

BEDBUGS



Health Protection for PICNet 2012

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Bedbugs

- Distribution
- Complaints
- Biology
 - lifecycle
 - habits
- Communicable Diseases
- Bedbug Bites
- Prevention & Control

Bedbugs: Distribution

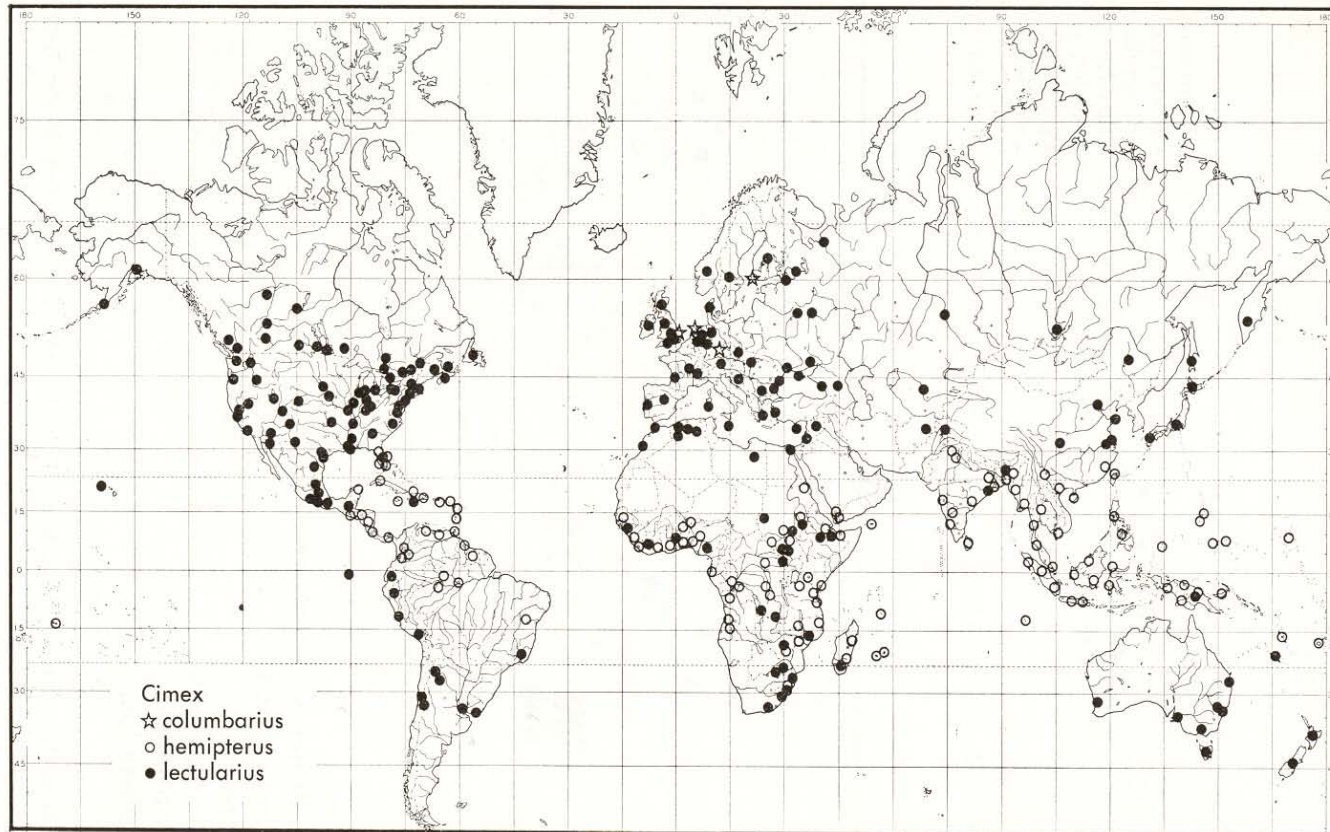


FIG. 11-2.—World distribution of the human bed bugs, *C. lectularius* and *C. hemipterus*, and the pigeon bug, *Cimex columbarius*.

Distribution:

If there is food and shelter, the bedbug can cause an infestation wherever it is transported to.

Anywhere.

History:

- In pre-war Europe, 30 – 50% of homes had bedbugs
- 47% of moving vans were infested
- In the 1900's, they used high test gasoline, cyanide powder to kill bedbugs
- In the late 1940's DDT was used that had an effective residual of 3 years. It was sold everywhere to anyone and applied to walls, floors and ceilings.
- By the 1950's bedbugs became rare.

Complaints:

- In 2009, infestation in New York City up 103% since 2007 (4,084).
- When bedbugs first arrived around 2000 the number of complaints received by Vancouver Coastal Health, Health Protection started to double every year.

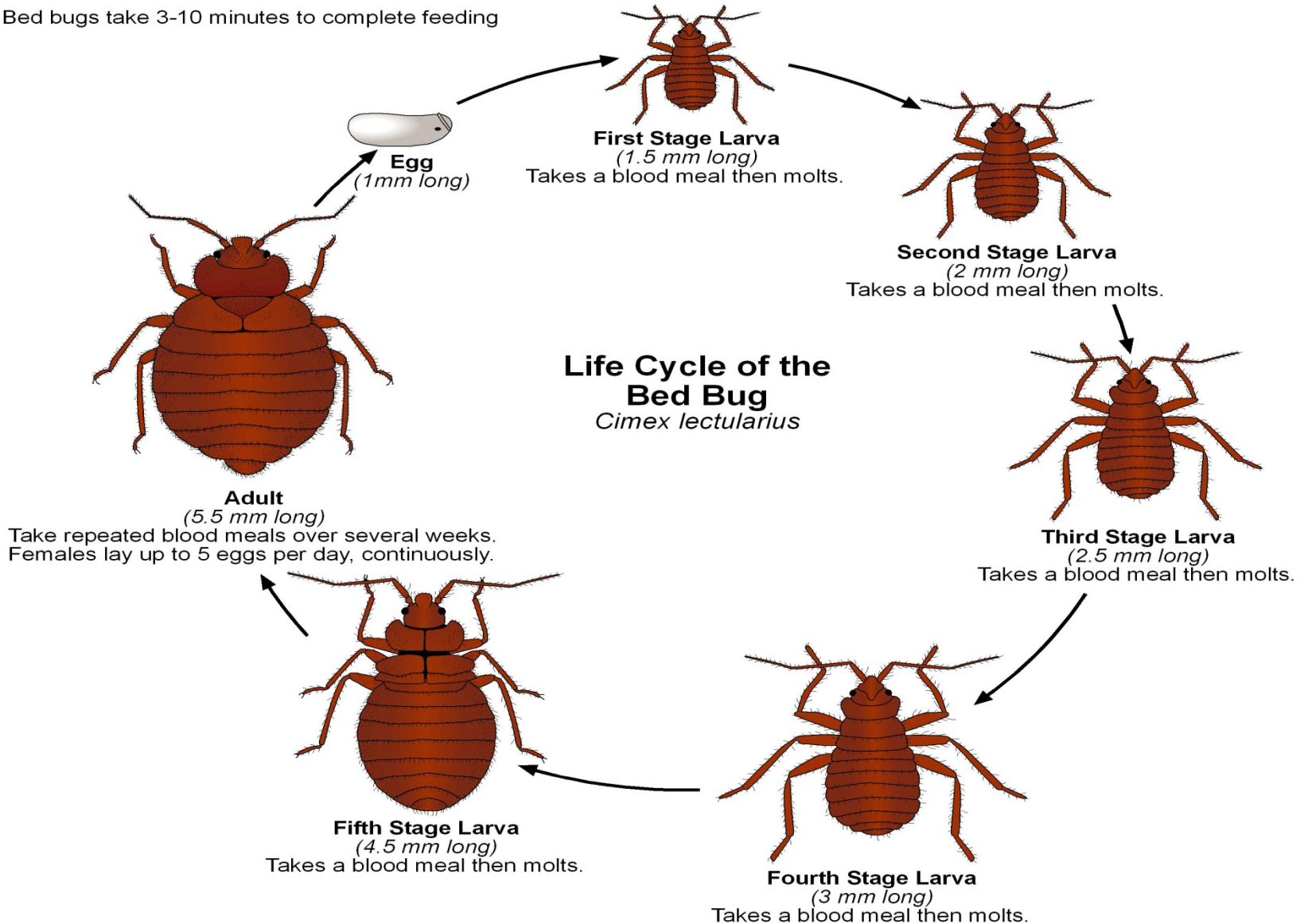
Complaints: Why an Increase?

- Less and more specific pesticide use
- Pesticide resistance
- More travel
- More second hand stores
- More awareness
- Higher population density in larger buildings



Biology: Life Cycle

Note: Bed bugs take 3-10 minutes to complete feeding



Biology: Life cycle

Adult male

Photo: Courtesy of University of Harvard © <http://hsph.harvard.edu/bedbugs/>



Biology: Life cycle

- Adult female

Photo: Courtesy of University of Harvard © <http://www.hsph.harvard.edu/bedbugs/>



Biology: Life cycle

- Engorged adult

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Biology: Life cycle

- 5 instars(molts) in nymph stage
- Must have blood meal to molt from each instar
- Can survive extended periods without blood meal in between each molt
- Egg to adult stage takes 5 weeks to 4 months
- Average life span is 6 to 12 months
- Can remain dormant for up to 1 year; but most recent research indicated ALL life stages live only ~ 70 days without food
- Brown turning reddish brown after feeding

Biology: Life cycle

- The juvenile stage(nymph)

Photos: Courtesy of University of Harvard © <http://www.hsph.harvard.edu/bedbugs/>



Biology: Life cycle

- Bedbug eggs are usually strongly attached to rough surfaces close to their daytime hiding places .
- Lay 3 – 5 eggs per day, 131 average in a lifetime
- Hatch in about 6 – 17 days, 90% within 9 days

Photos: Courtesy of University of Harvard © <http://www.hsph.harvard.edu/bedbugs/>



Feeding Habits

Locate host by

- Heat
- Carbon Dioxide
- Vibration
- Kairomones
- Perspiration?

Start looking for food again
5 to 10 days after
feeding



Photo: Courtesy of University of Harvard©
<http://www.hsph.harvard.edu/bedbugs/>

Feeding habits

- Blood is the only food
- Primary source of blood is human
- Secondary hosts are livestock, birds, rodents, bats, pets, etc.
- Hide in an area that offers tactile stimulation and shelter from light until they are searching for food. They eat and return to hiding.
- Most active from 2 to 6 am (nocturnal)

Bed Bug Bites

- There are 2 tubes inside the proboscis. One injects saliva with numbing agents; second tube draws blood, then folds up in proboscis after finish

Photo: Courtesy of University of Harvard © <http://www.hsph.harvard.edu/bedbugs/>



Bedbug bites:

- Bite are normally painless
- Bite location does not usually have characteristic red spot
- Will often make several bites in a row
- Normally bite exposed skin (they can't bite through anything)
- Will only remain on host long enough to feed

More on Bites..

- **Different studies:** 1) First bite =70% no reaction. 2) 20% of population insensitive. 3) Desensitized after 2500 bites 4) Not desensitized after 100,000 bites. 5) Sensitive after repeated exposure. 6) Guinea pigs - No change after repeated exposure.
- Infestation can go undetected for months
- Reaction can be delayed for up to 9 days

Photo: Courtesy of University of Harvard © <http://hsph.harvard.edu/bedbugs/>



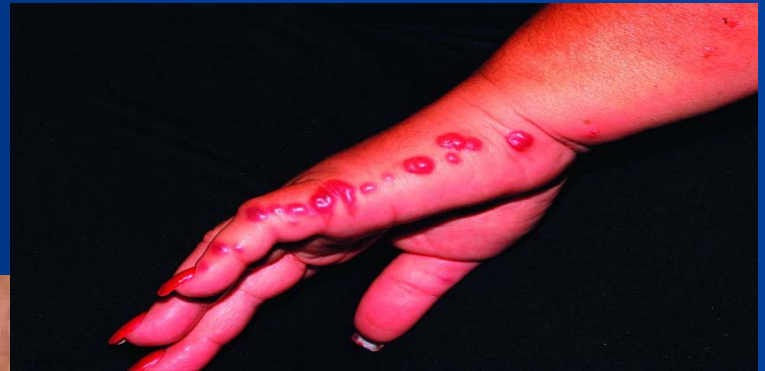
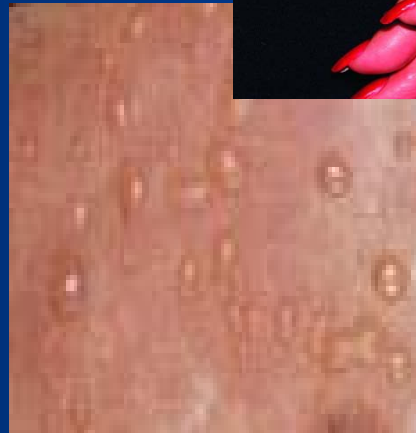
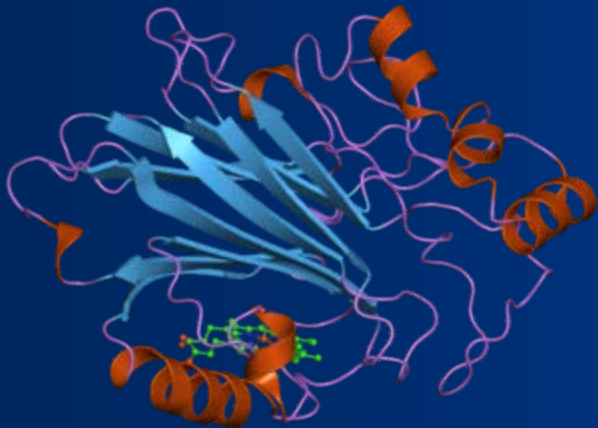
Appearance of Bites

Red welts



Rare reactions

- Bullous (blistering) eruptions, anaphylaxis
Due to hypersensitivity to hemo protein
(nitrophorin) in saliva.



Study on Bullous skin reaction



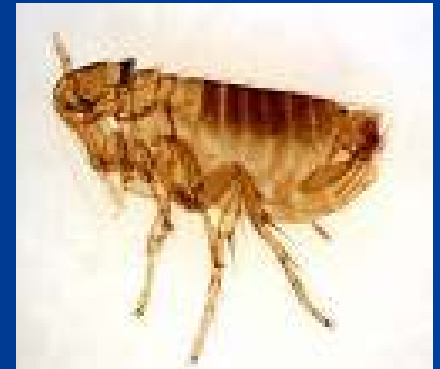
The Importance of Diagnosis

- Scabies



The Importance of Diagnosis

- Flea bites

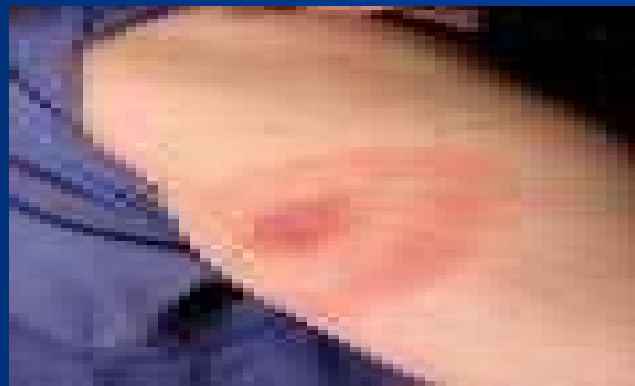


The Importance of Diagnosis

- Folliculitis



- Lyme disease



Communicable Diseases

- Bedbugs are not currently associated with the transmission of human diseases
- Bedbugs are considered a nuisance pest but significant impact to mental health



Communicable Disease

- Have been demonstrated to carry pathogens on or in their body (28+ to date)
- There is no documented case of disease transmission to date.
- 1930: Typhoid laden bed bugs did not transmit disease to primates
- Skin abrasion at bite sites may provide entry point for bacteria etc...resulting in infections

Communicable Disease

- Do not transmit infections
 - Hepatitis B, HIV virus DNA found to survive in bed bugs. Unable to replicate HIV proteins.
 - Hepatitis C virus RNA not detected in bed bugs at any time after feeding on an infectious meal.
 - No evidence of transmission.
- Possible Explanations:
 - Hide for 5 -10 days between feeds to digest food, mate and lay eggs (habit)
 - Not known to regurgitate blood
 - Inject and draw with separate tubes

Health Impact



1. Physical reaction to bites

- Red welts & itchiness are the most common reaction
- Reaction varies depending upon previous exposure and degree of immune response. Hypersensitivity to bed bug saliva (a hemo-protein) can cause systemic reactions (e.g. bullous reactions) is rare.
- Rare - anemia

Health Impact

2. Secondary reactions

Any insect bite that is scratched can become infected.

- Bacterial Infections
- Viral infections
- Fungal infections



Health Impact

3. Emotional

- Anxiety, distressed, sleeplessness, anger, wrapping in saran wrap to sleep, spraying bleach directly on skin
- Unable to relocate during treatment period;
- Choosing the street instead of an infested hotel.
- Cost of treatment
- Worry about social stigma
- Negative publicity

Other related Impacts

4. Miscellaneous issues

- Over treatment, spraying too much pesticide
- Fire
- Inability to replace and pay for discarded possessions and associated costs
- Misinformation about what has to be discarded (frozen salmon, jewelry)
- Law suits
- Eviction, job loss

Understanding Bedbug Habits

- Bedbugs often group together near their food source in what are called harborages
- Adults often return to the same harborage sites where they also mate and lay eggs
- Disperse when adjacent bedbug sends out an alarm pheromone (injury, high CO₂, ant attacks).

Photo: Courtesy of University of Harvard © <http://www.hsph.harvard.edu/bedbugs/>



Understanding Bedbug Habits

- harborage site



Understanding Bedbug Habits

Where found in 13 infested apartments

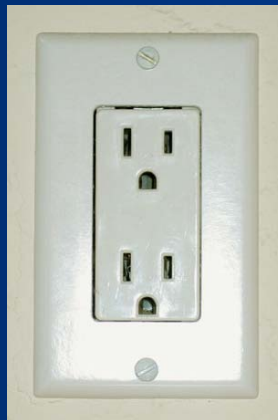
- Boxspring 34.6%
- Couch/chair 22.6%
- Mattress 22.4%
- Bed frame/headboard 13.4%
- Other 3.1%
- Walls/ceilings 2.3%
- Baseboard areas 1.4%
- Nightstand/dresser .2%

Understanding Bedbug Habits

- Bedbugs do not fly or jump but crawl over floors, walls, and ceilings.
- They can hitch rides and move around on clothing, bedding, furniture, and luggage.
- Bedbugs do not chew through anything.
- Bedbugs do not like to be repeatedly disturbed.

Understanding Bedbug Habits

- Examples of hiding places



Signs of Infestation

- Fecal stains (ink-like spots)
- Smash and drag
- Various stages of development
- Cast skins

Photo: Courtesy of University of Harvard © <http://www.hsph.harvard.edu/bedbugs/>



Signs of Infestation

- Inspector photos

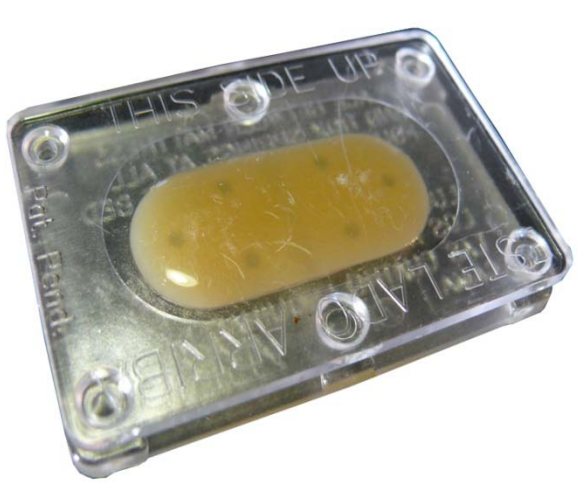


Control: The Basics

- Monitor
- Barriers – sticky, isolate bed
- Bed and furniture design
- Use mattress covers and disposal bags
- Vacuum often
- Improve sanitation, reduce clutter
- Extreme temp: Heat (50 - 60 °C)
- Extreme Cold: -108F

Control: The Basics

- Monitoring stations




BB ALERT® Active




BB ALERT® Passive

To make certain of your continued wellbeing this environmental monitor has been installed as an early warning system. Your comfort and wellbeing is very important to us.



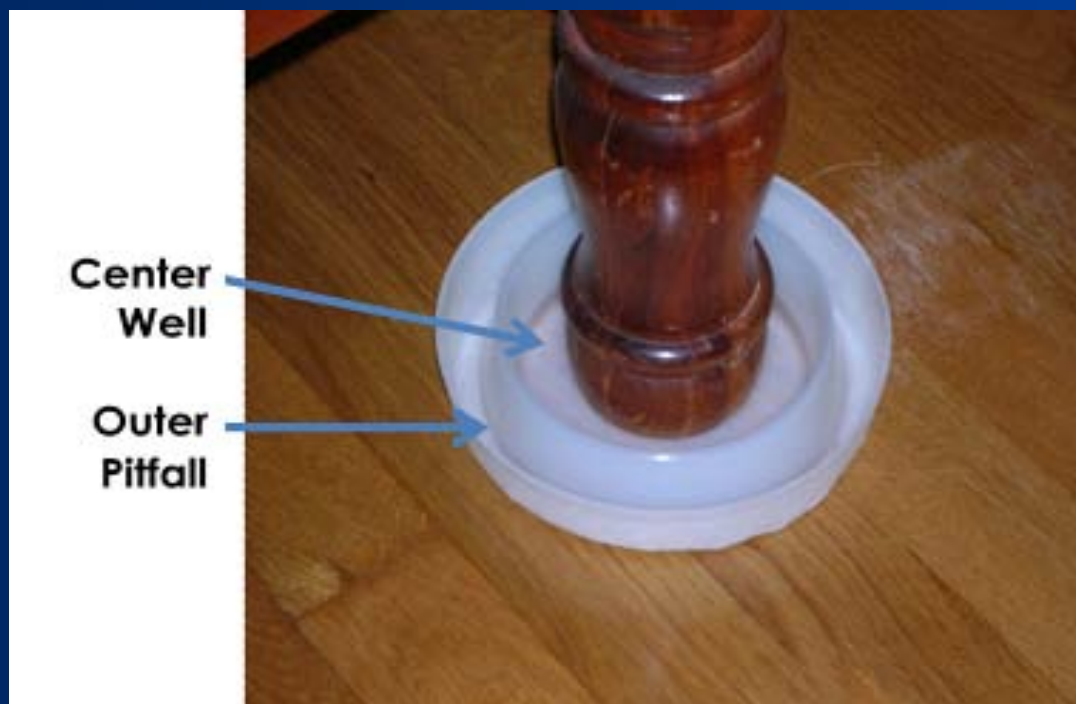
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Control: The Basics

- Monitor for signs of bedbugs

Interceptors



Study

360-unit apartment building

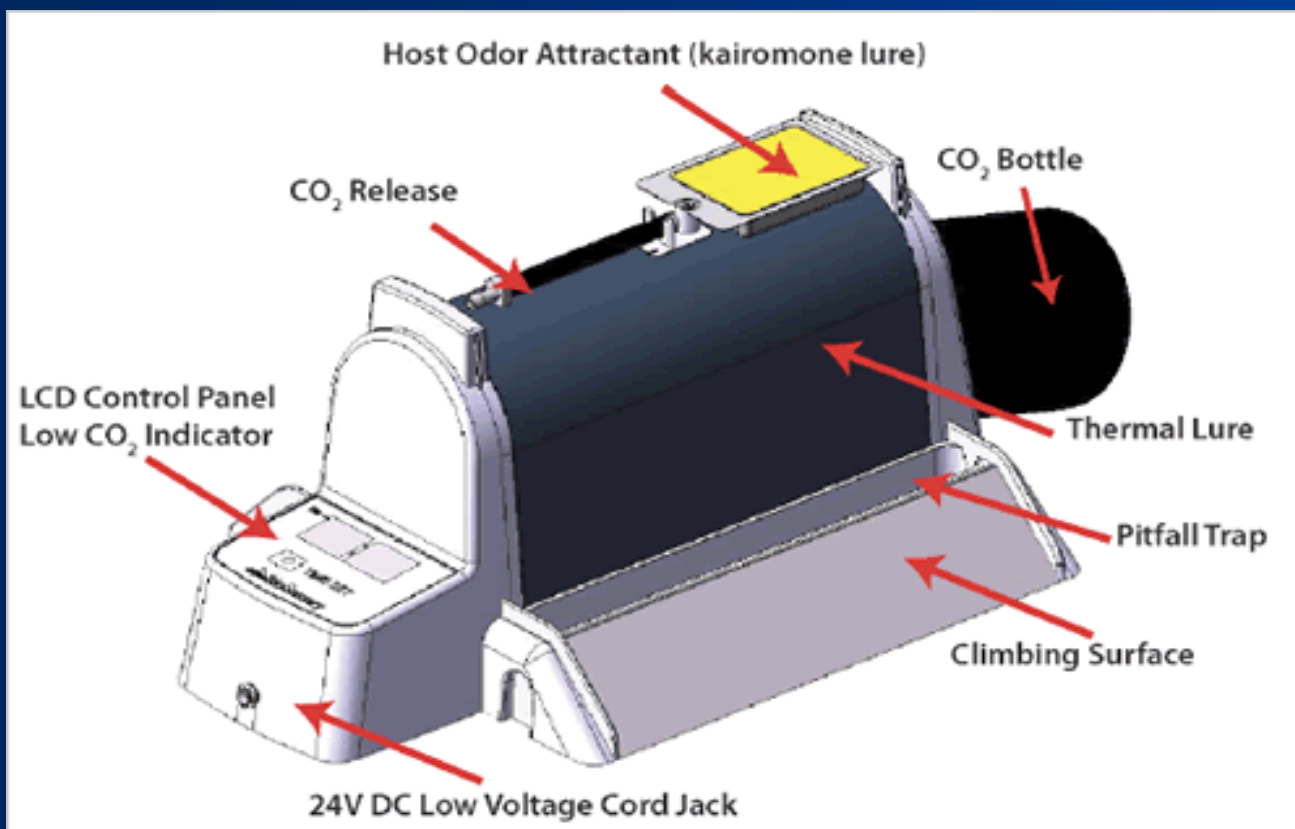
- 19 infestations reported by residents
- 43 additional infestations identified through building wide inspection & installation of interceptors
- 19%(8/43) identified through visual inspection
- 81% (35/43) identified with interceptors

85% (43/62) of the infestations were not reported by residents

Control: The Basics

- Monitor for signs of bedbugs

Nightwatch: a bed bug monitoring device that lures bed bugs by emitting heat, CO₂, kairomones (sweat odor, ear secretions, oil)



Control: The Basics

- Monitor for signs of bedbugs

CDC3000



Control: the basics

Monitor using trained dogs

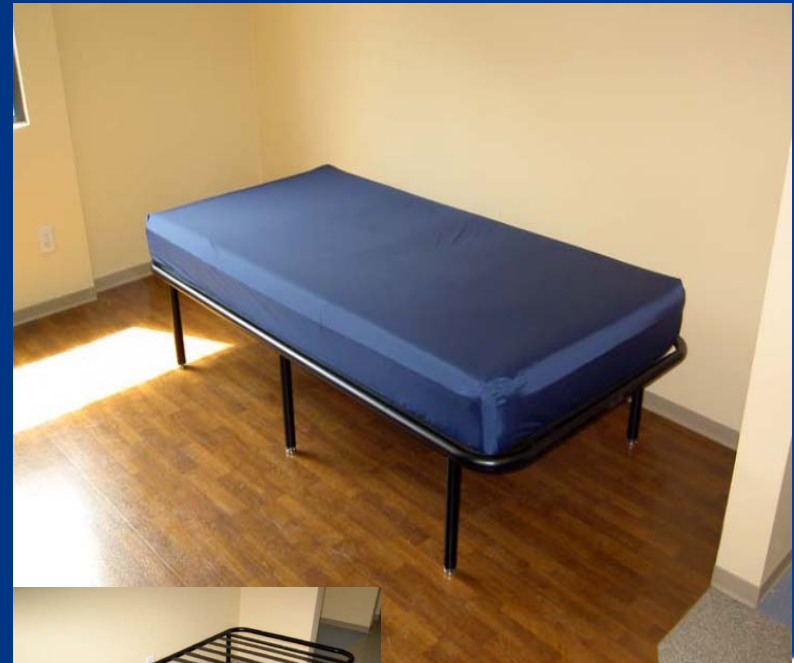
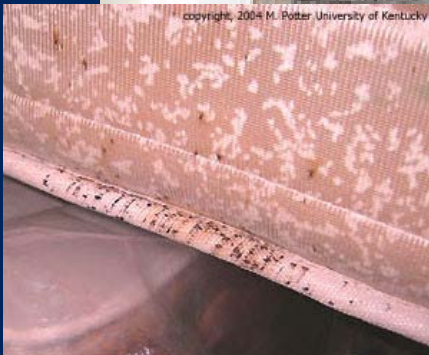


Control: The Basics

- Design facilities with bedbug habits in mind
 - structural – think like a bedbug
 - operational – think cross contamination
- Seal cracks and crevices
- Address a problem immediately
- Look in areas above, below and adjacent to bedbug harborages

Design for Control

- Choose the correct furniture



Design for Control



Extreme Heat Treatment

- Place your suitcase (or other item to be treated) on the rack inside PackTite™. Close the zipper. Plug it in. Turn on the timer. (A green light will appear). When timer light goes off, the treatment is complete.



Thermal death point 48°C for 90 min.

New Products!

- Cryonite – CO₂ extreme cold treatment, works as well as steam. Regular cold treatment does not work to kill eggs.

■



-78°C

Control Difficulties: Clutter

A pest control nightmare...



Challenges of DIY Bed Bug Control

- Use of restricted or ineffective chemicals
- Over-apply pesticides or apply them to wrong places
- Do not know where to find bed bugs
- Do not know how to effectively use non-chemical methods
- Lack of motivation to monitor

Control: Difficulties

Housing issues

- Lack of onsite laundry
- Difficulty getting laundry to laundry matt
- Physical or mental disability resulting in inability to prepare room for pest control
- Lack of furniture in room means clothing is on floor and room is cluttered
- Lack of a vacuum

Control: Difficulties

- Second hand goods brought into suites
- Cost of pest control approaching the amount that landlord receives in rent
- Disposal of goods spreads bedbugs through a building. Infested goods picked up by others.
- Poorly maintained buildings provide plenty of harborage spots
- Tenants may feel that the landlord is entirely responsible for getting rid of bedbugs

Control: Difficulties

Landlord Issues

- Evicting a problem tenant can be a slow process
- Cost
- Tenants may not advise you of a bedbug problem
- Rooms are not properly prepared for treatment
- Pest control company must identify a problem before they can treat

Control: Chemical

One study of 13 suites in Ohio found

- 90% of bedbugs were located on bed components, couches and recliners
- In 10/13 suites bedbugs were no longer found after 2 – 5 treatments
- In 3 suites a low level infestation remained after 6 treatments due in part to poor tenant/management co-operation and perhaps re-introducing bedbugs

Control: Chemical

- Legally pest control companies must give notice prior to treatment of suites
- Bedbug activity following treatment is normal. If problems persist another treatment may be required. It takes 24 – 72 hours for the pesticides to work and there may be activity for up to three weeks.
- In most cases treated suites should remain empty for 4-6 hours following treatment depending on the pesticide product utilized
- Ventilate the unit upon re-entry

Control:Chemical

- Hire an experienced pest control company
- Ensure that the area is properly prepared for treatment
- If there is no preparation one study showed only a 30% chance of solving the problem
- Think 3-D when treating bedbugs

Control: Miscellaneous

- A mountain of chemicals is not an advantage since the bugs will avoid them. They must walk over pesticide for it to work.
- All pest control should include a re-inspection in 10 – 14 days to get eggs hatched.

Control: Integrated Pest Management

- IDENTIFICATION – identify the pests
- MONITORING – monitor the pest population
- ACTION DECISIONS – determine when treatment is required to keep pests from an unacceptable level (economic damage, health hazard, nuisance or aesthetic tolerability)
- TREATMENTS – prevention (barriers, sanitation, environmental modifications) and Controls (physical, mechanical, biological, chemical)
- EVALUATION – evaluate effectiveness

General concept

- Pesticide is not the “silver bullet”, bedbugs can develop resistance
- Behavioral lines of defense may be the most durable strategies

General Concept:



- A. Provide a barrier between your insect-free item and the potentially infested surface
- Only take what is necessary into an infested situation
 - Set items that must be accessible onto a light colored surface (fabric drape/white plastic). This will allow you to see approaching bedbugs
 - Items that do not need to be accessible (e.g. coat) should be stored in a pest proof container

General Concept:

- B. Provide a barrier between your potentially infested items and the insect-free surfaces.
- When transporting or storing potentially infested items, store in a pest proof container or put infested items into a contained situation.



General Concepts:

C. When it is not practical to eliminate the risk of bed bug infestation, then items/clothing must be cleared of any potentially hitchhiking bed bugs.

- To minimize the chance of infestation, make bedbugs more visible on your items/clothing and easier to detect and remove by..
 - Decrease hiding spots in purchase choices
 - Use of light color
 - Wearing clothes/shoes that have few nooks and crannies

General Concepts:



- Inspect clothing and equipment for bed bugs and eggs. Brush shoes and soles off with a stiff bristle brush (outside). Store brush in pest proof container. Routinely cleanse brush. Use lint roller on clothing.
- Wear “wash ‘n wear” clothing to work and have separate work and home clothes.
 - Remove clothing immediately upon arriving home and put clothes directly into drier for 1 cycle or store in pest proof container.
 - Change out of clothes at work. Store in pest proof container.
 - Try to reserve care for clients in bedbug infested rooms and buildings to the end of the day.



General Concepts:



- D. Utilize appropriate room design in areas with which the public has access. The higher the risk, the more care is needed in furniture selection.
- Furniture and flooring should have a minimum of cracks and crevices
 - Furniture should be light enough in color to see and adult bed bug and fecal staining.
 - Ideally avoid upholstered furniture and carpets in facilities where the public has access. If used, inspect regularly.

Preventive Measures for Staff

To reduce the risk of transporting bedbugs to your personal vehicle or home

- Minimize the amount of personal and work related items taken to work. Storage!
- Inspect clothing and equipment if you have been in contact with an infested person
- Try to wear light colored clothing for easy detection.
- Try to avoid wearing pants with cuffs & clothing with folds, shoes too

Some Practical Ideas



Bedbug Treatment at Worksites

- Contact a reputable pest control company
- Have the company provide you with basic information regarding the treatment procedure so that questions from staff can be answered.
- Treatment according to label instructions is deemed to be safe for staff.

Control: Summary

- In a facility
 - Prevent entry at admissions and visits
 - Awareness, monitor and early detection
 - Control Strategies; bed and furniture design
 - Isolate and treat area immediately
- In a common area
 - Furniture design, good sanitation
- In a staff work area
 - Storage of personal belonging
 - Reduce clutter

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Questions

