A new puzzle piece to control the aging and age-related diseases

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Martin Ott. Credit: Magnus Bergström/Wallenbergstiftelserna

A basic discovery of how the cellular functions are connected to control aging is presented in the journal *Cell Metabolism*. The study shows that an increasingly deteriorating communication between the cells' organelles is an important cause of aging. The discovery is the result of a collaboration between five research groups at the University of Stockholm and Gothenburg.

"The whole project aims at finding new ways to address the problems of aging and, in the long term, to slow down or treat the onset of age-related diseases such as neurological diseases and dementia," explains Martin Ott, professor at Stockholm University.

In times when the general life expectancy increases, society confronts a growing challenge to provide an aging population with welfare and healthcare. It is therefore an urgent task to unravel the basic principles of biological aging, whose details are found at the cellular level.

Organelles are the cell's equivalent to the body's organs, each fulfilling a specific function. Previous research has shown that in aging cells, organelles stop functioning one after the other, but it is unclear what causes this. Because the organelles are coordinated to counteract damage to proteins that occur in cells, their interdependencies are of great importance for aging and health.

One such organelle is the mitochondrium, and it acts as the cell's power plant. The new study lead by Ott shows that it is production of mitochondrial proteins that controls the well-being of the whole cell via previously unknown communication links. When mitochondria are exposed to stress, a protection program is activated to keep all the functions of the cell in check, a mechanism that also operates when cells age. Importantly, the study shows that in aging cells, this communication between the organelles collapses, which causes vital cellular functions to deteriorate or fail.

"It has been a very rewarding and inspiring collaboration, in which each research group has contributed with key expertise. What we now want to investigate is when, how and why communication between cellular organelles ceases to function during aging," says Claes Andréasson, a lecturer at Stockholm University and a senior author of the study.

The discovery is based on studies of yeast cells. Although yeast may seem to have few similarities with humans, the mechanisms that control aging at the cellular age are essentially the same. Therefore, it is highly likely that the aging mechanisms identified at the cellular level in this study are also active in human cells.

More information: "Mitochondrial Translation Efficiency Controls Cytoplasmic Protein Homeostasis" *Cell Metabolism* (2018), DOI: 10.1016/j.cmet.2018.04.011

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