Taking a closer look at cancer

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(PhysOrg.com) -- Using a unique combination of biology and physics techniques, Swinburne University of Technology researchers are improving our understanding of cancer on a microscopic scale.

In a paper published in the journal Biochemistry and highlighted as a key scientific article in *Global Medical Discovery*, the researchers have shown why some cancerous cells respond to certain medical interventions.

A team led by Associate Professor Andrew Clayton, head of Swinburne's Cell Biophysics Research Group, in collaboration with Professor Andrew Scott from the Ludwig Institute for Cancer Research, examined mutated cells and how they reacted to different combinations of antibody therapies.

"Cells are able to sense their outside environment through groups of molecules called receptors," Clayton said. "In normal circumstances, these receptors send signals to a cell telling it what to do – for example grow, move or die – based on its environment.

"However, in some cancer cells receptors can carry mutations that cause them to malfunction. This usually causes the cell to grow out of control."

Using sophisticated optical techniques – generally associated with the world of physics – the researchers were able to take a close look at how faulty receptors responded to two different types of antibody treatment.

They did this by tagging the receptors with Green Fluorescent Protein, which is a luminous molecule extracted from a certain type of jellyfish.

“How that tag responds to light can tell us a lot about the receptor molecules,” Clayton said. “It allows us to make a range of determinations based on colour, polarisation, fluorescent lifetime and density.”

When examining cells with mutated receptors that received the first type of treatment – a single antibody – the researchers observed no changes to the receptor molecules.

However when they looked at cells that received the second treatment – a combination of two antibodies – they noticed that the receptor molecules began clustering together.

“By looking at the mutated receptors on a molecular level, we were able to determine that it is this clustering reaction is a synergistic effect of the combination of antibodies” Clayton said.

Previous trials done by the Ludwig Institute for Cancer Research have shown this combination of antibodies to be more effective at treating cancerous cells in animals; but this new finding helps the researchers to understand why.

And, according to Clayton, gaining a better understanding of how mutated receptors react on a molecular level, could lead to more advanced cancer treatments. His team’s next step is to combine multiple dimensions of fluorescent signals, to look at more complex interactions in cells.

“This is the future of medical research – looking at biology through a physics lens,” he said.

More information: Paper online: pubs.acs.org/doi/abs/10.1021/bi101785h

Provided by Swinburne University of Technology

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