

Genetics of attraction: Mate choice in fruit flies

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The fruit fly *Drosophila melanogaster* is a common model organism for studying sexual selection and evolution. Credit: Stefan Lüpold, UZH

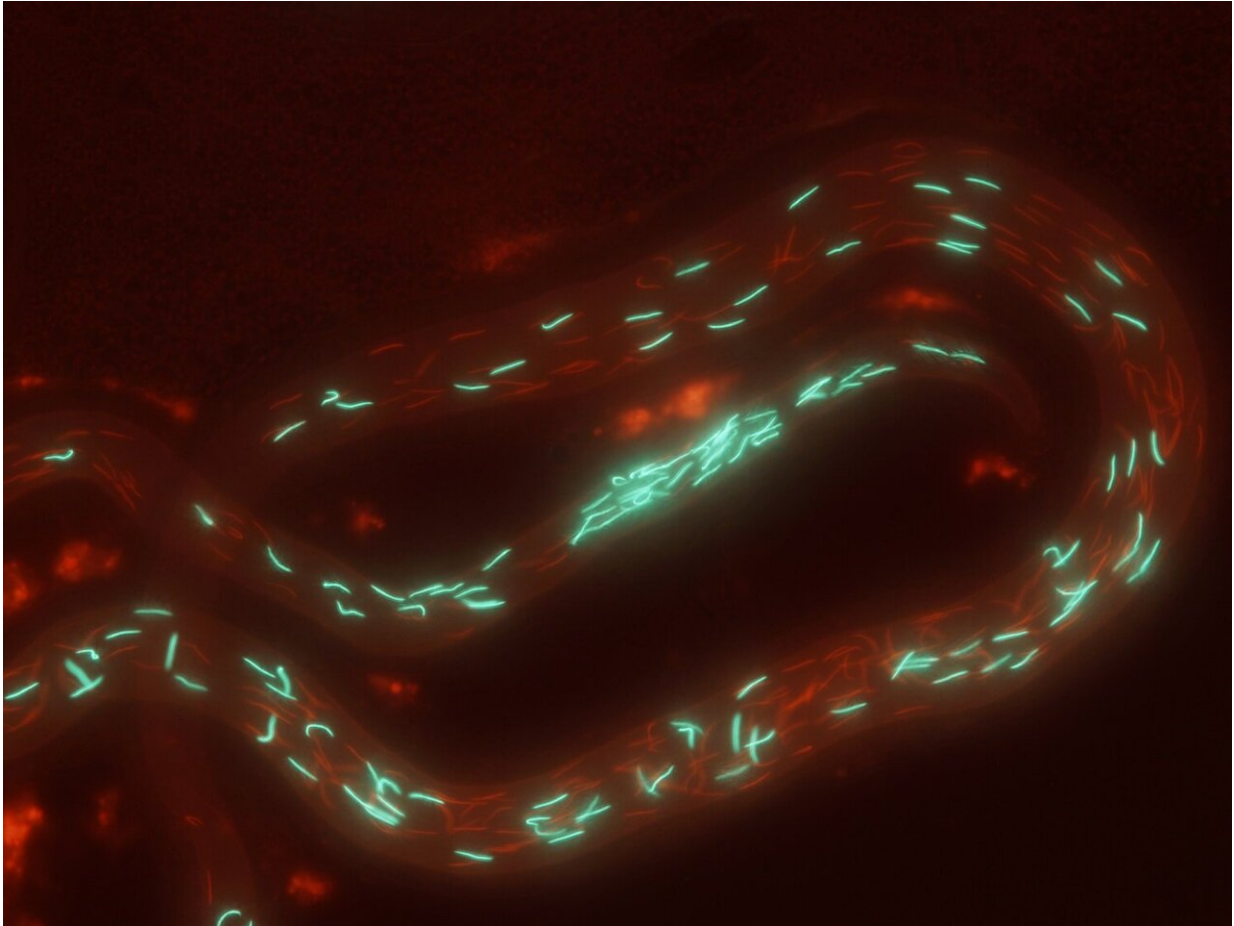
Genetic quality or genetic compatibility? What do female fruit flies prioritize when mating? Researchers at the University of Zurich show that both factors are important at different stages of the reproductive process and that females use targeted strategies to optimize the fitness of their offspring.

Breeding female fruit flies face a difficult decision: do they mate with the male that has the best genes, or with the one whose genes best match their own? Evolutionary biologists from the University of Zurich and Concordia University have now investigated this question, because, as UZH professor Stefan Lüpold explains, "the processes underlying mate choice influence the evolution of male sexual characteristics and thus the variation within a population—not only in flies."

Fluorescent sperm reveal reproductive process

The fruit fly *Drosophila melanogaster* is a common model organism for studying [sexual selection](#) and evolution. In this species, males do not provide any material benefits to [females](#), such as food or parental care. But the choice of mates can influence the fitness of the female's offspring through survival, growth and reproduction.

The research team led by Stefan Lüpold staged competitive matings of fruit flies. The male competitors differed in the quality of their genes and in their genetic compatibility with the target female. Using fluorescently labeled [sperm](#), the researchers tracked the entire reproductive process, from sperm in the [female reproductive tract](#) to paternity outcomes. The work is published in the journal *Science Advances*.



Using fluorescently labeled sperm, the researchers tracked the entire reproductive process. Credit: Stefan Lüpold, UZH

Pre-selecting at mating, readjusting during sperm storage

[This study](#) revealed that both factors—the [genetic quality](#) of males and their genetic compatibility with females—influence reproduction, though varying in importance across reproductive stages. For example, males with high-quality genes generally have higher mating success. But females, routinely mating with multiple males, can influence sperm storage and fertilization success by ejecting some of the sperm after mating.

Females appear to delay this sperm ejection if a male has better genes or is more compatible with the female than his predecessor. This gives the preferred sperm more time to enter the female storage organs and displace the rival sperm already residing there. The complex interplay of these processes ultimately affects paternity.

Sophisticated interplay between genetic quality and compatibility

"Our results suggest that female fruit flies use different criteria across stages of the reproductive process to influence the outcome of their mating activity," says last author Stefan Lüpold. "While choosing mates, they can preselect for males of superior genetic quality and then bias sperm storage to ensure that the most compatible of these fertilize their eggs. This approach might give them the best of both worlds."

According to Lüpold, the study offers new insights into the mechanisms and consequences of mate choice. "It helps us better understand how genes are passed on, [genetic variation](#) is maintained within species, and new species may arise."

More information: Hayat Mahdjoub et al, Interplay between male quality and male-female compatibility across episodes of sexual selection, *Science Advances* (2023). [DOI: 10.1126/sciadv.adf5559](https://doi.org/10.1126/sciadv.adf5559)

Provided by University of Zurich

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