Autophagy is the ultimate detox that doesn't yet live up to the hype

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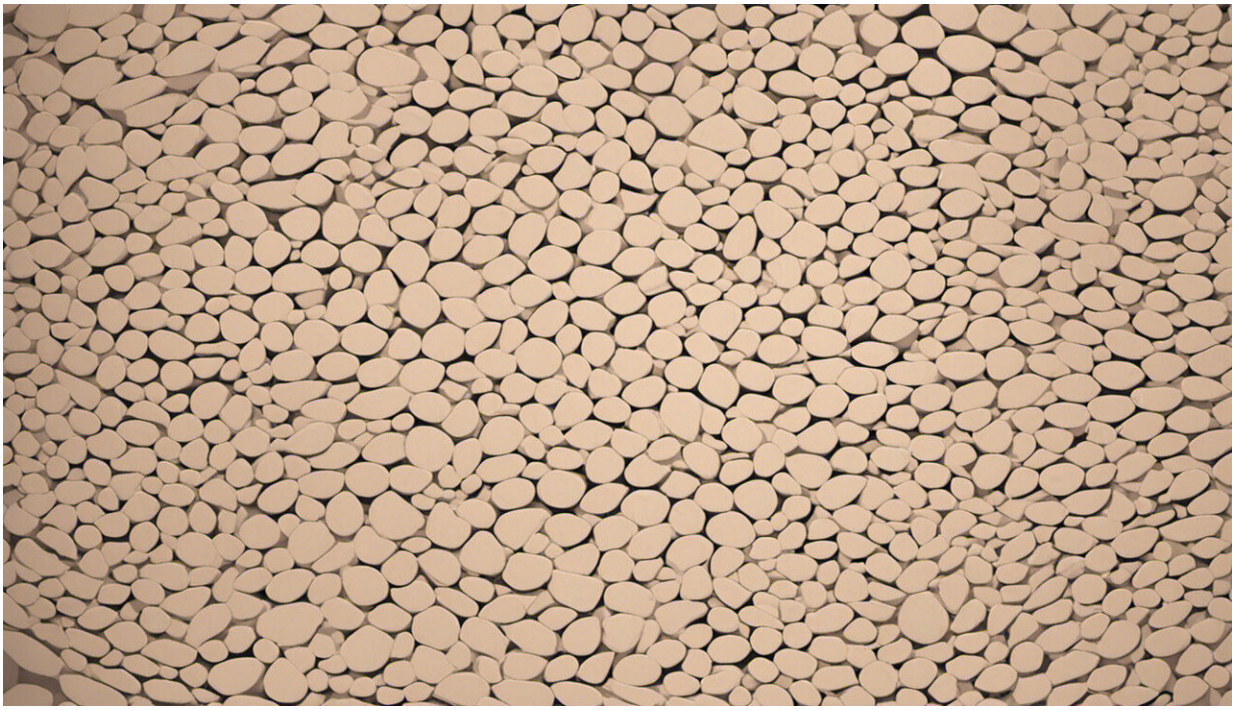


Credit: AI-generated image (disclaimer)

"The anti-aging MIRACLE." "Strengthen your immune system." "Lose weight fast."

These are some of the promises of autophagy, the silver bullet wellness influencers are saying is backed by Nobel-winning science.

In many cases, influencers say the best way to boost autophagy—the body's way of recycling molecules—is with a product available from their online store.

While autophagy sounds too good to be true, the scientific reality may cross over with the hype—at least in laboratory mice and some other organisms.

Here's where the science is up to and what we still need to find out to see if boosting autophagy helps humans.

Autophagy is the ultimate detox

Autophagy is a vital process that removes and recycles unwanted or damaged molecules from your cells.

The process begins with the cell marking unwanted or damaged organelles (made from molecules like proteins, carbohydrates, lipids, and DNA or RNA) for removal.

These marked organelles are enveloped by a membrane, sealing them inside like a garbage bag, becoming what scientists call an autophagosome.

The autophagosome then moves closer to another organelle called a lysosome, a small acidic bag filled with powerful enzymes. When the two fuse, their contents mix. The enzymes break down the rubbish into recycled nutrients your cells can re-use.

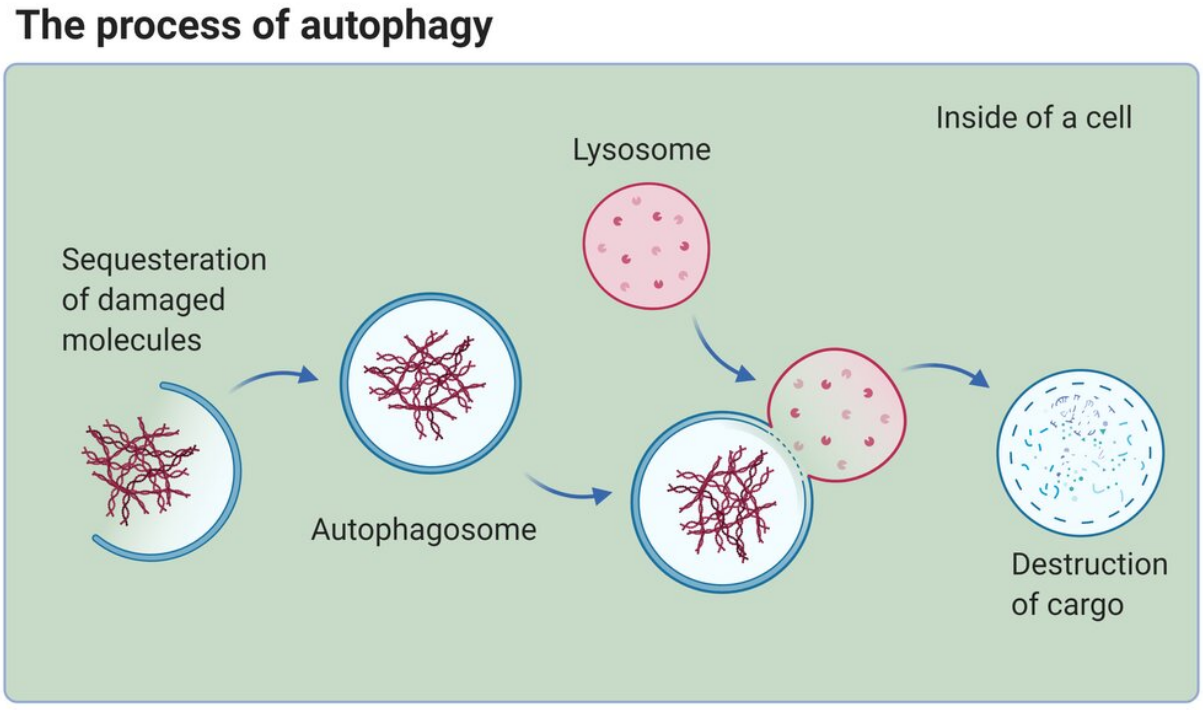
It is the ultimate detox, and you're doing it right now.

Mice benefit, but do humans?

Removing these waste products can potentially affect age-related diseases. For example, genetically engineered mice with less autophagy are more likely to develop tumors. Decreased autophagy also accelerates signs of dementia and heart disease in mice.

Autophagy degrades cellular components to re-use as an energy source during advanced stages of starvation in mice. And because autophagy is crucial for survival during starvation, it is sensitive to nutrient and energy levels. If we decrease nutrition in laboratory cells and laboratory animals, autophagy increases to compensate. This means diet can potentially modify autophagy.

It all sounds promising. But, and this is the big stumbling block, we don't really know how it acts in humans.



How autophagy works in the body. Credit: Created with BioRender.com, Author

provided

How would we know if it's the same in humans?

For us to know if fasting, taking a pill or some other activity affects autophagy in humans (and our health), we need to be able to measure if autophagy is increasing or decreasing.

And our group has developed the first test of its kind to measure how autophagy activity varies in humans. But even that is limited to blood samples. We're still not sure about the levels of autophagy in tissues like the brain or whether the autophagy activity we see in the blood matches elsewhere in the body. We are working on it.

How about those diets or pills then?

We simply do not understand enough about autophagy in humans, and there has not been enough time to test whether autophagy-boosting diets or supplements actually work in people. At best this makes various claims of boosting autophagy and its benefits premature, and at worst, completely incorrect.

Given the positive results in animals, and because autophagy is sensitive to nutrition, it is not surprising there is no end of advice and nutritional supplements that promise to increase autophagy for healthy aging.

These tend to be books or material that explain how to diet your way to more autophagy (using intermittent fasting or keto-diets for example). Or, you can buy supplements claiming to increase autophagy with ingredients such as citrus bergamot.

As dubious as these claims might seem, a lot of them do tend to stem from a grain of truth. Indeed, work on the mechanisms of autophagy really did win the Nobel Prize in 2016.

But influencers' claims wildly extrapolate from preliminary data without context. For example, a mouse can only go without food for two to three days before dying, while a human can go without food for weeks.

So exactly how much fasting is required to increase autophagy in humans is completely unknown: influencer claims of 16, 24 or 48 hours are stabs in the dark.

This is equally true for supplements. One prominent product for sale is spermidine, which can increase autophagy in the laboratory, such as in yeast and cultured human cells. However, nothing directly shows it can increase autophagy in humans.

Autophagy has only been widely studied for around 15 years. So far, we know it can slow biological aging in laboratory animals. Because of this, it has the potential to address some of the biggest health issues our society currently faces. This includes dementia, cancer and heart disease.

But, at the moment, we just don't know enough about autophagy in humans to make any claims about what we can do to increase it, or any health benefits.

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