



THE VICTOR CHANG
CARDIAC RESEARCH INSTITUTE

MEDIA RELEASE

YEAST: THE KEY TO UNDERSTANDING HOW CELLS WORK

Next time you sit down to enjoy a beer and burger, just remember that the humble yeast organisms that you are enjoying may actually be advancing our understanding of how the cells in our body work.

In a paper published this week in the prestigious international journal *Molecular Cell*, Associate Professor Thomas Preiss of the Victor Chang Cardiac Research Institute and colleagues from the Wellcome Trust Sanger Institute and the University of Cambridge, showed that yeast gene expression (the way cells “turn on” and “switch off” their genes) is a multistep process that is tightly controlled on many different levels. Control on each level is important to allow for more flexible and adaptable cell function and when it breaks down, disease occurs. What makes this work so unique, is that it had never been shown before, either in yeast or in any organism how surprisingly widespread the extent is, of the orchestration of different layers of control of the genes in our genomes.

“As medical researchers, a major challenge we face is to understand the inner workings of the cells that make up the human body,” Associate Professor Preiss commented. “It is difficult to come up with smart ways to treat diseases when we don’t understand the cellular processes that went wrong in disease.”

“The technological advances of Genome Science give us the opportunity to study how thousands of genes in a cell work together, rather than study one gene at a time,” said Dr Traude Beilharz, senior investigator in the Preiss lab. “These relatively new approaches are typically first developed in yeast, as they are really just a simpler version of human cells. This makes them a good model to work out the basics, and then we may apply the research findings and methodologies to the study of human cells”.

The major contribution to the collaborative study by Associate Professor Preiss’ Lab was to measure the length of polyadenosine “tails” on the messenger RNA (mRNA) molecules that are generated from each gene to serve as a blueprint in making proteins - the building blocks of life.

“One might think that a tail does not matter much, but with mRNAs it has a big impact on how long they stay around in cells and how much protein is made from them. In this way it is a case of *the tail wagging the dog*. Since nearly every mRNA in every human cell has these tails, it is not surprising that controlling their length turns out to be quite important. It is known to be involved in embryonic development and during learning and memory in the brain, for instance. The mRNA tails also seem to be the target for recently discovered tiny cellular brakes called microRNAs. Failure of these brakes contributes to human diseases, such as heart defects and cancer.

“Our work provides a comprehensive picture of the range of mRNA tail lengths in yeast cells and what cellular processes are affected by this. Our colleagues at the Sanger Institute have performed similar investigations of nearly every other step of gene expression. Together, these data provide a fascinating insight into the substantial coordination between different layers of gene control that exists in cells to ensure coherent protein production. While we made these observations in yeast, they very likely apply also to human cells and should be considered in future studies of disease mechanisms”.

Established in 1994, the Victor Chang Cardiac Research Institute (VCCRI) is committed to excellence in research into heart disease and cardiovascular biology, cardiovascular research training, and facilitating the rapid application of research discoveries to patient care.



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Further Information:

Prue MacSween Verve Communications (02) 8234 4300 or 0417 635 045	Gabrielle Thomson Victor Chang Cardiac Research Institute (02) 8382 3586 or 0408 862 040
Don Powell - Press Officer Wellcome Trust Sanger Institute Hinxton, Cambs, CB10 1SA, UK Tel +44 (0)1223 494 956 Mobile +44 (0)7753 7753 97 Email press.officer@sanger.ac.uk	