

Biology

Elizabeth Pennisi reports from Baltimore at a meeting of the Entomological Society of America

How a cockroach lost its sweet tooth

A decade ago, lots of homeowners got rid of cockroaches by placing small black plastic containers in inconspicuous spots throughout their houses and apartments. These bait trays contained food mixed with a poison. The insects ate the bait, died, and eventually disappeared.

These days, however, the bait trays sometimes don't seem to work as well. It's not because cockroaches have become resistant to the poison, report Jules Silverman and Donald N. Bieman, entomologists at the Clorox Technical Center in Pleasanton, Calif. Instead, cockroaches have evolved a dislike of the bait's glucose, Silverman says.

He and Bieman discovered that the insect had lost its taste for sweets after they collected German cockroaches from apartments where the bait had ceased to be effective. They evaluated each bait component by comparing the responses of these apartment insects with those of insects reared in the lab with no prior history of exposure to the bait trays. The poison killed both groups, but when apartment cockroaches touched glucose with their antennae, they quickly backed off, Silverman reports.

Very few animals avoid glucose, he notes. But because this glucose aversion showed up in populations of cockroaches from apartments as far apart as Florida and California, the researchers suspect such mutants exist throughout the cockroach world. Because the mutants avoided the bait trays, they survived while their sugar-loving peers did not; so eventually an aversion to sugar became common, say the scientists.

Fortunately for the bait makers, these cockroaches still like other kinds of sugars, they add.

Long-term protection from termites

Minute quantities of an insecticide used in Europe, but not the United States, to kill certain crop pests can provide slow, yet effective protection against subterranean termites.

In the soil, millions of these termites build nests that extend over an area the size of a football field. To protect houses, builders often put several kilograms of pesticides on the soil, says Nan-Yao Su, an entomologist at the University of Florida research center in Ft. Lauderdale. "It forms a chemical barrier but [doesn't] do anything to the population in the soil," he adds.

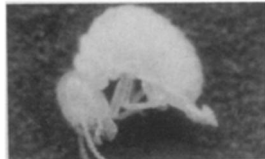
Consequently, researchers have been investigating other control strategies, many of which use growth inhibitors such as a chemical called juvenile hormone to try to reduce the number of termites in the soil. In coming up with one such control strategy, Su and his colleagues have discovered that, over time, a chemical called Hexaflumuron will wipe out these termites. This chemical inhibits the production of chitin, the material that makes the insect's outer coat strong.

Su mixed up to 1.5 grams of this pesticide in with bait, which termites retrieved and ate with no apparent ill effects. But weeks later, the ingested chemical prevented the insects from molting properly. "It's a time bomb, so to speak," Su explains.

For two years, he and his colleagues monitored the termite populations living near a group of infested houses. They placed wooden stakes around six houses and, once the stakes had become infested, placed bait-filled plastic tubes near them.

Within two months, the termites had disappeared completely from the ground near four of the infested houses and have not returned, even after two years, says Su. The ground near the other two houses still has a small number of termites.

A company called DowElanco in Indianapolis is developing the chemical for use against termites, says Su. But he expects it will take several years for a commercial product to appear.



Ingested chemical inhibits termite molting.

Calling all (brownbanded) cockroaches

For every cockroach that scurries across the kitchen floor late at night, countless more may hang out behind walls. To determine just how many lurk unseen — or in some cases, to know whether cockroaches are there at all — entomologists are hoping to harness one of these insects' own chemicals.

The chemical is a sex pheromone, a volatile substance used by females to attract males. Placed in a trap, this chemical lures in any nearby males. "There's nothing more sensitive than a pheromone trap," says Coby Schal, an entomologist at Rutgers University in New Brunswick, N.J.

Several kinds of cockroaches use these chemicals, but until now, scientists had only identified and made the one belonging to the American cockroach.

Schal and his colleagues have now isolated and synthesized the sex pheromone of the brownbanded cockroach, a widespread pest that tends to show up in hospitals, research laboratories, and other places where pesticides are not heavily used.

To track down this pheromone, Schal and his Rutgers lab group began about seven years ago to test the response of males to various female body parts. They pinpointed the richest source of this compound: the small porous plates covering two of the segments at the tip of the abdomen, says Schal. The researchers removed these plates from 10,000 cockroaches.

Then, at the New York State Agricultural Experiment Station in Geneva, Wendell Roelofs and Ralph Charlton of Cornell University purified the component of the extracted plates that lures the male. After analyzing the structure and makeup of this compound, Francis Webster and Aijun Zhang from the State University of New York at Syracuse finally synthesized the pheromone.

Even with just 300 molecules on a small filter paper, this synthetic pheromone can attract male brownbanded cockroaches into sticky traps, says Schal, who has begun isolating and identifying the German cockroach's pheromone. The researchers have filed for a patent on the brownbanded pheromone.

Mites in the carpet stay under the couch

No one really knows how they get there, but house dust mites live in almost every home. These invisible invertebrates feed on skin scales. Some research shows they live in carpets, and they thrive in the upholstery in commonly used rooms, says Judith A. Mollet, an entomologist at Virginia Polytechnic Institute and State University in Blacksburg.

Mites also tend to congregate in the carpet under that furniture, she and her colleagues now report. The researchers studied mite distribution in two infested houses, vacuuming the carpets and furniture, weighing the dust obtained, and, with a microscope, counting the critters in the dust.

In one house, the European house dust mite predominated, with 7,454 per gram of dust in the couch, 2,361 per gram in the carpet under the couch, and just 232 per gram in carpeting where people often walk. The other house contained mostly American house dust mites: 3,391 per gram in the couch, 269 per gram under the couch, and just 14 per gram in trafficked areas, Mollet reports.

In the past, researchers had assumed that the mites most likely hung out along traffic patterns in a house because that's where flaked-off skin builds up, says Mollet. But the mites may be sensitive to relative humidity and so may do best in protected spots under furniture, she adds.

These preliminary results suggest that housekeepers using antimite chemicals should apply them under stuffed furniture, not just in open carpeted areas.