Yeast mutants unlock the secrets of aging

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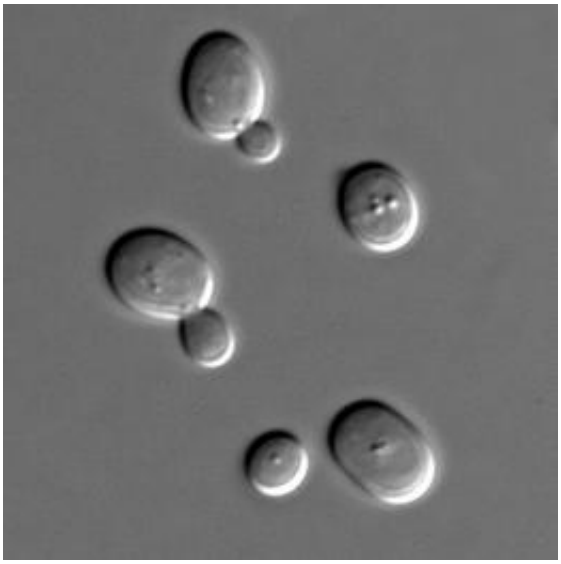

Sacharomyces cerevisiae cells in DIC microscopy. Credit: Wikipedia.

Yeast—it's more than just a fungus. It can also tell us a lot about growing older.

That's because aging in both human and yeast cells is not only the result of passive wear and tear. It's also caused by an active process orchestrated by a distinct set of genes, some of which slow down aging while others speed it up.

In two recently published articles, Concordia biology professor Vladimir Titorenko from the Faculty of Arts and Science and a team of fellow researchers take a closer look into what these delaying and accelerating

yeast genes might mean for humans.

"We're the first to provide evidence for the existence of genetic mechanisms that limit lifespan," Titorenko says.

For the studies, the researchers exposed yeast to lithocholic acid, an aging-delaying natural molecule that Titorenko discovered in a previous study. In so doing, they created long-lived yeast mutants that they dubbed "yeast centenarians."

These yeast mutants lived five times longer than their normal counterparts because their mitochondria—the part of the cell responsible for respiration and energy production—consumed more oxygen and produced more energy than in normal yeast. The centenarians were also much more resistant to oxidative damage, which is another process that causes aging.

"This confirms that lithocholic acid, which occurs naturally in the environment, can not only delay yeast aging but can also force the evolution of exceptionally long-lived yeast," Titorenko explains.

Reprogramming aging

The next step? Using yeast centenarians to test two types of aging theories:

1. Programmed aging theories claim that organisms are genetically programmed to have a limited lifespan because aging serves some evolutionary purpose. That would mean that there are active mechanisms that cause aging and limit lifespan.

2. Non-programmed aging theories contend that aging doesn't serve an evolutionary purpose. Therefore, an evolved mechanism whose main

goal is to cause aging or limit lifespan simply cannot exist. What's more, non-programmed aging theories posit that any exceptionally long-lived organism must grow slower and reproduce less efficiently than an organism whose lifespan is limited at a certain age.

By producing long-lived yeast mutants and culturing them separately from normal yeast, Titorenko and his team were able to show that the centenarians grow and reproduce just as efficiently as the non-centenarians—thereby confirming programmed aging theories.

From Titorenko's perspective, these findings are significant—for humans as well as yeast.

"By confirming that there are active mechanisms limiting the longevity of any organism, we provided the first experimental evidence that such lifespan-limiting active mechanisms exist and can be manipulated by natural molecules to delay aging and improve health."

Provided by Concordia University