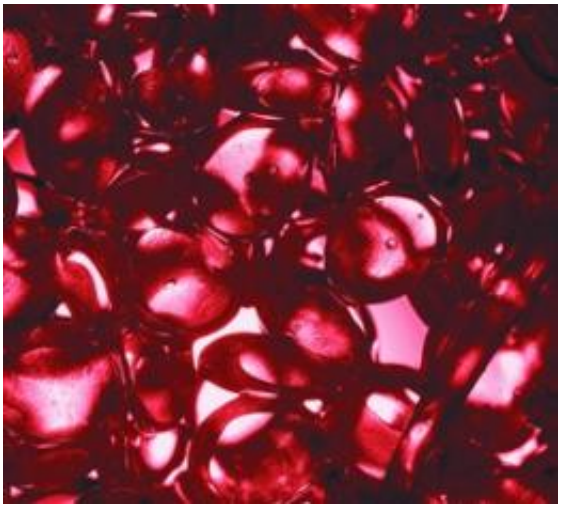
Super-resolution microscope shows how human T-cells make life or death decisions

December 3 2012



(Medical Xpress)—Using a super-resolution fluorescent microscope, medical scientists are a step closer to understanding why and how human immune cells decide to activate or not, thus enabling or preventing disease taking hold in the body.

Professor Katharina Gaus and her team at the Centre for Vascular Research based at UNSW's Lowy Cancer Research Centre used some of the most advanced super-resolution optical microscope technology available anywhere in the world to see changes in individual proteins in T-cells – the workhorse of our immune system.

"Every day, every second, our immune cells make decisions to activate or not activate," Professor Gaus says. "Every time they make a decision, the outcome is life or death."

In a paper published in Nature Immunology, Professor Gaus and her team show, for the first time, how the molecule protein 'kinase' is distributed across membranes – opening and closing like the Pacman in the 1980s computer game.

"The kinase we examined is called Lck and is essential for the activation of T-cells but is also involved in many other cell signalling processes," Professor Gaus says. "Understanding how kinase activity is controlled is the key to knowing what goes wrong in many diseases including immune disorders and cancer."

The super-resolution microscope has allowed the researchers to watch this dynamic opening and closing process.

There are only half a dozen of the super-resolution microscopes in use around the world, one of which is at UNSW.

The technology allows the researchers to light up particular molecules and proteins to pinpoint their precise localisation. The process highlights the proteins' position and function, enabling a super-resolution image of the activity to be captured.

"The link between intra-molecular rearrangements to surface patterning of signalling molecules is important because it can explain how engagement of a few receptors can trigger an activation response," the researchers say in their paper.

Further findings from Professor Gaus and her team appear this week in the journal *Nature Communications*.

Provided by University of New South Wales