Researchers discover architecture for fundamental processes of life

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A team of Canadian researchers has completed a massive survey of the network of protein complexes that orchestrate the fundamental processes of life. In the online edition of the journal Science, researchers from the Université de Montréal describe protein complexes and networks of complexes never before observed – including two implicated in the normal mechanisms by which cells divide and proliferate and another that controls recycling of the molecular building blocks of life called autophagy.

These processes are implicated in diseases such as cancers and autophagy has recently been shown to be involved in degenerative neurological disorders such as Alzheimer's and Huntington's diseases. The discovery will fill gaps in basic knowledge about the workings and evolutionary origins of the living cell and provide new avenues to explore in linking these fundamental processes to human disease.

The study was led by Stephen Michnick, a Université de Montréal biochemistry professor and Canada Research Chair in Integrative Genomics, along with Université de Montréal co-first authors: Kirill Tarassov, Vincent Messier, Christian Landry and Stevo Radinovic. Collaborators from McGill's Department of Biology included Canadian genomics pioneer Prof. Howard Bussey and Prof. Jackie Vogel.

"Our team systematically analyzed the interactions of proteins of bakers yeast, a unicellular organism confirmed to provide insight into fundamental processes shared by most living cells including those of

humans," explained Prof. Michnick.

New technology makes discovery possible

The examination of protein complexes was made possible by a unique technology developed by Prof. Michnick with his post-doctoral fellows and graduate students. The novel technology allows interactions between proteins to be studied in their nearly natural state in the cell. With this technology, the scientists performed approximately 15 million pair-wise tests to identify about 3,000 interactions between protein pairs.

Since protein-to-protein association largely defines their function, this is a major advancement towards scientific understanding of the inner life of human cells. Thanks to Prof. Michnick's technology, the researchers also uncovered the architecture of protein complexes – key information necessary to determine how proteins work together to orchestrate complex biochemical processes.

"The technologies and resources developed for this study can be applied to investigate protein networks in more complex organisms including crop plant and human cells," said Prof. Michnick. "They may also be used to link multiple genes implicated in complex human diseases to common cellular processes. What's more, applications to diagnostic tests and the development of drugs and antibodies against human cancers can be readily envisioned."

Source: University of Montreal