A moth and its flame: Mate selection found to evolve from response to flower odors

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For moths, love is literally in the air through the action of pheromones to attract mates.

Virgin females release a perfumery concoction, specially blended to attract males from the same species, even over long distances.

To date, little is known on how males evolved to heed their siren's call.

In general, pheromone compounds in moths and other insects are detected by specialized receptors that generally do not respond to plant volatiles.

Pheromones and other odorants are detected by odorant receptors (ORs) expressed in olfactory sensory neurons found most prominently within the insect antennae.

In moths, there are four major groups of pheromones classified by their chemistry and how the compounds are biosynthesized. The pheromones of old moth lineages, Type 0, are thought to represent the ancestral state of moth pheromones. Type 0 pheromones all have short carbon chains and they are remarkably similar to many common plant volatiles.

Now for the first time, Jothi Yuvaraj and colleagues at Lund University, Sweden, have identified the corresponding pheromone receptors (PRs) from a primitive leafminer moth, called *Eriocrania semipurpurella*.

Then, they show that these receptors also respond to plant odors and propose a scenario in which pheromone receptors evolved from plant odor receptors.

"Our results suggest that PRs for Type 0 pheromones have evolved from ORs that detect structurally-related plant volatiles," said professor Christer Löfstedt. "They are unrelated to PRs detecting pheromones in advanced Lepidoptera, which, in turn, also independently may have evolved a novel function from ORs detecting plant volatiles."

The authors, therefore, propose that not only have the pheromone receptors of this basal moth evolved from ORs that recognize plant odorants but that the same might be true of the canonical pheromone receptors of more derived moths.

"Our results suggest that sex pheromone receptors in Lepidoptera have evolved sex pheromone detecting functions from ORs detecting plant volatiles on multiple occasions," said Jothi Yuvaraj.

The new study advances our understanding of the evolution of moth pheromone sensory systems in general and primitive moths in particular.

More information: Multiple evolutionary transitions from plant volatile receptors to pheromone receptors within the Lepidoptera, *Molecular Biology And Evolution* (2017). DOI: 10.1093/molbev/msx215

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