Bed Bugs

Pesticide Safety Technical Note

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Bed Bugs

Bed bugs are small wingless insects that feed on human blood. They belong to the family *Cimicidae* within the order *Hemiptera.* The insect's name is derived from typical areas where humans rest. Places that the bed bugs live with humans include houses, hostels, bedrooms, beds and places of little movement such as cinemas or theatres. Bed bugs although unable to fly are fast movers and are quick to escape once they are exposed to light.

Adult bed bugs have a flat oval-shaped body, which is light brown in colour and may become red and engorged after a blood meal. Ranging in length from 1 - 5mm, fully-grown adults reach a similar size to an apple seed. They have six legs, long antennae and large mandibles (mouth parts), which can impale human skin. There are two main species of bed bugs found in Australia.

Figure 1 C. Lectularius

Cimex Lectularius or Common Bed Bug is the species being best adapted to temperate climates and having the most widespread distribution across the globe.

C. hemipterus or Tropical Bed Bug is usually confined to tropical regions. This species prefers high humidity and temperature.

While similar looking, they can be identified by looking at the first section of the thorax, or the part between the head and abdomen. The first section of the thorax on the common bed bug is expanded laterally and the extreme margins are more flattened than

that of the tropical bed bug. The tropical species are usually found mainly north of the NSW/QLD border and the common species to the south, with some overlap between states.

Bed bugs are mainly nocturnal, resting during the day and completing most of their feeding at night. Warmth and the presence of carbon dioxide (which humans breathe out) attracts these insects. Bed bugs will feed every five to ten

days but may survive for several months without a blood feed. They are equipped with two hollow tubes to pierce the skin and aid in feeding. One of these tubes is used to withdraw blood from the sleeping victim, while the other injects anticoagulants and anaesthetic into the host.

The anaesthetic can make the bite painless, which means that a sleeping victim may be unaware of the bite. The anticoagulant stops the blood from clotting, making it easier for the bed bug to withdraw the blood. Because of this, the person may continue to bleed from the bite site leaving tell-tale spots of blood on the sheets. Bed bugs may take up to 10 minutes to feed. Bed bugs may also quietly rest themselves under the cover of various materials and lie completely still for long periods, making detection difficult.

Life Cycle

In Australian conditions, adult bed bugs can live for up to 6 months, dependant on feeding patterns. Female bed bugs lay two or three white eggs per day and up to 3500 during the course of their lifespan. Eggs usually hatch within 5-10 days under warm conditions but can lie dormant for longer periods if the conditions are not ideal. Newly hatched nymphs look very similar to adults but are smaller, translucent and white in colour. Nymphs are often more numerous than adults in sites of infestation.

A bed bug goes through five moults (shedding of their skin) before they reach maturity. Younger nymphal stages have a white appearance when unfed and become darker with increasing feeds. A blood meal is required for each moult. It normally takes about 21 days (at 22°C) for the nymphs to reach the adult stage but may take significantly longer if no food is available or in cooler conditions.

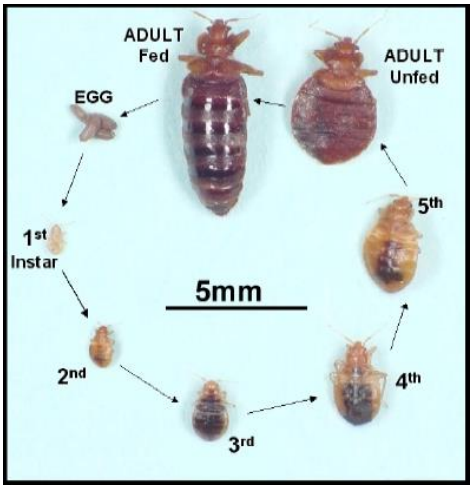


Figure 2 Lifecycle of the common bed bug

Bed bugs as a pest

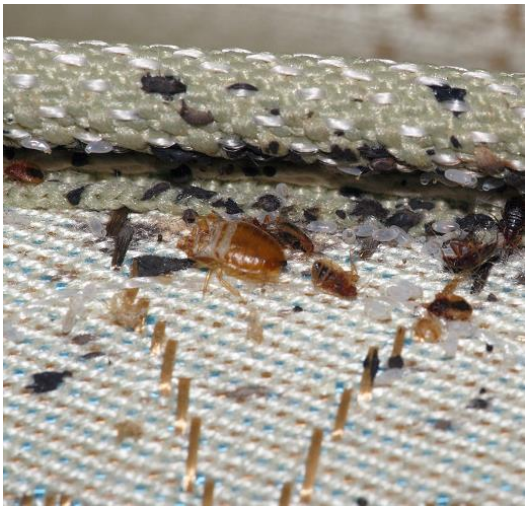
In recent times there has been an increase in the number of bed bug infestations. Bed bugs are common all over the world and have been found in Australia in small numbers. Recently they have become widespread with infestations increasing substantially in Victoria, and most parts of the world, over the last ten years. The main reason for the increase is thought to be due to insecticide resistance; modern bed bugs are highly resilient to many of the commonly used insecticides.

Other contributing factors include the increase in world travel with bed bugs being spread in luggage, shoes and clothing. Once acquired at high turnover accommodation, the hitchhiking bed bugs may then be transported and brought back to the homes of guests in their luggage. This can allow for a new infestation to occur inside the home. Many hostels worldwide have now banned the use of travellers' own sleeping linen in shared accommodation as a safety precaution against this pest.

Detection

In early infestations, bed bugs are usually found around the seams, beading and folds of mattresses, sleeping bags and sheets. Later, as the infestation spreads, the bugs move to any tiny crevices, which may be in bed heads, skirting boards, cracks in plaster and bedroom furniture. Because of their colour, adult bed bugs can easily be spotted with the naked eye on white sheets and bedding, but very difficult to see on brown wooden floors and other dark surfaces. The small size of the young nymphal stage makes them difficult to observe on any surface.

Heavily used hiding places are evident by black or brown spots of dried blood excrement or “spotting”. There may also be an offensive sweet sticky odour when bed bugs are numerous. This odour sometimes described as “buggy” is similar to the odour when a stink bug is squashed. White eggs, the egg cases and moulted skin shells may also be found near these places, as well as living bed bugs.



Bed bugs use pheromones to communicate. This method of communication and the release of alarm pheromones can make them very difficult to treat as bed bugs become alert and quickly vacate the area being treated if not previously properly quarantined.

Bed bugs may also spread into a new residence by traveling between multi-unit housing such as dormitories and apartment buildings. Once they find a suitable host, bed bugs will feed and are likely to harbor in close proximity to the victim. In this case, new locations can quickly become infested with bed bugs in a short amount of time.

Symptoms of a bed bug bite

Different people have varying reactions to the bites of bed bugs, depending on a number of factors. Some people have little or no reaction to the bite. In others the bite site can become red and intensely itchy. This can occur during the course of the night or may take up to 9-14 days to develop. If the host experiences an allergic reaction from the injected anticoagulants; then large wheals, welts and swelling can occur on the limbs that have been bitten. The red wheals may range from 2 cm to 5 cm in width with inflammation common. Anaphylactic shock could possibly occur in individuals that are highly allergic, although this is very rare.

Discomfort and loss of sleep is common from the psychological effects of bed bugs. Bites may be found on a variety of places on the body. Another characteristic is the bites are sometimes in orderly rows, unlike the random pattern of mosquitoes. These rows are caused by the bed bug being disturbed during feeding and having to pierce the skin to feed again. They can also be caused by bed bugs having difficulty in locating a suitable vein.

Bed bugs mainly feed on humans but will also feed on other mammals and poultry if necessary. Although they may carry diseases such as hepatitis, they are not known to transfer these diseases to other individuals.

Bed Bug Control

Bed bugs are particularly problematic to treat, with complete eradication unlikely to be achieved with a single treatment. Sprays may kill the bed bugs, but they are largely ineffective on the eggs. Follow up inspections are always required, and further treatments are often necessary.

The survival of bed bug eggs is also an issue. It is not uncommon for the live bed bugs amongst an infestation to be completely eradicated during an effective treatment cycle, only to have the remaining or surviving eggs hatch and populate the location once again. The eggs can also have an incubation period of up to two weeks and may be deposited in hidden areas that are difficult to treat.

This stubborn tendency of bed bug infestations is made more problematic due to the now smaller size of the newly re-emerged bed bug nymph. Once an infestation is detected, all adjoining rooms need to be inspected and treated if also affected.

Non-chemical treatment

Hygiene

It is important to maintain an appropriate cleaning regime such as regular vacuuming behind beds.

Physical removal

This can be completed by the use of adhesive tape (if insect numbers are very small) to trap the insect. Vacuuming is also recommended before chemical treatment as it removes all dust and debris from the site of the infestation making it easier for following chemical control to penetrate and in turn be effective.

Particular attention should be paid to the edges of the room, near furniture and around fixtures. The vacuum bag should be placed in a sealed bag and incinerated, or discarded appropriately, immediately after cleaning. Care must be taken not to unintentionally spread the eggs by the use of stiff brushes.

Heat

The rapid increase of temperature is an excellent way of killing bed bugs in bedding and sheets. Bed bugs will die within one hour when exposed to temperatures over 45°C, or immediately at temperatures of 60°C or higher. Gradual and slow heating of infected area will result in the bugs migrating away from the heat source and potentially causing them to infest new areas.

Heating items through the use of steam has the advantage of killing the bug in all stages of its life cycle. Steam vapour may be used on all soft and hard surfaces especially on seams and in little crevices. Washing in water above 60ºC (to ensure every bug stage will be killed) and drying infested linen in a dryer is an effective method of killing bed bugs. It is recommended that clothes be placed on the hot setting and dried for at least 30 minutes.

Cold

Rapid freezing can be fatal to bed bugs. Placing smaller items in the freezer overnight is an effective control method. It is suggested to leave items in freezer for 10 hours per 2.5 kg of dry linen weight.

Chemical treatment

A licensed pest control operator must only apply pesticides that are currently registered and permitted for use by the Australian Pesticides and Veterinary Medicines Authority (APVMA) for the control of bed bugs. The pesticide applied will be selected on its usage patterns. For example, dust is excellent at penetrating voids

and cracks where bed bugs reside but would not be as effective in a location where it can be dispersed by foot traffic and vacuuming.

Pesticide sprays are also used for the treatment of bed bugs. A product with a residual formulation is used and any risk areas of potential bed bug infestations are targeted. It is important to ensure accurate and direct application to target areas such as beading on mattresses, cracks and crevices in furniture and flooring If the pest control operator completes an inaccurate space spray, the fine droplets can excite the bed bugs. This in turn can cause them to excrete alert pheromones and can disperse the infestation to other areas.

It is important to consult the pesticide label before use as some pesticides cannot be applied to mattresses. At the end of the treatment the room should be well ventilated and re-entry periods observed. A follow up treatment visit should be conducted in about a week, to allow for hatching of eggs, and pesticide re-applied where necessary. The clients should be advised to limit the amount of cleaning so that the residual pesticide is not removed. Sprays may kill the bed bugs, but they are ineffective on the eggs.

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