

# Update

NPMA LIBRARY UPDATE

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## Bed Bugs: A Continuing Challenge

### BACKGROUND

Blood-feeding bugs of the family: Cimicidae (bed bugs) probably evolved as cave-dwelling ectoparasites of mammals (mainly bats) and birds. When humans moved into those same caves, one group of the bugs apparently switched hosts and developed a "preference" for humans' blood. The common bed bug, *Cimex lectularius* L., became the most directly associated with humans. As our civilizations developed, these bugs moved with us into tents, and then houses; and they have remained a pest throughout recorded history.

Wide-spread use of synthetic insecticides like DDT began soon after World War II, and by the mid-1960s bed bugs had become very rare pests. Although they have continued to be commonly present in various cities and countries around the world, and have sporadically been locally serious pests, they seemed to have nearly disappeared in most developed countries. Many current pest management professionals (PMPs) in North America and Europe with as many as 10 years on the job may have never actually seen an active bed bug infestation. However, over roughly the past seven years, bed bugs have been making a rapid, progressive come-back in

these regions of the world. Regional and national technical experts have been reporting them more and more often in homes, hotels, hostels, and long-term care facilities. During the past six years, NPMA Entomologists have received specimens for ID of true (common) bed bugs from at least 119 separate infestations, in 44 states, the District of Columbia (DC), and Puerto Rico (PR); plus four provinces of Canada, and three states of Mexico. A technical expert in a national pest management company in the U.S. has verified multiple common bed bug specimens and related control efforts in two additional states in the past two years. NPMA has also received



specimens for ID from 18 separate infestations of Eastern Bat Bugs, *Cimex adjunctus* Barber, from at least 11 states; and specimens of a Swallow Bug, *Oeciacus vicarius* Horvath, from three separate infestations in three states.

## DESCRIPTION

Bed bugs are small, 3/16 inch (4-5 mm.) long, broadly oval, flat, brown to reddish-brown true bugs (Order: Hemiptera), with a 3-segmented beak, 4-segmented antennae, and vestigial wings. They have very thin, vertically-flattened bodies covered with short, golden-colored hairs. Males have somewhat pointed abdomen tips; females and older nymphs have broadly rounded abdomen tips. When fully engorged, an adult bed bug's body looks somewhat cigar-shaped. Pictorial keys in Pest Management references, such as the Mallis' Handbook or the NPCA Field Guide, and a 10X hand lens, can help accurately identify (ID) these pests to species. Rapid, correct ID is essential to effectively controlling them.

## BIOLOGY

Bed Bugs feed only on blood from mammals or birds. They mate by "traumatic insemination," a strange behavior in which a male pierces a female's abdomen and injects semen into a lens of fatty material in her body cavity. Their life cycle, under good conditions of 75 to 80 percent RH; 83-90°F, takes four to five weeks (egg-to-egg). They attach their small (1 mm long) pearly-whitish eggs to surfaces, usually in crevices (harborages) where the bugs hide in loose groups or clusters. They have five nymphal instars, and each needs at least one blood meal to develop to the next instar. A female may lay 200 - 500 eggs in her lifetime. These bugs may produce a series of bites in "rows," or fairly straight lines, usually along an edge beside an item of clothing or a bed sheet which was lying against their human host's skin at the time the bugs fed. Bed bugs give off a distinctive, "musty, sweetish" odor, which may be obvious to some humans' sense of smell, where a number of bugs have congregated in a shared harborage for a long time. Fewer than 50 adult bugs (based on actual collected specimens),

along with their offspring, present for no more than a few weeks, have been observed to produce detectable levels of such an odor. They routinely deposit partially-digested remnants of prior blood meals in their hiding places, as a "rusty" or tarry residue. Cast skins usually also accumulate in harborages.

## HABITS

Bed bugs are nocturnal, hiding in many places near their hosts, including: bed frame joints, cracks, crevices, inside box springs, mattress seams, along 'tack strips' under edges of rugs, in furniture drawers or hollow legs, and even behind wallpaper or pictures on nearby walls. It may take three to 12 minutes for one bug to feed to repletion. Bugs will sometimes (about 20 percent of the time) "void" remains of earlier blood meals while feeding. This produces the typical "rusty" spots seen on bed clothing in many infested bedrooms. They will feed repeatedly, but **must** have at least one blood meal for each instar to develop to the next instar (or to produce more eggs). Contrary to reports that bed bugs become inactive (go into "hibernation") at temperatures below 61°F (16°C), bugs in a population started from bugs wild-caught in New Jersey in 1973 have remained very active, feeding aggressively, at 44°F (6.6°C). Similar low-temperature bed bug activity was reported by Wigglesworth (1984). These bugs will readily travel five to 20 ft. (in one report, more than 100 ft.) from an established harborage to feed on a human. Although they seem to "prefer" humans, bed bugs very readily feed on birds, rodents, or other mammals.

## MEDICAL IMPORTANCE

Common bed bugs have been found naturally infected by 28 human pathogens, but have never been proven to biologically transmit even one human pathogen. Although their bite is often nearly undetectable, their saliva contains proteins which can cause a progressive sensitivity to repeated bites (there are typically five stages of: no reaction, delayed reaction, delayed and immediate reactions, immediate reaction only, and finally no reaction; depending on the combined biting intensity and frequency). Humans who are frequently

bitten by large numbers of these bugs may reportedly develop a sensitivity 'syndrome' which can include nervousness, nearly constant agitation ("jumpiness"), and sleeplessness. In such cases, removing either the bed bugs (by physical or chemical elimination), or relocating the person, reportedly caused the syndrome to disappear in about a month. Several different species of Cimicidae may bite humans, including: Tropical Bed Bugs, Poultry Bugs, Swallow Bugs, and several species of Bat Bugs. Adult bed bugs can live for several months (in some reports, more than one year) and nymphs for at least three months without feeding. There may be a serious social "stigma" to having an infestation of these bugs.

## RESURGENCE

Some possible reasons for the resurgence of bed bugs as pests include:

1. Greatly increased human mobility (rapid long-distance travel, frequent career changes, etc.), along with much less attention to quarantine programs by most governments, has made it more possible for these and related bugs to be spread quickly to any country, city, or home; and across all social and economic strata.
2. Incorrect identification or inadequate surveillance, may lead to not finding all of the population actually present.
3. In the past 10 to 15 years, there has been a significant switch to using mainly baits to control cockroaches and similar pests. Bed bugs feed only on blood and would not consume, and may not even contact or be affected by such baits.
4. In the past 10 years, most PMPs have switched to using mainly pyrethroids for nearly all indoor residual pesticide treatments. Bed bugs are good at detecting and avoiding many chemicals. Some pyrethroids are repellent, and could cause the bed bugs' population(s) to "split up," spread out, or move to one or more new locations.
5. In many countries, the public knows little about bed bugs, their biology, or control (or prevention.) Unfortunately, many laymen, some doctors, and even a few PMPs may blame "bed bugs" for any 'bite

symptoms' which they can't explain, or for which they can't seem to find any other definite cause.

## INFESTATION

Some of the most common ways by which new bed bug infestations may be introduced include:

- Spending a night (or longer) in an environment which is already infested by bed bugs.
- Having a guest visit who has come from such an infested environment.
- Renting furniture or buying used furniture or bedding.
- Picking up discarded bedding or furniture from a curbside, trash collection point, or dumpster.

## CONTROL STRATEGIES

- Note: Sanitation alone **will not** eliminate these bugs!
- Do a thorough initial survey and careful ID to be sure what, and where, the pests are. Significant portions of many infestations will be found in areas off the bed (e.g., under carpet edges, in other furniture, under baseboards). Due to their small size and cryptic behavior, young bed bugs can easily be missed in low level infestations even by a highly trained and experienced professional.
- Consider using a vacuum to initially collect (fatally) as many of the bugs as you can. Low-moisture steaming devices have been used with success to kill bed bugs in seams of mattresses, but residual moisture can sometimes be a problem.
- Next, treat all detected harborage sites with a properly labeled residual insecticide.
- Partly because of currently limited chemical insecticide options, it can be extremely difficult to eliminate an established infestation of bed bugs. Consider using non-repellent active ingredients or the least repellent formulations available for residual treatments; and consider using new products, including IGRs, which are being developed and labeled specifically for use against bed bugs. Most distributors can provide information about such new products.

*Bed bug bite,  
after 24 hours.*



- Seal shut all cracks, crevices, or joints through which the bugs may be passing to get to your customers (their hosts).
- Consider using a properly labeled dust in electric junction boxes, or other voids, which cannot be sealed.
- Educate all involved about the bugs, about suggested management strategy (and what part they have in it), and about the fact that these bugs are **not** known to transmit **any** human pathogens, despite extensive testing.
- Bed bug infestations are seldom controlled in a single visit. It usually requires multiple visits, a very thorough effort with great attention to detail and client cooperation to achieve control. It takes longer without good client cooperation.
- These bugs are very resilient and they may become a problem again months after they were apparently eliminated.
- Humans' vacating an infested premises is **not** an effective control strategy, because bed bugs will often leave an empty or partially-treated room and move to new sites several rooms, or several floors, away. This often happens in hotels, apartments, or similar large buildings with connecting or attached units.
- Launder all bed clothing (or other cloth items) with hot (at least very warm) soapy water to kill and remove any bugs and their eggs which might be hiding or attached there. [Heat of at least 140°F for more than 20 min. should kill nearly every kind of arthropod, including these bugs.] Soapy water, or cold temperatures (for a much longer time), will also kill them, but the efficiency of each of these methods varies with particular circumstances.
- Place sticky traps (monitors) in likely pathways between harborages and beds (hosts).
- Consider placing physical barriers (specific to local conditions) between horage sites and the beds (hosts).

## SAMPLE CONTRACT

The NPMA has a sample contract for bed bug control available to members at [www.npmapestworld.org](http://www.npmapestworld.org).

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