INNOVATIVE APPROACHES TO BED BUG MANAGEMENT

In this article, Dr Richard Naylor and Alexia Naylor from the Bed Bug Foundation share their perspective on how bed bug treatments are evolving, what pest professionals need to know in 2025, and the highs and lows of testing treatments (including voluntarily sleeping with bed bugs).

We respond to bed bug queries from the public every single day. The people who contact us are often at breaking point. One email that landed in our inbox recently simply read: "This ordeal has been mentally and physically exhausting. It's affecting my ability to work and take care of my children. I'm at my wits' end. I cannot afford to keep throwing money at ineffective treatments. Can you advise me on the most effective products or methods to finally rid my home of bed bugs?"

This is what we do at the Bed Bug Foundation: we try to bridge the gap between the science and the suffering. In this article, we want to share what we've learned recently in our testing labs, and offer practical suggestions that might help pest controllers refine their approach.

Getting under the covers: bed bug biology

Bed bugs (Cimex lectularius) have a six-to-eight-week generation time at 25°C. They feed once per life stage and, under the right conditions, a female can lay 15 to 25 eggs per week. We once stocked a demo dome for a trade show and, when we opened it up 15 months later, found live bugs still inside.

The Cimicidae family includes about 100 members. All rely on a host that returns to the same place to rest or sleep, like bats and nesting birds. In Europe, we typically encounter the common bed bug, the European bat bug, the tropical bed bug and the martin bug. The latter are often mistaken for bed bugs when they end up inside homes.

Warren Booth's lab recently published research showing that bed bugs have been living alongside humans for around 245,000 years. That makes them one of our oldest "urban pests".

How they get in – and where they go

Bed bugs don't fly. They climb, crawl and hitchhike. The most common way they enter a property is via luggage, clothing or furniture. In flats and HMOs (Houses in Multiple Occupation), they can spread through electrical outlets, pipework and cracks.

Once they've fed, bed bugs look for nearby shelter, usually within half a metre of the host. Over time, they build aggregations. When disturbed

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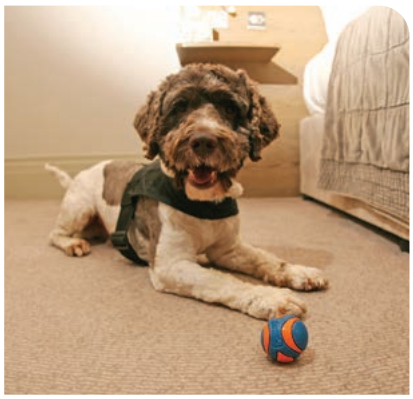

Dogs are used because their superior sense of smell accurately locates hidden bed bug infestations by detecting their specific pheromones. Benji (pictured) is a Bed Bug Foundation certified bed bug detection dog.

"We hid vials around a bus. The dogs found them all. We found one."

or overcrowded, they disperse. Ironically, DIY treatments often trigger this dispersal.

In our test bedrooms, we've found that eight out of ten hungry bugs will feed on their first night with a host present. They detect CO_2 and heat, and that's their cue to start foraging. They're negatively phototropic, so when you're inspecting a room, start on the darker side.

Bites tend to appear in lines, especially along the edges of clothing or sheets. Some people barely react; others require antihistamines or medical attention. Once fed, bed bugs defecate almost immediately, producing dark, watery spots. Exuviae from weekly moults also accumulate around harbourages.

What we're seeing in 2025

When bed bugs made headlines across Europe in late 2023, we wanted to see if the panic matched the data. We looked at our Bed Bug Foundation specimen ID service, which has been running for years. In 2023, 20% of the submissions we received were bed bugs - a normal proportion.

Interestingly, 2021 saw a dip to 16%, which aligns with data from the Swiss Pest Advisory Service. From 2010 to 2018, bed bugs steadily increased. Then Covid hit, hospitality shut down, and the bugs took a hit. They're coming back, but not explosively. It's more of a slow, steady recovery.

Resistance: the hard truth

In 2022, we tested multiple field strains of bed bugs against various professional insecticides. Most products, even after 36 hours of exposure, didn't kill a single bug. The only exceptions were both heavy on pyrethroids. The problem? In practice, bugs aren't exposed for 36 hours. They walk across treated surfaces for seconds. If that's all it takes to reinfest a treated room, we're in trouble.

Desiccant dusts: what works and why

We tested two categories: diatomaceous earth (natural) and synthetic silica dioxide (like ChinChex). Fresh, dry diatomaceous earth killed all bugs within four days. But after a month in 40% Relative Humidity (RH), it took 19 days. At 85% RH, half the bugs were still alive after two months.

ChinChex, in contrast, killed 100% in two hours under continuous exposure and maintained efficacy under high humidity. In real-world intermittent exposure scenarios, it still achieved full mortality within five weeks, unless RH hit 93%, in which case it took a little longer.

People often confuse bed bugs with other small insects like carpet beetles (pictured above) and booklice due to similar appearances. Other common mix-ups include cockroach nymphs, fleas, and ticks, as well as other common skin conditions or insect bites. Olei, CC BY-SA 2.5, via Wikimedia Commons

We also found that bed bugs die off naturally at very high humidity levels, probably due to fungal infections.

Monitoring: the good, the bad and the misleading

Why monitor? For early detection, complaint resolution, or as part of ongoing treatment. We tested over a dozen monitors, including sticky traps, passive crevice traps, pitfall designs, and active monitors that use heat or CO_2.

Sticky traps designed for cockroaches were generally ineffective. Bed bugs can't grip plastic or glossy card well. Crevice traps and monitors made of fibrous materials performed better.

Adding heat or CO_2 greatly improved catch rates. But smart tech must balance functionality, cost, discretion and ease of use for pest controllers and hotel staff alike.

Misidentification: still a major issue

People confuse all sorts of things for bed bugs: booklice, woodlice (somehow), minute pirate bugs, and most commonly, carpet beetles. Only carpet beetles share the same habitat, and their larvae (woolly bears) can cause allergic reactions.

Dogs are still the gold standard for detection. We tested this in Switzerland. We hid vials around a bus. The dogs found them all. We found one. It was humbling.

A cautious approach: containment first

You can't fix what you haven't found. Confirm the pest. Identify infested items. Deal with beds and sofas before dispersal spreads the infestation.

Start with heat, steam or sprays, but be thorough. Encasing mattresses and bed bases helps eliminate harborage and makes inspection easier. Isolate the bed: no contact with the wall, no trailing sheets, interceptors on legs.

Treat cracks and crevices around the bed, and consider replacing beds with metal-framed models if reinfestation is likely.

More than ever, successful bed bug control is about containment, confirmation, and careful strategy. It's about using the tools that work for the environment you're in.

We're here to help where we can, and to keep testing new ideas, including some that require sleeping in a bed full of bugs. (Don't worry, we now use a separate test room. Alexia drew the line at testing in our bedroom.)

NEW TOOLS IN THE PIPELINE

EXHALE
A CO_2-emitting device that convincingly simulates a host. It reliably triggers foraging.

SIMULAIR MONITOR
A Swedish design using heat, CO_2 and a pitfall trap. Effective at luring bugs from all areas of the room.

APREHEND
A fungal biopesticide (Beauveria bassiana) currently used in North America. Field trials are currently underway in the UK. It showed outstanding residual efficacy with very low volumes applied.

"Repellents might keep bugs off the bed, but use them in an infested room and you'll just spread the problem."

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"Rats on a Scholar's Desk" by Nagasawa Rosetsu, 1790. The Metropolitan Museum of Art, New York, public domain.

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