

Reproductive strategy drives slower female aging

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Researchers at Linköping University use fruit flies as a model organism to study sex differences in aging. Credit: Karin Söderlund Leifler/Linköping University

The aging of males and females is influenced by how they choose to invest their available energy, according to a study of fruit flies carried

out at Linköping University, Sweden. The results, published in *The American Naturalist*, support the idea that differences in strategy between the sexes to maximise the number of offspring contribute to differences in aging between males and females.

Differences in aging and the length of life between [males](#) and [females](#) are common in the animal realm. Males often have shorter lifespans than [females](#). A research group at Linköping University is trying to find out why this is the case. One possibility is that sex differences in aging lead to maximum numbers of [offspring](#) that animals produce during life.

"The idea is that each individual has a certain amount of resources that can be used for different activities. The individual can either invest more energy into increasing the probability of having as many offspring as possible, here and now, or invest more energy into maintaining the body in good shape, to live longer and continue to have offspring. We wanted to test the theory that the sexes give different priorities to the way they use their resources, and that this contributes to sex differences in aging", says Martin Brengdahl, doctoral student at the Department of Physics, Chemistry and Biology and principal author of the article describing the study.

The strategies used by the sexes for successful reproduction differ. In many species, the possibility for males to father many offspring depends on how well they compete with other males for the available females. It may be a case of winning physical battles, or attracting females in various ways using bright colours or attractive sounds. This evolutionary mechanism that determines the access of a male to females, and in this way his possibility to pass on his genes to the next generation, is known as "sexual selection".

The researchers used fruit flies, *Drosophila melanogaster*, to investigate whether sexual selection lies behind [sex differences](#) in aging. They

wanted to determine whether the two sexes are affected differently when they are in poorer physical condition, in other words, when they have poorer access to nutrients and energy. In particular, they were interested in the ability of the flies to reproduce, and how this ability changes when the flies age, in a process known as "reproductive aging".

The flies were allowed to do what they are experts at: eating and mating. However, the researchers had manipulated the genetic material of some of the flies, such that they had many small harmful mutations in their genes. These mutations had a negative influence throughout life, meaning that an individual with such mutations converted food to useful energy slightly less efficiently. Thus, even though all of the flies had access to the same food and could eat equal amounts, the manipulated flies were in poorer physical condition.

In order to mate with available females, the aging males were compelled to compete with young males. It turned out, as expected, that males in good physical condition were better at this than those who were in poorer condition, independently of how old they were. The reproductive aging of males, however, decreased at the same rate, independently of whether they were in good or poor physical form.

Things were different for females. Early in life, there was no difference between the number of offspring produced by females in good condition, who could use the available resources better, and the number produced by mutated females, who were in poorer condition. The two groups, however, aged at different rates. As the females became older, those who were in good physical form had more offspring than their less fortunate sisters. The results are compatible with the idea that it is access to resources, such as the energy from food, that limits the number of offspring a female can have.

"The results show that [sexual selection](#) contributes to the differences

between the sexes in reproductive aging. This "is" probably because females in good condition, with good access to nutrients, invest the extra resources into maintaining their bodies, such that they can continue to reproduce to a more advanced age. Males, in contrast, seem to invest a great deal of their resources, independent of their condition, into trying to ensure that they achieve successful mating here and now", says Martin Brengdahl.

The researchers believe that the result is valid for species other than [fruit flies](#), while there may be differences between species in the way in which aging is influenced when resources are limited.

More information: Martin Brengdahl et al. Genetic Quality Affects the Rate of Male and Female Reproductive Aging Differently in *Drosophila melanogaster*, *The American Naturalist* (2018). [DOI: 10.1086/700117](#)

Provided by Linköping University

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