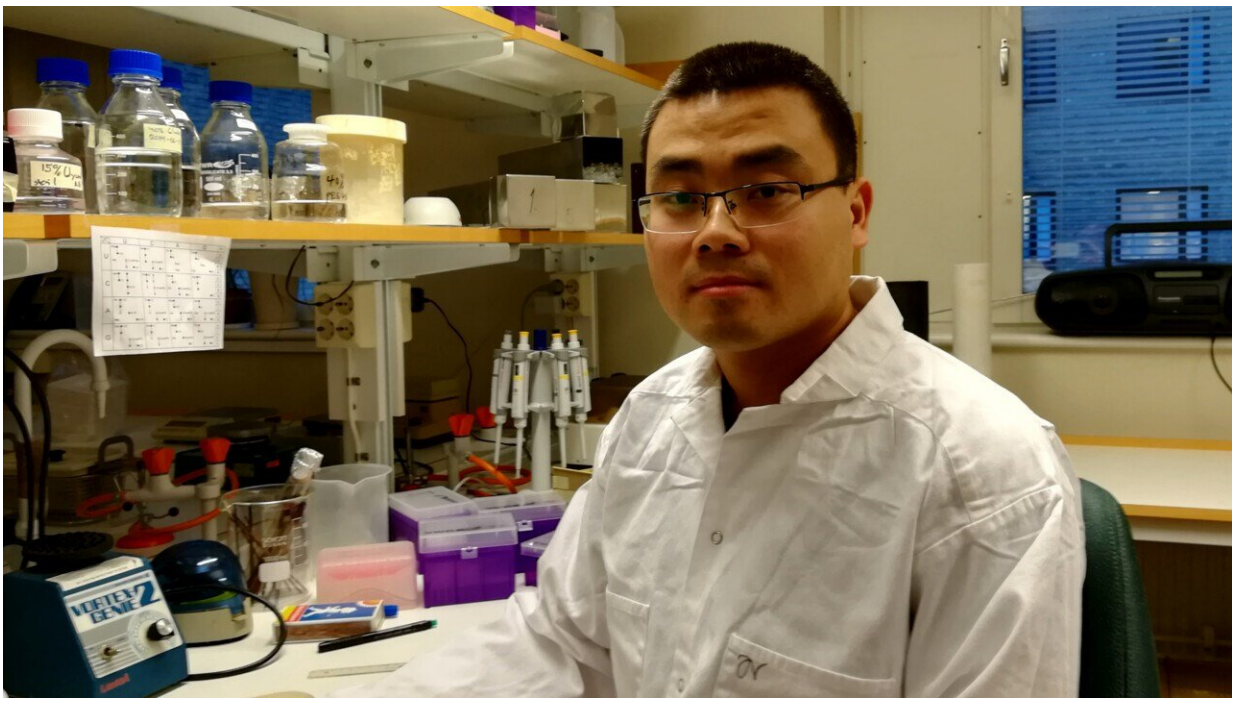
Factors that ensure cellular protein production

January 16 2020, by Ingrid Söderbergh



Fu Xu, Department of Moleculat biology, defends his thesis on Wednesday 29 January. Credit: Anders Byström

Defects in tRNA biogenesis influence gene expression and are associated with many types of human diseases, such as cancer and neurological diseases. In his thesis, Fu Xu contributes to new knowledge about the factors that modulate tRNA-biogenesis.

The genetic information in DNA is decoded to RNA in the process of transcription, and messenger RNA (mRNA) is decoded to proteins in the translation process. During translation, transfer RNA (tRNA) functions as an adaptor molecule by carrying amino acids to the ribosomes, the cell´s protein factory. Thus, factors required for biosynthesis and function of tRNA are essential for protein biosynthesis.

Many of the human genes and proteins are similar to those found in yeast cells. The researchers therefore use yeast as a model to learn more about the gene functions of humans.

In his thesis, Fu Xu found that the YPK9 protein influences the translation process in yeast. In a genetic screen for factors required for read-through of a termination codon by a suppressor tRNA, he found that lack of the Ypk9 protein causes a defect in this read-through by influencing the cellular levels of polyamines, which are positively charged metabolites.

"The human homolog to the Ypk9 protein is named PARK9 and is associated with Parkinson's disease. Thus, my observation in yeast may provide a hint for the mechanism of PARK9-associated Parkinson's disease," says Fu Xu.

Elongator is a protein complex required for formation of a specific set of tRNA modifications in eukaryotic organisms. Inactivation of the Elongator complex causes a translational defect generating multiple phenotypes in yeast and has also been linked to diseases in human. In his thesis, Fu Xu shows that the mRNA-binding protein Ssd1 modulates the multiple phenotypes of an Elongator mutant.

Additionally, Fu Xu identified several novel factors that promote tRNA maturation that are critical for translation.

More information: Factors modulating tRNA biogenesis and function in Saccharomyces cerevisiae: umu.diva-portal.org/smash/record.jsf?pid=diva2%3A1377835&dswid=-3695

Provided by Umea University