AB037. P-05. Evaluation of infrared spectral signature associated with pathology as biomarker for cancer progression in cholangiocarcinoma

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Background: Cholangiocarcinoma (CCA) is a cancer of the bile duct epithelium and remains an important public health problem in Southeast Asia, with a particularly in Northeast Thailand due to its high incidence and high fatality rates. The highest prevalence of *Opisthorchis viverrini* (OV) related CCA found in northeast Thailand. The disease is difficult to early diagnose and is usually fatal because patients usually come to the physician at the advance stage and the effective non-surgical therapy is not currently available. In this study, we aim to focus on periductal fibrosis and bile duct cells initiated into cancer development, which are characterized by Fourier transform infrared (FTIR) microspectroscopy giving specific spectra corresponding to biomarkers as an early diagnosis of CCA.

Methods: Here the liver tissue sections from the OV-infected hamster to induce tumor were performed. FTIR spectral changes were monitored in a time dependent manner during 6 months of tumor induction under the parameters of analysis using 64 co-added scans at 10 µm × 10 µm aperture size with 4 cm^{-1} spectral resolution. Following spectral preprocessing, infrared spectra were interrogated with principal component analysis (PCA). Moreover, the histochemical staining for fibrosis and bile duct epithelium of hamster tissues were stained by serious red and CK19, respectively.

Results: Firstly, the result provided the discrimination of periductal fibrosis and bile duct cells in the circumstance. From PCA, the major infrared (IR) peaks of periductal fibrosis showed signature spectra at amide I (1,648 to 1,645 cm^{-1}: beta-sheet form); CH3 asymmetric methyl deformation (1,454 cm^{-1}) collagen III (1,338 cm^{-1}) and collagen triplet (1,282, 1,235 and 1,201 cm^{-1}). Secondly, the discrimination of pre-cancerous (1 month) and cancer cholangiocytes (over 2 months) after OV-infection had been classified by definite specific vibrational bands of biomolecules. Characteristic spectral changes included increase intensity of a band from phosphate groups (1,080 cm^{-1}) and C=O carboxylic esters (1,735 cm^{-1}) in cancer cells.

Conclusions: This information implies that FTIR microspectroscopy is the potential tool to provide a spectral signature of biochemical components acting as a molecular probe of sample composition in the detection and diagnosis of a disease including CCA.

Keywords: Biomarker; cholangiocarcinoma (CCA); cancer progression; Fourier transform infrared microspectroscopy (FTIR microspectroscopy); principal component analysis (PCA)

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