Researchers link calorie intake to cell lifespan, cancer development (w/ Video)

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UAB Research Associate Yuanyuan Li, Ph.d., M.D., works in her biology laboratory. Credit: Jamie Cottle/UAB

Researchers from the University of Alabama at Birmingham (UAB) have discovered that restricting consumption of glucose, the most common dietary sugar, can extend the life of healthy human-lung cells and speed the death of precancerous human-lung cells, reducing cancer's spread and growth rate.

The research has wide-ranging potential in age-related science, including ways in which calorie-intake restriction can benefit longevity and help prevent diseases like cancer that have been linked to aging, said principal investigator Trygve Tollefsbol, Ph.D., D.O., a professor in the Department of Biology.

"These results further verify the potential health benefits of controlling calorie intake." Tollefsbol said. "Our research indicates that calorie

reduction extends the lifespan of healthy human cells and aids the body's natural ability to kill off cancer-forming cells."

The UAB team conducted its tests by growing both healthy human-lung cells and precancerous human-lung cells in laboratory flasks. The flasks were provided either normal levels of glucose or significantly reduced amounts of the sugar compound, and the cells then were allowed to grow for a period of weeks.

"In that time, we were able to track the cells' ability to divide while also monitoring the number of surviving cells. The pattern that was revealed to us showed that restricted glucose levels led the healthy cells to grow longer than is typical and caused the precancerous cells to die off in large numbers," Tollefsbol said.

In particular, the researchers found that two key genes were affected in the cellular response to decreased glucose consumption. The first gene, telomerase, encodes an important enzyme that allows cells to divide indefinitely. The second gene, p16, encodes a well known anti-cancer protein.

"Opposite effects were found for these genes in healthy cells versus precancerous cells. The healthy cells saw their telomerase rise and p16 decrease, which would explain the boost in healthy cell growth," Tollefsbol said. "The gene reactions flipped in the precancerous cells with telomerase decreasing and the anti-cancer protein p16 increasing, which would explain why these cancer-forming cells died off in large numbers."

The UAB research into the links between calorie intake, aging and the onset of diseases related to aging is thought to be a first of its kind given that it used the unique approach of testing human cells versus laboratory animals.

"Our results not only support previous findings from the feeding of animals but also reveal that human longevity can be achieved at the cellular level through caloric restriction," Tollefsbol said.

"The hope is that this UAB breakthrough will lead to further discoveries in different cell types and facilitate the development of novel approaches to extend the lifespan of humans," he added.

More information: The group's study titled "Glucose Restriction Can Extend Normal Cell Lifespan and Impair Precancerous Cell Growth Through Epigenetic Control of hTERT and p16 Expression" has been published in the online edition of *The Journal of the Federation of American Societies for Experimental Biology*, or *FASEB Journal*.

Provided by University of Alabama at Birmingham