

# Fruit fly testes offer potential tool against harmful insects

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A way to curb nagging insects has been flying under our radar—an enzyme from fruit fly testes. The compound could control bugs that carry disease and harm crops by stunting their ability to procreate, Johns

Hopkins University researchers found.

"We have a toe in the door to control fruit fly populations with this enzyme," said Steven Rokita, a professor of chemistry at Johns Hopkins who led the research. "It could offer a good way to control fertility of all kinds of biological and agricultural pests, starting with mosquito populations."

The findings are set to [publish](#) in *Proceedings of the National Academy of Sciences*.

Rokita's group stumbled upon the discovery while studying how iodide works in the thyroid gland. The team previously demonstrated the ubiquity of the enzyme iodotyrosine deiodinase, which seemed to play an unexpected role in key physiological processes of certain bacteria, invertebrates, and many other organisms.

The new insights show suppressing it in fruit flies leads to an overload of bromotyrosine, a natural variation of the common amino acid tyrosine. Too much of that compound hinders the insect's sperm-making ability.

Scientists previously thought the enzyme was limited to organisms that generate thyroxine, one of the [thyroid hormones](#) produced by all vertebrates, including mammals, birds, reptiles, amphibians, and fish. The enzyme's job is to keep the body's iodine levels at healthy thresholds to produce thyroid hormones, which regulate metabolism, growth, and other functions.

"To our surprise, this enzyme is in a huge number of animals, some bacteria, fruit flies, sea anemones—all kinds of organisms that don't need iodide," Rokita said. "What's it doing there if these organisms don't need it?"

By removing and dissecting the testes of fruit flies, the team tracked how the enzyme regulates bromotyrosine levels. When they turned off the specific gene responsible for the enzyme, they saw bromotyrosine build up in the fruit fly testes.

"It turns out that if the enzyme is lacking, bromotyrosine accumulates in male [fruit flies](#), and that overload severely inhibits spermatogenesis," Rokita said. "All flies have a similar gene, which means they might react to bromotyrosine in a similar way."

Potential pest control strategies could include using standard sugar-based mosquito traps mixed with bromotyrosine or other substances that stop the enzyme from working, Rokita said.

The scientists are testing their findings on mosquitoes with the Johns Hopkins Malaria Research Institute.

Enzymes are proteins that help speed up various biological processes that sustain our bodies. Even though the enzyme in question is like a mammalian [enzyme](#) of similar function, humans don't express it in their testes, and bromotyrosine is unlikely to affect human fertility, Rokita said.

The findings show the value of exploring biological processes scientists often ignore, Rokita said. Specifically, the findings show many living things rely on the process of halogenation, where bromine or similar elements are added to molecules like the amino acid tyrosine to control key bodily functions.

This reaction is common to many organisms, but its function had only been clearly defined in the thyroid, Rokita said.

"This is opening our eyes to the idea that halogenation of tyrosine might

be common and very important either because it's detrimental or because it's some kind of regulatory response that we had missed all this time," he said.

Other authors are Qi Su, Bing Xu, and Xin Chen, all of Johns Hopkins.

**More information:** Rokita, Steven E., Misregulation of bromotyrosine compromises fertility in male *Drosophila*, *Proceedings of the National Academy of Sciences* (2024). [DOI: 10.1073/pnas.2322501121](https://doi.org/10.1073/pnas.2322501121)

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