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Technology to License

High Sensitivity, High Specificity Cervical Cancer Analyser

Dublin Institute of Technology (DIT) is seeking companies to license an automated diagnostic system for screening cervical cancer that has high specificity and high sensitivity.

Currently, cytologists are needed to examine smear samples under a microscope to visually assess the shape, size and stain pattern and determine if abnormal cells are present which could indicate cervical cancer. Alternatively, automated image analysis is used to determine nuclear density but cytologists are still needed to determine the presence of abnormal cells. The current processes are prone to human error and misdiagnosis can be up to 60%. They are also time consuming and costly.

Sample user interface for spectral acquisition and classification.

Researchers at DIT have invented an easy to use, low cost, automated analyser that uses a pre-defined library of known cell signatures and a proprietary classification algorithm to detect abnormal cells with an accuracy of 99%. The analyser can be used with a regular microscope, an image analyser or as a point-of-care system with results displayed using an intuitive user interface. The image and the classification can be saved in digital format, stored in a national database, and sent to the medical team or experts worldwide.

Applications

- The cervical cancer analyser can be used:
  - with a regular microscope
  - with an image analyser
  - or as a point-of-care system
- It can also be used for other cell analysis applications e.g. most other cancers, forensics and food contamination

Advantages

- **High sensitivity** – greater than 99% accuracy in the classification of abnormal cells, improving cancer detection and reducing false negatives.
- **High specificity** – greater than 99% accuracy in the classification of normal cells reducing false positives.
- **Low cost** – the technique uses a low cost, low resolution Raman spectroscope and operating costs are low as no reagents are needed.
- **Easy to use** – no specialist training or experience in spectroscopy is required to operate the system and the system works with a common microscope.
- **Less human error** – as definite negatives can be eliminated automatically, more time can be given to the analysis of possible positives.
- **Fast** – with low resolution scanning and less subjective interpretation of the results, the screening rate is faster than the 5-8 minutes per conventional smear tests.
- **Network friendly** – digital classification data can be stored in databases and remotely sent to experts for consultation.

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Technology Description

This low cost cervical cancer analyser uses algorithms to analyse Raman spectra of sample cells and classifies the samples by comparison with a pre-defined sample database. It can be used with conventional microscopes or more advanced image analysers and can also be used as a point-of-care system. The system is an improvement on current cervical cancer screening processes given more automation and less reliance on human subjectivity. As the analyser is small, fast and works with conventional microscopes, it is suitable for clinical applications.

Stage of Development

This patent pending system has been successfully benchmarked against standard tests from two Dublin hospitals (National Maternity Hospital, Holles Street; Coombe Women and Infants University Hospital) and research on additional applications and manifestations is ongoing.

Dr. Fiona Lyng

Dr. Lyng has been manager of DIT's Radiation & Environmental Science Centre (RESC) since 2003. She received her Ph.D. on Radiation Biology & Electron Microscopy from University College Dublin in 1995. Fiona has published over 50 peer reviewed articles and her current research interests include the non-targeted effects of ionising and non-ionising radiation and vibrational spectroscopy for disease diagnosis.

Dr. Fiona Lyng

Prof. Hugh J. Byrne

Prof. Byrne has been Facility Manager of the Focas Institute, at DIT since 2000. Prior to this, he lectured in the School of Physics, DIT and was a research scientist at the Max-Planck-Institut für Festkörperforschung, Stuttgart and at the National Institute of Materials and Chemistry Research, Tsukuba, Japan. Hugh has 17 years research experience and over 100 peer reviewed publications.

Dr. Eoghan Ó Faoláin

Dr. Ó Faoláin has a Ph.D. in biospectroscopy and was previously a postdoctoral researcher at the Focas Institute, DIT.

Dr. Colin Clarke

Dr. Clarke has a Ph.D. from Cranfield University, UK and currently works at the Focas Institute, DIT providing multivariate statistical and machine learning support to the biospectroscopy group.

Kamila Ostrowska

Ms. Ostrowska has a M.Sc. from the University of Wroclaw, Poland and is currently working toward a Ph.D. at DIT on 'Vibrational Spectroscopy for Cytology Applications'.

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Hothouse is the award winning Innovation and Technology Transfer Centre at Dublin Institute of Technology. A magnetic energy hub, Hothouse draws in entrepreneurial and academic talent, ignites creativity and provides a dynamic environment to fast-track businesses and technologies to commercial success.

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