Shining a new light on the immune system

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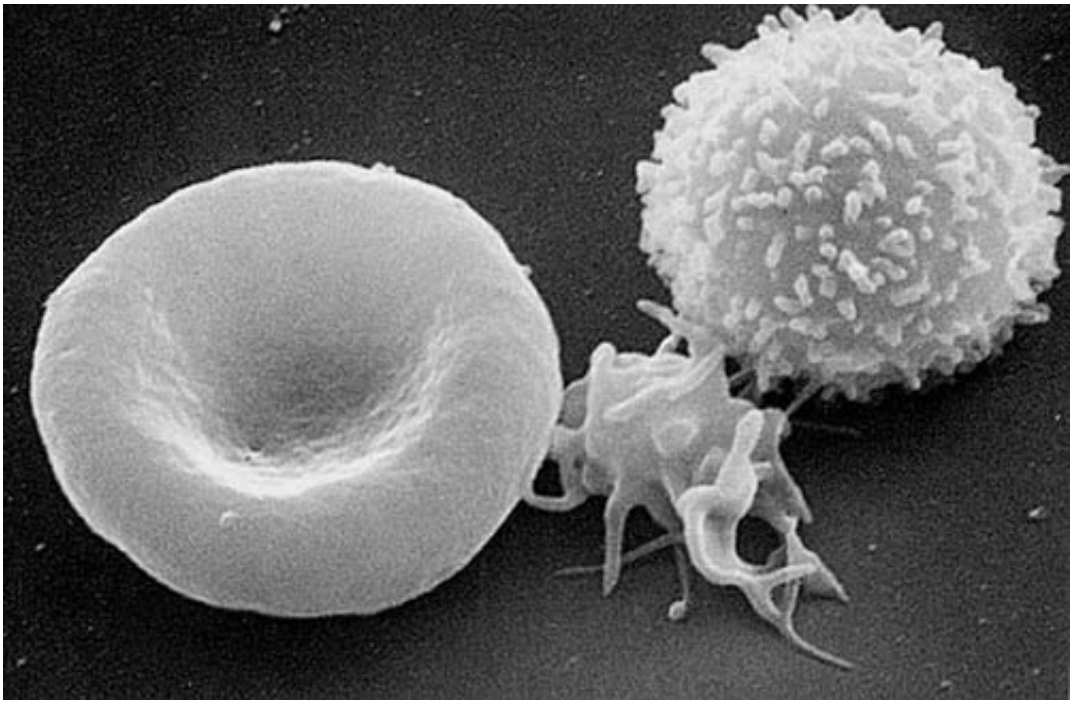

Scanning electron micrograph of blood cells. From left to right: human erythrocyte, thrombocyte (platelet), leukocyte. Credit: public domain

Scientists at the University of St Andrews have developed a revolutionary method of identifying cells of the immune system with "molecular fingerprints" which could pave the way for the rapid detection of conditions such as leukaemia and lymphoma from a small blood sample.

In a study published today (20th May 2015) by journal *PLOS ONE*

researchers used a light scattering technique called Wavelength Modulated Raman Spectroscopy (WMRS) to identify important types of white blood cells, including T lymphocytes, Natural Killer cells, and dendritic cells.

The immune system comprises a range of cell types that react to infections and other challenges, resulting in a powerful immune response with the aim of eradicating the infective agent or problem. Traditional methods of identifying and isolating these cells from blood usually involves labelling them with fluorescent or magnetically labelled antibodies.

This new method demonstrates the ability to identify immune cells with absolutely no labelling at all, thus permitting rapid identification and further analysis to take place with no potential alteration to the cells.

Raman scattering refers to light scattering from molecules in a sample where the light energy can be shifted up or down and recorded then as a 'molecular fingerprint' that can be used for identification.

Normally this process is very weak and further hampered by other background light (e.g. fluorescence).

The team at Physics and Astronomy at St Andrews have developed WMRS which subtly changes (modulates) the incident laser light that in turn results in a modulation of the Raman signal, allowing it to be extracted from any (stationary) interfering signal. This means more accurate diagnosis of the sample.

The work was led by and Dr Simon Powis of the School of Medicine, and Prof Kishan Dholakia of the School of Physics and Astronomy, and continues the close collaboration of medical scientists and physicists in the area of biophotonics pioneered by the University in recent years.

Dr Powis, Reader in Immunology, said, "Under a normal light microscope these immune cells essentially all look identical. With this new method we can identify key cell types without any labelling.

"Our next goal is to make a full catalogue of all the normal cell types of the immune system that can be detected in the bloodstream. Once we have this completed, we can then collaborate with our clinical colleagues to start identifying when these immune cells are altered, in conditions such as leukaemia and lymphoma, potentially providing a rapid detection system from just a small blood sample."

More information: "The Use of Wavelength Modulated Raman Spectroscopy in Label-Free Identification of T Lymphocyte Subsets, Natural Killer Cells and Dendritic Cells." *PLoS ONE* 10(5): e0125158. DOI: 10.1371/journal.pone.0125158

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