# Scientists shut down reproductive ability, desire in pest insects

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Kansas State University entomologists have helped identify a neuropeptide named natalisin that regulates the sexual activity and reproductive ability of insects.

The team is the first to observe and name the neuropeptide, which is composed of short chains of amino acids in the brain of insects and arthropods. The finding may open new possibilities for environmentally friendly pest management, said Yoonseong Park, professor of entomology at Kansas State University.

Park and colleagues recently published their findings in the study, "Natalisin, a tachykinin-like signaling system, regulates sexual activity and fecundity in insects." It appears in the journal *Proceedings of the National Academy of Sciences* and was conducted by the Institute of Science and Technology in South Korea; the Slovak Academy of Sciences in Slovakia; Korea University in South Korea; and Kansas State University.

Natalisin is part of insects' and arthropods' peptidergic system—a genetic network that uses small peptides as neurotransmitters to chemically relay messages throughout the body.

"Natalisin is unique to insects and arthropods and has evolved with them," Park said. "It appears to be related to a neuropeptide called tachykinin that is in mammals and invertebrates. While tachykinin is involved with various biological processes, including the control of blood flow in mammals, natalisin is linked to reproductive function and mating behavior in insects and arthropods."

The study looks at natalisin in fruit flies, red flour beetles and silk moths . These insects have four life stages of development—egg, larva, pupa and adult—allowing scientists to observe the insects throughout the entirety of their life cycle to find what natalisin controls.

Kansas State University specializes in red flour beetle research, while South Korea's Institute of Science and Technology and Korea University are leaders in fruit fly research, and Slovakia's Slovak Academy of Sciences in silk moth research, Park said.

The researchers saw that in all three insects, natalisin was expressed in three to four pairs of neurons in the brain.

Using a genetic tool called RNA interference, or RNAi, the researchers looked at what happened when natalisin was silenced or knocked out from the insects' brains.

They found that the absence of natalisin in the brain led to the insects' physical inability to reproduce as well as reduced their interest in mating.

"For example, we saw that knocking out the natalisin in the fruit fly makes them unable to mate," Park said. "The female is too busy grooming her body for the male to approach her. The male doesn't send a strong enough signal to the female to get her attention. We're not sure if that's because the male can't really smell her or because he is not developed enough to signal her."

Park said he anticipates this neuron knockdown will help scientists develop targeted control methods for pest insects that would be environmentally safe. Because natalisin is only found in insects, a future insecticide would not affect plants, animals or humans.

Additionally, Park said the finding is likely to benefit the scientific community. It sheds new light on how the brain functions with the neurosystem, and provides more information about the basic biology of the fruit fly, which is the model insect for research.

**More information:** Natalisin, a tachykinin-like signaling system, regulates sexual activity and fecundity in insects , www.pnas.org/cgi/doi/10.1073/pnas.1310676110

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