Molecular tag team revealed to control cell division

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In a ground-breaking paper published in *Nature*, they show that the three protein complexes act in relay to regulate cell division: reactivation of one leads to the second becoming active.

Cells rely on control systems to make sure that each aspect of the cell division cycle occurs in the correct order. Following successful segregation of the genomes in mitosis, each must return to its pre-division state in a process called mitotic exit. Mitotic exit is irreversible for all multicellular organisms. Loss of cell cycle control during this process - leading to unregulated and abnormal growth - is a key characteristic of cancer cells.

Now researchers based within the Cancer Research UK Manchester Institute at The University of Manchester - part of the Manchester Cancer Research Centre - have investigated the regulation of mitotic exit in yeast cells.

Professor Iain Hagan, who leads the Cell Division group that carried out the research, said: "In particular, we wanted to find out the role played by three molecules, known as Protein Phosphatase 1, 2A-B55 and 2A-B56."

Phosphatases are enzymes that remove phosphate groups from molecules, leading to a change in the molecule's activation and its control of cellular activity. They act in opposition to kinases, which add phosphate groups and are known to be over-active in some cancers.

PP1 and PP2A account for 95% of all of the phosphatase activity of a human cell and had previously been assumed to be unlinked enzymes with a discrete set of functions.

The group looked at the activity of the three phosphatases and found that PP1 was the master regulator that controlled the timing of the successive activation of each PP2A. This molecular 'tag team' coordinated the yeast cell's progression through the different steps in mitosis.

"Much of this process is conserved throughout all mammalian cells, which means that our studies in yeast will give us greater insight into cell division, and indeed overall cellular communication, in humans," added Professor Hagan.

More information: "A PP1/PP2A phosphatase relay controls mitotic progression" A Grallert et al. (2014) *Nature*. DOI: 10.1038/nature14019

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