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BEDBUG MANUAL

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TRAINING

Contents

Classification

Bedbugs belong to the family Cimicidae, within the order Hemiptera – the true bugs. There are thought to be 91 species of Cimicidae, grouped into 23 genera. A selection of these is listed below.

Order: Hemiptera

Suborder: Heteroptera

Family: Cimicidae

Genus *Cimex*

- *Cimex lectularius* (Bedbug) **UK Species**
- *Cimex hemipterus* (*C. rotundatus*) (Tropical bedbug)
- *Cimex pilosellus* (Bat bug)
- *Cimex pipistrelli* (Bat bug) **UK Species**

Genus *Leptocimex*

- *Leptocimex boueti* (Bat bug)

Genus *Haematosiphon*

- *Haematosiphon inodora* (Poultry bug)

Genus *Oeciacus*

- *Oeciacus hirudinis* (Martin bug) **UK Species**
- *Oeciacus vicarius* (Swallow bug)

Origin, History & Distribution

The evolution of obligate haematophagy (feeding only on blood) in the ectoparasitic *Cimex lectularius* seems to have originated and progressed from phytophagous (plant feeding) bugs that would predate by chance or accident, to predatory bugs feeding on invertebrates associated with nesting mammals or birds, to bugs that feed on the vertebrate host itself. The common flower bug, *Anthocoris nemorum*, which predates other insects and is occasionally herbivorous, is an example of a close relative to *Cimex lectularius. Anthocoris nemorum* will also pierce human skin and suck blood.

In terms of bedbugs evolving to feed on humans, it has been hypothesised that bedbugs made the switch from bats to Man, when Man was cave dwelling in pre-history.

The ecology of the human race means they are an excellent host for bedbugs, as humans live communally in enclosed spaces, sleep at a predictable time in a predictable place and have high body temperature, are relatively hairless and have a rich blood supply to a relatively thin epidermis.

Cimex lectularius is cosmopolitan in distribution and is therefore a worldwide problem.

Identification

This section provides descriptions, pictures and a key to facilitate identification of bedbugs.

EGG

Bedbug eggs are approximately 1mm long and 0.5mm wide, with an egg-cap (the operculum). Unhatched eggs are pearl coloured and opaque before hatching, becoming translucent when hatched.

NYMPH

Nymphs are small versions of the adult form, with a thinner cuticle, which displays the colour of partly digested blood. The bedbugs increase in size from 1.3 – 5.0mm as they pass through 5 instars.

ADULT

Adult bedbugs are mahogany-brown, oval, dorso-ventrally flattened, wingless insects, which are approximately 5-7 mm in length and possess piercing mouthparts. When unfed, adults are pale, yellow-brown in colour, but after a full blood meal, they take on a darker mahogany-brown colour. Three pairs of walking legs are present, slender but well developed, with efficient tarsal claws for clinging on to the host during feeding. The bedbug's head is short and broad, with a pair of prominent compound eyes, in front of which is a pair of clearly visible 4 - segmented antennae. The proboscis is slender and normally held closely along the ventral surface of the head and prothorax.

Other key points for identification are the 3 - segmented proboscis lying in a ventral groove, ocelli being absent, and the tarsi being 3 - segmented.

Bedbugs are very distinctive and can usually be identified immediately.

SIGNS OF BEDBUG PRESENCE

Cast nymphal skins, hatched or unhatched eggs, straw-yellow, dark brown or black marks (excrement spots, consisting mainly of excess water, with a little blood) and a sickly sweet / coriander-like smell, are all signs that are used to identify bedbug presence, along with customer complaints and evidence of bites.

KEY (TAKEN FROM MALLIS, 1964)

A. Rostrum reaching to coxae of fore-legs

1. Front margin of pronotum deeply concave

a) Hairs on body not long. Man the usual host.

1) Pronotum with wing-like expansions, hairs fringing pronotum relatively straight. ...*Cimex lectularius*

2) Pronotum not wing-like, hairs fringing pronotum curve backwards. ...*Cimex hemipterus*

b) Body with long hairs, bats are the usual host.

1) In the United States –
Eastern United States – *Cimex adjunctus*
Western United States – *Cimex pilosellus*

2. Front margin of pronotum much less concave, body with long hairs, swallows the usual host.

a) In the United States – *Oeciacus vicarius*

b) In Europe – *Oeciacus hirundinis*

B. Rostrum longer, reaching to coxae of hind legs, poultry the usual host. *Haematosiphon inodora*.

Biology

Bedbugs have well defined resting sites (sometimes referred to as 'refugia') in which many individuals from all the different life stages are found. This harbourage is an essential part of the life cycle of the insect since it is in this area that the young bedbugs pick up the internal microorganisms that are essential to their survival, some of which are also inherited by transovarial transmission through the egg covering. Bedbugs spend the majority of their time in these harbourages, aggregated together under the influence of aggregation substances (which is exactly why targeted crack and crevice treatments are so crucial – see Control section). Alarm pheromones are also emitted in response to stress, causing bedbugs to scatter.

Bedbugs reproduce by traumatic insemination – the male pierces the female abdomen, sperm enters the sperm receptacle and then travels through the blood to reach the ovaries.

LIFE CYCLE AND BIONOMICS

Bedbugs exhibit incomplete or gradual metamorphosis, from egg, through 5 nymphal stages, to adult. Female bedbugs lay eggs throughout their life, an unusual feature in insects. They generally produce around 2 to 3 per day and since they can live for many weeks, indeed months, each female could produce around 400 - 500 eggs during their lifetime. The eggs are deposited all around the environment in which the bedbug is living. The length of time spent in the five nymphal stages is greatly dependent upon the food resources available (each nymphal instar requires a blood meal for further development), temperature and relative humidity.

The importance of this data is that the temperature dependent life cycle can be manipulated to aid control. In particular, increasing room temperature to 27°C can stimulate eggs to hatch after 5 – 6 days and vulnerable 1st instar nymphs will quickly come into contact with fresh insecticide deposits. It is often thought that higher temperatures will reduce the residuality of insecticides, but at these moderate temperatures this is not the case, especially when microencapsulated insecticides are used. Lower temperatures mean that the time to hatching could be elongated and insecticide deposits are likely to be less effective. Delayed hatching of eggs could also give the false impression that an infestation has been eradicated, only for the bedbugs to reappear in time, especially as the unhatched eggs could remain viable for 3 months and adults can also survive for more than a year without a blood meal.

If temperatures were to drop below 13°C, bedbugs become unable to complete their life cycle, although many properties are heated so bedbugs are a year-round problem.

Under ideal conditions, the life cycle from egg to adult can be as short as 3 weeks.

***Cimex lectularius* bionomics – Eggs**	
Temperature (°C)	Egg hatching time (days)
13	49
15	34
18	21
22	12
27	5 - 6

***Cimex lectularius* bionomics – Egg to Adult**	
Temperature (°C)	Complete cycle (weeks)
13	Not completed
15	34
18	18
22	8
27	4.5

PUBLIC HEALTH SIGNIFICANCE

The close association of bedbugs with human beings means that they can cause substantial nuisance through their blood-feeding habit. They feed at night on sleeping human hosts. If the infestation is high there can be a risk of anaemia being suffered by infants, although this is rare. The nuisance and itching caused by the bites and the possibility of secondary infection is more common. Bats, chickens and other domesticated animals may also be attacked.

Both male and female, adult and nymphal bedbugs take blood meals and so are equally important as nuisance pests. There is no evidence of bedbugs being involved in the transmission of infections or diseases to humans, and they are therefore not considered to be disease vectors.

Reaction to bites is variable. Some people show little or no reaction whereas others may suffer allergic or other severe reactions (there are some documented cases of anaphylactic shock) and sleepless nights. The biting nuisance is not to be underestimated, especially considering recent high profile litigation, damage to reputation and associated economic losses.

Adult bedbug feeding & excreting excess water ingested

FEEDING, HOST LOCATION AND HOST ASSOCIATIONS

As already stated, nymphal, adult, male and female bedbugs all require blood meals to develop and reproduce successfully. Bedbugs will feed mainly at night when the human host is sleeping, although they may also feed in the daytime if conditions are favourable. On average, a bedbug will feed once every 7 days, although higher temperatures can stimulate more frequent feeding – another added bonus of manipulating the temperature dependent biology is that more frequent attempts to feed are likely to bring bedbugs into contact with insecticide deposits.

Bedbugs generally take 5 – 10 minutes to complete a blood meal and the quantity of blood taken can be many times the weight of the bug.

Bedbugs feed on exposed areas of skin, with most bites typically being found on the abdomen, but also the neck, arms, legs and feet. Multiple lesions are found, often arranged in a linear pattern and sometimes clustered into groups of three. The lesions are varied in appearance, often recognisable as raised reddened swellings, similar to flea bites, although with no central red area.

Bedbugs are thought to locate their host by random searching, followed by orientation to heat, CO_2 and host odours from perspiration and other secretions. These stimuli and possibly aggregation substances could be utilised if bedbug monitors are deployed.

Although bedbugs are closely associated and usually most successful when feeding on humans, they can also survive and complete their life cycle on bat, bird, mouse and rabbit blood. Other domesticated and zoo animals may also be attacked (Usinger, 1966).

DISPERSAL

To prevent the spread of bedbugs throughout a domestic property, it is recommended that the client should continue to sleep in the same room until the infestation is eradicated. For hotels and similar premises, this is not an option for obvious reasons, and is discussed in a later section. The presence of a sleeping person in the room also provides a stimulus for bedbugs, likely to lead to more frequent foraging and therefore contact with insecticide deposits.

It is thought that bedbugs disperse via travel, in suitcases, back-packs and also second hand furniture. Areas with a frequent change-over of residents, such as student and institution accommodation, multi-occupancy housing with migrant workers or travellers, seem to be at a higher risk.

RESISTANCE

Reports have shown that bedbug field strains taken from different locations in London exhibit resistance to technical alphacypermethrin. It is crucial, however, that resistance management practices are utilised to avoid treatment failure – current results from the field indicate success when a variety of insecticides, with different modes of action, are used alongside physical measures.

Experience seems to show that control failure is generally down to a variety of factors, such as poor treatment methods or a lack of understanding of bedbug biology. Some authorities experiencing call – backs to bedbug treatments have simply changed their working practice to be more thorough. After implementing this new strategy, no call – backs were observed. Some authorities commented that their successful bedbug treatments were due to the excellence and skill of their pest control staff.

Resistance is also not a new issue – bedbug resistance to DDT in the 1950's was overcome with new insecticides.Resistance problems to standard pyrethroids can be overcome with alternative insecticides like insect growth regulators, physical mode-of-action immobilisation sprays, stream treatments and non-chemical control such as laundering, vacuuming and extreme temperature treatments and a targeted Integrated Pest Management strategy, outlined in the following sections.

Bedbug Control

All insect control should follow the Integrated Pest Management (IPM) template and bedbug control is no exception. The IPM strategy outlined here incorporates inspection, monitoring, recording, chemical and non-chemical treatment guidelines. The Killgerm Training document, Bedbug Control Practical Tips should also be consulted for further advice. The use of properly certified canine bedbug detection techniques should be considered.

INSPECTION

A thorough visual inspection should be conducted. Use of a torch and hand lens may prove useful. A flushing agent is an essential part of a thorough inspection. The following key areas should be inspected:

- Mattress, including under buttons and along seams.
- Divan base – remove the material covering the base and also check hollow caster legs.
- Bed frame.
- Bed head.
- Bedside furniture, checking drawers in tables and cupboards.
- Other furniture, along seams, buttons and joins.
- Furniture should also be turned over and the underside examined.
- Electrical fittings and appliances, such as telephones, clock radios, televisions.
- Underneath carpet edges and along the straight edges.
- Floor-board joins.
- Under loose wallpaper.
- Architraves.
- Picture frames, wall mirrors, blinds, curtains and curtain rods, books, behind electrical conduit, cracks and joins in the ceiling and ceiling mouldings.
- Lounges in common rooms of Youth Hostel etc.
- Housekeeping rooms

INSPECTION NOTES

PICTURES OF KEY INSPECTION AREAS

- Inspect bed head and surrounding areas.
- Light fittings, telephones and light switch covers can all harbour bedbugs.

• Inspect behind loose wall paper

• Inspect mattresses

• Inspect furniture, removing drawers and checking wardrobes

• Check mattress seams

• Do not forget the underside of mattresses

• Inspect luggage, particularly along fold, seams, zips and buttons

• Check telephones and other electrical equipment

• Remove and inspect light switch covers

• Check behind mirrors

A flushing agent is an essential part of a thorough inspection, as visual inspection with a torch and/or hand lens will not reveal all bedbugs

PRE-TREATMENT ADVICE TO CLIENTS

Hotels

GUEST COMPLAINT PROCEDURE

- Any report of bedbugs should be investigated and recorded.
- Any guest complaining of bedbugs should be immediately relocated, to avoid bites occurring again.
- Prior to relocation, belongings should be inspected for bedbugs (with consent of the owner) and laundered, to minimise the chance of the infestation spreading.
- Medical assistance should be sought if there is a severe reaction to bedbug bites.
- A qualified pest controller should inspect the area (which should be vacated until an inspection is organised) for bedbugs.
- Details of the inspection and action taken should be recorded.
- Ideally, the pest controller should inspect the room before the client removes items. This is so the pest controller can gauge the extent of the infestation.

BEDBUG INFESTATION CONFIRMED: ACTION TO TAKE

- If a bedbug infestation is confirmed, the guest should be provided with advice on how to prevent infestation of their home.
- Guidance on the “Bedbug client checklist” should be followed.

BEDBUG CLIENT CHECKLIST

Client Responsibilities

- ☐ Loosen the carpet at wall / floor junction, but do not remove it from the room.
- ☐ Remove any wall-mounted items but do not take them out of the room.
- ☐ Remove plug and switch plate covers. Isolate the supply to the room to avoid electrocution.
- ☐ Remove linen from bed and base. These should be bagged and laundered (see laundering procedures in later section).
- ☐ Empty wardrobes and cupboards of items.
- ☐ Do not remove any items of furniture from the room. In most cases beds can be treated and do not need to be disposed of.
- ☐ If a mattress is torn and therefore difficult to treat, it can be disposed of. Discuss this with the pest controller. The mattress should be rendered unusable, sealed and disposed of after being treated with insecticide.

After Treatment

- ☐ Replace all items removed from walls.
- ☐ Replace carpet.
- ☐ Re-assemble room.
- ☐ Keep room unoccupied until bedbugs are eliminated

Signed: _____

Date: _____

BEDBUG CLIENT CHECKLIST FOR PCO

Information for client

- ☐ Bedbug client checklist provided.
- ☐ Recommend that rooms to be treated should be taken out of service until bedbugs are eliminated
- ☐ Bedbug fact sheets provided, along with details of insecticides to be used.

Customer responsibilities completed

- ☐ Carpet loosened at wall / floor junction.
- ☐ All wall-mounted items removed.
- ☐ Plug and wall switch plate covers removed.
- ☐ Linen removed from bed and ensemble base.
- ☐ Items removed from wardrobes / cupboards.

Pest Control Manager: _____

Signed: _____

Date: _____

Bedbug Fact Sheet

KEY FEATURES

Adult bedbugs are 4-8 mm in length, wingless and uniformly mahogany brown in colour. They have long well-developed walking legs with efficient tarsal claws for clinging on to the host during feeding. Prominent antennae project from the head adjacent to the compound eyes.

BIOLOGY

Female bedbugs lay eggs throughout their life, an unusual feature in insects. They generally produce around 2 to 3 per day and since they can live for many weeks, indeed months, each female could produce around 400 - 500 eggs during their lifetime. The eggs are deposited all around the environment in which the bedbug is living and are small and white or whitish/yellow about 1 mm long. The nymph that emerges from the eggs after about 10 days at 22°C is a small version of the adult feeding also on the blood of vertebrates. The length of time spent in the five nymphal stages is greatly dependent upon the food resources available, temperature and relative humidity. Bedbugs have well defined resting sites in which many individuals from all the different life stages are found. This harbourage is an essential part of the life cycle of the insect since it is in this area that the young bedbugs pick up the internal gut microorganisms that are essential to their survival.

DISTRIBUTION

This genus has representatives worldwide.

SIGNIFICANCE

The close association of bedbugs with human beings means that they can cause substantial nuisance through their blood-feeding habit. They feed at night on the human hosts as they are sleeping. If the infestation is high there can be a risk of anaemia being suffered by the human hosts, although this is rare. The nuisance and itching caused by the bites and the possibility of secondary infection is more common. Bats, chickens and other domesticated animals may also be attacked.

CONTROL

A thorough inspection should be made to determine the extent and source of the infestation. Bedbugs may, for instance, have been introduced in second-hand furniture, where bugs may remain undetected for considerable periods until a suitable host appears. All harbourages should be treated with a residual insecticide. A very thorough treatment is needed, as harbourages are diverse and difficult to detect.

RECORD OF PEST COMPLAINTS

Name					
Unit Address					
Date	Nature of Pest Complaint	Location of Complaint	Reported by	Date of action	Reference Number

PEST CONTROL REPORT SHEET

Name	
Address	
Date	
Reference Number	
Report Number	

Initial Visit ☐ Routine Visit ☐ Follow-Up Visit ☐ Job/Call-Out ☐

Observations/ Comments	
Recommendations/ Treatment	
Action	
Pesticide(s) Used	
Quantity(ies) Used	

Customers Name: _____ Signed: _____

Technicians Name: _____ Signed: _____

RECORD OF PESTICIDE APPLICATION

Operator	
Date of Treatment	
Address/ Site of Application	
Areas to which applied	
Reason for Treatment	
Product Used	
Type of Application	
Quantity Used	
Dilution Rate	
Application Rate	
Reference Number	
Other Relevant Information	

INSECTICIDE APPLICATION

- Use an approved insecticide with correctly calibrated and serviced spraying / dusting equipment.
- Flat fan and crack and crevice nozzles are recommended for broad spray treatments and crack and crevice treatments respectively.
- An appropriate pressure regulator is recommended.
- If insecticide approval allows it (see product label), treat mattresses, around buttons and along seams. Do not use insecticide on bedding.
- Treat the bed frame and bed head, including joins and grooves.
- Treat electrical goods such as telephones, clock radios and televisions with dust.
- Apply insecticide to the wall – floor junction, under carpet edges, where the carpet meets the skirting board and under the skirting board if accessible.
- Apply dust to the inside of all electrical junction boxes. Light switch covers can be removed and treated.
- Treat furniture framework – upholstered furniture can be treated with crack & crevice spray, similar to mattress treatments and dust can be applied to the hollow metal tubing of appropriate furniture.
- Treat items removed from the walls.
- If bedbugs are found in the guide tracks of wardrobes, arrange for these tracks to be pulled up. Treat this area and arrange for the tracks to be re-attached post-treatment.
- Inspect and treat housekeeping rooms.

BLOCK TREATMENTS

	X	

X - Infested Room

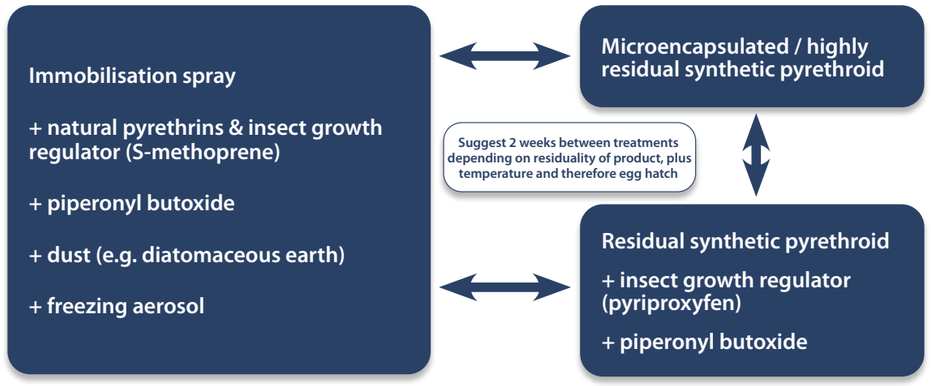
Block treatments are essential in good pest control. All rooms in contact with the infested room should be inspected and treated if necessary. This includes rooms adjacent, above and below the infested room.

It is a good pest control strategy to ‘work from the outside, in’. Find the extent and outer limit of the infestation and work inwards towards the focus to gain control.

INSECTICIDE TREATMENT REGIME

The suggested treatment regime utilises a mixture of insecticide groups and formulations, ensuring an integrated approach to control and resistance management.

Cimex lectularius suggested treatment regime



This regime ensures that the maximum number of insecticide groups and therefore modes of action are used against the bedbug. Modes of action include sodium channel modulators (work on the nervous system), insect growth regulators, physical mode-of-action immobilisation sprays, while some insecticides contain a synergist, piperonyl butoxide, which inhibits the insect detoxification mechanism.

ULV based flushing agents are also available. ULV flushing agents can excite bedbugs and flush them into other areas so they should be used with caution. A flushing agent in aerosol formulation is recommended as an essential part of the inspection process.

This regime also utilises a number of different formulations, including microencapsulated, dust, concentrates, physical mode-of-action immobilisation sprays and freezing aerosols.

The order of these suggested treatments can be determined by the operator dependent on the situation.

High numbers of bedbugs, with suspected pyrethroid or other resistance, may need to be immobilised quickly and subjected to multiple modes of action. A weakness with this option, as a first treatment, is a non-residual action (although note that IGRs and dusts have residual effects) so a second and residual treatment may need to be brought forward to within a week.
A microencapsulated / highly residual pyrethroid treatment could be the first option so that long-lasting insecticide deposits (residual for 12 weeks or longer, depending on product choice) remain alongside any following treatments. This could be a good option where no pyrethroid resistance is suspected - if this turns out not to be the case then follow-up treatments with other modes of action will remove any remaining resistant individuals. This highly residual treatment can also sit well as the final of the third applications, providing a long-lasting effect against any remaining low numbers of bedbugs.

Note that direct application of insecticide, in some cases, is most effective against bedbugs versus relying on them crossing dried residual deposits.

MONITORING

A range of bedbug monitoring devices are described in the Killgerm Bedbug Control Practical Tips booklet.

ALTERNATIVE CONTROL

Non-chemical control – Vacuuming

- Vacuum general area of the floor and use crack and crevice extension at wall / floor junction.
- Vacuum mattresses and other furniture, removing cushions and turning furniture upside down.
- Vacuum cleaners with HEPA filters are recommended to prevent the spread of potentially irritating debris through the exhaust.
- Dispose of the vacuum cleaner contents in a sealed bag as soon as possible, preferably by incineration. Insecticide dust can also be applied to the contents.
- Inspect all other potential bedbug refugia and vacuum if insects are present.
- Vacuum cleaners themselves could spread infestations. They should be 'treated' by soaking plastic parts in hot water. When not in use, the vacuum cleaner should be stored in a sealed bag.
- Vacuuming will not remove all bedbug eggs, so subsequent insecticide application is essential.

LAUNDERING PROCEDURES FOR BEDBUG CONTROL

The following table is an extract from work by Richard Naylor at the University of Sheffield.

Treatment Method	Temperature & Duration	Control Level
Washing machine (non-biological detergent) 3.2kg	Cool – 30°C – 30 minute wash	Did not kill Egg stages
	Hot – 60°C – 30 minute wash	Killed all life stages
Tumble Dry 3.2kg	Cool dry – 30 minutes	Did not kill all stages
	Hot dry – 30 minutes – 40/45°C	Killed all stages
Cold Soak 3.2kg	Cold water – 30 minutes	Killed adults/nymphs only
	Cold soak – 24 hours	Killed adults/nymphs only
Dry cleaning (perchloroethylene)		Killed all life stages
Freezing 2.5kg	2 hours at -17°C (8 hours to get clothes and items to -17°C, takes total 10 hours of treatment)	Killed all life stages

EXTREME TEMPERATURE TREATMENTS

There are commercially available extreme heat and cold treatments that can be used to treat bedbug infestations. These techniques certainly have their uses, especially where pesticide use may be undesirable or resistance is suspected. Tests have shown that bedbugs can be controlled successfully using extreme cold treatments, backed up with vacuuming. It must be remembered, however, that extreme temperature treatments offer no residual effect.

STEAM TREATMENT

This technique can be used successfully, depending on the quality of the steam. This method can be particularly useful as it kills all life – stages of the bedbug, including the egg. The quality of steam is important. 'Dry' steam with less than 5% humidity, at 94°C, applied at a high pressure is recommended.

Note that aerosol 'ice' freezing treatments are available for bedbug management.

POST-TREATMENT ADVICE AND RISK MINIMISATION MEASURES

- Repair any loose wallpaper.
- Repair any sources of moisture.
- After treatment, re-attach the cloth cover to the bottom of the divan base.
- After treatment, seal cracks and crevices.
- Covering the mattress with a plastic or allergy-proof cover may help prevent re-infestation by reducing the harbourages. Some covers will trap bedbugs, causing them to die of starvation.

It is recommended that this manual is read in conjunction with the Killgerm 'Bedbug Control Practical Tips' booklet and the 'European Code of Practice for the Management of Bedbug Infestations.' Available from www.killgerm.com and www.bedbugfoundation.org respectively.

Other UK species

***Cimex columbarius*, the pigeon bug.**
It is very similar in habits and appearance to the common bedbug, *Cimex lectularius*. Control is as for *Cimex lectularius*, although removal of pigeons and their roosting material is the key to control.

***Cimex pipistrelli*, a blood-feeding bug associated with noctule and serotine bats.**
These bugs will feed on birds and man in the absence of a more suitable host.
This species was originally found in southern parts of the UK and Ireland, but recent records show a more northerly distribution.

The relevant Statutory Nature Conservancy Organisation should be contacted in view of the fact that bats were or are present.

***Oeciacus hirundinis*, Martin bug.**
These insects resemble bedbugs and are commonly mistaken for them. They are blood feeders, parasitising birds, particularly martins and swallows although sparrows and woodpeckers may also be attacked. When young birds vacate the nest the martin bugs will leave and search for other warm-blooded creatures such as human beings. Control is as for *Cimex lectularius* and removal of birds' nests is the key to control.

Recommended training for PCOs

Bedbug training courses

For further information about training courses, please contact Killgerm Training on 01924 268445 or training@killgerm.com

Notes

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