

New discovery shows how living longer can be achieved without eating less

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Monash scientists have provided new insights into the role of protein and cholesterol in diet which may have implications for aging.

Scientists have known for almost a century that moderate [dietary restriction](#) can extend lifespan in a broad range of animals, but they didn't know how.

Using dietary manipulations in [flies](#), researchers from the Monash University School of Biological Sciences have now found that [protein](#) is important, but only because it changes the availability of another key nutrient for maintaining body integrity—cholesterol.

The findings are outlined in a study published today in *eLife*.

"Historically, the major components of the diet, such as protein, carbohydrate and fat, have been the focus of attention in aging studies," said lead study author, Brooke Zanco, a Ph.D. candidate at the Monash University School of Biological Sciences.

"This is because low protein diets consistently extend lifespan across a broad range of animals," she said.

"We now show that the problem is not protein, but a deficiency in a micronutrient."

But what components of the diet are important and what is the correct balance?

Evidence during the last 15 years has increasingly focused on the role of protein, with animals found to live longer if they eat less protein.

When flies eat high protein diets, they are triggered to commit key nutrients (such as cholesterol) to [reproduction](#) at the expense of maintaining their own body. This shortens their lifespan.

"Until now we thought that low protein diets increased animal lifespan by reducing reproduction," said co-study author Dr. Matthew Piper, also from the School of Biological Sciences.

"However, reproduction in itself is not the problem," he said.

"Instead, we have found that increased dietary protein results in increased reproduction and this depletes the mother of key micronutrient stores at a rate faster than they can be replenished.

"It is this secondary depletion of the micronutrient cholesterol that shortens her lifespan."

The research team found they could extend the flies' lifespans by feeding them more of the micronutrient or by feeding them a drug to suppress reproduction.

Flies have a different physiological requirement for cholesterol than humans. Flies require cholesterol in their diet but humans make their own cholesterol. Flies also have a different circulatory system from

humans and unlike humans, their blood vessels are not blocked by cholesterol plaques.

However, humans also have essential dietary components that they only need in very small amounts (for example vitamins such as folate and B12) and the requirement for these increases when reproduction is most costly. This is why [pregnant women](#) are often encouraged to take folate supplements during pregnancy.

"Our work brings us closer to understanding the mechanistic basis of dietary manipulation and the aging process," said Dr. Piper.

"Humans fast intermittently or restrict calorie intake in the hope of living longer and healthier lives," he said.

"Our study shows that perhaps people don't need to eat less to live longer and healthier lives but instead consume a rich food [diet](#) that is modified to be correctly balanced."

Further studies are needed to determine if these same nutrient dependent trade-offs are occurring in other animals consuming high protein diets. The research team is now looking into exactly how dietary [cholesterol](#) depletion reduces [lifespan](#).

More information: Brooke Zanco et al. A dietary sterol trade-off determines lifespan responses to dietary restriction in *Drosophila melanogaster* females, *eLife* (2021). [DOI: 10.7554/eLife.62335](https://doi.org/10.7554/eLife.62335)

Provided by Monash University

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