As the result, these information prove that FTIR might act as a diagnostic tool to distinguish normal and cancerous human tissue which provides as an index of disease progression,

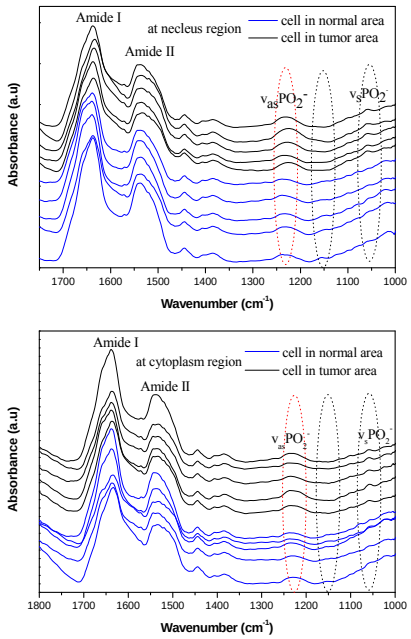

Figure 1. IR spectra in the range from 1800-1000 of human normal and cancerous tissues. Peak shift between normal and cancerous regions can be seen and a small vibrational peak at 1150 cm-1 only appears in the spectra of the normal area.

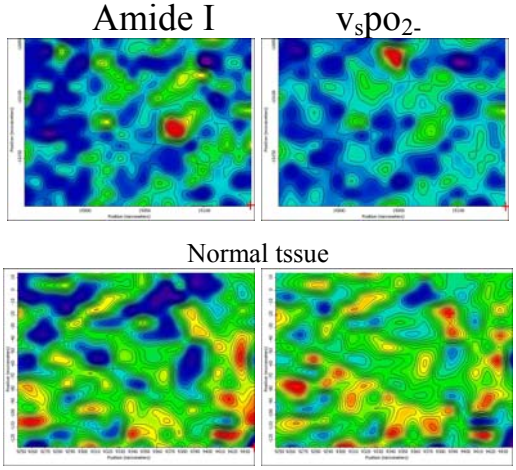

Figure 3. The functional group map of (a) normal, and (b) cancerous live section of characteristic bands of PO_2^- and amide I.