

Guidelines for Prevention and Management of Bed Bugs in Shelters and Group Living Facilities

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State IPM Program, Cornell University
2008



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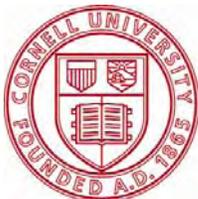
Produced for the New York City Department of Homeless Services, in cooperation with the New York City Department of Health and Mental Hygiene and the New York State Integrated Pest Management (IPM) Program, Cornell University.

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Thanks to the Bed Bug Advisory Group for ideas, comments, editing, support, and interest in facing this challenge: Waheed Bajwa, NYC DOHMH; Sarah Bannister, NYC DHS; Gil Bloom, Standard Pest Management; Caroline Bragdon, NYC DOHMH; Tony Branch, NYC DHS; Stephen Clohessy, NYC HPD; David Coard, NYC DHS; Wayne Coger, NYS DHS; Richard Cooper, Cooper Pest Solutions; Sharon Heath, NYC DOHMH; Daniel Kass, NYC DOHMH; and Louis Sorkin, B.C.E., American Museum of Natural History. Thanks also, to those who generously provided photographs for this publication, including Louis Sorkin, Rick Cooper, Phil Stravino of PAC Exterminating, Lynbrook, NY, Allison Taisey, New York State IPM Program, and Black Widow Pest Control, Valley Stream, NY.

This publication is supported, in part, with funding (IPM Partnership Grant 2007-008) from the Northeastern IPM Center (www.NortheastIPM.org) and the USDA Cooperative State Research, Education and Extension Service.

This publication was produced by Community Integrated Pest Management Program, a part of the New York State IPM Program, which develops sustainable ways to manage pests and helps people to use methods that minimize environmental, health, and economic risks. For more information or web-based copies of this guide (IPM No. 618) see the New York State IPM Program website at www.nysipm.cornell.edu. 8/08 AP .7M



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Summary

This publication covers bed bug prevention, management and control, education and awareness, and is specifically geared toward public agencies and private or public housing administrators and their facilities management teams. It is applicable to other types of living situations, though techniques and recommendations may need to be adapted. Fact sheets listed at the end are intended to be used as stand-alone educational document for residents, housekeepers, medical and social service providers, and others as needed. Detailed information about the use of pesticides for managing bed bugs is not covered in this book, but can be found in *The Bed Bug Handbook* (Pinto, Cooper and Kraft 2008).

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Introduction

What are bed bugs?

Bed bugs are insects of the Order Hemiptera and Family Cimicidae, which has over 90 species around the world and 15 in North America. Bed bugs and their relatives are wingless, blood-feeding parasites of animals. The common bed bug (*Cimex lectularius*) is a pest of humans this species has recently become a problem in the United States and countries all over the world.



Bed bug adult and egg. Photo by J. Gangloff-Kaufmann.

Bed bugs have three basic life stages; egg, nymph, and adult. They begin as a very small but visible egg, hatch to become a first instar nymph or juvenile, which is 1 millimeter long or about the size of a poppy seed. There are five juvenile stages, which feed on blood, molt and grow over time. The adult is about the size of an apple seed.

Bed bugs tend to gather together in hidden and undisturbed places where a person sleeps, or sits for an extended period of time. They are usually found in the bed, along the seams and sides of the mattress and box spring, the headboard, and bed frame, creating clusters of live bed bugs, shed skins, dark-colored fecal spots, and eggs. In heavily infested locations bed bugs can be found anywhere in the room. As bed bugs grow they shed their amber-colored, transparent skins, leaving behind what look like hollow bed bugs.

A fecal spot, the result of bed bug digestion, may look like a brownish-black bump on a hard surface, or a dark stain (like a magic marker dot) on fabric. Eggs are cemented to fabric, wood, paper, and most other surfaces as the female hides or wanders in search of a host.

Bed bugs, cast skins, eggs and fecal matter on the wood under a bed. Photo by P. Stravino.



Where did bed bugs come from?

It is unclear exactly why and from where bed bugs re-emerged as a pest in our homes, dormitories, hotels, and shelters, but the resurgence was noticed throughout the world in the late 1990's. During pre-World War II times, it was estimated that nearly 30% of American

homes had bed bugs. After World War II, many long-lasting pesticides were commonly used indoors. Bed bugs were nearly absent for 50 years in America. However, stories and reports indicate that bed bugs may never have truly disappeared in America but they were very uncommon, until recently.

What is the risk of having bed bugs?

Bed bugs must bite to feed on blood. They have pointed mouth parts, like mosquitoes, and feed for just a few minutes at a time. They must feed to grow and although they primarily feed at night, bed bugs will bite during the day if necessary. Bed bugs have never been shown to transmit disease to humans. The most common symptom of bed bug bites are itchy welts on the skin of most but not all sufferers. Reactions vary widely from person to person and bites alone cannot be used to confirm bed bugs. Bites may develop secondary infections through scratching. Anemia has been reported in the elderly and very young in cases where homes are heavily infested. Asthma has also been linked to the presence of bed bugs in homes, though not yet in the United States.



Bed bug bites. Photo by L. Sorkin.

More risks can arise with the use of insecticides to treat bed bug problems in the home, particularly when individuals attempt to eradicate bed bugs without the help or advice of a professional pest manager. People with no pesticide application experience are using total release aerosol foggers (“bug bombs”), professional products, and sometimes illegal products to attempt to control bed bugs in their homes. The impact on public health from overexposure to pesticides used to control bed bugs is unknown. The New York City Department of Health and Mental Hygiene strongly discourages the use of “bug bombs” and foggers because of the potential of human exposure to insecticides and the risk of device explosions.

Bed bugs can be transferred among people, and that places a great deal of social, emotional and financial stress on sufferers. Control is challenging and costly, and there is still a certain amount of social stigma attached to living with bed bugs. Having bed bugs may restrict the social lives of people. Sufferers avoid visiting friends and family and often throw away belongings, at great cost, and minimal benefit. Tenant-landlord disputes over who is responsible continue to take place and these battles can be damaging to both parties.

How can we get rid of them?

Pesticides alone, or the use of any single method, will not eliminate bed bugs. A strategy that includes a number of methods is absolutely necessary, especially in multiple unit facilities like apartments, shelters, dormitories, group homes, and hotels. The following are needed for effective bed bug control:

- Cooperation of landlord, management, and resident to focus on the problem
- Accurate identification to be sure it is a bed bug and not another pest
- Identification of the source (especially if bed bugs are moving from an adjacent room or apartment unit)
- Thorough inspection of the facility and identification of all possible hiding spots

- Cleaning and organization of the living area
- Reducing clutter in the home
- Bagging and removal of bedding and clothing from the affected area
- Washing sheets and blankets and drying on HOT setting
- Encasing the mattress and box spring in a zippered encasement
- Washing or treating the headboard and bed frame
- Cleaning and removing bed bugs from other items
- Isolating the cleaned (bed bug free) items until bed bugs are gone
- Careful and targeted use of insecticides, following label instructions
- Inspection and treatment of all surrounding adjacent units
- Follow up inspections and all other procedures as needed (there should be at least one follow up inspection 3 weeks after initial treatment)

Management of bed bugs should begin at the first sign of a problem. The longer an infestation is allowed to exist, the more difficult and expensive it will be to control. It may take several months to get rid of bed bugs if there is a large infestation.

There must be cooperation among tenants and the management staff in multiple dwelling facilities. A bed bug management program must be coordinated for the entire building as well as the individual room or person, because bed bugs can go undetected for long periods of time and can spread very easily through walls, on electrical and plumbing conduits. Cooperation from the tenant includes following the pest reporting procedures, cleaning and preparation of the room for treatment, and taking measures to avoid reintroduction of bed bugs.

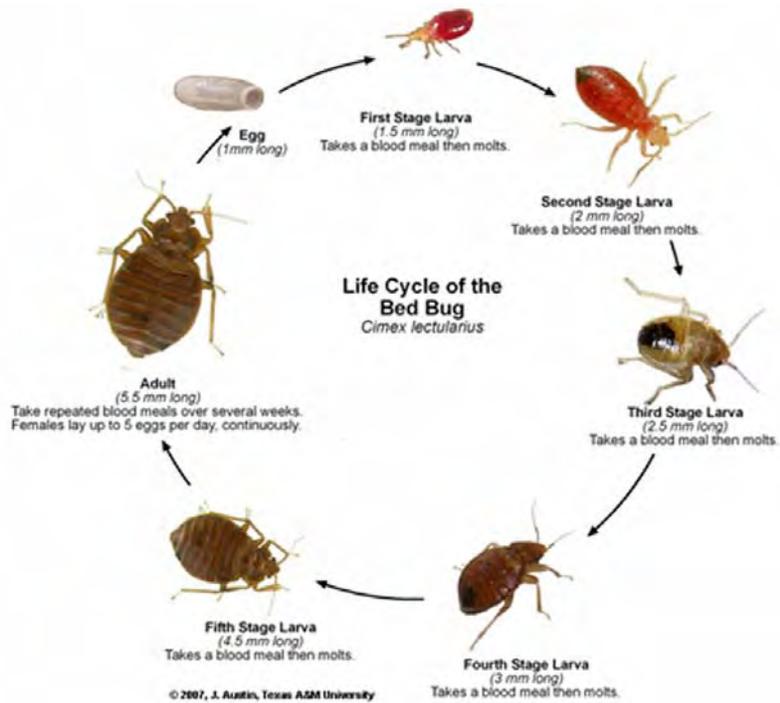
Building management must ensure that tenants are aware of these procedures and are provided with the necessary contact information they need to report a complaint. Complaints must be addressed in a timely manner. Most building managers cannot deal with a bed bug infestation without the help of a pest management professional (PMP). The PMP should be involved at an early stage. Professionals know how and where to look for bed bugs, and can thoroughly assess an infestation to ensure the right measures are taken.



The life stages of bed bugs, from egg to adult (left to right). Photo by A. Taisey.

Identification of Bed Bugs

Bed bugs are small but visible insects. There are three main life stages: the whitish egg (about 1 mm in length), five pale juvenile (nymph) stages that range from 1mm to 4.5 mm (1/4 inch), and the adult which can be as long as 7 or 8 mm (3/8 inch) when fed. The newly hatched nymph is very pale until it feeds. Then it looks like a tiny droplet of blood. Each nymph stage will feed and become filled with red blood. The adult is about the size and shape of an apple seed, and dark red to brown in color and as flat as a credit card before feeding.



The first sign of a bed bug infestation is usually the appearance of bites on the arms, neck, torso, or legs. Read on for more information about bed bug bites. One may also find live or dead bugs. Collect a sample for positive identification. Clusters of small stains or droplets of dried blood on furniture and bedding may also be found. These stains are the bed bugs' fecal droppings. They may be accompanied by shed skins, because bed bugs shed their outer skin, or molt, as they grow. Shed skins are amber in color and resemble the shape of a bed bug. There may also be live bugs and eggs where droppings are found.



Bed bugs, cast skins, fecal stains and eggs in the wood structure of a box spring. Photo by P. Stravino.

DON'T mistake bed bug droppings for cockroach droppings. Cockroaches leave behind tiny rectangular pellets, not round droplets or stains. There may also be rectangular egg cases or dead cockroaches nearby.

When searching for bed bugs it is important not to overlook the nymphs, which can be difficult to spot. Look for nymphs where droppings and stains appear, especially in crevices on fabric and wood surfaces.

Actual sizes of bed bug life stages:

0	0	0	0	0	0	0
Egg	1 st	2 nd	3 rd	4 th	5 th	adult



A newly hatched bed bug is smaller than a poppy seed (left) and the color of a sesame seed (right). Photo by J. Gangloff-Kaufmann.



The stains from bed bug fecal droppings can appear as rounded bumps or blackish, soaked-in stains. Photo by J. Gangloff-Kaufmann.



This adult bed bug is waiting to feed on blood. Adult bed bugs are very flat and fit into crevices as thin as a credit card before they feed. Nymphs are even thinner. Once fed, they are longer and plump until they begin to digest the blood meal. Photo by J. Gangloff-Kaufmann.

Bed Bug Bites and the Bites of Other Arthropods

Bites are usually the early warning sign of a bed bug infestation. Bed bugs feed only on blood. Each life stage feeds, except the egg. They insert the fine stylets from their beak directly into the skin in search of a tiny blood vessel, and may move and bite repeatedly until they find the right spot. At each point the beak releases saliva into the skin. The saliva contains proteins and enzymes that will cause an allergic reaction in many people. Allergic reactions vary widely from practically no reaction, to small itchy red or white bumps, to blisters or pustules. Not every person in a household will react the same way and many times only one person will show signs of bites, leading others to believe it cannot be bed bugs.



Bed bug bites on a woman's leg. Photo from www.bedbugger.com.

It is difficult, if not impossible, to distinguish bed bug bites from those of other biting pests without other circumstantial evidence that will link to a specific pest. It is critical to confirm bed bugs in the sleeping or living area through inspection to be sure that bites are caused by bed bugs. Bed bug bites can resemble mosquito and flea bites.

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, in a typical situation.
- Under stressed conditions bed bugs may feed during the day. Stressed conditions include:
 - *Bed bugs have no access to hosts because people are not sleeping nearby*
 - *When bed bugs are disturbed by cleaning or pesticides they may move to other areas*
 - *As the numbers increase, bed bugs may spread due to overcrowding*
- Bed bug bite reactions can take a few minutes or as many as 14 days to appear.
- If bed bugs cannot be located in sleeping areas after multiple inspections, other biting pests must be considered.
- If local temperatures are over 60° F and the individual is outdoors or has unscreened windows open, mosquito bites must be considered. Mosquitoes can also breed in standing indoor water in basements or unused sinks, toilets, drains, refrigerator pans, pet water dishes, plants, or dirty fish or reptile tanks. A quick inspection will help identify these conditions.
- Pets or wildlife, including raccoons, squirrels, rabbits, and rodents may carry fleas that bite humans, especially in warmer months.

There are other causes of bites and lesions aside from bed bugs. While bites can vary, the activities of the person bitten may help determine the cause.



- **Mosquitoes** – Generally, mosquitoes feed at dawn and dusk, but at least one species bites during the day. In most people, a wheal and flare reaction is common and occurs quickly. Mosquito bites are usually associated with warm weather and being outdoors. A torn or missing window screen allows mosquitoes into the living area.



- **Head, body, and pubic lice** – Lice live on the human body, feeding by penetrating the skin. Head lice live on the scalp among hairs, body lice live in clothing and feed on adjacent skin, and pubic lice feed among the hairs of the pubic region. Look for signs of lice and their eggs (nits) in the hair and clothes.



- **Ticks** – Most often associated with natural areas, such as grassy shorelines and wooded areas, ticks are rarely encountered indoors unless pets bring them inside. Ticks insert their mouth parts into the skin and remain attached to feed on blood. They usually remain attached for a long period of time (1 to 3 days), become greatly engorged with blood and are much more noticeable for these reasons.



- **Fleas** – Flea bites are usually associated with the presence of animals serving as flea hosts, such as pets and occasionally wildlife. Fleas tend to leave multiple bites on the arms and legs.



- **Bird and rodent mites** – Associated with birds, rats and mice nesting in or on the building. Bird mites are usually spotted when young birds and their parents leave the nest. Mites may be seen on windowsills or air conditioning units. Most mites do not live long off the host but will bite people, if they get onto the skin. They do not cause serious bites or transmit disease. Mites should be cleaned up with soap and water. Birds should be discouraged from nesting on the building or in AC units. Rodents should be exterminated from the building and access points permanently sealed. Trapping rodents helps remove the source of mites, unlike rodenticides, which result in dead rodents within walls, which can attract other pests.



- **Scabies** – The scabies mite (human itch mite) is a parasite that burrows in layers of the skin creating small lesions containing mites and eggs. Scabies is transferred among humans by close contact. This is a medical problem that should be confirmed by a doctor and treated with scabicial cream or lotion applied to the body. **Scabies are not a pest management issue**, and do not require treatment of a room or home, however bedding and clothes should be laundered at high temperatures for sanitation reasons.



- **Spiders** – Spiders have paired mouth parts, like jaws and leave behind one or two puncture wounds when they bite. Bites are usually associated with some localized pain; however spider bites are relatively rare in the Northeastern United States, where venomous spiders are uncommon.

For more information about arthropod bites, please see *Physician's Guide to Arthropods of Medical Importance, 4th Edition*. 2003. Jerome Goddard, Ph.D., CRC Press, New York, NY