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Infrared spectroscopic diagnosis of cancer

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Apart from the enormous efforts in understanding, prevention and treatment, cancer remains a leading cause of death. The gold standard in most cancer diagnosis is histopathological evaluation of a stained tissue obtained from biopsy of a particular organ. Though cytology and histopathology are highly efficient diagnostic tests they are invasive and in certain instances, these tests by themselves fail to provide a decisive answer as to whether a lesion is a tumour or not. Though non invasive imaging techniques like computed tomography and magnetic resonance imaging has gained much importance in cancer diagnosis, they remain as expensive techniques for routine screening purpose. In recent years infrared spectroscopy has caught much attention in disease diagnosis as a non invasive, time saving and economical technique. The feasibility of using Fourier transform near infrared fibre optic spectroscopy as a non invasive diagnostic tool to discriminate tumour from normal tissues and of using Fourier transform infrared spectroscopy as an analytical tool to study the cancer related structural disorders in the DNA molecule was investigated. Cluster analysis and neural networks were used as pattern recognition techniques to discriminate tumour spectra from normal. The method was tested with surgically resected colon diverticulitis, colorectal and pancreatic tumour tissues

Cluster analysis and neural network evaluation of the FTNIR fibre optic spectra of surgically resected human colorectal tumour tissues and cluster analysis of the FTNIR fibre optic spectra of surgically resected human colon diverticulitis and pancreatic tumour tissues showed high sensitivity and specificity in discriminating diverticulitis and tumour spectra from normal. These findings suggest that FTNIR spectroscopy may offer the potential for non-invasive in vivo diagnosis of tumour.

The FTIR studies of DNA showed structural disorders in pancreatic and colorectal tumour DNA. The structural disorders in pancreatic cancer DNA were found in phosphodiester deoxyribose regions, whereas the structural disorders in colorectal cancer DNA were found only in the region for phosphate. These findings suggest that FTIR spectroscopy can be used as an analytical tool to study the disease related structural disorders in DNA.