

Medical imaging breakthrough may lead to early cancer detection

January 13 2014, by Meghan Lodwick

(Phys.org) —A breakthrough technique for super-resolution 3D medical imaging of living cells has been developed by researchers at Swinburne University of Technology.

The new [technique](#) potentially could aid in minimally-invasive surgery and the early detection of cancer.

The researchers, Professor Min Gu, Dr Xiangping Li and Dr Hong Kang, applied a technique announced last year, enabling three-dimensional optical beam lithography at nine nanometres, to two-photon fluorescence endo-microscopy.

Two-photon fluorescence endo-microscopy is a powerful technique for non-invasive, high-resolution imaging of biological tissue.

Using this technique, they have for the first time demonstrated that greater image definition can be achieved with a two-photon probe using a special donut-shaped beam generated from a double-clad optical fibre.

"Until now, [image resolution](#) for 5 mm probe imaging has been very poor, making it impossible to obtain sub-wavelength details of organs that can provide information for early diagnosis of diseases," Director of Swinburne's Centre for Micro Photonics, Professor Gu, said.

"We have now been able to demonstrate an image resolution of 310 nanometres for the endoscopic probe where the numerical aperture is

0.35."

Professor Gu said this achievement paves the way for further high-resolution medical studies.

"At this resolution it should be possible to reveal the internal structures of goblet cells, which are glandular epithelial cells found in the lining of the digestive and respiratory tracts.

"Theoretically, we should be able to achieve a 75 nanometre image resolution, but this needs to be confirmed by further studies."

Professor Gu said the technique has potential uses for brain imaging, early cancer detection and minimally invasive surgical procedures as well as the development of new tests for drugs and other treatments.

The research is published in the latest edition of *Scientific Reports*.

Provided by Swinburne University of Technology

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