Did scientists discover the secret of youth?

Finding. Researchers claim to have unraveled key mechanisms behind the mysteries of aging. Metro investigates the issue.

Future. Researchers found out that they could manipulate and optimize the aging process. / ISTOCK

Daniel Casillas
Metro World News

Aging is undoubtedly one of the greatest human fears. And many people seek to delay it with different products or surgeries.

The global anti-aging market generates millions of dollars in profits. According to data by Statista, in 2018 it was estimated to be worth about $50.2 billion. Moreover, it is expected to enjoy a 5.7 percent compound annual growth rate until 2023.

That could be explained by several factors. One of those is the increased aging of the world's population. Others have to do with social pressure that makes people want to look younger and social networks.

"The market has been shaped by constantly changing customer demands. Since the majority of the customer base in the market has become social media savvy, awareness about anti-aging solutions has been on a rise. Hence, providing innovative and effective products & services has become imperative for market players," Grand View Research, business consulting firm, published in a report.

While anti-aging products and procedures continue the rise, so does scientific research. Recently molecular biologists and bioengineers at the University of California, San Diego have unraveled the key mechanisms behind the mysteries of aging. They discovered two distinct pathways that cells travel during aging and designed a new way to genetically program these processes to extend life.

Experts found that the same type of cells can age in different ways, possibly depending on various factors during the first few days of the cells' lives when they are in a more sensitive state.

"The movie 'Jurassic Park' brought home to many of us the 'butterfly effect': that a minor event can sometimes lead to drastic consequences. It only happens if this event occurs when a system is in a sensitive state. Our results show that early in life, a cell is indeed in such a sensitive state, and it can choose one of two aging paths", Lev Tsimring, Lorraine Pillus and Nan Hao, researches at at the University of California San Diego, the U.S., explained to Metro.

By discovering the different ways in which the same cells can age, researchers found out that they could manipulate and ultimately optimize the aging process. Computer simulations helped them to reprogram the master molecular circuit by modifying its DNA, allowing cells to genetically create a new path with a dramatically extended lifespan.

The researchers studied aging in the budding yeast, but they do not rule out that their findings may one day be applied to human cells.

"Whether such manipulation would work in humans is the most important question. There is a reason to believe that the answer may well be "Yes." Here's why: genes fundamentally controlling the two paths are deeply conserved over evolutionary time. That is, they are incredibly similar in all kinds of organisms ranging from yeast to human," the researches concluded.

4 QUESTIONS TO...

Nan Hao,

senior author of the study and an associate professor in the Section of Molecular Biology at the University of California San Diego

1 How did you unravel the mysteries of aging?

—We studied aging in budding yeast – the champion of many biological experiments that is also a stalwart contributor to beer-making and baking! Yeast DNA is easy to modify and yeast cells age in a similar way as do human cells, especially our skin cells and stem cells. We used cutting-edge imaging technologies to track how the molecules and components inside each cell change in real-time during each step of their lives and as they near death. These analyses enabled us to discover two aging paths and the molecular circuit the governs how cells age.

2 Tell more about those paths.

—We found that cells with the same DNA, which are experiencing the same controlled environment, aged in two very different ways. About half of the cells age with a gradual decline in the stability of their DNA, whereas the other half age with a decline in their mitochondria, the energy production factories of the cell.

3 Why do cells age differently?

—A small tweak or fluctuation can push it in one or the other direction. Such fluctuations can come from the environment outside the cell or they may be due to inherent randomness in processes that control the life cycle of every cell. In our experiments, we worked to eliminate external fluctuations and found that early in a cell's life, inherent randomness was apparently enough to push cells onto different aging paths.

4 The research suggests that there is a way to manipulate the process. How is that?

—We identified molecular processes underlying the two aging paths and the connections between them, revealing a molecular circuit of proteins and genes that controls cell aging. This circuit is analogous to the electrical circuits that control our home appliances. Computer analysis helped us simulate how the circuit works and predict, if we reprogram the circuit, how it will affect aging and lifespan. Guided by the computer simulations, we then modified the DNA inside of cells to reprogram the circuit and created a third new aging path with a dramatically extended lifespan.

We actually showed that simultaneous altering the factors influencing both aging paths can promote a third path that is characterized by a longer and healthier lifespan.

R-UP

Four innovative ways to combat aging

1 Drugs
In recent years, biogerontologists at Paul F. Glenn Center for Aging Research at the University of Michigan documented four different drugs that work in mice to slow aging and postpone diseases and disabilities that make aging problematic.

2 Gene therapy
Libella Gene Therapeutics says it will administer a gene therapy to volunteers could reverse aging for up to 20 years. The therapy will attempt to repair people's telomeres, the caps on the end of our chromosomes that shorten as people age.

3 Anti-ageing' protein
In a recent study, researchers at University College London identified a novel anti-aging protein called Gaf1. They found that Gaf1 controls protein metabolism, a process that is related to aging. They also found that without this protein, cells have a shorter life span.

4 Pathways to extend the lifespan
Scientists at the MDI Biological Laboratory have identified synergistic cellular pathways for longevity that amplify lifespan fivefold in ***Caenorhabditis elegans***, a nematode worm used as a model in aging research. The increase in lifespan would be the equivalent of human living for 400 or 500 years.

CREATIVECOMMONS