



A half century ago, almost every American had a bed bug story. The tiny, blood-sucking insects probably came to this continent with the early settlers and by the early 20th century they were well established. Then pesticides like DDT arrived and bed bugs disappeared.

But as the potential health impacts of these powerful pesticides became apparent, their use was curtailed and by the early 1990s bed bugs had started to recover.

“Before 1999 I had never seen a bed bug infestation,” says Phillip Koehler, a UF entomology professor and an international expert on bed bugs. “Now, we’ve had calls from all over the place. The first major infestation that I saw was in 2003 at a hotel in Orlando.”

Bed bugs (*Climex lectularius L.*) only cause a reaction in about 50 percent of individuals, and even then it might not occur for days after the bite. So while earlier generations of Americans might have readily recognized a bed bug bite, today the chances of tying exposure to a specific time or place are even slimmer.

The National Pest Management Association reports that from 2000 to 2005 the number of public inquiries about bed bugs to pest control agencies increased by 71 percent.

“There have even been workers’ compensation claims because of bed bug exposure in the workplace,” Koehler says.

In today’s interconnected world, it doesn’t take long for reports of bed bugs in luxury hotels or other unexpected places

A hand is shown holding a white fabric, possibly a sheet or pillowcase, which is covered in numerous small, brown, oval-shaped spots. These spots are arranged to form the word "TODAY" in large, block letters across the middle of the fabric. To the right of the word, a large question mark is also formed by these brown spots. The background is a light, warm tone, and the overall composition suggests a problem or a question related to the spots, which are bed bugs.

Bed Bugs Are Biting Again, But UF Entomologists Are Fighting Back

By Claudia Adrien

Photography by Ray Carson

to spread, so it's hard to tell how much of the increase in bed bug reports can be attributed to more bugs or just more people noticing bugs.

But it's enough of a problem that the federal government has established a Federal Bed Bug Work Group, comprised of representatives from the Environmental Protection Agency, the departments of Housing and Urban Development, Agriculture, Defense and Commerce; the National Institutes of Health; and the Centers for Disease Control and Prevention.

Koehler is also a member of a National Pest Management Association Blue Ribbon task force that has developed standards for detecting and controlling bed bugs.

Historically, bed bugs, which measure just one-tenth the

size of a penny, have secreted themselves in the seams of mattresses and other dark places. They crawl out at night to get their blood meals from sleeping victims. But in the past decade, infestations have spread beyond the bedroom to offices, movie theaters, schools and subways.

Entomologists used to think that bed bugs preferred sleeping victims because they needed at least 10-15 minutes of undisturbed feeding to get a sufficient blood meal. But several years ago, UF researchers conducted controlled feeding experiments which showed that even a five-minute "snack" provides enough nutrients for the insects to survive.

"This is why you might find bugs outside the bedroom," says Roberto Pereira, an associate research scientist in UF's

Urban Entomology Laboratory. “They can survive almost anywhere.”

Margie Lehnert earned her Master’s degree at UF studying bed bugs, and one of the things she found is that female bed bugs are being driven out of their traditional hiding places by overly aggressive males trying to mate as often as possible with as many females as possible. To survive, some females are leaving their traditional niches for less-crowded places to lay their eggs, including health-care facilities.

Although bed bugs are not known to be carriers of disease, health officials worry that hospital and nursing home beds that harbor the bugs expose people with already weak immune systems to bites, scratching and an increased chance of contracting secondary infections, such as MRSA, a bacterial infection that causes 19,000 deaths a year in the United States.

“If you put bed bugs and MRSA together, then we have a scary combination for a lot of bad things happening as a consequence of these bug bites,” says Koehler.

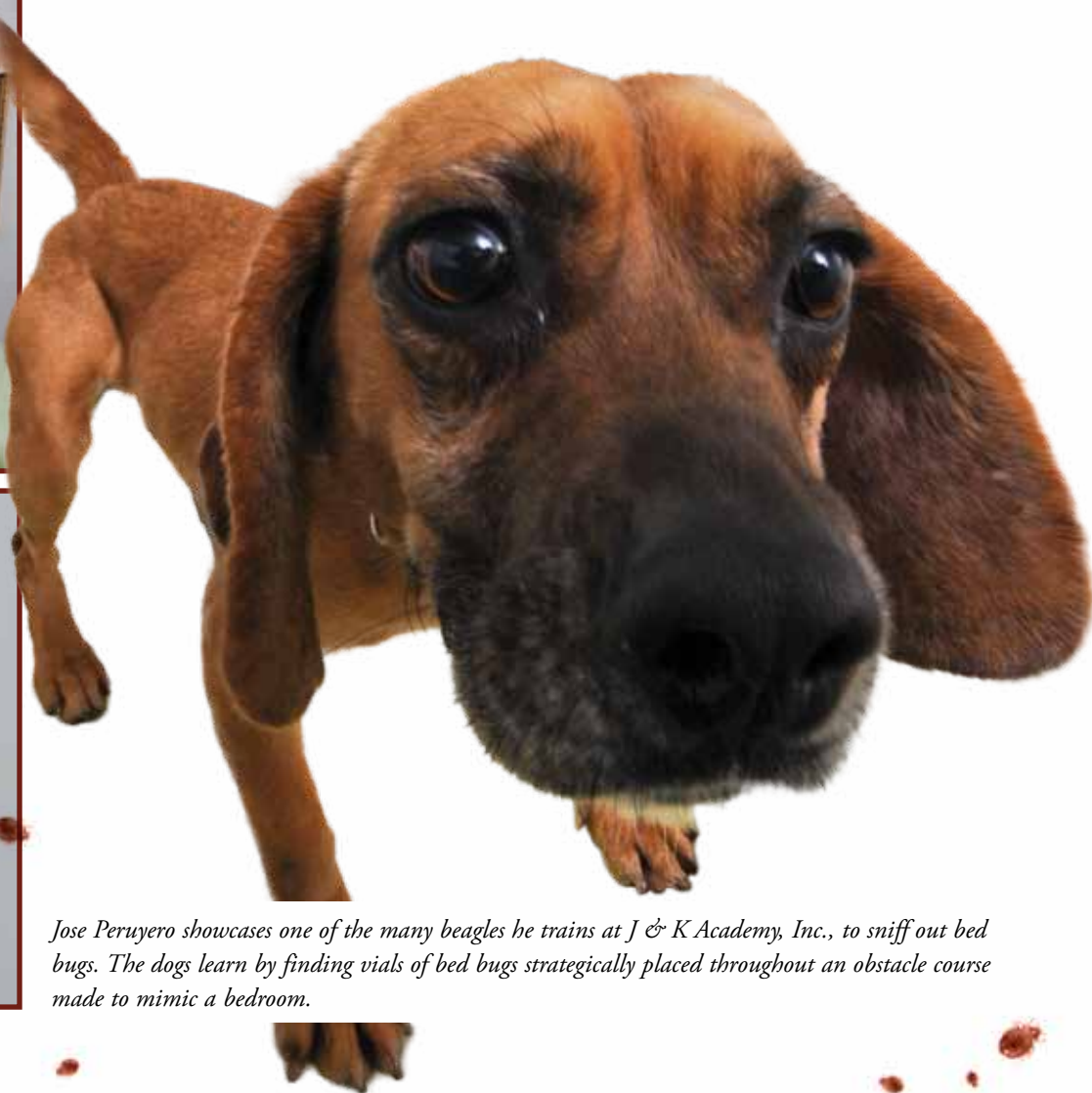
SNIFFING THEM OUT

When the iconic United Nations headquarters in New York had a bed bug infestation last year it was big news, so officials turned to bug-sniffing dogs to track down the critters.

With their ultra-sensitive noses, dogs have become the first line of defense in identifying a bed bug infestation, says Jose “Pepe” Peruyero, the CEO of Pepedogs of J&K Canine Academy, Inc., in High Springs, Fla. The company is one of the country’s leading trainers and purveyors of bed bug-sniffing dogs and works closely with UF entomologists on training methods.

A human can walk into a kitchen and know — through sense of smell — that stew is cooking on the stove. But a dog’s sense of smell is so sharp that it can be trained to distinguish a stew made with carrots from one without.

“I tell people they’re buying a nose with four legs to carry it,” Peruyero says. “They love to eat, love to smell. It’s what they live for.”



Jose Peruyero showcases one of the many beagles he trains at J & K Academy, Inc., to sniff out bed bugs. The dogs learn by finding vials of bed bugs strategically placed throughout an obstacle course made to mimic a bedroom.

In the late 1990s UF researchers worked with Peruyero to develop training techniques for dogs to sniff out termites. So when the bed bug problem took off in 2005, Peruyero, a former canine handler for the Miami and Gainesville police departments, approached them about using similar reward-based techniques for bed bugs.

After perfecting the training program, Koehler, Pereira and Lehnert devised a series of experiments to determine if the dogs could find bed bugs, could distinguish between dead bugs and living ones, and could differentiate between bed bugs and other insects.

The results were impressive. When vials of bugs, dead and alive, were hidden in hotel rooms, the trained dogs could find as little as one bed bug or one egg in less than two minutes with 98-percent accuracy. And, equally important, they had almost no “false positives,” which could result in expensive but unnecessary treatments.

Peruyero says that because of their size and demeanor, beagles and beagle mixes are perfect for navigating through places like hotels and dormitories. To train them, he allows the dogs

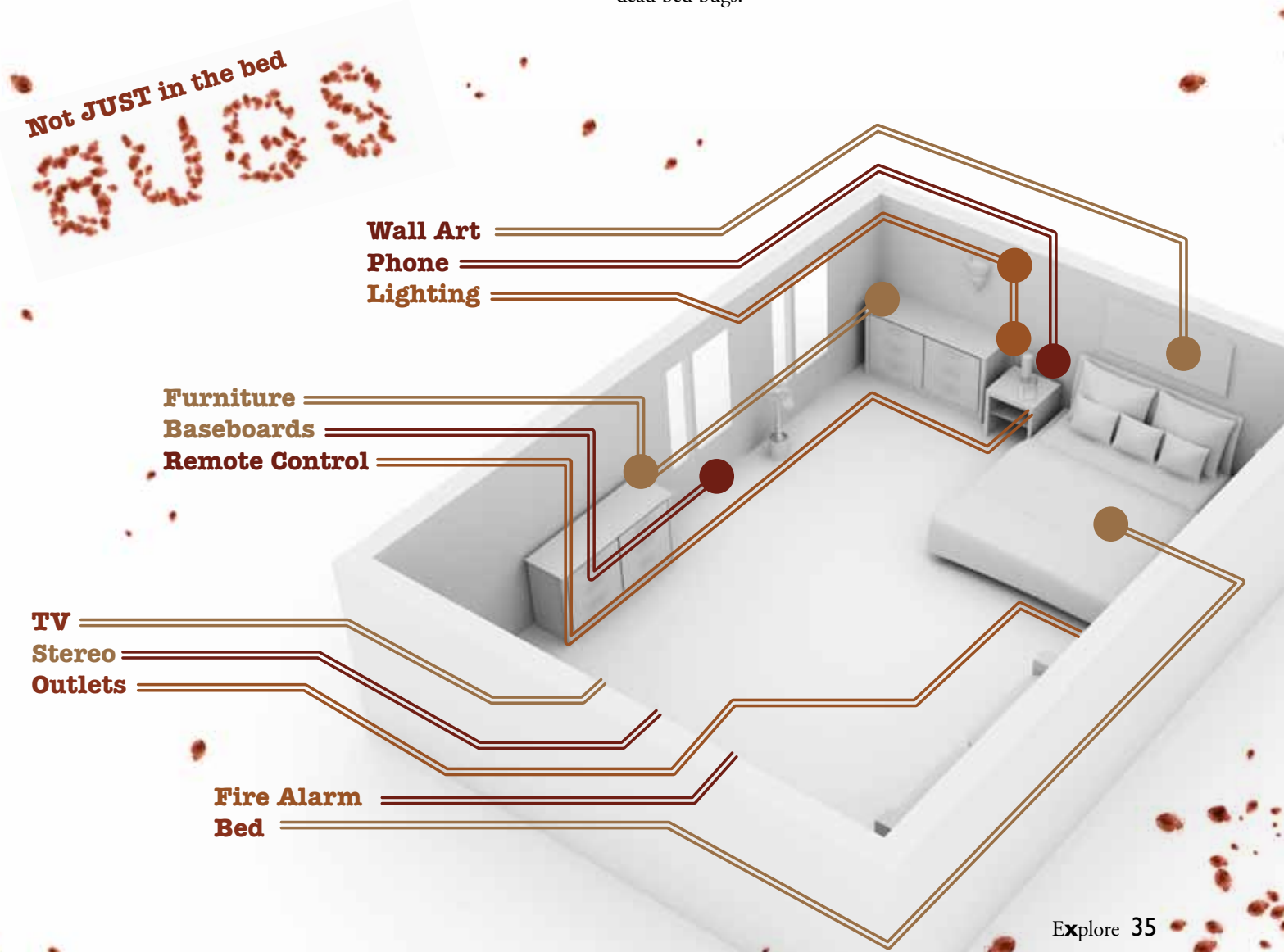
to sniff for vials of bugs placed under mattresses, behind wall outlets and in other tight spaces the academy designs to mimic real-world situations.

More than 90 percent of the dogs trained at the academy are sold to pest control companies around the country.

“Bed bugs are so labor intensive,” says Terry Griffin, a canine handler for Rose Pest Solutions, which recently purchased its first dog from Peruyero. The company will provide the canine service to residents of Ohio, a battleground state in the “war on bed bugs.”

“It requires a team of our exterminators 30 to 40 minutes to inspect a hotel room, but for a beagle, it’s just 30 seconds to a minute to sniff out the bug,” Griffin says.

Three years ago, Lehnert conducted a series of tests that proved that dogs could distinguish live bugs and nymphs from dead ones. One concern of pest control companies is whether these animals can discriminate between dead bugs and live ones after a chemical agent is applied to an area for treatment. The researchers found that dogs’ sense of smell is so refined that they can distinguish between the odors released from living and dead bed bugs.



Researchers at UF's Urban Entomology Laboratory breed bed bugs to use in experiments to determine the best way to exterminate them. Entomologists Roberto Pereira (left) and Phillip Koehler hold specimens of bed bugs in their UF laboratory.



PESTICIDE PROBLEM

A century ago people habitually checked for bed bugs and fought them with some pretty toxic pesticides, including cyanide. For 20 years beginning in the 1950s DDT was the chemical of choice for just about every type of pest, until its negative effects on wildlife and humans led to its ban in most countries, including the United States in 1972. But Koehler says it was the passing of the Food Quality Protection Act in the late 1990s that led to the banning of many chemicals used for household pests.

“This commercial ban became a significant contributing factor in the proliferation of bed bugs during the last decade,” Koehler says.

Since DDT was banned, pyrethroid-based synthetic insecticides are all that’s available, but recent studies show the bed bugs are becoming completely resistant to the chemicals.

Researchers might be able to create new molecules for insecticides that meet EPA standards but the cost of development is tens of millions of dollars. However, the bug problem is so pervasive that these costs might be recouped in a short period, Koehler says.

“They did the bugs in,” says Koehler of past remedies. “Now, we don’t know much about the bugs and how to treat the problem.”

In the absence of a chemical solution, UF researchers have been leaders in developing heat-based treatments.

Several years ago, they created a portable chamber big enough for a bed or dresser using less than \$400 in equipment. Over the course of two to seven hours, heaters inside the chamber gently raise its air temperature to a minimum of 113 degrees Fahrenheit — enough to destroy the insects but not damage the items.

In one study, the method killed 100 percent of bedbugs in nine out of 11 trials conducted in dormitories and apartments. This approach is attractive because it can be used to treat individual units in large apartment buildings and dormitories without displacing other residents.

The project’s origins go back to 2006, when UF campus housing officials were looking for ways to treat occasional bedbug infestations.

Discussions with Koehler led to several attempts to develop a heat treatment for furniture.





Eventually Koehler settled on a combination of oil-filled electric space heaters, electric fans to circulate air and polystyrene insulation board to form the chamber walls.

Ironically, when the researchers first tested their chamber, they purchased used mattresses from a local furniture outlet with the intent to infest the mattresses with bed bugs bred in the laboratory. But, to their surprise, the mattresses were delivered with their own bugs.

Homeowners should not attempt to build their own heat treatment chambers, the UF researchers say, warning that it could lead to fires.

Ultimately, addressing costs is essential because Americans who are unable to pay for expensive treatments may be maintaining a population of bed bugs in their homes, says

Koehler, who has a proposal before the EPA to collaborate with university entomologists throughout the Southeast to create

a homeowner's awareness guide. The guide will provide tips on early detection of bed bugs, stopping them before they are brought into a home, and simple steps like using a clothes dryer to kill bed bugs hidden in clothing. In particular, he advocates that employees in service industry jobs, such as hotel cleaning staff, need to be made most aware of the gravity of the problem because they are a segment of society regularly exposed to the bugs and can further perpetuate the spread of the insects.

"That's why there is a need for a low-cost treatment, to reach people in low-income groups," says Koehler. "If not, that means bed bugs are going to continue in society over time." ❌

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Related website:

http://ipm.ifas.ufl.edu/community/structural/bed_bug_IPM.shtml



UF researchers have developed a lower-cost method of exterminating the bugs by sealing infested furniture in a box and raising the temperature to more than 120 degrees Fahrenheit.