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Integrated Pest Management (IPM) BED BUGS

Bed bugs mostly troubled *rich* people in medieval times, because they had the warmest homes. But as the quality of homes improved during the late sixteenth century, bed bugs became a problem for people of all economic classes. Before World War II, they were a common pest in the U.S. until a combination of factors including DDT, a household appliance, and fashion nearly eliminated them. Unfortunately, bed bugs have made a worldwide comeback. They're also turning up in surprising places, such as fancy hotels, hospitals, college dorms, laboratories, airports, and maybe even your home. Why? Many experts consider globalization a major culprit. People and goods are traveling more widely and in greater numbers than ever before. Bed bugs are nocturnal, small, shy, and easily overlooked—and the adults can live for half a year without food—making them perfect stowaways in luggage and shipping crates. So what should you do about bed bug infestations? First, relax. Although they feed exclusively on blood, bed bugs are *not* known to transmit any diseases to humans. They may be horrifying to some, but they pose less of a risk to us than do mosquitoes. In fact, if improperly applied, pesticides intended to manage bed bugs could be dangerous to your health. The best strategy to deal with bed bugs is integrated pest management (IPM), which combines a variety of practical techniques and products that pose the lowest risk to our health and to the environment. The first step in your IPM campaign is to make sure that you're dealing with bed bugs and not some other insect.

What do they look like?

Bed bugs are insects. They are a member of the Order of true bugs, Hemiptera, and the Family, Cimicidae. A few types of bed bugs live in close association with people. The common bed bug, *Cimex lectularius*, and the bat bug, *C. pilosellus*, are often found in homes in the northeastern United States. Adult bed bugs are straw-colored to reddish-brown, ovalbodied, wingless insects. Their upper bodies are crinkly, like paper, and covered with short, golden hairs. Before feeding, they're $\frac{1}{4}$ – $\frac{3}{8}$ " long (about the size of a pencil eraser) and nearly as flat as a piece of paper—which is why they can fit into such narrow crevices. Their appearance changes dramatically after they've fed; they become bloated and dark red and have been described as "animated blood drops." Their eggs are white, slightly pear-shaped and about $\frac{1}{32}$ " long, about the size of a pinhead, with a "lid" at one end through which the young will emerge. They're found in crevices, in clusters of 10–50 eggs. Newly hatched bed bugs are nearly colorless but otherwise resemble the adults, only smaller. Bed bugs are gregarious, so you may find adults, young, and eggs in the same location.

How quickly do they multiply?

Inside buildings, bed bugs can breed all year. In the Northeast, they typically have up to three generations per year. Their average lifespan is ten months to a little over one year, and in that time, a female may lay from 200– 400 eggs, depending on the temperature and the amount of food available. The females need a blood meal before laying eggs.

Eggs hatch in about ten days. Under ideal conditions, the young can reach adulthood in five to eight weeks. Young bed bugs must take a blood meal before they can shed their skins and grow. They shed their skins five times before becoming adults.



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How bad is a bed bug bite?

The common bed bug (*C. lectularius*) prefers to feed on humans, but will feed on mice, rats, bats, rabbits, guinea pigs, and birds, especially chickens and swallows. Pets such as dogs and cats are not a major host for bed bugs. The other species of bed bug found in the Northeast, the bat bug (*C. pilosellus*) prefers bats, but when the bats migrate for the winter, these parasites may venture into our living spaces; in a pinch, humans will do. Bed bugs feed for about five to ten minutes at night, while the host sleeps, then drop off the host and crawl to a sheltered crevice where they'll remain for several days while digesting the meal.

They tend to bite all over the body, especially on the areas that are more exposed while we sleep, such as the face, neck, arms, and hands. But you may not see this evidence of their feeding because people experience a range of reactions to bites from blood-sucking insects. Some people are hardly aware they've been bitten, but others suffer an allergic reaction to the saliva injected while the insects feed, and may develop painful swellings. For this reason, people in the same household may have different opinions about how "bad" the infestation is, or whether bed bugs are present at all. Heavy infestations of bed bugs have been shown to cause anemia in children and the elderly. Bed bug problems in the home may also cause stress and sleeplessness. Their presence may be undetected for months. Also, because they can survive for about six months without feeding, bed bug infestations can persist in abandoned buildings or those that are only used seasonally.

How to inspect for bed bugs

In the early stages of an infestation, bed bugs will be found around the seams and tufts of the mattress, while later on, they'll spread to cracks in the bed frame and then to gaps behind baseboards, pictures, window and door casings, wallpaper, and other similar shelters. Look for the insects, their cast skins, and eggs near crevices. Check pillowcases, sheets, and the mattress for bloodstains, smears, or flecks (the sign of their feeding). When their populations are high, you may notice a pungent, sickly-sweet odor that smells like raspberries. Examine the room thoroughly, moving in a logical pattern. Use a flashlight to peer behind and underneath furniture and woodwork. Look under all items that are attached to or against the wall.

Check possible hiding places such as

- Seams, creases, tufts, and folds of the mattress and box spring
- Cracks in the bed frame and head board
- Underneath chairs, couches, beds, dustcovers
- Between the cushions of upholstered furniture
- Underneath area rugs and the edges of carpets
- Between the folds of drapery or curtains
- In the drawers of night stands, dressers, etc.
- Behind the baseboards
- Around door and window casings
- Behind electrical switch plates
- Under loose wallpaper, paintings, posters, etc.
- In cracks in the plaster
- In telephones, radios, clocks, and similar places



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It's also important to inspect new and used furniture before bringing it inside. Look in narrow spaces, along the seams, under folds of cloth, and under cushions. If you find signs of bats in the building, then you could be dealing with bat bugs. First, remove and exclude bats from the space (refer to the *Bats* fact sheet for advice). In addition to treating the living spaces the bat bugs may have invaded, you'll need to find the location of the bats' roost and clean that area.

I found bed bugs. Now what?

There's no getting around it: if you want to get rid of bed bugs, you need to clean. A lot. And get rid of all the clutter, especially in your bedroom. Remove things they could hide behind or underneath, such as pictures, posters, and area rugs.

What Tenants Can Do

Protect mattresses with plastic mattress covers designed to contain dust mites. They will contain bedbugs, too. Wash bedclothes, pillows, and clothing in hot water and dry them in commercial laundry dryers (the high heat will kill bedbug eggs). Keep clean laundry in sealed plastic bags to keep out bedbugs. Use a steam-cleaner in places where using pesticide is difficult or inappropriate, such as closet corners or a baby's crib. The heat from the steam-cleaner can kill bedbugs. Before moving furniture or luggage into your home, inspect them carefully. Avoid taking in furniture if you do not know where it has come from, especially if it has many cracks. Clean carpets and vacuum floors frequently and discard vacuum cleaner bags immediately. Eliminate clutter in your home to reduce the narrow hiding spaces that bedbugs prefer.

Less Effective Measures

Although high heat will kill bedbugs, using a space heater or leaving furniture out in summer sun are not very effective because the heat is too diffuse. Steam-cleaning mattresses or couches may not be effective if the bedbugs are burrowed deep and can avoid the steam. Temperatures below 32° F kill bedbugs. If you put out furniture in Boston's winter, make sure the temperature is below freezing.

VACUUM

Vacuuming is an effective way to remove bed bugs and the dirt that provides them with shelter (it works for many other insects, too). To manage bed bug infestations, it's best to vacuum each area thoroughly, every day. Tilt the mattress, box spring, and furniture upside down so you can reach all sides. Concentrate on seams, creases, folds, and around any tufts or buttons. Vacuum the furniture, the bed frame, the floor, and baseboards—wherever your inspection revealed the presence of bed bugs. Empty the vacuum immediately. If your vacuum has a bag, you can close the bag, and then place the bag in a freezer for at least 24 hours before disposing of it; this will kill the bed bugs.



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CLEAN BED LINENS

Bed bugs are sensitive to extreme temperatures in all of their life stages; the young are more vulnerable than the adults. So toss your sheets, pillowcases, bed skirt, and blankets into a *hot* (140F) dryer for 20 minutes to kill bed bugs. Steam cleaning is another option if it is done thoroughly at a high temperature.

You don't have to throw out your bedding. Both extreme heat and freezing can also be used to remove bed bugs from clothing and other objects that can withstand that temperature.

MAKE YOUR BED AN ISLAND

Move your bed away from the wall, and make sure the linens, bed skirt, and blanket don't touch the floor. This will make it harder for the bed bugs to crawl into your bed. They don't fly or jump, so crawling is their only option. You may also want to slip the mattress into a cover that zips closed all the way around.

Popular remedies in the early 1900s included smearing petroleum jelly on the bed legs or standing the legs in jars of soapy water. Some now advise wrapping bed legs with double-sided sticky tape or silicone tape. While it's true that bed bugs can't navigate an extremely sticky or smooth surface or pass through soapy water, these techniques could damage the bed. And in some cases, it might not be possible to wrap the tape around the legs tightly enough to keep the insects from crawling underneath the tape.

SEAL CREVICES

Do your best to eliminate their shelter by sealing the crevices you found during the inspection. Caulk will work well in many areas, such as around window sills or along baseboards, but if you need to fill cracks in the floorboards, furniture, or the bed frame, you may wish to consult with a furniture maker (there are removable caulks that may be appropriate). Repair or remove peeling wallpaper, and tighten any loose light switch covers. And while you're at it, take the time to try to prevent future invasions. That's critical, because you don't want more bed bugs to enter your home! Bed bugs travel along routes created by pipes and electrical conduits. So seal any openings where pipes or wires or other utilities come into your home. Pay special attention to walls that are shared with other apartments.

WHAT ABOUT PESTICIDES?

Pesticides are another option for killing bed bugs, but as early as 1948 there were reports of bed bugs that were resistant to such insecticides as DDT; such resistance complicates efforts to manage populations using pesticides. Luckily, several types of less toxic products for killing bed bugs are now available, and because some of these products work in different ways, bed bugs also won't be able to develop resistance to them as easily. For example, silica gel dusts work by chafing the outer waxy cuticle of an insect, causing it to rapidly lose water and die. Silica gel is sometimes combined with pyrethrums, which are toxic to insects. They're often used in wall voids and inaccessible places around the home.



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DON'T GIVE UP TOO SOON

Whatever techniques the pest management professional uses to manage the infestation, give them time. It's extremely difficult to penetrate all of the bed bugs' hiding places, so even if your IPM approach is working, you may see a few living bed bugs for 2 to 3 weeks.

The exterminator will implement an Integrated Pest Management (IPM) plan, which describes the extent of the infestation and the steps to control and monitor it. For example, treating adjacent apartment units might be recommended, depending on the level of infestation and condition of the building. The IPM should be shared with both landlord and residents of the affected units. Repair cracks in walls and ceilings. Seal any gaps where water and heating pipes come through the walls or floors. Fill gaps in wooden floors with wood-filler. Remove wall-to-wall carpeting.

The bottom line

For most people, bed bugs are more of a nuisance than a medical threat. Humans are generally responsible for introducing bed bugs into new areas; they have a limited home range, and spread slowly by themselves. So with some diligence, you should be able to eliminate the infestation using an IPM approach. First, **identify** the insect. **Inspect** the rooms thoroughly, focusing on the bedroom. Look for signs of bed bugs, for possible hiding places and for openings that would allow them to enter your home. **Clean and get rid of clutter** to eliminate their shelter. Choose the **removal** methods that best fit your situation; if that includes a pesticide, opt for a less toxic one. Make any **repairs** needed to prevent future invasions. If you decide to hire a pest management professional to deal with the infestation, ask for an IPM approach. Success will depend on your cooperation. Allow the technicians access to every location that could hide bed bugs, including closets and clothing dressers, and follow their recommendations—especially concerning vacuuming and cleaning.

Tips for travelers

Bed bugs are often found in places that experience a high volume of overnight guests, such as hotels and motels, hostels, and dormitories. Remember, they feed at night while you're sleeping, then retreat to a sheltered crevice by morning. That shelter might be within your luggage or souvenirs. When visiting a hotel, check the room quickly for signs of bed bugs, such as blood stains on the pillows or linens.

Inspect the seams of the mattress carefully. Peek behind the headboard and wall decor. Bed bugs will hide in these places; if you don't see them or their signs, there should be no problem. If it's possible, move the bed away from the wall. Tuck in the linens and keep the blanket from touching the floor. Unfortunately, leaving the lights on will not unduly stress bed bugs. (Some sources claim that medieval travelers placed a pig in their beds to sate the bed bugs. Although it's an interesting tale, even if true, it's certainly not practical for most modern travelers). If you visited an infested place, inspect your luggage and souvenirs before bringing them back into your home. If infested, clothing should be placed in hot dryers; cold treatments might be appropriate for other items.