

THE INDUSTRY'S LEADING TECHNICAL JOURNAL SINCE 1933

PMP Pest Management PROFESSIONAL

The background of the cover features three cockroaches, likely German cockroaches, shown in detail against a plain white background. One is positioned in the upper left, another in the upper right, and a third in the lower left. The large red text 'KNOWLEDGE IS POWER' is superimposed over the central part of the image.

**KNOWLEDGE IS
POWER**

**Entomologists
share insights
from recent
German
cockroach
studies**

BROUGHT TO YOU BY



**Control
Solutions Inc.**

A member of the ADAMA Group

INSIDE

**GC2 Word from
our sponsor**

GC3 Control tips

GC4 Research



German cockroaches have evolved, but so have PMPs

By Dr. Janis Reed, BCE

As a pest management professional (PMP), I have seen structures where populations of German cockroaches (*Blattella germanica*) not only gained a foothold, they grew so large that the prospect of managing them seemed impossible.

In my opinion, German cockroach populations build — and therefore managing these populations is a particular challenge to PMPs — because of several factors, including:

- **Reproductive potential.** Each individual ootheca a German female produces may contain up to 48 individual eggs. Additionally, a single female may produce four to eight oothecae in her life. This means populations build fast, at an exponential rate.
- **Parental care.** German cockroach females hold their egg capsules until just before they hatch, increasing the chances of early nymph survival when compared to other cockroach species. This means more of the eggs the females produce survive to the first and second instar.
- **Cryptic nature.** German cockroaches, especially the nymphs, are very small and can hide in minute cracks and crevices, away from even a careful inspector's eyes and flashlights. If even a few nymphs are missed, a large population can develop within just a few months.
- **Adaptation and evolution skills.** Thanks to all the above biological factors and more, German cockroaches have the ability to quickly adapt to changing environments and exposure to insecticides. Over the years, PMPs have faced resistance (DDT, certain pyrethroids), bait aversion (glucose aversion), and behavioral changes that make management a challenge.

A SHIFT IN TREATMENT STRATEGY

Over the past 40 years, cockroach management strategies have evolved dramatically. Early on, treatments included an all-out assault, with pesticide applications made as a general surface application. Resistance management was not understood as a concept, and



PMPs usually used a single product for every account, regardless of the pest problem.

Modern German cockroach control is much more surgical in its approach, with physical removal, pinpoint or crack-and-crevice applications, using products specifically targeted to these pests. This shift means we as an industry are more educated and knowledgeable about where cockroaches are living, what they are feeding on and what conditions are conducive for their survival and success. Product selection is vast and specific, with many products designed specifically to target German cockroaches.

Control Solutions Inc. (CSI) is dedicated to providing effective and economical tools to help PMPs manage German cockroaches. Last year, we launched Doxem Precise, featuring the Precision Delivery System (PDS). These two innovative products, a dry flowable bait and a precision applicator, are designed to help PMPs tackle even the toughest cockroach infestations.

By using the PDS to make applications deep into harborage areas, PMPs can apply bait into places they have never reached before, with a tool never seen by our industry. Once applied, Doxem Precise continues to kill cockroaches for up to two years, so a single application provides long-term control — even if a new population is introduced.

Additionally, CSI provides the industry with Combination Chemistry insect growth regulator (IGR), Tekko Pro. This product, if used alone, can be applied to nearly any surface in a commercial kitchen or residence to stop the next generation of cockroaches. This product can be a game-changer in tough accounts, where environmental conditions make management of German cockroaches seem insurmountable.

TOOLS AND TECHNIQUES EVOLVE

Modern PMPs have many products, techniques and limitations they work within every day, and these continue to change. Additionally, product selection, application techniques and customer expectations continue to evolve and change. We develop products for PMPs to aid in management of both the familiar and the new pest species. We hope to provide PMPs with an ever-growing toolbox to employ during their daily battles in all pest situations.

We at CSI are proud to be a part of, and to support, this industry, and look forward to partnering with PMPs to confront any challenge on the horizon, regardless of pest species. Our passion is support and providing these tools every day. **CSI – innovation you can apply.**



German cockroach control tips

By Diane Sofranec | PMP Senior Editor

German cockroaches (*Blattella germanica*) are a steady revenue generator for many pest management professionals (PMPs). They are prevalent in residential settings and commercial facilities. What follow are control tips from PMPs who work in both.

MULTI-UNIT HOUSING FACILITIES

Gaining control of German cockroaches in multi-unit housing facilities may pose a challenge. Residents who do not allow access to their units or have poor sanitation practices may hamper inspection and treatment options.



RANDY HAMILTON, ACE

- Educate your customer.
- Get buy-in from your customers. If they aren't willing to get rid of the cockroaches, you will have issues.
- Vacuum, and then vacuum some more. This shows the customer instant progress and immediately reduces the population.

- Redistribute clutter. Moving items around helps you discover areas on which to concentrate.
- Monitor for problem areas.
- Take advantage of times when residents are not present. Use the time to educate the facility's maintenance staff. This will help you develop a working relationship with staff, which you must have.
- Don't give up! Time is a concern, but it also can be an ally. At times I wish I could have turned cases over to another company. However, part of what makes our in-house pest control division unique is that we have to deal with the issue, even when the customer doesn't understand the value we provide.

— Randy Hamilton, ACE, Assistant Director of Operations, Sanitation Safety & Rapid Response Teams, The University of Tennessee, Knoxville in Knoxville, Tenn.

- Always rotate your products.
- Treat behind baseboards and cove moldings. If possible, pull them off the wall; you may be surprised what you find.
- If you plan to conduct follow-ups, don't space them too far apart.

— Vince Sanfilippo, Owner, Bugs Be Gone, Washington, Mo.



VINCE SANFILIPPO

COMMERCIAL KITCHENS

German cockroaches can be found in even the cleanest commercial kitchens. Kitchens offer cockroaches everything they need to survive and thrive: water from sinks and dishwashers, and condensation on constantly running equipment; harborage inside cabinets and pantries, behind backsplashes and under countertops; and food that is readily available or improperly discarded and stored.



MICHAEL BRODER

- Inspect! I don't just mean a quick peek at a shelf, but moving and disturbing items to really see what's going on. As you disrupt the cockroaches in their environment, you may see them scatter or find their droppings in cracks before evidence is

found by customers, or even caught on monitors.

- Disrupt their environment. Move and disturb items on shelves and cabinets, from floor to ceiling. You will not get rid of cockroaches if you don't find them.
- Monitor for activity. German cockroaches can be introduced in any shipment to a commercial kitchen. We have seen hundreds of cockroaches regularly brought in on deliveries just days earlier.

— Michael Broder, BHB Pest Elimination, New York, N.Y.

- Use safe, effective products. Do not get comfortable with the same products; rotate chemical families.

- Offer ongoing training to technicians.
- Don't sell cockroach jobs on price.

● Do not wait for your customer to contact you if the cockroach issue is still ongoing. Follow up and address it quickly.

— Thomas Chiarello, Field Representative, Turner Pest Control, Jacksonville, Fla.



THOMAS CHIARELLO

KNOWLEDGE IS POWER

Entomologists share insights from recent German cockroach studies

By Heather Gooch | PMP Editor

Research is the lifeblood of the professional pest management industry. Without entomologists performing observational studies, experiments and testing that build upon known results of previous studies, we wouldn't have the equipment, materials and techniques we do today.

This is especially important for the control and suppression of populations of German cockroaches (*Blattella germanica*). Their sheer numbers and fast reproductive cycles mean a population can build very

quickly. They also are among the most adaptable creatures pest management professionals (PMPs) encounter, and staying a step ahead of any resistance issues has long been a big focus.

What follow are insights gleaned from experts at two leading university entomology departments: Purdue University, West Lafayette, Ind., and Rutgers University, New Brunswick, N.J.

PURDUE RESEARCHERS BUILD UPON RESISTANCE FINDINGS

In 2019, Dr. Michael Scharf and his team at Purdue made headlines with results

of their German cockroach resistance study, published in *Scientific Reports*. But while the media made hay with the old “cockroaches will outlive humans” theory, Dr. Scharf notes there's actually a lot of nuance in the findings. As of mid-September, in fact, Purdue has three follow-up projects in the works based on this study.

“First, we are trying to look at new cockroach populations from different areas of the country to see if they can build resistance in response to well-defined insecticide selection pressure, as we saw in the first study,” notes Dr. Scharf, who is a professor and



the O.W. Rollins/Orkin endowed chair at Purdue. “Unfortunately, COVID-19 creates all kinds of problems for doing field work right now — and for university research in general — so this work is on hold.”

A second related study, also on hold as this article goes to press, involves trying to see whether insecticide resistance and cross-resistance levels are larger and broader in locations where cockroach field populations are larger.

“In other words, do ‘mega-cockroach populations’ exist because of resistance, or are there other, equally manageable factors at cause?” Dr. Scharf explains, noting that current data is limited on the topic.

Dr. Scharf points out that in the 2019 study, some of the findings were dependent on location and other population variables. It was preliminary, he stresses, and the three studies that resulted from the initial findings — as well replicating studies by other researchers, over time — will be more helpful in drawing firmer conclusions about cockroaches and resistance.

“What works in one location may not in another, and vice-versa. For our 2019 paper, for example, there were some repellency issues that drove cockroaches to new, insecticide-free locations and kept populations from shrinking,” he tells *PMP*. “This study needs to be replicated in other locations and by other researchers.”

Baby food jars were used to live-trap *B. germanica* in the field, baited with white bread soaked in beer and greased around the top to prevent escape.

RAPID TESTS IN OUR FUTURE?

Last but not least, the third project that sprang from the 2019 study involves “research to develop rapid tests that PMPs can use to diagnose resistance and make fast decisions about which products will have the greatest likelihood of success,” Dr. Scharf says, noting the team hopes to publish its findings within the next two years.

In the 2019 study, the team lab-tested the populations first to ensure they knew what level of resistance to certain active ingredients each population had at the onset. Dr. Scharf says his team is working toward this being something feasible that pest management firms can do in their offices.

For example, he foresees the day where, before embarking on a cockroach cleanout for a restaurant, your technician brings back three or four live specimens and has your staff entomologist run a test to see what the best product(s) are going to be for the account.

“When lab assays revealed low resistance levels for specific

insecticides, we were able to deploy those insecticides without rotation, with good results that most likely would satisfy customers,” Dr. Scharf says of the 2019 study. “The problem with that study was, we used a bioassay test that really only can be done in a research lab. Tests that PMPs can perform on live-trapped insects, using formulated products, would be easier to execute and quickly provide information to drive decisions. We are working now to develop tests that will provide turnaround in 12 to 24 hours. Obviously, we want to get it right, which will involve lots of calibration and testing on different populations to maximize predictive potential.”

Until we can find “realistic and efficient ways to monitor resistance,” Dr. Scharf says, “rotation is one of the best options we have.”

CONTINUED ON PAGE GC5



DR. MICHAEL SCHARF



CONTINUED FROM PAGE GC5

While biochemical test kits based on resistance mechanism monitoring have been developed for bed bugs, Dr. Scharf notes “there is no substitute for bioassays on live insects, and bed bugs may have a narrower range of resistance mechanisms since they have likely recently gone through a genetic ‘bottleneck.’”

This “bottleneck” effect, he explains, makes bed bugs more homogeneous across geographic locations. It also helps that for the second half of the 20th century, bed bug populations were extremely low worldwide, only experiencing a resurgence in the late 1990s.

German cockroaches, by contrast, have not gone through such global bottlenecks, but rather “have been migrating around and mixing things up genetically for centuries,” he explains.

The bottom line on resistance? Dr. Scharf underscores the fact that “resistance evolution is a dynamic

process, and it evolves differently in different populations.” To get a full, more accurate picture, he adds, researchers must continue to look at the issue from multiple angles.

RUTGERS TEAM FINE-TUNES A PROACTIVE APPROACH TO MULTI-UNIT RESIDENTIAL ACCOUNTS

Dr. Changlu Wang, an extension specialist in urban entomology for Rutgers University, and his team also are building upon findings of their 2019 published study. The focus of that study, published in the *Journal of Integrated Pest Management*, found that in essence, best practices for both cockroach and bed bug prevention seem to be well-established for integrated pest management (IPM) within individual apartments. But not much has been written about what to do to keep populations spreading within the hallways, and between walls and ceilings, etc., to other apartments. This

is an issue, the team said, because cockroach infestations among units in particular often are correlated.

The study, as noted in the abstract, “evaluated the effectiveness of a contractor-led bed bug IPM program and researcher-led cockroach IPM program in a high-rise apartment building for one year. A second apartment building that received conventional monthly pest control service was used as control.”

At the 12-month mark, the “proactive IPM building” saw declines from a 9 percent to a 3 percent infestation rate for bed bugs (a 63 percent reduction), and a 49 percent to 12 percent infestation rate of German cockroaches (a 75 percent reduction). By contrast, the control building saw an increase of bed bugs — 6 percent to 12 percent, or a 117 percent increase. German cockroaches were reduced at the control building, but not at the same rate: 47 percent to 29 percent, or a 39 percent reduction.

“Early detection and treatment to prevent their spread, and building-wide inspections and treatment are necessary to control cockroach infestations at the building-wide or community-wide level,” Dr. Wang tells *PMP*.

In the 2019 study, the team distributed one-page educational fact sheets so residents understood the importance of cleaning floors, stowing pet food,



“Our efforts helped the housing authority save money and reduce pest-related health risks.”

DR. CHANGLU WANG

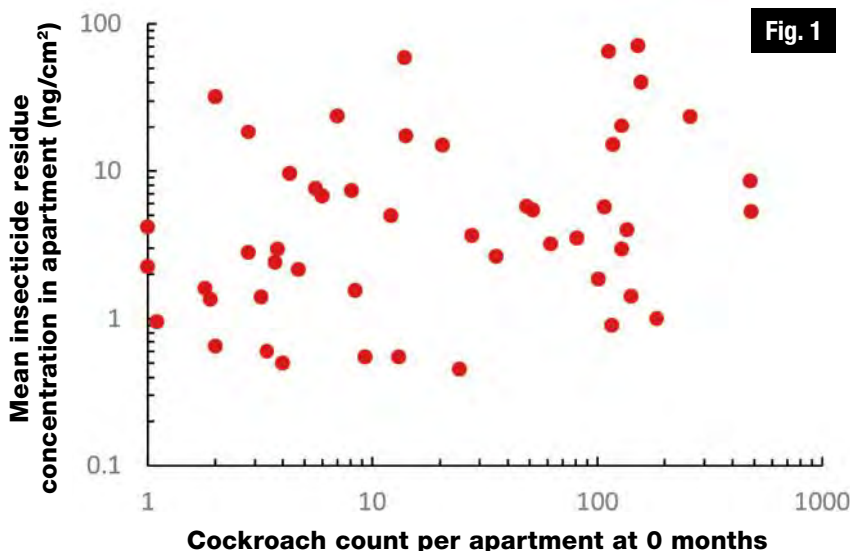


Fig. 1

Fig. 1. Association between insecticide residue concentration per apartment (mean residue concentration measured in bedroom and kitchen) and initial cockroach count.

and not using do-it-yourself (DIY) products. In addition to handing the sheet to each resident as the team conducted the building-wide inspection, property managers kept a stack of flyers for distribution as needed. Dr. Wang says both ways worked well, and recommends to PMPs interested in doing the same to ensure they have enough sheets to cover both ways.

Individual distribution had one benefit over relying on the managers, however. “By handling the flyer by ourselves, we had the opportunity to speak to the residents about good sanitation, decluttering, and reporting pest infestations.”

The team also held two seminars for residents in a community room, Dr. Wang says. “The meetings went well, and residents learned a lot from the presentations. Residents also spoke to one another about their experiences. Most of the residents and the staff were very appreciative of our work.”

IMPLICATIONS FOR PMPs

The study found that in a multi-unit housing account, proactively bundling bed bug and German cockroach IPM and prevention programs seemed to be more beneficial than reactively treating individual infestations.

“Our efforts helped the housing authority save money and reduce pest-related health risks,” Dr. Wang says. Being proactive, and then able to solve problems right as they happen, means PMPs can charge for their knowledge, expertise and effort. They’re bringing value in the long term, over a company that just comes in with a low price and minimal effort.

As a result, he says, “We need to educate the property managers and government. It is up to the property managers and housing

authorities to modify their bidding process and specifications so that quality is emphasized, rather than solely selecting a contractor based on low cost.”

STUDY LEADS TO TWO NEW PROJECTS

The 2019 study led to two additional studies for Dr. Wang and his team.

As published in *Insects* magazine, a publication from the Multidisciplinary Digital Publishing Institute, the first additional study reported on the changes in insecticide residue levels in homes after implementation of a proactive IPM strategy.

Floor wipe samples were collected from the bedrooms and kitchen floors of 69 apartments with German cockroach infestations at the start of the study, and again 12 months later from 49 of them. The team measured the levels of 18 insecticide residues. (See Fig. 1.)

“The mean insecticide residue concentration per apartment decreased by 74 percent after 12 months,” Dr. Wang reports.

The second publication, published in *The Journal of Allergy and Clinical Immunology: In Practice*, reported the effect of IPM on cockroach allergen reduction.

“It showed that after 12 months, the allergens Bla g 1 and Bla g 2 were reduced by 96 percent and 90 percent, respectively,” Dr. Wang says. (Editor’s Note: See “Defining German cockroach allergens,” at right.)

“These two publications show that IPM is not only more effective in reducing pest populations, but also has significant benefits in reducing insecticide residues and cockroach allergens,” Dr. Wang concludes. PMP

You can reach GOOCH at hgooch@northcoastmedia.net or 330-321-9754.

Defining German cockroach allergens

Blattella germanica can produce and carry at least 11 allergens. The variants range from “Bla g 1” to “Bla g 12” and all take the route of airway exposure. (There is no Bla g 10 currently.) The allergens are proteins in the cockroach’s body parts, saliva and waste, and even dead cockroaches can cause an allergic reaction in humans. In some cases, they can trigger asthma attacks.

COMMON GERMAN COCKROACH ALLERGY SYMPTOMS INCLUDE:

- Sneezing
- Runny nose
- Itchy, red or watery eyes
- Stuffy nose
- Itchy nose, mouth or throat
- Postnasal drip (a flow of mucus from behind your nose into your throat)
- Cough
- Itchy skin or skin rash

FOR ASTHMATICS, SYMPTOMS CAN INCLUDE:

- Difficulty breathing
- Chest tightness or pain
- A whistling or wheezing sound when breathing out
- Trouble sleeping caused by shortness of breath, coughing or wheezing

SOURCES: ALLERGEN.ORG; AAFA.ORG



PRECISION DELIVERY SYSTEM

PROFITABLE & PROFESSIONAL

Reduce Material Cost

- The 4-pack of Doxem® Precise 5-gram containers provides up to 400 applications
- Doxem® Precise remains effective for up to 2 years, reducing reapplications
- Consistent and precise applications, reduces wasted product

Reduce Labor Cost




- Make applications much more quickly using the Precision Delivery System
- Withstands extreme temperatures, won't freeze or melt in your truck or on site
- Targeted applications increase accuracy of every treatment

Increase Customer Satisfaction

- No scraping off old crusty gel bait
- Highly professional appearance
- Fast acting and long-lasting efficacy

A dry flowable cockroach bait

csi-pds.com

 @cntrlisol  @csipest  @csi_pest



**Control
Solutions Inc.**

A member of the ADAMA Group

