

# **Bedbug Control with Steam, Vacuum and Exclusion: Safe, Sure and Sustainable**

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Bedbugs have long plagued humans in their living environment. This pest has substantially increased in importance as a result of the public's fear of this insect, particularly because of their characteristic odor and their feeding behavior. Bedbug feeding on human hosts can cause serious physical distress; mainly persistent, intense itching, which varies with each individual.

There are neither precise nor detailed records of the costs neither of bedbug control efforts nor of any of the related costs to people bitten in residential, commercial or institutional housing.

The costs for the hospitality industry include:

- increased laundry expenses
- replacement of bedding and furniture
- structural cleaning and physical modifications
- lost revenue from negative publicity
- Insurance claims and lawsuits.

Since the banning of DDT, we have seen resurgence of bedbugs; particularly in the past 15 years. Bedbugs have become a major pest problem; particularly in places with multiple occupancy such as hotels and motels, group and nursing homes, schools, libraries and offices, just to name a few. According to a survey of pest control operators, over 90% of bed bug infestations occur in mattresses and box-springs, as well as nearby carpeting and base boards. In fact, bed bugs thrive in areas where there is an adequate supply of available human hosts and plenty of cracks and harborage areas within approximately 4-feet of the host.

Bedbugs are very small, nocturnal, transient and elusive. They seek cryptic harborages, and can detect and avoid many chemicals including cleaning agents. In the absence of human hosts, adults can live without feeding for several months to more than a year, and nymphs easily survive for three months or longer. This makes the common bedbug difficult to control without a fully integrated approach.

Getting rid of bedbugs is even a greater problem because sleeping areas and other sensitive locations are not conducive to the use of conventional pesticides. Spraying the mattress with insecticide is undesirable as the room must be suitably ventilated and sufficient time must be given after application before the mattress can be used again. More importantly are concerns over the possible health effects of pesticides on people and pets including allergic reactions to the chemicals, and other possible health risks such as cancer and acute neurotoxicity. Therefore, non-residue methods are preferred to insecticides.

Control methods other than toxic chemicals are demanded by the customer. Among the best of these alternative treatment methods is the effective use of vacuuming, together with directed steam treatment; followed by exclusion.

## **Vacuuming**

Bedbugs can be physically removed from exposed harborages or resting sites, such as edges of a box spring or mattress seams, by sucking them up with a vacuum cleaner. Any vacuum used in a bedbug elimination program should have a HEPA filter on its exhaust to prevent

redistribution of bed bug eggs and fecal pellets. A HEPA-filtered vacuum removes more than 99% of all particles greater than 0.3µm in diameter (about the size of a Bacterium). This would ensure that allergens associated with bedbugs or their debris was being removed. Vacuuming will usually kill a large portion of those bugs and can be done at the same time as using steam, thereby immediately eliminating a significant portion of the pest population.

While vacuuming helps reduce bedbug infestations, it does not eliminate bed bugs hidden inside of materials and cracks and crevices. To reach bedbugs in these areas, a heat treatment is necessary. Bedbugs are rather difficult to dislodge with vacuuming alone because they hide in places where normal housecleaning efforts do not reach. Adults and nymphs cling tightly to surfaces and each tiny translucent egg is affixed with a cement-like substance. Vacuuming will dislodge many bedbugs. However, some individuals, and especially their eggs will be left behind. Removal becomes difficult if not impossible when bugs and eggs are located deep within crevices of wood, fabric or upholstery. To reach the pests hiding in these areas, additional treatment using dry directed steam is necessary.

## **Steam**

Steam treatments are effectively used to quickly eliminate live bugs and their eggs from the seams of mattresses and other cloth items. Effective use of this technique requires practice and care. Manufacturer's instructions about the steam generating devices' operation, maintenance and safety precautions must be followed carefully. Steam treatment can effectively kill all stages of bedbugs. If bedbugs have a weakness, it's elevated temperature. Temperatures of about 120°F are lethal to most insects provided they cannot escape to a cooler location. Steamers work by delivering lethal temperatures to where bedbugs may be hiding. Dry steam is quite effective when bedbugs are on the surface of items and up to ¾ inch into fabric surfaces. In cracks and crevices, dry steam will kill bedbugs up to 2½ inches into a gap.

The advantage of steam is that heating is intense and immediate. Vapor that is too hot to touch is what's needed to kill bed bugs and eggs on contact. To be effective, steamers must be capable of delivering a minimum of 150°-180°F for a sustained period. When targeting bed bugs though, the less moisture emitted the better, especially when treating mattresses and other slow-drying materials where mold growth is a possibility. Therefore, low-moisture, commercial-grade steamers are preferred.

Steam can be used to treat almost any area where bed bugs are found or suspected. Logical places include beds, couches and recliners, baseboards and carpet edges, beneath and within nightstands and dressers and floor areas, especially under and around beds. Avoid treating finished wood surfaces or delicate items that might be damaged by high heat.

Steam treatments are even more effective when used diligently and carefully particularly when steamers are used in conjunction with vacuuming. Effective treatment requires repeated and very thorough steaming of the mattress, box spring, bed frame, bed covers, pillows, not to mention other materials and objects within the infested room, such as carpets and curtains.

Steam requires following the manufacturer's instructions concerning the steam generating devices' operation, maintenance and safety precautions. The steam emission tip must usually be about 1 to 1½ inches from the surface being steamed. If the tip is too far away, the steam may not be hot enough to kill all the bed bugs and eggs that it contacts. If the tip is too close,

excess moisture may be injected into the treated material, particularly if the steam is not hot enough. This may lead to other problems such as facilitating dust mite population survival and increase the growth of surface molds in addition to causing damage to varnished wood finishes. Immediately vacuuming the areas after they were treated by steam will increase the efficiency of the bed bug control program by removing the dead insects, eggs and fecal pellets.

While steam is effective, there are several precautions to take when operating this equipment. Always read and understand the manufacturer's instruction manual that came with the equipment.

- The steam will be hot, as high as 212 – 240°F. This can cause burns, so never let children use the machine and always direct the steam away from you.
- Larger brush heads usually work best. Small diameter tips are less efficient and frequently emit too much pressure, causing bugs and eggs to be blown off the substrate. While some of the dislodged bed bugs may die, others could be scattered and survive.
- When using steam on a surface, always test on an unseen area as some fabrics may be damaged. With microfiber fabrics, always steam with the direction of the microfiber.
- Steamers will sometimes spit out hot water when you start up, or after the steamer has not applied steam for some time. Pointing the wand at a towel when you first start will allow you to capture this water.
- Do not use a pin-point steam nozzle; make sure you use a nozzle to distribute the steam at lower pressures such as a floor or upholstery attachment. Pin point nozzles can blow bed bugs off a surface and they may survive.

The best steamers for treating bedbugs are also the best units for commercial cleaning and sanitation. The ideal units are quiet, professional steam generators that feature an integrated HEPA-filtered vacuum for recovery of waste materials. Like all mechanical equipment, commercial steamers/vacuum units require periodic maintenance such as descaling of the boiler and changing the high-efficiency air filter. Look for units that do not require outside service or specialized tools to keep the steamer/vacuum system in top running condition.

## **Exclusion**

There is one additional step in the integrated control of bedbugs. After the steaming and vacuuming of the areas in which the insects live, the cracks and crevices as well as the mattresses and box springs need to be sealed. Sealing access to harborages can effectively isolate bedbug populations. Bedbugs have specially adapted piercing–sucking mouthparts, and three-segmented, structurally primitive terminal leg segments with claws. Both their mouths and legs make them incapable of chewing or clawing through even a very thin layer of sealant or caulking or an unbroken layer of paper or cloth. Sealing a layer of almost any material in place, so that it completely covers the opening of any harborage, can stop bedbugs from passing through. If any bedbug is sealed inside a void or harborage, it is permanently removed from the pest population; even if it continues to live for another year, or two. Just sealing most of the known openings between a harborage and the bugs' usual host access site(s) will restrict the bugs' movements and help temporarily reduce the intensity of their feeding.

Enclosing clothes and other items in plastic bags and similarly tightly sealed containers can greatly reduce the availability of harborage sites. In addition, commercially available plastic covers, at least 0.8 mm thick and usually having a zippered edge, can completely encase a

mattress or box spring and stop any bedbugs harboring in either of them from further access to bite a host using that bed.

## Conclusion

A integrated pest management system that includes steaming, vacuuming and exclusion will significantly reduce a bedbug infestation and the intensity of their feeding without the use of harmful chemicals.

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