

WHAT CAUSES BED BUGS



Bed Bugs Handbook
www.bed-bugs-handbook.com

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Getting to Know the Bedbug

Natural History

Bed bugs are thought to have evolved from cave-dwelling insects in the Middle East that fed on bats and eventually started feeding on humans instead. Human bed bugs were noted in Greek and Latin literature long before the Common Era and the insects rapidly spread throughout Europe with human populations. ***Cimex lectularius* is the species that is now infesting homes.** Bed bugs live where people live because they only feed on sleeping humans. Thus, they are found primarily in homes, apartments, hotels, shelters and dormitories. The presence of bed bugs in human dwellings is not caused by a lack of cleanliness. They are an equal opportunity pest that only requires a warm, sleeping body and a place to hide nearby. Bed bugs have been found in both five-star hotels and homeless shelters.

Biology

Bed bugs belong to the family Cimicidae in the insect order Hemiptera. All Hemiptera, or “true bugs”, have piercing-sucking mouthparts to feed on plant juices, other insects, or the blood of vertebrate animals. The family Cimicidae includes many species that feed primarily on bats or birds, but only three species tend to specialize on humans. *Cimex lectularius* is the most cosmopolitan and is the species found throughout North America and Europe. The other two species (*C. hemipterus* and *Leptocimex boueti*) are found exclusively in tropical areas, with *C. hemipterus* being widespread in those regions.

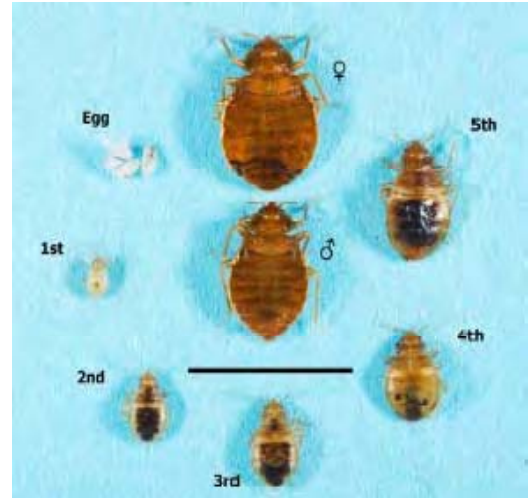


Bed bugs are recognized and distinguished from other similar insects by their extreme dorsal-ventral (back to stomach) flattening, their lack of wings and their reddish brown coloration after feeding. The flattening is not as obvious in blood-engorged individuals. They typically do not get larger than 7 mm (~1/4”) in length. Infestations with bed bugs are sometimes associated with a sweet, musty odor produced by glands on the ventral (bottom) side of the thorax (middle body segment).

Life Cycle

Bedbugs go through five nymphal (immature) stages after hatching from the egg and before molting one final time to an adult. They require at least one blood meal at each stage. Adults may feed many times

throughout their lifespan, every 3 to 7 days varying with temperature and other factors, with females requiring a blood meal to produce egg batches. Males may feed less frequently. Nymphal stages last from about 4 days to 24 days based on temperature and other environmental conditions. Adults may live for more than a year. Under optimal conditions, the cycle from egg to egg can take place in under 5 weeks. However, the insects can go for long periods (up to one year under optimal conditions) between blood meals. Females must mate to lay eggs. Mated females lay eggs singly, cementing them to surfaces in crevices and protected areas away from, but near a host sleeping area. They average 3 to 5 eggs per day, but may lay as many as 12, producing over 500 eggs in their lifetime. As with other stages, the eggs are very durable and can remain viable for weeks under harsh environmental conditions.



Feeding

The nymphs and adults locate hosts using heat and carbon dioxide sensors, and recognize human hosts through olfactory (smell) receptors on their antennae and mouthparts. Bed bugs normally feed late at



night or early morning when the host is in their deepest sleep. Most people are unaware when being fed upon – the bed bug is stealthy and its saliva contains desensitizing agents that prevent the host from feeling its mouthparts penetrate the skin. The bite sites are usually small, pinprick-sized lesions that may or may not become inflamed. Reaction to bed bug bites varies from person to person. Most people show no reaction

the first time they are bitten, but subsequent bites may develop into welts that itch. Some people react severely with welts that itch for weeks, and individuals prone to keloid scarring may be affected dramatically. The bugs feed for 3 to 15 minutes and then leave the host. It is rare to actually find bed bugs feeding. Once in their protected hiding spots, the blood meal is digested. During this process, they will defecate, leaving reddish brown spots that are characteristic of bed bug infestations.

Biology and Control Issues

Bed bugs are remarkably resistant in almost every sense of the word, and are comfortable within all but the extremes of climate. They can survive freezing temperatures (32° F) for days and tolerate much lower temperatures (5° F) for short periods. Their upper lethal temperature is 120° F causing death within minutes, but longer exposures to temperatures above 113° F are also lethal. They have a wide humidity tolerance range but tolerate dry climates better than humid, and **have been known to survive without blood meals for up to a year**. They spend most of their time hiding in small inconspicuous crevices that are difficult to reach with normal vacuum cleaning and “bug bomb” applications. By hiding in clothing, luggage, bedding and



mattresses, bed bugs may be accidentally transported to new locations. Bed bugs often choose to hide in box springs because they are undisturbed and offer many crevices and close proximity to hosts. Although they are slow moving and prefer to stay where people sleep, they will eventually move if their host leaves, or if their resting place becomes too crowded with other bed bugs. If humans are difficult to find, they will seek blood from other warm blooded animals in the vicinity (e.g. dogs, rodents, chickens, etc.).

At present, because of the stealthy habits of the bugs and their remarkable abilities to tolerate environmental fluctuations and host availability, it can be **difficult to eradicate** them once established. Many populations of bed bugs have also been found to be extremely difficult to kill with certain pesticides (this is referred to as “pesticide resistance”). Pyrethroid pesticides are the most common class of pesticides on the market today for both professional and consumer products. Bed bugs collected from homes and apartments across the nation were studied for the degree of resistance or susceptibility to pyrethroid pesticides. The study showed 80% of the populations to be resistant in some degree to pyrethroids and only 20% of the populations to be susceptible. Some populations were extremely resistant to the point that they would not die unless pesticide was applied directly to their bodies. Several samples from bedbug populations were found to be highly resistant, but this does not mean that all bed bugs found are resistant. Non-chemical means (e.g., steaming, vacuuming, freezing) can be effective under certain conditions, but the variety of hiding places in most dwellings precludes total control with these methods. Circulating dry (convection) heating is the only non-chemical treatment currently available that is effective against bed bugs in all of their hiding places.

Health Concerns Associated With Bed Bugs

What Activities Put Me At Risk of Encountering Bed Bugs?

Bed bugs carry a stigma and popular culture tends to associate their presence with poverty, filth and overcrowding, but none of these are requirements for bed bugs to thrive. Bed bugs are opportunists and are adapted to human activity. They live out their lives in close proximity to their slumbering human hosts. The following are common risk factors for bringing bed bugs home with you:

- Bringing uninspected, used or second-hand furniture (particularly mattresses and box springs), clothing, or electronics items into the home
- Staying in a shelter, hotel, youth hostel, group home, apartment building or dormitory where population turnover is high
- Travel, both domestically and internationally. Always inspect your luggage when returning home.



How Do You Know If Bed Bugs Are Biting?

When bed bugs feed, they inject a small amount of saliva under the skin. Some people do not react to the bites. In others, the proteins in the saliva can stimulate an immune response, leading to red, itchy swelling at the sight of the bite. Some individuals become sensitized over time and repeated exposures, leading to more severe localized or even generalized allergic reactions.



The following should be considered if you are experiencing bites and bed bugs are suspected:

- Bed bugs generally feed on exposed skin not covered by clothing.
- Bed bugs typically feed during the night in darkened conditions.
- Rarely, they may feed during daytime hours if they have been denied a host for long periods of time.
- Bed bug bite reactions may occur immediately, or up to 14 days after the bite.

• A careful inspection of both the sleeping and living areas for the source of the irritation must occur. If bed bugs cannot be located after several careful inspections then other biting pests or allergens must be considered.

Can Bed Bugs Make You Sick?

Bed bugs have been plaguing humans for millennia. Their blood-feeding lifestyle requires that they dwell in close proximity to their next blood meal, preferably people. While blood-borne pathogens have been detected in recently fed bed bugs, there is little evidence in the literature that they transmit communicable diseases between people.

- Anemia has been reported in the elderly and young children living in homes that were heavily infested with bed bugs.
- Studies in Egypt found that allergens excreted in bed bug environments can produce reactions in persons with asthma. The presence of bed bugs in a living environment may exacerbate symptoms in sensitized asthmatics.
- Even though bed bugs do not appear to transmit diseases, they are considered vermin. The presence of bed bugs in a dwelling can produce a range of physical and psychological discomfort in their human hosts, and infestations can be very difficult to remedy. As a result, bed bug infestations are considered a public health nuisance.
- Dwellings that harbor bed bugs may fall under the authority of state and local laws that address public health nuisances or sanitary housing conditions.

What Are Some Other Possible Health Effects from Bed Bugs?

While bed bugs may not be responsible for transmitting diseases to people, they can have a profound psychological effect on those who experience bites. In addition to suffering bites, people often experience a strong repulsive reaction to the idea of being fed on by bugs when unconscious and unaware. This may manifest as mild to severe anxiety and stress. Because bed bugs can be transmitted between people, people suffering with an infestation may feel isolated from friends and family.

Treating a residence for bed bugs can be difficult and expensive. Sufferers may have to dispose of infested furniture and belongings, leading to both financial and psychological stress. Some people are driven to take extreme actions to rid themselves and their homes of these pests, potentially harming themselves and their families with pesticides or other hazardous methods.

Is There An Effective Treatment for Bed Bug Bites?

- Preventing feeding by effectively eliminating the bed bug infestation is the best method of treating the bites.
- Treatment with topical or systemic anti-histamine or anti-inflammatory medications may provide some relief from a localized allergic reaction.
- **Topical insecticides such as those used for head lice and scabies, and repellants have no effect on bed bugs, and their use in the hope of preventing further bites may be dangerous.**



What Are Some Other Causes for Red, Itchy Swellings of the Skin?



- Contact with topical or systemic allergens may cause hives or lesions that look like “bites”. Changes in the use of detergents for laundering, or allergic reactions to materials in the environment can cause a range of skin reactions and must also be considered if no insect culprit can be identified. A **thorough medical evaluation** is required to rule out a **biological cause** for the symptoms such as allergic reaction or other skin infection.

- Bites from other insects can all have a similar appearance. These include mosquitoes, biting flies, fleas, ticks, mites such as scabies, and sucking lice (pediculosis). **If a person thinks they are suffering from repeated bites, it is essential to attempt to identify the offending creature either on or in the skin or in the person’s environment.**

- If a causative agent cannot be identified in a person who is convinced they are receiving insect bites, the person may be suffering from delusory parasitosis, a psychosomatic condition unrelated to an actual infestation with an insect or parasite.

Other Biting Arthropods

Other arthropods (insects and arachnids) can cause bites and lesions and it is often difficult to distinguish bed bug bites from those of other biting pests. Bite reactions may vary and factors such as bite location on the body, personal activities, time of year and environmental conditions can help determine the cause. If you or someone you know has bites, consider the following:

- Bed bugs tend to feed on exposed skin, but can feed under loose clothing.
- Bed bugs primarily feed at night in the dark.
- Bed bug bite reactions can take a few minutes to 14 days to appear.
- If evidence of bed bugs cannot be located in sleeping areas after multiple inspections, consider other biting pests.
- If local temperatures are over 60° F and the individual is outdoors or has windows or doors open, mosquito or “no-see-um” bites must be considered.
- Pets or wildlife may be a source of fleas and mites that can bite humans, especially in warmer months.

The following is a list of other potential culprits besides bed bugs:

Mosquitoes:

Mosquitoes are normally encountered outdoors during the warmer months of spring and summer; however, damaged screens, open doors and windows will allow them to enter the living area. They generally feed at dusk or dawn, but some species will bite during the day. In most cases, skin reaction to the injected allergen from mosquitoes results in the appearance of an irregular blanched wheal, surrounded by an area of itchy redness. Mosquitoes can bite on any part of the body that is exposed and may bite through thin layers of clothing. Mosquitoes typically only bite once and bites will not normally be clustered or in a line, however multiple mosquitoes may bite during the same time period.



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Head, Body, and Pubic Lice:

Unlike bed bugs, lice live on the human body, feeding by penetrating the skin. Head lice live in the hair on the scalp and lay their small, whitish eggs (nits) close to the base of hair follicles. Pubic lice usually live in the hairs of the pubic region, but can also infest the chest, armpit and eyelashes. Body lice are not common in the U.S., but are unique because they lay their eggs in the seams and folds of clothing, and feed on adjacent skin.

The most common symptom of head lice is itching of the scalp due to sensitization to allergens in lice saliva. Often there are no symptoms. Occasionally, scratching leads to chafing and secondary bacterial infection requiring treatment with an antibiotic.

Head lice outbreaks are common in elementary schools, child care facilities, and group living situations. Head lice do not transmit diseases, but are a “nuisance pest” and can be difficult and

time consuming to eliminate.

Ticks:

Ticks are most often present in natural areas such as grassy shorelines, wooded areas, or fields near wooded areas. Ticks are rarely encountered indoors unless pets bring them inside. Adult ticks have 8 legs and are 1/8 inch to 5/8 inch long (smaller than a sunflower seed), and their colors can vary widely. Nymphal (immature) ticks are smaller, usually less than 2 millimeters.

Ticks feed painlessly by attaching themselves to the skin with their piercing



mouthparts. They can attach anywhere on the body, but are commonly found in the hairline, ears, waistline, armpit and groin. Unlike bed bugs, most ticks must stay attached to their host for several days. The most common ticks encountered by people are the American Dog tick, the Blacklegged tick and increasingly, the Lone Star tick. Some ticks, however, exhibit “bed bug-like” behavior, including stealthy night feeding, short feeding times and harborage indoors. These ticks are uncommon, but may be encountered in parts of the U.S. (particularly in rustic mountain cabins), and internationally.



Fleas:

Flea bites on people are normally associated with the presence of companion animals (dogs and cats) which are the flea’s normal host. Fleas also infest wildlife and are most abundant outdoors in the late summer and fall. Fleas can be maintained indoors year round. The presence of fleas in a home or apartment will be the result of an infested pet, or the presence of rodents or other wildlife in wall voids, basements, crawl spaces or attics. Unlike bed bugs,



fleas jump rather than crawl in the environment. Fleas prefer to bite animals, but will feed on people when their normal host is not readily available. They usually bite exposed skin, especially around the ankles, and bites can appear in lines of 2 or in clusters. Flea bites typically appear as red spots or raised,

itchy lesions and may be confused with bed bug bites.

Mites:

Mites are very small arthropods related to spiders and ticks. Several species are associated with humans, pets, domesticated fowl and rodents. The human scabies mite can cause irritation via feeding and burrowing into the skin. Typically, the organisms are found in skin folds; any associated skin damage is typically distinct from the pinprick lesions associated with bed bug bites. Other mites, such as species normally found on bird or rodent hosts, can bite humans if their primary host vacates the nest. These organisms will bite day or night and their bites can be felt, in contrast to most bed bug bites. Rodent or bird nests in or on a human dwelling are usually the source of these infestations.



Spiders:



Spiders rarely bite people unless they are disturbed in their environment or while moving through the environment. Many bites occur when people are reaching for items in closets, basements, or other places where items are stored, or when sleeping people roll onto spiders by accident. Spiders have paired mouthparts and venom glands. Many spiders’ mouthparts are too small to

puncture skin, but others can leave a painful or itchy bite. All spiders are venomous, but those dangerous to humans are rare. Necrotic skin infections associated with Staphylococcus bacteria are often mistaken for brown recluse spider bites. Any spider bite is usually quite different from bite marks left by bed bugs.

Responsible and Safe Use of Pesticides for Bed Bugs

Pesticides are chemicals designed to repel or kill a wide range of animal and insect pests. **All pesticides are potentially harmful to people and other animals.** Pesticides are registered at the federal and state level, and **MUST** contain a label that outlines how and where they are to be used. Also, the label will contain information about which type of pest it is meant to control. It is a violation of federal and state laws to use a pesticide in any way other than as the label directs. It is important to **FOLLOW THE LABEL DIRECTIONS** including the use of appropriate personal protective equipment that may be required to protect the health of the applicator. Strict adherence to the label will protect both individuals in the treatment location and the environment. Before deciding to use pesticides to treat a bed bug infestation, consider the following:



- Pesticide application **IS** normally required to effectively eradicate a bed bug infestation. Other non-chemical methods such as heat (dry or steam) can be effective. Often, multiple methods will be used in combination as bed bug infestations are difficult to control.
- It may be possible to minimize pesticide applications with thorough and repeated cleaning, and removal or repair of hiding places.
- Pesticide application by a licensed pest management company with experience treating bed bugs is recommended, as they have the training to use pesticides safely and effectively.
- Some pesticides may only be applied by a licensed pesticide applicator. If you choose to apply pesticides yourself, **READ AND FOLLOW THE LABEL CAREFULLY.**
- Do not use a pesticide if the label does not specifically say it is for use on bed bugs.
- Do not apply any insecticide or pesticide to mattresses or to surfaces that would be in direct contact with a person, unless the label instructions specifically say to do so.
- Do not use a pesticide indoors, if it is only labeled for outdoor use.
- Do not use 'bug bombs' or total release foggers to treat for bed bugs. They put people and pets at risk, but do not get rid of the bed bugs. These devices release insecticides in small droplets which fall on surfaces, but do not get into the cracks and crevices where bed bugs live. The use of these products has been linked to acute pesticide toxicity in people and pets through misuse.
- Only use legal pesticides, with an EPA registration number on the label. Illegal and home-made pesticides may be dangerous, ineffective, or both.
- Be careful when using flammable pesticides, especially if you smoke.
- Clean and vacuum before any pesticide application, so the pesticide can more easily get into the bed bug hiding places.
- Use caution with bleach or ammonia. The vapors can be harmful. **NEVER** mix bleach and ammonia.



BUG BOMBS:

Fogger or “bug bomb” products may have labels that are misleading. The label may clearly say Bedbug Fogger, but these products are not effective in reaching the crevices and hiding spots that bed bugs harbor in. These products are often over-used because of difficulty in calculating the total cubic feet of the space to be treated, or because of a lack of effectiveness (“more is better”). Overuse of these products may cause mild to severe illness.

Find more information visit
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