

BED BUGS

Information for Managers and Staff

ABOUT BED BUGS

Bed bugs (*Cimex lectularius*) are oval, flattened insects that primarily feed on blood while their host is sleeping. When feeding, bedbugs inject anticoagulant, salivary secretions into their host. This normally results in a raised, 'crusty' welt on the host's skin.

Even though bedbugs aren't currently considered to be a major health hazard or capable of spreading infectious agents, the injection of 'saliva' causes itching and may result in secondary infections and sores.

A number of pathogenic agents have been found in bed bugs. These include viruses, bacteria, protozoa, and parasitic worms. It is believed that none of the pathogens multiply within bed bugs and few survive for any length of time inside a bed bug.

At the time this information is being written, there is no definitive evidence that bed bugs transmit (via bite or infected feces) any pathogen (including hepatitis B or HIV).

The development of secondary infections at the feeding site is of medical concern - especially for individuals who may have immune system issues. Of course, their presence and biting behaviour adversely impacts quality of life.

Life Cycle

- Bedbugs develop from an egg stage through a number of immature (nymphs) stages to become an adult.
- Other than the egg, all life stages feed on blood meals and bedbugs require a blood meal before they can moult.
- Bedbug populations can increase fairly rapidly. A female is typically lays between 200 to 500 eggs during her lifetime.
- Freshly laid eggs are about the size of a period on a page and are sticky and adhere to the surfaces on which they are oviposited.
- Depending on environmental factors, eggs hatch in about 10 days.
- There are normally five nymphal (immature) stages; under room temperatures the time to reach adulthood may be as little as 35 to 45 days.
- Nymphs require a blood meal in order to progress from one life stage to another.
- Under normal room temperatures, bedbugs typically live for approximately six to twelve months.
- When conditions are not ideal (cool, lack of food, etc.), bedbugs can live many months longer than their anticipated lifespan. Many insects (including bed bugs) are capable of living in less than ideal conditions with their life cycle "on hold" or progressing at a slower than normal rate.
- Bedbugs are extremely resilient to starvation. Adults have been reported to live up to approximately a year and one-half without a blood meal. Nymphs, having less stored resources, can live a few months without a blood meal.

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Behaviour

- Bedbugs usually hide in cracks and crevices during the day and feed during the night.
- Although bed bugs are usually found on or near sleeping or resting areas (such as beds and furniture) they may be found hiding in any crack or crevice. They typically hide in folds in mattresses, on bed frames, behind pictures frames, in drawers, in cupboards, behind baseboards or any similar crack or crevice.
- In the early stages of infestation bed bugs are usually found on or near beds and other furnishing. As infestations grow larger they tend to spread away from the infestation focal site.
- Bedbugs feed (much like a mosquito) through sucking mouthparts. They typically take approximately five to ten minutes to feed and do so while their host is sleeping.
- Bed bugs usually feed every 3 or 4 days.
- When feeding is completed, bed bugs do not remain on their host but move into nearby hiding places.

IDENTIFYING BED BUGS

Appearance

Bed bugs are oval, flattened insects (often described as resembling a flattened flax seed or brown, flattened lady bug). Their flattened shape allows them to hide in cracks and crevices or small depressions. Although appearing flat, following a blood meal they may appear to be slightly bloated in appearance.

Size

- When not full of host blood, adults are approximately 6mm in length (about 1/4 inch). Immature bed bugs look very similar to adults only smaller. After a recent blood meal, they can be slightly larger, as their body distends due to their food content.
- Depending on their life stage, immature bed bugs may vary between approximately 1-5 mm.
- Eggs are not easily found, as they are very small - less than 1 mm in size (approx. 1/30 inch). They are creamy white, and typically found in clusters, adhered to the surface on which they are laid.

Colour

- Bed bugs are usually rusty-brown or may be yellow or orange-brown.
- Bed bugs molt as they grow. Newly molted insects may appear white for a short while after molting.
- After feeding on a blood meal, bed bugs take on a darker, redder-brown colour.



Above: Enlarged photo of bedbug next to grains of rice. 2 eggs located in lower right hand corner.

SIGNS OF INFESTATION

Blood/Fecal Spots

Small spots of dried blood are frequently observed when bed bugs are present. Since bed bugs feed on blood, their feces consist of digested blood and are reddish brown in colour. During infestations, blood spots may be seen on bedding. As bed bugs are gregarious, the blood spots are typically found in groups where bed bugs hide (mattress seams, bed frames, etc.).

Shed exoskeletons

Typical of all insects, bed bugs have a 'skeleton' on the outside of their body. As they grow this is shed (like a snake sheds its skin) to accommodate a new, bigger body. Shed bed bug 'skins' are another symptom of bed bug infestation.

Musty Odors

With severe infestations, one can often detect a sweet sickly, musty odor.

Bite Marks

A symptom of bed bug activity is the 'bite' marks left as a result of their feeding on their host. Bed bugs have piercing or sucking mouthparts, much like a mosquito. They feed by piercing the host skin and drawing their blood meal from their hosts. In order to facilitate feeding, an anticoagulant is introduced into the host. Most people develop an allergic response to the anticoagulant injected into the bite.

Usually a raised, frequently itchy, welt is created following feeding. There is often a hard, whitish, crusty patch in the centre of the bite. It must be noted that a small percentage of individuals do not react to bed bug bites and there are no raised welts produced.

Aggregation Pheromones

Bed bugs do not have a communal nest but are commonly found gathered in groups. This has been attributed to the presence of 'aggregation pheromones'. Such pheromones have been identified and researchers at Simon Fraser University have been testing these materials. Thus far their work has not resulted in a functional trapping system for monitoring populations.

Spread of infestation

It should be noted since these insects don't fly or jump, infestations spread through walking into uninfested areas, or more typically being physically transported into infested areas.

WHAT TO DO IF YOU SUSPECT BED BUGS

Bed bugs can hide in almost any crack or crevice or any small depression. One of the reasons for their current rise in infestation levels in society is the ease with which they are transported on personal items, furniture or other items. In hospitals and other health facilities, when there is evidence of bed bug infestation it is important to ensure that other areas are protected from the spread of these insects. It is important to be proactive in ensuring, *if* an infestation has been introduced, it not be spread within the facility.

1. Assess The Situation

Before taking any action first try to determine if there are bed bugs present. Look for telltale signs of their presence.

- Look for the offending insect and get and save a specimen for later identification. Specimens may be dead or alive but should be kept as intact as possible. Pill bottles or similar containers make excellent specimen jars. Scotch tape or sticky insect traps are poorer methods of retaining a specimen.
- Communicate with the patient to get as much background information as possible. Try to determine if the individual is experiencing problems at their permanent or temporary residence. Although transients/”street people” have the highest risk of having infested possession, bed bugs can be found throughout our community. No person entering a facility can be assumed to not be bringing bed bugs in with their possessions.
- Examine the patient to determine if there is evidence of insect bites. This is not always totally reliable as other skin conditions can be confused with insect bites or the individual may not react immediately to bites.
- Where possible, the area of concern should be isolated so that it may be examined for evidence of infestation later.

2. Always Assume Contamination

The first line of defense must be to prevent potential spread within the area of introduction and to other areas of the facility. The best course of action is to initially assume the infestation is present until confirmed otherwise later. It is important to take proactive measures in managing the potential spread of an infestation.

Clothing

- Patients should be bathed and receive a fresh, change of clothing.
- Patient clothing should be placed in sealed bags. Clothing should not be mixed with dirty laundry or any items that are to be transported out of the area.
- Clothing (currently being worn or brought in with other possessions) should be washed and dried in high temperatures.
- When clothing is laundered the potentially infested materials should be carefully put into a washer trying to ensure that insects do not have the opportunity to escape during the process. It is important to wash and dry clothing using high temperature settings.
- It may be wise to have washer and dryer settings tested prior to use for these purposes to ensure they are working properly.
- One should assume plastic bags used to transport infested materials are also infested. These bags should be in other bags, sealed and identified so they may be separated from other waste for disposal or destruction.

WHAT TO DO IF YOU SUSPECT BED BUGS (cont'd)

Patient Possessions

- It is important for personal items to be isolated so as to reduce the possibility of contamination of items or areas not currently infested.
- **All** personal items should be sealed immediately in plastic bags, identified and isolated from other materials. They can be inspected and/or treated later. The initial response should be one of containment.
- Knapsacks, backpacks or other items used to transport patient property must be considered high-risk items. These afford numerous harbourage areas and allow for transportation of infestations into the facility.
- Possessions *should not* be stored anywhere in open bags or other containers.
- Patient possessions should either be removed from the hospital, disposed of or heat treated in order to eliminate infestations. Never allow possessions to be moved to patient rooms or anywhere within the facility before they can be treated to reduce the potential for spreading an infestation.
- In order to reduce the potential for spread to other areas of the facility or to the homes of staff, it is especially important not to place these items near clean linen, items that are to be taken home by staff or any item that is to be routinely moved from the area.

Cleaning Staff

If there is no requirement for treatment with pesticides, the current and appropriate response by cleaning staff is to perform a “terminal cleaning” of the area.

In this process the area undergoes a thorough cleaning and potentially infested bedding is isolated from other laundry. Although this will not definitely eliminate an infestation, it may at the least help prevent further spread.

Currently vacuums are not used in this procedure. It is suggested acquisition of a vacuum cleaner modified/designed for bed bug management may prove to be a useful tool in helping deter the spread of these insects.

3. Population Control (Pest Management Procedures)

Reduction/elimination of infestation includes:

- Proper collection and identification of the insect
- Assessment of the extent of the infestation
- Potential for population expansion
- Use of residual pesticides (dusts, liquids and aerosols)
- Heat treatment of items not amenable to applications of pesticides
- People and information management

WHAT TO DO IF YOU SUSPECT BED BUGS (cont'd)

4. Information

It is important to educate hospital staff on proper procedures to be taken in managing bed bug infestations. In order to reduce emotional responses or fear staff should be aware of the basic biology of this species, how to identify the organism, how it is spread and proper responses to perceived threats. Without proper education, individuals can make incorrect management decisions and be unnecessarily stressed as a result of perceived versus real threats.

Facts about bed bugs that impact their management:

- They are not good climbers and have difficulty climbing smooth or metallic surfaces. Smooth or slippery surfaces impede their mobility and ability to climb out of containers with smooth surfaces.
- Being blood-sucking organisms, they do not have chewing mouthparts and are incapable of chewing through even the flimsiest materials. Bed bugs can be easily contained in plastic bags or similar containers.
- They are incapable of flight and cannot jump. Spreading bed bug populations is mainly achieved by their walking to uninfested areas or, more commonly, by their transportation in goods moved from infested to uninfested sites.
- Their nature of hiding in or near a resting or sleeping host makes the purchase or acquisition of used goods risky.
- They are not generally deterred by insect repellents.
- Although they prefer to be active at night, when wishing to feed bed bugs are not deterred by light. Simply lighting an area will not deter their feeding.
- There are concerns regarding the development of resistance to pesticides thereby reducing their efficacy in controlling populations.

Heat can be an effective tool in eliminating items that are not amenable to treatment with pesticides. Temperatures of approximately 97-99°F (36-37°C) will cause mortality in bed bugs, but the “thermal death point” is considered to be 113-115°F (44-45°C). To eliminate bed bug populations temperature should be raised to at least the thermal death point. The University of Kentucky summarizes “thermal death points” and exposure to heat as:

| | | |
|----------------------------|----------------|------------|
| Bed bug adults and nymphs | 45°C (113°F) | 15 Minutes |
| Bed bug eggs | 45°C (113°F) | 60 Minutes |
| Bed bugs - all life stages | 46°C (114.8°F) | 7 Minutes |

Cold will cause mortality in bed bugs, but eggs are more resistant to cold than adults and need longer exposure. Damage caused by cold can also be reversible, while heat damage is not generally reversible (mainly due to proteins and other biological materials being denatured).