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Bed Bugs Limited

Prepared by

David Cain

Development Protocol

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Version 1.3

DEALING WITH BEDBUGS BY PASSIVE MONITOR REPLACEMENT A NON CHEMICAL APPROACH

Contents

Forward.....	3
Overview of the process.....	4
Advance preparations.....	5
Recommended items.....	5
Optional Items.....	5
About bedbugs.....	6
Life cycle.....	6
Habits.....	7
Injury.....	8
Telltale Signs.....	9
Control Measures.....	9
Prevention.....	9
Inspection.....	10
Self inspection and sanitation.....	11
Where to start.....	12
Types of bedbug infestations.....	12
Single source infestations.....	12
Local source infestations.....	13
Inspection and manual eradication overview.....	14
Procedure for bedrooms.....	15
Procedure for lounges and living spaces.....	16
Procedure for office and working spaces.....	17
Procedure for vehicles.....	18
Decontamination of possessions.....	19
Clothes and fabrics.....	19
Books and paper materials.....	19
Hand decontamination.....	19
Activity log.....	20
Collection of field samples to aid academic research.....	22
Feedback.....	23
Acknowledgements.....	24
Disclaimer.....	25

Forward

This protocol has been developed to deal with light infestations of bedbugs using no chemicals. It is only designed to work with light single sources of bedbugs or as an adjunct to professional treatment. If you have a heavy infestation, consult an experienced pest control professional who specialises in bedbugs for assistance.

This method works best if the passive bedbug monitoring technology is installed in advance of the introduction of bedbugs as they will naturally colonise the passive monitor before they “nest” in other areas.

Unlike all other treatment options this method relies upon the fact that if bedbugs are allowed to freely travel around an infested room they will relocate into an optimally positioned passive monitor from existing refugia. It is therefore essential that the following approaches are not used in conjunction with this approach:

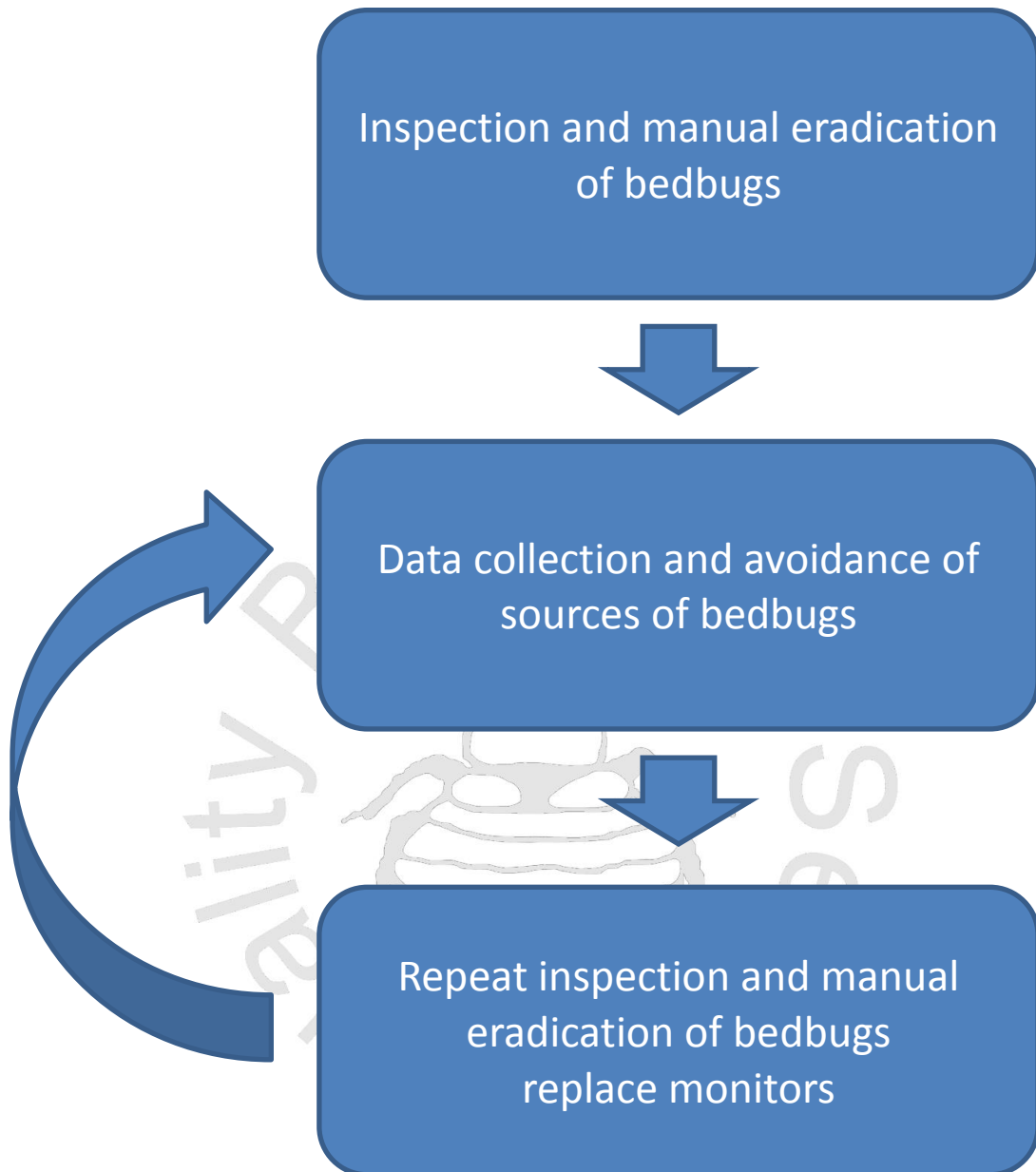
- Bed isolation using
 - Barrier tapes on the bed legs
 - Interceptor devices on the bed legs
 - Vaseline or mineral oil barriers
- Mattress encasements – if not correctly fitted can provide alternative refugia for bedbugs

If unrestricted, bedbugs will start to colonise the passive monitor within 12 – 72 hours from installation as evident by the faecal trace deposits which appear on the detection skirt.

If you suspect your infestation is due to insects related to bedbugs such as bat bugs and martin / bird bugs, please have a sample confirmed by a professional entomologist as their biology and behaviour may not work with this approach.

Finally, the room **MUST** remain occupied throughout the process to ensure that the bedbugs do not spread to other occupied parts of the property.

Overview of the process



Advance preparations

To increase the chance of this approach working for you, it is essential that you understand the facts about bedbug infestations and are capable of identifying all life stages, faecal traces and cast skins. In order to ensure that you are familiar with these we recommend the following documents:

Bed Bug Beware – an easy to understand guide to bedbugs, their prevention and control by David Cain and Richard Strand ISBN 978-0-9562617-0-0

www.Bed-Bugs.co.uk/aboutbedbugs.html

<http://www.Bed-Bugs.co.uk/gallery.html>

<http://www.BedBugBeware.com/confirmingBBsignsfinal.pdf>

<http://bedbugger.com/2006/10/22/faq-what-are-bed-bugs-do-i-have-them-what-else-could-be-causing-this/>

http://www.flickr.com/photos/lou_bugs_pix/345296553/

Recommended items

Inspection gloves (latex or nitrile medical type ones)
Bright LED head torch (it's easier to work with both hands free)
Alginate or dissolvable bags for processing laundry
Large refuse bags to assist with de-cluttering and safe disposal
Pallet wrap or wide saran style cling film
Strong suction vacuum cleaner
Fine weave stockings or tights to prevent infestation of vacuum cleaner

Large sheets or polythene plastic or a shower curtain
2 Rolls of double sided carpet tape, as sticky as possible

Optional items

Low pressure dry steam cleaner
Smooth sided plastic storage boxes to isolate items which may be infested
Minifying glass or jeweller's lens

About bedbugs

<u>Common Name</u>	<u>Scientific Name</u>
Native Bedbug	Cimex lectularius
Tropical Bedbugs	Cimex hempiterus

Bedbugs are parasites that preferentially feed on humans. They are a persistent pest and have developed a number of highly evolved abilities to remain close to humans.

Bedbugs have been documented as pests since the 17th century although they have been around for much longer and most likely followed man out of the caves millennia ago. Bedbugs were common in the UK prior to World War II, after which widespread use of synthetic insecticides such as DDT greatly reduced their numbers. At one stage in the 1930's 25% of all homes in the UK were infested!

In the past decade, bedbugs have begun making a comeback across the world. Although they are not considered to be a major pest or health hazard they can be highly unpleasant to live with and can cause anxiety and a severe lack of sleep. International travel and commerce are thought to facilitate the spread because eggs, young and adult bedbugs are all readily transported in luggage, clothing, bedding, and furniture. Bedbugs can infest aircraft, ships, trains, vehicles including taxi's and buses. Many recent cases that we have worked on have been traced back to travel where the source was identified to be the return journey rather than an infested room.

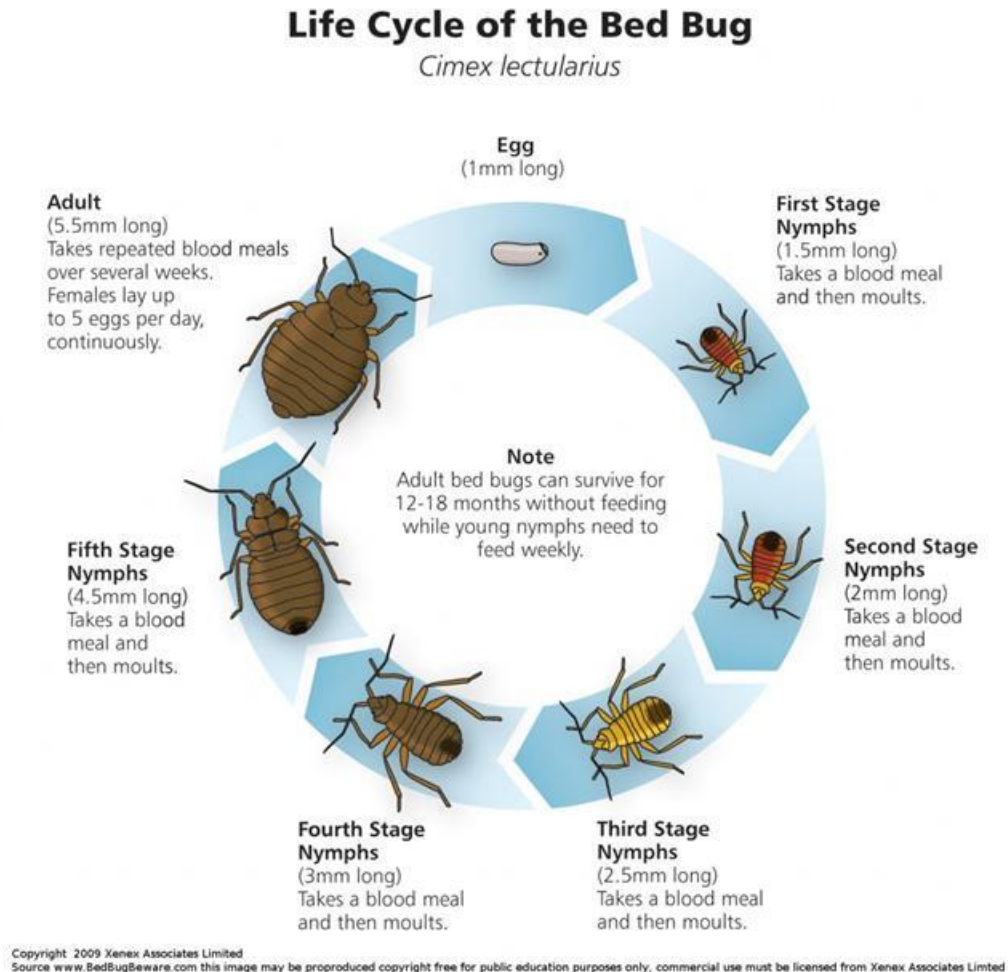
Bedbugs are most frequently found in dwellings with a high rate of occupant turnover, such as hotels, motels, hostels, dormitories, shelters, apartment complexes, tenements, and prisons. Such infestations are not usually a reflection of poor hygiene or bad housekeeping, but that a previous occupant had come into contact with them at some stage.

Adult bedbugs are brown to reddish-brown, oval-shaped, flattened, and about 3/16 inch to 1/5 inch long. Their flat shape enables them to readily hide in cracks and crevices. In some cases colonies have been found in places where it is difficult to insert a sheet of paper.

Life cycle

Female bedbugs lay from one to twelve eggs per day, and the eggs are deposited on rough surfaces or in crack and crevices. The eggs are coated with a sticky substance so they adhere to the surface. Eggs hatch in around 10 days, and nymphs can immediately begin to feed. They require a blood meal in order to moult and develop into the next stage. Bedbugs reach maturity after five moults. Developmental time (egg to adult) is affected by temperature and takes about 21 days at 30°C/86° F to 120 days at 18°C/65° F. The nymphal period is greatly prolonged when food is scarce. The adult's life span may encompass 12-18 months and they are known to be able to survive for 12 or longer months between feeds. If a source of blood meal is available

in a property they will detect it, even if this means moving between rooms or in some cases through to adjoining properties.



Habits

Bedbugs are fast moving insects that are blood-feeders using a stylet to pierce a hole in the skin. Nymphs may become engorged with blood within three minutes, whereas a full-grown bedbug usually feeds for ten to 15 minutes. They then crawl away to a hiding place to digest the meal, which may take three or four days. Although widely reported as such, they are not nocturnal and become active when food is most readily available.

Bedbugs hide during the day in dark protected sites, preferring fabric, wood, and paper surfaces. They usually harbor in fairly close proximity to the host, although they can travel significant distances for food. Bedbugs can often be found in tufts, seams, and folds of mattresses, later spreading to crevices in the bedstead. In heavier infestations, they also may occupy hiding places further from the bed. They may hide in window and door frames, electrical boxes, floor cracks, baseboards, furniture, and under the tack board of wall-to-wall carpeting. Bedbugs often crawl upward to hide in

pictures, wall hangings, drapery pleats, loosened wallpaper, cracks in plaster, and ceiling mouldings.

The use of inappropriate treatment solutions such as aerosol insecticides, foggers and products that they are tolerant to will often spread an infestation. Bedbugs have the ability to rapidly develop resistance to chemical control strategies as they can rapidly interbreed with their siblings, developing tolerant strains very quickly.

Injury

The bite is painless at the time but will typically cause the skin to become irritated and inflamed. Individuals differ greatly in both the extent and timing of their response to a bite. A small, hard, swollen, white welt may develop at the site of each bite which can occur in rows or batches of three or four although this does vary from person to person. This is usually accompanied by severe itching that lasts for several hours to days. In rare cases an allergic reaction may follow - in such cases seek medical attention immediately. The morphology of bites is highly variable and bed bugs are almost impossible to diagnose on bites alone.

It is believed that one in ten people show no signs of biting, often leading to the myth that they only attack certain people. Cases of extreme reaction seem to be on the increase and affect as many as two in ten people. If you have a severe reaction to other insect bites such as fleas and mosquitoes, you are more likely to have an extreme reaction to bedbugs. We have also noted increasing anecdotal evidence that once you have been bitten, the environment that you find yourself in can induce a more severe reaction. Therefore, if possible avoid areas of high pollution or concentrations of irritants that will enter through the open wounds.

Some individuals respond to bedbug infestations with anxiety, stress, and insomnia. Bedbugs are not known to transmit any diseases. Although some studies have shown that they are capable of carrying infectious material, it is believed that their evolutionary path prevents them from transmitting anything person to person.

If an infestation is heavy or prolonged, it is advisable to use an iron containing dietary supplement as anaemia or iron deficiency can develop. If you are feeling tired and lethargic, this may help significantly.

There is some evidence that prescribed antihistamines can help reduce the effects. However it is essential that you explain to your GP that the problem is bedbugs related as the symptoms can be mistaken for more serious complaints, such as scabies, although they are in no way related. We advise our clients that they should show the evidence newsletter in the Helpful Advice section to their GP. To get relief from the itch Eurax or Antisan cream, which is available from pharmacists, is recommended but as with all medication, you should consult a medical professional.

Telltale signs

A bedbug infestation can be confirmed through the presence of the following signs:

- Live samples – adults which are the easiest to recognise and confirm are a mahogany brown colour and can either be thin and round (an apple pip shape) or long and cylindrical when they have fed.
- Faecal traces – bedbugs excrete droppings that are usually blackish in colour and often resemble a felt tip pen mark on hard surfaces. If bedbugs are present these will always be visible somewhere in the room. They are the second most definitive sign of an infestation.
- Cast skins – these paper thin cast off outer shells are left behind as bedbugs develop from nymphs through adult. They may not always be visible at the start of an infestation

The following signs are not definitive of bedbugs but can illustrate a potential problem:

- Bites – it is not technically possible to diagnose an insect based on this bite. We are all too individual in our response for this to be accurate. It is best to think of bites as telling you something is wrong, not what it is.
- Blood spots on sheets – there are many different reasons for blood spots on the sheets and in fact, different types of blood spots give you different information. It is extremely difficult to use blood spots as a diagnostic tool, as people's perception of colour varies greatly.
- An offensive, sweet, musty odour from their scent glands may be detected when bed bug infestations are severe. As the smell develops over time, you may become accustomed to it.

Control measures

Control of bedbugs is best achieved by following an integrated pest eradication (IPE) approach that involves multiple tactics, such as preventive measures, sanitation and possibly chemicals applied when appropriate to targeted sites. Severe infestations should only be handled by a licensed pest management professional with experience in dealing with bedbug infestations. But as with all problems if you identify it quickly before it spreads, the matter can be dealt with more easily than an advanced infestation.

Prevention

Bedbugs are a pest of exposure. If you do not come into contact with an infested location, item or adjoining neighbour you will not get bedbugs. However, the reality of modern life is that infested locations can include:

Hotel or stay away from home

Adjoining neighbour or regular visitor

Infested item brought into the property

Workplace

Vehicle

Public transportation

International travel

Cinema, theatre, restaurant or bar

Checking regularly visited locations such as work and vehicles can help you understand how you became exposed to bedbugs and thus help avoid them in the future. As this can sometimes be hard to achieve with busy modern lifestyles we have developed a process that relies upon the PackTite™ as a personal decontamination system to ensure that all bedbugs that you may come into contact with do not end up at home with you.

Inspecting items such as furniture before they come into your home is essential to ensuring your home remains bedbug free, as is the ability to discuss the matter with friends and family to ensure that they are taking the correct prevention steps as well.

Unless the source is excluded from the property, the stock of bedbugs will be continually replenished and the life cycle will continue. We therefore advocate education and open communication as one of the most powerful tools the fight against bedbugs. We hope that you will use the newsletters in this information pack, and available online, at www.BedBugBeware.com, to help educate people.

Inspection

A thorough inspection of the premises to locate bedbugs and their harbourage sites is necessary so that cleaning efforts and insecticide treatments can be focused. Inspection efforts should concentrate on the mattress, box springs and bed frame, as well as cracks and crevices that the bedbugs may hide in during the day or when digesting a blood meal. The latter sites include window and door frames, floor cracks, carpet tack boards, baseboards, electrical boxes, furniture, pictures, wall hangings, drapery pleats, loosened wallpaper, cracks in plaster, and ceiling mouldings. Detection is something that you develop an "eye for" with time, particularly in the case of eggs which appear amber in colour when fertile and pearlescent white when hatched.

You should start off with items on the edges of the bed and work inwards until you find signs of activity. As infestations tend to spread out from the most occupied areas if the signs away from the bed are minimal it is a good sign that it is a light infestation. Working in towards the bed also gives you the best chance to stop and prepare before working on the bed itself which can be awkward due to its size.

If the bed is fitted with a headboard, always inspect the forks of the legs first before removing it from the bed as bedbugs will often hide at the top of the forks. However, faecal traces can be more wide spread.

Self inspection and sanitation

The assumption that bedbugs have anything to do with the cleanliness of your home is one of the biggest and most inaccurate myths surrounding the subject and one of the main reasons for the resurgence of an issue that no one wants to talk about.

Regular self inspections built into your bed and sleeping area cleaning regime will help ensure that bedbugs are always detected quickly. We recommend a single 30 minute cleaning regime once a month as a fair return for the average of 180 hours per month spent sleeping in a bed. Passive bedbug monitors are designed and recommended for monthly inspection for this very reason and in recognition for the fact that initial infestations are often limited for the first three to six weeks until the full breeding cycle starts.

By catching the problem quickly you can help ensure you remain bedbug free and that any problems are dealt with in an environmentally sustainable fashion with minimal disruption to your life.

Mattress encasements can help prevent your mattress from getting stained with bedbug faecal material, but they will not help prevent any bedbugs from being introduced; only you can do that. Although some pest controllers use and recommend encasements, specialists are increasingly agreeing that they have limited use in bedbug treatments.

Where to start

The key to this approach is attention to detail and being thorough. This process can not be rushed and may take as long as one day per room. There are no short cuts and to attempt to circumnavigate any of the steps is a false economy in terms of time and results.

If you have issues with remaining focused on a task and do not have the ability to spend long periods of time uninterrupted on the matter, do not attempt this procedure.

It is important that you do not attempt this procedure in the following circumstances:

- If you have been repeatedly treated for bedbugs using chemical, thermal or steam treatments and the bedbugs have returned after a period of no activity
- If you have experienced continual infestation for more than six months
- If you have not confirmed the infestation through the presence of
 - Live samples
 - Cast skins
 - Faecal traces
- If you have a local source infestation (see following section)

Types of bedbug infestations

As leaders in the field of bedbug infestation eradication we are often a few steps ahead of everyone else in the way that we look at the problem. Through scientific analysis of our methods and procedures we have identified two different dynamics of bedbug infestations. Being able to distinguish between the two and take rapid action can reduce the duration of an infestation by several months.

Single source infestations

If you come into contact with bedbugs during a stay away from home, such as a friend's house or hotel room, or if an item has been brought into your home, you have effectively only been exposed to a source of bedbugs once. The extent of the problem if quickly identified will be limited to the numbers that travel back with you until they start to breed.

This is usually between six and 12 samples in total unless a heavily infested item is brought into your home. Once the population has been identified and treatment starts, the numbers will not continue to dramatically increase once steps are taken to control the problem.

The population should rapidly decline following the inspection and eradication step of this protocol. Although there may still be some activity up until the monitor replacement date, it should not increase again after this date. If activity drops off but then picks up again, it is unlikely that you have a single source exposure and you need to consider the additional steps associated with a local source infestation of bedbugs.

Local source infestations

This type of infestation is more complex to treat and will only be resolved once the source of the infestation has been identified and contact is removed. The typical activity pattern shows a rapid decline in activity followed by subsequent peaks and increases as new bedbugs are introduced to the property.

The reality is that the source of the infestations **MUST** be identified and treated or avoided in order to stop you being continually exposed.

Potential source

Control steps needed

Public transportation	Do not sit down / stand or get a shooting stick
Work environment	Check you working area
Regularly visited location	Change your routine until you are clear
Adjoining neighbour	Communicate using the newsletters
Personal/Work vehicle	Check and inspect the vehicle, valet advised
Items brought into home	Check and inspect all items

Although most people are hesitant to communicate the issue of bedbugs with friends, neighbours and colleagues, the reality of the matter is that without open communication of the issue, others do not know what signs to look for and what steps to take while traveling to avoid contact with this pest.

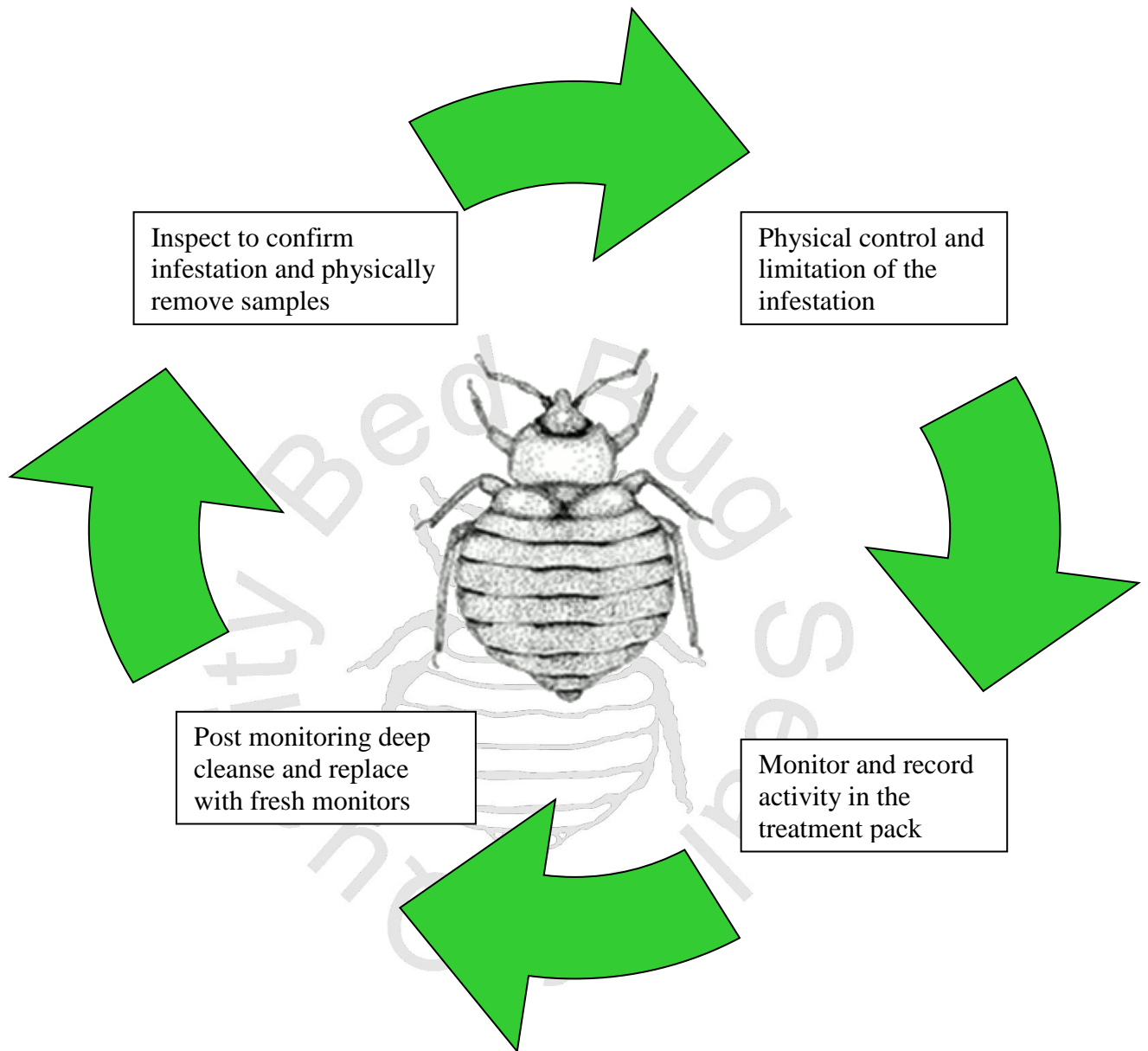
We are often quoted in the media as saying that the number one reason for the resurgence of bedbugs is lack of public awareness. Sadly after extensive communication through the media since 2005, this still remains the case today.

We would always advise you to be open and communicative about bedbugs with all colleagues and adjoining neighbours as soon as a problem is confirmed. Bedbugs are not associated with dirty or poor living conditions although this is a common misconception.

Without clear and accurate communication you may continue to be exposed to a problem that is beyond your control and your issue will never be resolved until the source is identified and eradicated. To assist you in efficiently and effectively doing this, we would suggest that you use the following communication sheets:

<http://www.bedbugbeware.com/neighbour3fold.html>

Inspection and manual eradication overview

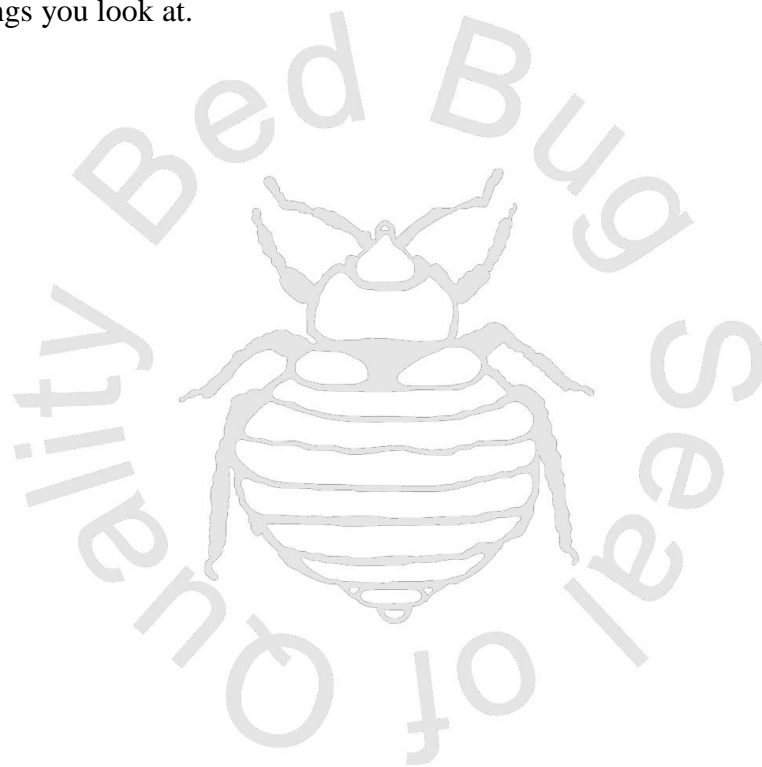


Procedure for bedrooms

We are still working on the best way to illustrate a cleaning specification that takes into account different furniture types and room designs. Until this is available the best advice we can give you is think of this as a back to new deep clean. You want to clean everything on all sides and seams with the aim of making it as clean as new. Sometimes we describe this as a forensic level clean because it is all about attention to detail and removing all trace signs of activity.

Yes this especially means the places where the dust bunnies roam free and you never get to clean because you are too busy.

We would also counsel you against using a commercial cleaner unless they are specifically trained in cleaning with regards to bedbugs as this is not just a light clean of all the things you look at.

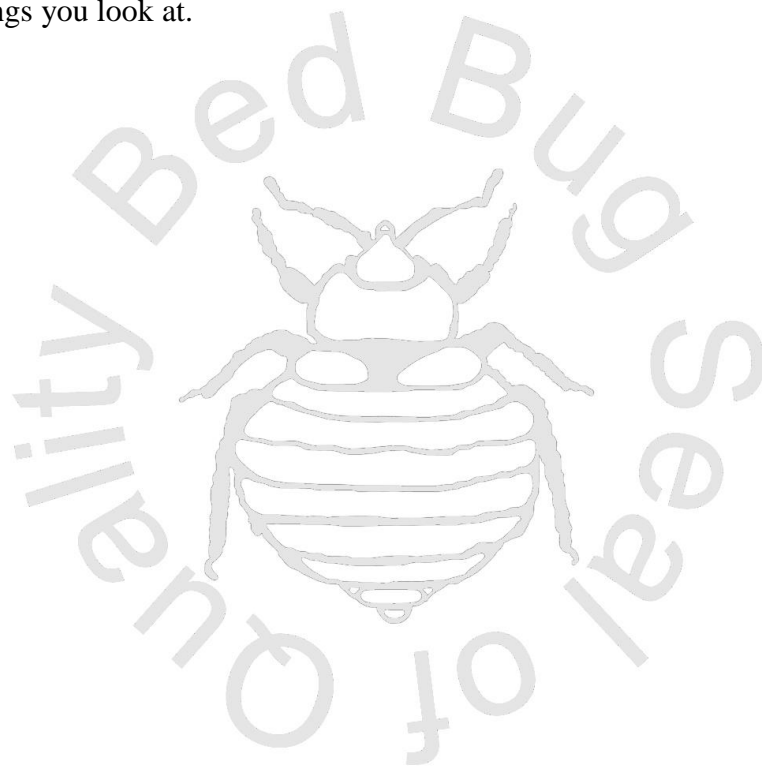


Procedure for lounges and living spaces

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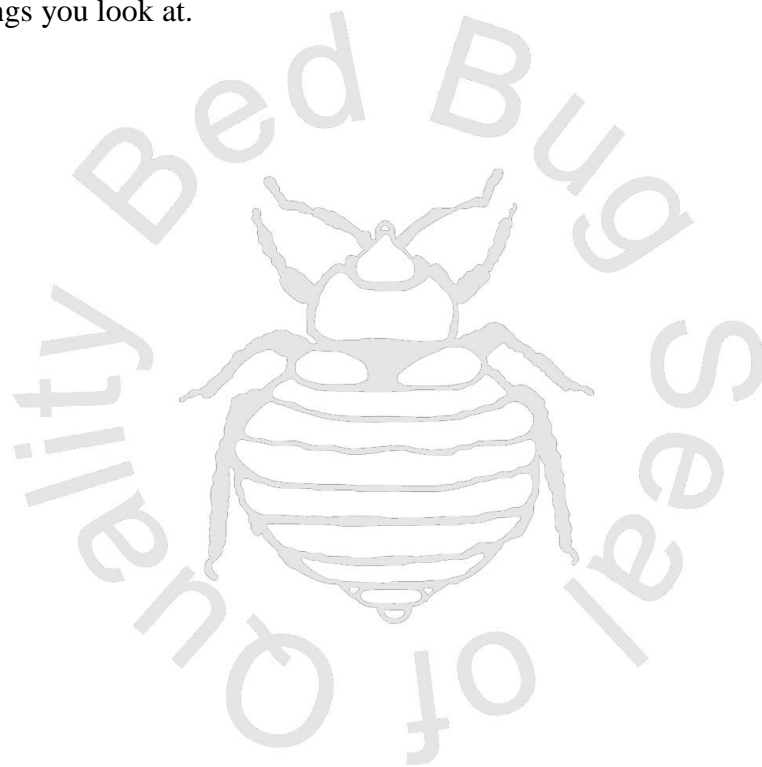


Procedure for office and working spaces

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Procedure for vehicles

We are still working on the best way to illustrate cleaning specifications for vehicles. Until this is available, the best advice we can give you is think of this as a back to new deep clean. You want to clean everything on all sides and seams with the aim of making it as clean as new. Sometimes we describe this as a forensic level clean because it is all about attention to detail and removing all trace signs of activity.

With vehicles this includes any booster seats and down the sides of the chairs. Although you may be tempted to use a valet service, their turnaround time means they are less likely to be as thorough as you need to be to do this successfully.



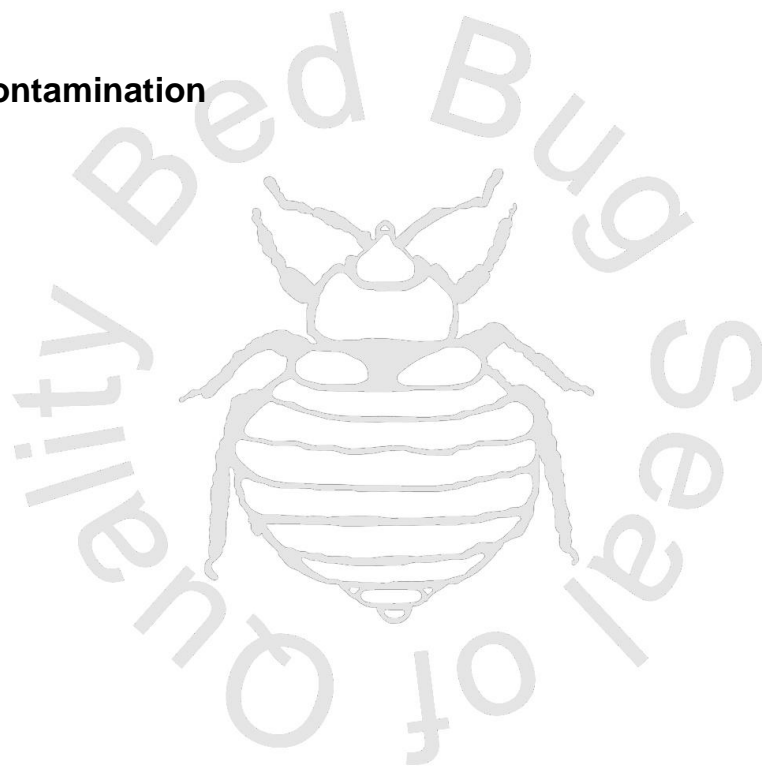
Decontamination of possessions

The aim of this section is to assist you in decontaminating items from within your home which may have been exposed to bedbugs. We advocate a decontaminate, not replace, policy to help reduce the economic impact that bedbug infestations can have on you and your home.

Clothes and fabrics

Books and paper materials

Hand decontamination



Activity log

Accurate scientific data is essential in the monitoring of the removal as well as helping to identify potential reinfestations. **Please assist us by keeping the log accurate and up-to-date** including recording days with no activity.

If activity persists beyond day 14 of this process please, consult a pest control professional experienced in dealing with bedbug infestations.

Day	Adults 3 – 5mm	Young 2 – 3mm	Babies 1 – 2mm	Bites	Blood spots	Dead bed bugs	Marks on passive monitor	
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2								
3								
Inspect non treated rooms Clear <input type="checkbox"/> If signs found to extend treatment to new rooms.								
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14	Cleaning procedure day and re inspect non treated rooms Clear <input type="checkbox"/> If signs found to extend treatment to new rooms.							If
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This page may be copied if needed.

Once the infestation is clear, please send the log to the address below, the feedback that it gives us will help to continually modify and develop our methodologies and treatment programs. **Please remember to do this so we can help others deal with the problem.**

Your Address:

Send to

Bed Bugs Limited
3 Cobden Road,
London,
SE25 5NY

Collection of field samples to aid academic research

We are actively collaborating with some of the world's leading academics on the mapping of bedbug populations to see if there are any genetic links between field samples. It would, therefore, be extremely useful to their projects if you could return any infested monitors to us at the address below sealed in a ziplock bag including your zipcode or postal code so we know the approximate geography of where the samples were found.

Send to

Bed Bugs Limited

3 Cobden Road

London,

SE25 5NY

United Kingdom

Collaborating with this project will assist us all in better understanding how and why bedbugs have made such a rapid resurgence into society and may lead to the solution to this growing problem.

Samples collected must be sealed in a ziplock bag and sent in protective padded envelopes only. This will minimise the risk of the package being torn or damaged during transit.

Feedback

While this protocol is new and in development, your feedback will greatly assist others and us with optimisation.

We, therefore, request that if you utilise this approach that you send us feedback and what aspects worked best for you in your circumstances and how the profile of decontamination looked.

We regret that we are not always able to answer lengthy technical questions individually but will develop a frequently asked questions section for the website on passive monitors to cover the common questions.

Please submit feedback via our web interface:

<http://www.bed-bugs.co.uk/feedback.html>

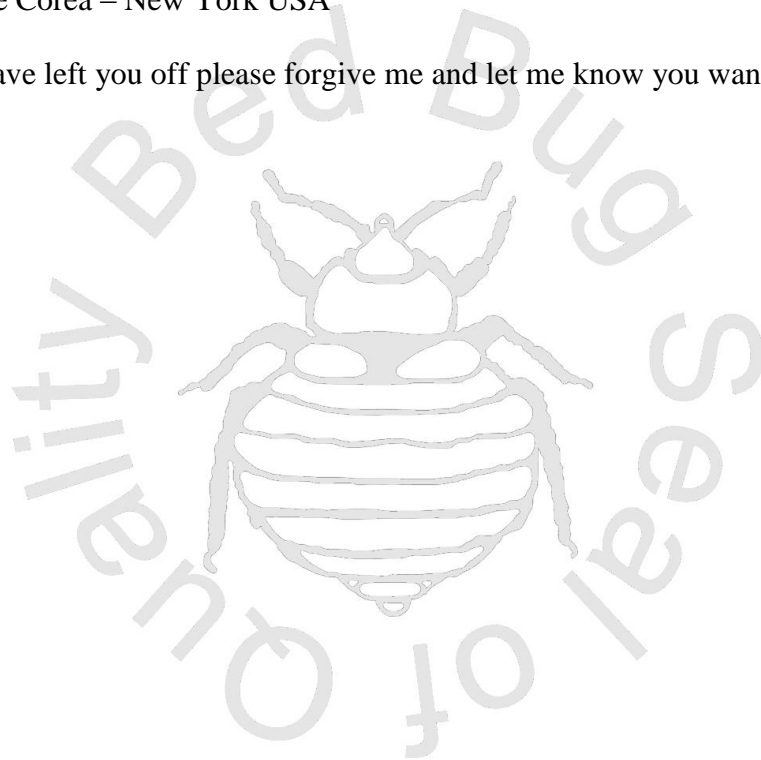


Acknowledgements

The authors of this document would like to thank the following people for inspiration and support throughout this project and for their invaluable emotional and technical support:

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Oliver Madge – Bed Bug Foundation UK
Rob Fryatt – Xenex Associates UK
David James PackTite USA
NoBugsOnMe – BedBugger.com Cyberspace
Renee Corea – New York USA

If I have left you off please forgive me and let me know you want to be added.



Disclaimer

This document is provided in good faith to help people with bedbug problems. It is designed to help people with light and recently introduced infestations.

We offer no guarantees that this method will work 100% of the time. Bedbugs are biological creatures and, therefore, not always predictable. Your success with bedbugs often relies upon the steps you take to avoid future contact with sources.

We accept no responsibility for any losses or damages which are incurred through the use of this protocol although every effort has been taken to ensure that this should not be possible.

We regret that we are not able to offer remote support of this protocol other than by integrating your feedback as we are not funded sufficiently to be able to do so.

