

Coby Schal • Contributor

NCSU Update

Based on media reports, professional presentations at scientific meetings and pest management seminars, you'd think cockroaches have dropped off the face of the earth and were replaced by blood-sucking bed bugs. But nothing could be further from the truth.


As the German cockroach continues to challenge pest management professionals (PMPs), researchers continue to unravel its incredible adaptability. Dr. Coby Schal's lab at North Carolina State University (NCSSU) is tackling three significant questions:

Bait aversion. Almost 20 years have passed since Dr. Jules Silverman and Donald Bieman discovered glucose aversion in German cockroach infestations in apartments. But the physiological mechanisms that underlie this behavior have remained elusive. Post-doctoral researcher Dr. Ayako Wada-Katsumata, in collaboration with Silverman, found glucose acts as a feeding deterrent in a glucose-averse strain of cockroaches — and the paraglossae (sensory appendages at the mouth opening) are more important than the antennae, labial palps and maxillary palps for sensing deterrents. Her current electrophysiological research is unraveling the neuronal wiring inside the sensilla (taste hairs) that allows the cockroach to avoid glucose, as well as the molecular basis of this behavior. The sensory mechanism of glucose aversion in cockroaches has become the best-understood mechanism responsible for behavioral resistance in insects.

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Schal in his NCSU lab.



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Aggregation and reproduction. More than 20 years ago, research showed female German cockroaches reproduce faster in groups, whereas isolation slows down reproduction. Now, doctoral student Adrienn Uzsák is investigating the sensory modalities and pathways that mediate this phenomenon. Her findings show social interactions stimulate the production of the juvenile hormone, which, in turn, accelerates egg maturation and the onset of sexual receptivity in females. She also has found physical contact (touch) is more important than pheromones or vision. In collaboration with engineers, Uzsák has developed artificial, motor-driven “antennae” that mimic the contact stimulation cockroaches perceive when interacting with other cockroaches.

Sex pheromones. *Parcoblatta* wood cockroaches are abundant in southeastern pine forests. Although considered pests when they enter homes, they’re quite beneficial because they represent more than 50 percent of the diet of the endangered red-cockaded woodpecker. Drs. Dorit Eliyahu and Satoshi Nojima, along with other collaborators, extracted 1,400 female *P. lata* and identified

a new, highly effective sex pheromone that was named parcooblattalactone. This chemical is a new pheromonal structure for cockroaches, and a novel natural product for science. It could be used in traps. However, because it attracts several *Parcoblatta* species in pine forests, it also could be a useful tool for monitoring wood cockroaches in red-cockaded woodpecker habitats. **PMP**

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