

Bed Bugs: What's New?
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Introduction: A Brief history

Once upon a time...bed bugs were common place. People had come to accept the bugs as an annoying part of life and we did what we could to mitigate the irritation.

"Bed bugs are among the most common and troublesome of all household pests in human habitations." Pest Control Technology, 1950

Somewhere in the 60's, quietly & without fanfare, they went away. We take credit, but there may be more at work than some well-placed insecticides and a few favorable changes in human behavior.

Then the bed bugs came back. They came slowly at first, but then in a blizzard of new infestations. Here in North America they showed up first in New York and LA and then began spreading to interior parts of the nation. Hawaii had serious problems with bed bugs before the mainland was even aware a resurgence was in progress.

In actuality, they were never totally gone. A number of areas had significant problems continuously:

Chicken houses in the mid-south, Native American reservations, even whole Nations, such as India (but India has reported an increase as well) had continuous activity.

Bed bugs as a Public Health Pest

Although bed bugs are not known to transmit disease, they are a pest of significant public health importance. A joint statement from CDC/EPA was published to state as a certainty that bed bugs are indeed a public health pest.

- See this document at:

http://www.cdc.gov/nceh/ehs/Docs/Joint_Statement_on_Bed_Bug_Control_in_the_US.pdf

...or simply run a Google Search on *CDC, bed bugs, public health pest.*

There was a study that seemed to link bed bugs to MRSA in Vancouver, but a simple reading of the study revealed some hefty assumptions.

Just because bed bugs can take in a pathogen, or even that a viable pathogen can be extracted from such a bed bug, does not mean that the bed bug is a vector. In order to transmit a disease, the bed bug must be able to extract the pathogen from an infected person, allow the pathogen to multiply or at least maintain the pathogen in a viable condition, and transfer viable pathogens to a previously uninfected person in a form and quantity sufficient to start an infection.

Bed bugs achieve their status as a public health pest by so afflicting people that they lose sleep, are unable to function in normal roles, or may become reclusive no longer able to receive visitors (including their own family) or go to visit others. There are a number psychological concerns that may be connected to a protracted bed bug infestation.

Bed Bug Biology and Geographical Spread

The bug's biology helps it to spread to new environments.

The bed bug is an *R strategist*, this means it spends its biological capital to produce as many offspring as possible while spending little if any resources on keeping them alive. It's a numbers game. I have 500 children, someone is going to succeed.

Bed bugs exhibit a number of behaviors that favor their spread to new environments:

- They are excellent hitchhikers.
- They are desiccation resistant and can tolerate dry environments (but they are susceptible to moist environments and survivorship drops dramatically).
- They exhibit a high degree of food efficiency and can survive long periods between feeding. There a number of records that document adult bed bugs surviving well in excess of one year without a meal.

New research is opening new perspectives on bed bugs:

Dr. Michael Siva-Jothy of the University of Sheffield has been studying bed bugs since the mid-90s; some of the research coming out of his lab shows that bed bugs:

- Do best with regular meals
- Thrive without the genetic diversity of immigrant bugs becoming more fit through in-breeding.
- Disperse without regard to gender, age, or mated status; we used to think it was mostly mated females that dispersed.

Movement by hitchhiking means the traveling bed bug must start or help start a new infestation.

Starting an infestation is not an easy task. The bed bug must find adequate harborage near a suitable host with mixed gender adults or a mated female.

From *my observations and consideration* of this process, there are stages to a developing infestation once these conditions are met:

- “Outposts” of one or a few bugs. If they are nymphs, they must develop to maturity.
- “Congregations” of breeding adults and several stages of nymphs
- “Explosions” occur when newly developed adults begin reproducing and population growth takes a steep upward trend.

Nothing succeeds like success. Once a population becomes large enough, dispersal begins and bugs begin to be “exported” to a number of regularly visited destinations (work, friend’s homes, relative’s homes, theaters, etc.) and these places eventually become infested and the process starts anew. If the original infestation is eliminated, bed bugs can easily be re-introduced from the new infestations that started from it. Chemical cues left by previous infestations are quickly re-colonized by re-introduced bugs. They are highly attracted to harborages that have previously had bed bugs.

A Clumped Distribution

New York seems to be the worst, but there are other hot spots. Why haven’t they spread evenly around the nation by now (10-12 years later)? There are a number of factors that may explain this, but for now, several regions and many rural areas “await their turn” to host the spreading plague!

Inspecting for Bed Bugs

The most common signs of bed bugs are their droppings. Black spots and stains are easier to see than bugs that may be hidden. The more bed bugs that are present, the easier they are to find,

- “Explosions” are *relatively* easy to find.
- “Congregations” can be found regularly through a careful, methodical, diligent search by a trained person.
- “Outposts” are a nut and I am a blind squirrel.

Monitoring for Bed Bugs

Active vs. passive

Active monitors use attractants to actively draw in bed bugs. The common attractants are:

- Heat

- CO₂ – by far the greatest factor
- Kairomones or food attractants; odors that smell like...humans (ooh, ick)
- Pheromones and odors from previous bed bug harborages

Active monitors count on bed bugs seeking a host or harborage. The bugs may not comply. A bug in monitor means something, an empty monitor may mean the bugs haven't found the monitor, the monitor is misplaced, or the bed bugs are happy where they are.

Sticky vs. slippery

Sticky traps are noticeably poor at catching bed bugs, the pit fall traps work much better.

Every day a new monitor hits the market. FMC has introduced Verifi®, but the jury is still out in spite of the studies that suggest it readily catches bugs. Several researchers have done studies, but none of them have been catching known numbers of released bed bugs in field conditions.

Eliminating Bed Bugs

Pesticides

Pyrethroid resistance is found in most of the populations tested and often at alarmingly high levels. Resistance ratios have been determined at 3000X! Imagine that!

For those resistant bugs, direct application still works, dried deposits do not. Follow-up treatments are crucial. Survivors come from untreatable harborages and re-infestations. Resistant bed bugs can be eliminated using pesticides, but different classes should be used, different formulations in appropriate areas, and application must be thorough. We don't call these *conventional* treatments (nothing conventional about them) but *manual* treatments, because we are doing it by hand.

A number of combination products (pyrethroid + a neonicotinoid, e.g., Temprid®) and non-pyrethroid products (e.g., Chlorfenapyr) will give good results if diligently applied with appropriate cooperation albeit results may be slow.

Preparation is the key. If the tenants will cooperate (human behavior), success is just a matter of time.

Snake oil and other remedies. With no really effective products, people will grasp at straws and any lofty claim will induce a certain segment of industry and the consumer market to try a new product that has no rational expectation of efficacy.

I have good news and bad news! Isopropyl alcohol works and is inexpensive and low hazard, but if you use too much, you can “woof” your apartment or start random fires in new and amazing ways.

Much controversy surrounds the use of alcohol by consumers as a bed bug killer.

Heat

Bed bugs are exquisitely susceptible to heat.

Lower lethal limit once thought to be 113° F is now thought to be 118° F for adults and 123° F for eggs. More work is needed.

Heat penetrates furniture, clothing in closets, household goods and even walls to kill all stages of bed bugs.

It requires less preparation than manual treatments and normally no follow-up treatments.

It employs no harsh pesticides although many companies, including ours, use certain pesticides carefully as a hedge against re-infestations and survivors from thermally protected areas.

Unfortunately, it is expensive and takes all day.

Whole area heating

- Portable heaters
 - Electric – Expensive and not so efficient, high energy costs.
 - Propane - lots of hazard including heat damage to household goods
 - Hydronics (uses a fluid to transfer heat, like your car’s heater core) – efficient with low energy costs, but may be problematic in set-up and comes with a “leakage” hazard.

Chamber heat treatments

Small scale

Low energy cost

High efficacy

Steam

Advantages

- Penetrates a layer of fabric and maybe even two
- No residues

- Great for small scale work in sensitive environments

Disadvantages

- Time intensive (expensive to operate), large jobs are not practical
- Penetration is limited with no way to test
- Can peel your wall paper/ruin some finishes

Cold

Advantages

- Relatively low hazard
- Relatively low cost

Disadvantages

- No ability to penetrate
- Takes practice to become adept
- May spontaneously relocate bed bugs
- Some researchers suggest that you need to achieve 0°F for 7 – 10 days. Some say 4 days is sufficient. Environmental cold (leaving items outside in the winter, is not a reliable way of de-infesting goods.

What's Next?

The Gold rush! The huge demand is spawning start-up businesses, and a phalanx of contraptions, potions and schemes.

Litigation is growing as the public looks for someone (else) to blame and pick up the tab.

Legislation is beginning to emerge, but in all the laws surrounding landlord responsibilities, tenant responsibilities, and product requirements, the most applicable law may well be the law of unintended consequences.

Stay tuned! New developments are occurring every day.