

Intermittent fasting makes fruit flies live longer—will it work for people?

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Whether intermittent fasting is called the 5:2 diet or the 16/8 method, celebrities swear that these eating regimens are a great way to lose weight. Fasting is now trendy, but real science backs up claims that fasting two days a week or restricting eating to an eight-hour window each day leads to weight loss.

And scientists have found intermittent [fasting](#) has even more health benefits that are not related to weight: Studies in mice and other animals show that intermittent fasting also increases longevity.

But for those who want to adopt intermittent fasting to slow the aging process, there is a catch. In modern society, people are used to three meals a day, and intermittent fasting is hard.

Can the benefits of fasting be packaged in a pill? A new study of fasting fruit flies by Columbia University researchers suggests the answer may be yes.

The study, published Sept. 29 in the journal

Nature, revealed how intermittent fasting works inside cells to slow the [aging process](#) (at least, for fruit flies) and points to potential ways to get the health benefits of fasting without the hunger pangs.

Intermittent fasting and time-restricted feeding in general limit food, but not overall caloric intake, to specific hours of the day. (In contrast, dietary restriction, which also has been shown to increase longevity, reduces caloric intake.)

"Because [intermittent fasting](#) restricts the timing of eating, it's been hypothesized that natural biological clocks play a role," says Mimi Shirasu-Hiza, Ph.D., associate professor of genetics & development at Columbia University Vagelos College of Physicians and Surgeons and an expert in [circadian rhythms](#), who led the study.

Shirasu-Hiza and Matt Ulgherait, Ph.D., an associate research scientist in her lab, turned to fruit flies to investigate. Fruit flies have similar biological clocks to humans, staying active during daylight and sleeping at night, while also sharing roughly 70% of human disease-related genes. Fruit flies are an excellent model for aging, Shirasu-Hiza says because fruit flies and humans age in similar ways, but since [fruit flies](#) only live for two months, aging experiments are more technically feasible.

The researchers put their flies on one of four different schedules: 24-hour unrestricted access to food, 12-hour daytime access to food, 24-hour fasting following by 24-hour unrestricted feeding, or what the researchers called intermittent time-restricted fasting or iTRF (20 hours of fasting followed by a recovery day of unlimited feeding).

Among the four eating schedules, only iTRF significantly extended the lifespan—18% for females and 13% for males.

And the timing of the 20-hour fast was critical: Lifespan increased only for flies that fasted at night and broke their fast around lunchtime. The lifespans of flies that instead fasted all day, eating only at night, did not change.

Provided by Columbia University Irving Medical Center

For the researchers, the role of time was a big clue to how fasting is linked to longevity. They found that a cell-cleaning process kicks in after fasting, but only when fasting occurs during the night. Scientists call the cell-cleaning process autophagy (Greek for self-eating), and the process is known to slow aging by cleaning up and recycling damaged components of the cell.

"We found that the life-extending benefits of iTRF require a functional circadian rhythm and autophagy components," Shirasu-Hiza says. "When either of those processes were disrupted, the diet had no effect on the animals' longevity."

iTRF not only increased the flies' lifespan, the eating regimen also improved the flies' "healthspan," increasing muscle and neuron function, reducing age-related protein aggregation, and delaying the onset of aging markers in muscles and intestinal tissues.

Human cells use the same cell-cleaning processes, so the findings raise the possibility that behavioral changes or drugs that stimulate the cleaning process could provide people with similar health benefits, delaying age-related diseases and extending the lifespan.

"Any type of restricted eating is difficult," says Ulgherait. "It requires a lot of discipline, and most studies of time-restricted fasting in humans have built in a cheat day to make it more tolerable. It would be much easier to get the same [health benefits](#) if we could enhance autophagy pharmacologically, specifically at night."

More information: Matt Ulgherait et al, Circadian autophagy drives iTRF-mediated longevity, *Nature* (2021). [DOI: 10.1038/s41586-021-03934-0](https://doi.org/10.1038/s41586-021-03934-0)

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