

Study shows obese flies live longer on a diet at any age

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Drosophila. Credit: Wikipedia

Old, obese flies get healthier and live longer if put on a diet, University of Connecticut researchers report [on Dec. 8 in *PNAS*](#). If the effect holds true for humans, it would mean it's never too late for obese people to improve their health with diet.

For way too many of us, eating too much goes along with getting old and

a tendency to be obese. Different health organizations define obesity differently, but all agree it means having too much body fat, and is associated with a host of diseases related to metabolism including heart disease and diabetes.

Many animal studies have shown that eating less—meaning sharply restricting [calories](#) without malnutrition—lengthens [lifespan](#). While [human trials](#) have shown evidence of beneficial effects of eating less on health, especially in healthy obese individuals, studies examining effects on lifespan have been unrealistic for humans.

Now, UConn School of Medicine researchers have shown that [fruit flies](#) fed a high-sugar, high-protein, high-calorie diet that mimics the processed modern diet have [metabolic changes](#) similar to obese humans. Switching these obese flies to a [low-calorie diet](#), even very late in life, can dramatically change their metabolisms and extend their lives.

Fruit flies live short and fast—the lifespan of flies raised on a high-calorie diet is less than 80 days, while the longest-lived on a low-calorie diet can reach 120 days. To test whether changes in diet late in life can change a fly's lifespan, researchers led by geneticist Blanka Rogina from UConn's Department of Genetics and Genome Sciences and the Institute for Systems Genomics raised several batches of fruit flies.

Some of the flies were raised on a low-calorie diet that provided just half the energy of a regular diet, while the others were raised on a high-calorie diet that provided three times the usual number of calories.

In this study, they looked specifically at male flies. Young flies switched from a high-calorie to a low-calorie diet at 20 days old lived very long lives, similar to the flies fed a low-calorie diet from day one.

What surprised the researchers was that switching the flies' diet to a low-

calorie one remained a reliable way to extend lifespan even for old flies in ill health. The older insects raised on the high-calorie diet had more lipids in their bodies, and they expended more energy defending their bodies from reactive oxygen species.

They also had a higher death rate than flies raised on the low-calorie diet. But when the surviving high-calorie flies were switched to a low-calorie diet at 50 or even 60 days (when most of the high-calorie flies had already died) their metabolisms changed, their death rate plummeted, and their lifespans lengthened.

"Our studies were performed in flies aged on a high-calorie diet, akin to obese individuals, suggesting that late-life diet shift in obese humans might have remarkable beneficial impact on health," Rogina says.

UConn School of Medicine Genetics and Genome Sciences Chair Brent Graveley and other researchers on the team looked at the genes expressed by the high-calorie flies and contrasted them with the low-calorie flies. Genes that control physiological and metabolic adaptation are different between the groups.

"The remarkable finding of this study is that even after living a significant portion of their lives on a high-calorie diet, flies can gain the benefits of life span extension by simply switching to a low-calorie diet," Graveley says.

The team's results show that flies' metabolisms can adapt to a change in diet even in old age. Since many basic metabolic pathways in fruit flies are shared with humans, this study suggests that human metabolism may respond the same way, and individuals eating a [high-calorie diet](#) could benefit from reducing their calorie intake in old age. The researchers are currently analyzing data from female fruit flies to see if there are any sex-related differences in response to [diet](#) shifting.

More information: Michael Li et al, Late-life shift in caloric intake affects fly metabolism and longevity, *Proceedings of the National Academy of Sciences* (2023). [DOI: 10.1073/pnas.2311019120](https://doi.org/10.1073/pnas.2311019120)

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