

Study suggests sugary diet endangers waste-eating protein crucial to cellular repair

December 16 2020



Credit: Pixabay

A protein that functions like the vintage video game Pac-Man, eating toxic cellular waste caused by high sugar intake, is itself compromised by a sugary diet, according to the results of a study in mice with potential implications for humans. The study, led by a research team at Tufts University joined by researchers at eight other institutions, appears in *Aging Cell*.

The protein alleviates age-related cellular damage stemming from too much [sugar](#) consumption, according to the study findings. "This is a 'double jeopardy' impact. On one hand, proteins are damaged by excess sugars and must be removed to avoid [toxic effects](#) on [cells](#). On the other hand, the very protein that works to remove and repair our cells from a high sugar diet is itself vulnerable to sugar, leaving cells threatened," said Allen Taylor, co-last author and lead scientist at the Nutrition & Vision Research Team at the Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University (USDA HNRCA).

A high-sugar diet, typical in the United States, causes damaging byproducts to build up in cells. The byproducts, called advanced glycation end products (AGEs), accumulate and are linked with age-related diseases. The study results show that the Pac-Man-like protein, called p62, is essential for the removal of toxic cellular waste caused by sugar through a process called autophagy, which literally means self-eating. The autophagy process clears the cells of damaging byproducts of high sugar intake.

Researchers compared the tissues of laboratory mice that were fed either high-sugar or low-sugar diets and found:

- p62's self-cleaning ability plays a role in clearance of AGEs (the damaging byproducts of sugar intake). Augmenting p62 accelerates cell cleaning.
- Loss of p62 leads to cell toxicity from sugar and accumulation of AGEs.
- p62's targeting of cells for clean-up is compromised by glycative stress, a reaction from sugar.
- Autophagy (the body's cell-cleaning process), when chemically enhanced, protects against glycative damage.

"Our results suggest p62 could be a new target for interventions to

reduce the damage sugar does to aging cells and could one day have applications for targeting diseases such as [age-related macular degeneration](#), heart disease, diabetes, Alzheimer's and Parkinson's," said co-last author Eloy Bejarano, a scientist on the Nutrition & Vision Research Team at the USDA HNRCA.

The first author on the study is Gemma Aragonès, a research associate also on the Nutrition and Vision Research Team.

"In light of these results—and because the p62 [protein](#) works similarly in the human body—we can look at ways to leverage it to enhance cell function for older adults. Solutions might include recommending diets that help reduce sugar loads, drugs that counteract the damaging effects of too much sugar, or harnessing p62 to prevent buildup of toxic substances in cells," Taylor said.

More information: Gemma Aragonès et al. Autophagic receptor p62 protects against glycation-derived toxicity and enhances viability, *Aging Cell* (2020). [DOI: 10.1111/ace.13257](https://doi.org/10.1111/ace.13257)

Provided by Tufts University

Citation: Study suggests sugary diet endangers waste-eating protein crucial to cellular repair (2020, December 16) retrieved 16 May 2023 from <https://medicalxpress.com/news/2020-12-sugary-diet-endangers-waste-eating-protein.html>

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