



Bed Bugs

Bed bugs, *Cimex lectularis*, are widely distributed insects in the blood-sucking family Cimicidae. Both the nymphs and adults feed on humans, usually at night. Household infestations were common in the United States before World War II, but improvements in hygiene and the widespread use of the pesticide DDT in the 1940s and 50's almost eliminated the problem.

In recent years, infestations in homes, hotels, dormitories, and other locations have increased. Bed bugs are most often associated with clutter and filth but have also been reported in the finest hotels and living accommodations. Although there is no specific explanation for the resurgence of this pest, increased international travel and pesticides with reduced residual activity have probably contributed.



Figure 1. Bed bug



Figure 2. Eggs, nymph, and mature bed bug

Description and Life Cycle

Adult bed bugs are small, oval, wingless, flattened insects about $\frac{1}{8}$ inch long and rusty to dark red in color (Figure 1). They have four-segmented antennae and small, compound eyes located on the side of the head. Immature bed bugs, or nymphs, are similar in appearance to adults, but smaller (Figure 2). A female bed bug can produce 200 to 500 eggs in a lifetime. Eggs are tiny, white, and deposited in clusters of 10 to 50. They are covered with a glue-like substance that

allows them to adhere to surfaces, often long after nymphs hatch (Figure 2).

Newly hatched nymphs are about the size of a pinhead and a light yellowish color, making them difficult to detect. Nymphs grow larger after each of five molts before reaching adulthood (sexual maturity). Bed bug nymphs require

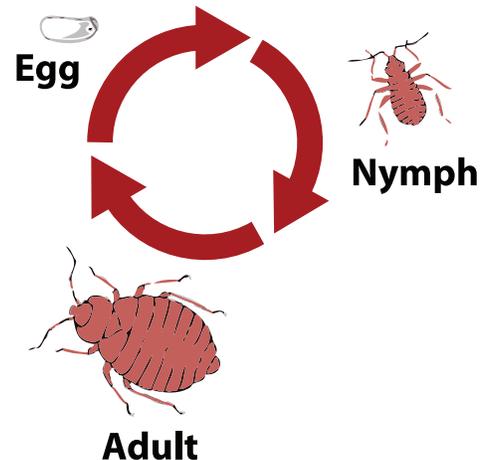


Figure 3. Bed bug life cycle: Generally, five nymphal stages, each requiring a blood meal before molting.

a blood meal before each molt. The complete life cycle can take anywhere from five weeks to four months (Figure 3). They develop rapidly under ideal conditions (70° to 82° F), but cooler temperatures or limited blood supply may delay growth.

Both nymphs and adults can live for months without feeding. Although they prefer humans, they can feed on other warm-blooded animals such as dogs, cats, and rodents. Controlling an infestation by temporarily abandoning a dwelling is not effective. Adults live approximately 10 months. There may be three to four generations a year.

Damage

Because bed bugs are secretive, they are difficult to detect, especially in the early stages of an infestation. They often feed multiple times before victims realize it. By then, females have had plenty time to deposit eggs to increase the population.

Bed bugs feed at night while people are asleep, but the bite usually is not noticed until later. They can consume up to six times their weight in blood, and a single feeding may take anywhere from 3 to 10 minutes. They feed by piercing the skin with two elongated stylets (mouthparts). One stylet carries saliva from the bed bug into the wound and



Figure 4. Dried bug excrement



Figure 5. Bed bug indicators

the other carries body fluids from the host into the bug. Saliva may produce swelling and itching, and these areas may become infected when scratched.

Reactions to bed bug bites vary among individuals. Swelling may occur a few hours after the bite, a few days later, or not at all. It can be difficult to distinguish bed bug bites from mosquito, flea, or spider bites. In general, at the feeding site, bites are itchy and red, with a darker red center. They are arranged in a line or clustered together and located on exposed areas such as the face, neck, arms, hands, or ankles. Many people have no reaction to the bites, but some have an allergic response such as itching, blistering, or hives.

Confirmation of bed bug bites requires locating the infestation and identifying the insects. People are often bitten while traveling and not able to locate the bugs for identification. Bed bugs may reduce the quality of life by causing discomfort, sleeplessness, and anxiety. They are not known to transmit diseases.

Detection

Bed bugs are more problematic in dwellings such as condos, apartments, homes, hotels, motels, and nursing homes than in retail stores. They have been discovered in furniture stores, laundromats, movie theaters, and on public transportation. Bed bugs are usually transported to new locations in suitcases, purses, backpacks, etc. where they are extremely difficult to detect. Once in a new habitat, they hide during the day, and feed on the inhabitants at night. It is more difficult to eradicate a bed bug infestation than ants, fleas, cockroaches, or termites.

During early stages of infestations, bed bugs are most commonly found in or near the bed, so inspections should begin by examining the mattress, bed frame, and headboard. Because these insects are small and secretive, they

are difficult to see unless the bed is dismantled and a flashlight is used. Adults and nymphs can be seen with the naked eye, but eggs require magnification. As infestations increase, the bugs may move away from the bed into other furniture, under loose wallpaper, in cracks and crevices along floorboards, under the edge of carpeting, switch plates and outlets, and even inside phones, clocks, and smoke detectors.

Both nymphs and adults typically feed at night but hide in nearby crevices and cracks during the day. Their small size and flattened bodies make it easy for them to hide in the seams of mattresses and box springs, cracks in bed frames and bedside tables, under loose wallpaper, behind wall hangings, and in other furniture. Although bed bugs do not live in nests or colonies, they tend to congregate around good hiding places. These areas are usually evident because they are stained with dark red to blackish spots, which is dried bug excrement (Figure 4). There may also be eggs, eggshells, and the brownish molted skins (exuviae) of the maturing bugs (Figure 5).



Figure 6. Bed bug bites

If itchy bites appear during or upon returning from travel, luggage should be bagged and washed immediately (Figure 6). If bed bug-like insects are found, it is important to determine the species, especially if bats, pigeons, or rodents live on the premises, because several similar species may infest these animals but not humans. Specimens should be taken to a local K-State Research and Extension office or sent to an insect diagnostic lab for positive identification.

Prevention

Bed bug infestations are difficult to prevent because they normally are transported from one location to another on clothing, in luggage, or on used bedding or furniture. Thoroughly inspect all secondhand furniture before bringing it into the home. When possible, clothing should be laundered and dried immediately. It is best to avoid bringing discarded furniture and bedding into the home.

Travelers can help prevent distribution of bed bugs by inspecting bedding before use for signs of bugs along seams of mattresses and box springs. Keep suitcases elevated on luggage stands, which can prevent entry into luggage. Hotels, motels, or dormitories with suspected bed bug infestations should take immediate action to detect and eliminate them to prevent spreading this troublesome pest to other locations.

Management

Bed bugs are difficult to eliminate from a structure. Treatment or control measures must be thorough. In most cases, it is necessary for a homeowner to hire professional pest control services with experience inspecting and treating bed bugs that are licensed to use restricted use pesticides if necessary.

Excess clutter makes it difficult to locate and control bed bugs. Clothing, bedding, and other materials should be removed and disposed of or cleaned. Bedding and other materials exposed to bed bugs should not be treated with insecticides. They can be treated by heating in most tumble dryers on the hot cycle to a consistent temperature of at

least 104° F for a minimum of 30 minutes, washing all items at 104° F, or freezing at 0° F for at least 2 hours. Treating fewer items in each cycle will make it more difficult for bed bugs to avoid the hot or cold environment. All life stages (egg, nymph, and adult) seem to be killed at 0° F but need to be exposed to this consistently cold temperature for at least 2 hours. DO NOT take clothing suspected to be infested to public laundries or dry cleaners, because this presents the risk of infesting nearby garments.

Because mattresses should not be treated with pesticides, it is best to discard the bed, especially older mattresses and box springs that may have holes or tears, which make it easier for bed bugs to hide deep inside where they cannot be effectively treated. Other options include purchasing a mattress encasement specifically designed for bed bugs, available through some pest control companies or retail outlets. Encasements are designed to keep bed bugs trapped in the mattress where they will eventually die and prevent new bed bugs from infesting the mattress.

Nonchemical control methods may aid in removing bed bugs but rarely eliminate an infestation. Mattresses, box springs, carpeting, and furniture can be thoroughly vacuumed or steam cleaned to remove nymphs and adults. A wand should be used to get into cracks and crevices but may still not remove the sticky eggs or bugs that have crawled deeper into materials. These procedures must be repeated several times to remove bugs not previously affected or recently hatched. It is also helpful to seal potential hiding places such as cracks and crevices in walls and other surfaces and remove loose wallpaper or other materials that may provide shelter.

Pest control companies trained in bed bug management have experience detecting and treating infestations. Most methods are beyond the financial or technical means of the average homeowner. They include bed bug pheromone and mechanical traps, thermal treatments, dogs trained to detect infestations, and restricted use pesticides. If a bed bug infestation is suspected, call a professional trained in bed bug management before the problem spreads.

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