

## Early stage cancer screening

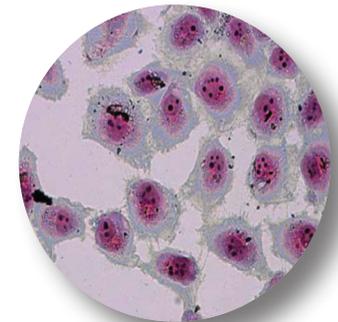
### The Problem

Approximately 20 million people worldwide suffer from cancer which is one of the main causes of death. A definitive diagnosis is not always possible from a biopsy as some early stage abnormal cells cannot be detected using conventional methods. Understanding the micro-biological changes leading to the onset of these diseases is vital to develop methods for early diagnosis and new treatments.



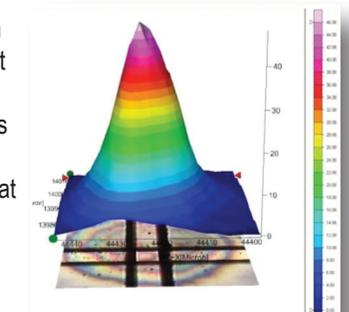
### The Challenge

It is crucial to find an alternative technique that could help clinicians in diagnosing cancer and, more importantly, to be able to (sub)classify the type of cancer from a very small number of cells in a timely manner. Infrared microspectroscopy has recently been used as a quantitative analytical method to study cells and tissues for cancer diagnosis. Lab-based FTIR spectrometers equipped with an internal IR source provide enough photon flux for the study of tissues and cell-based samples. However, the study of cells at the sub-cellular level becomes challenging, due to the requirement for higher spatial resolution, higher photon flux density and better signal-to-noise ratio.



### The Solution

Clinicians, together with scientists from Diamond, have used the synchrotron-based IR microspectroscopy and imaging beamline at Diamond (MIRIAM) to study chemical speciation of human tissue and cells for cancer diagnosis in a non-destructive manner. A successful pilot study looked right inside cells – both lung cancer cells and normal cells – in tissue samples taken from lung cancer patients. Infrared microspectroscopy studies allowed lung cancer cells to be distinguished from normal cells. In contrast from conventional lab-based IR methods, synchrotron-based micro FTIR spectroscopy allowed measurement of spectra of single cells at both cellular and sub-cellular level with an excellent spectrum quality in a short time.



### The Benefits

Synchrotron IR absorption spectroscopy can be successfully used to screen tissue and cytology samples for the presence or absence of cancer cells and it can help pathologists to classify those cells that are suspicious but not diagnostic for cancer. A possibility of earlier cancer diagnosis without the need to wait for a further biopsy can reduce the risks, side effects and costs for patients and the NHS. This technology has clear important implications for future clinical applications.



*“Identifying cancer cells in this way will reduce the number of biopsies thus reducing risks and side effects for patients, starting treatment earlier, and reducing costs for the NHS.”*

**Dr Josep Sulé-Suso, Keele University & Cancer Centre, University Hospital of North Staffordshire**

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