

Bed Bug Basics – Identification, Prevention, Control

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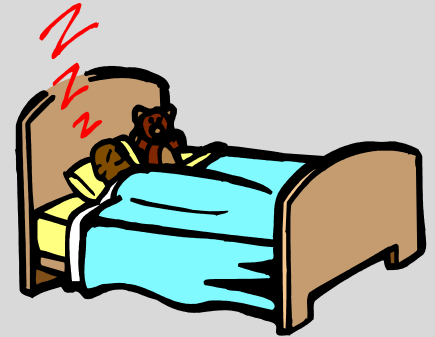
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The Bed Bug

(*Cimex lectularius*)

- 🪳 Insects (true bugs)
- 🪳 Typically feed at night
- 🪳 Feed only on blood
 - Prefer to feed on humans
 - Alternate hosts:
rodents, bats, birds, pets
(cats, dogs, etc.)
- 🪳 Cause significant economic, physical, & mental distress

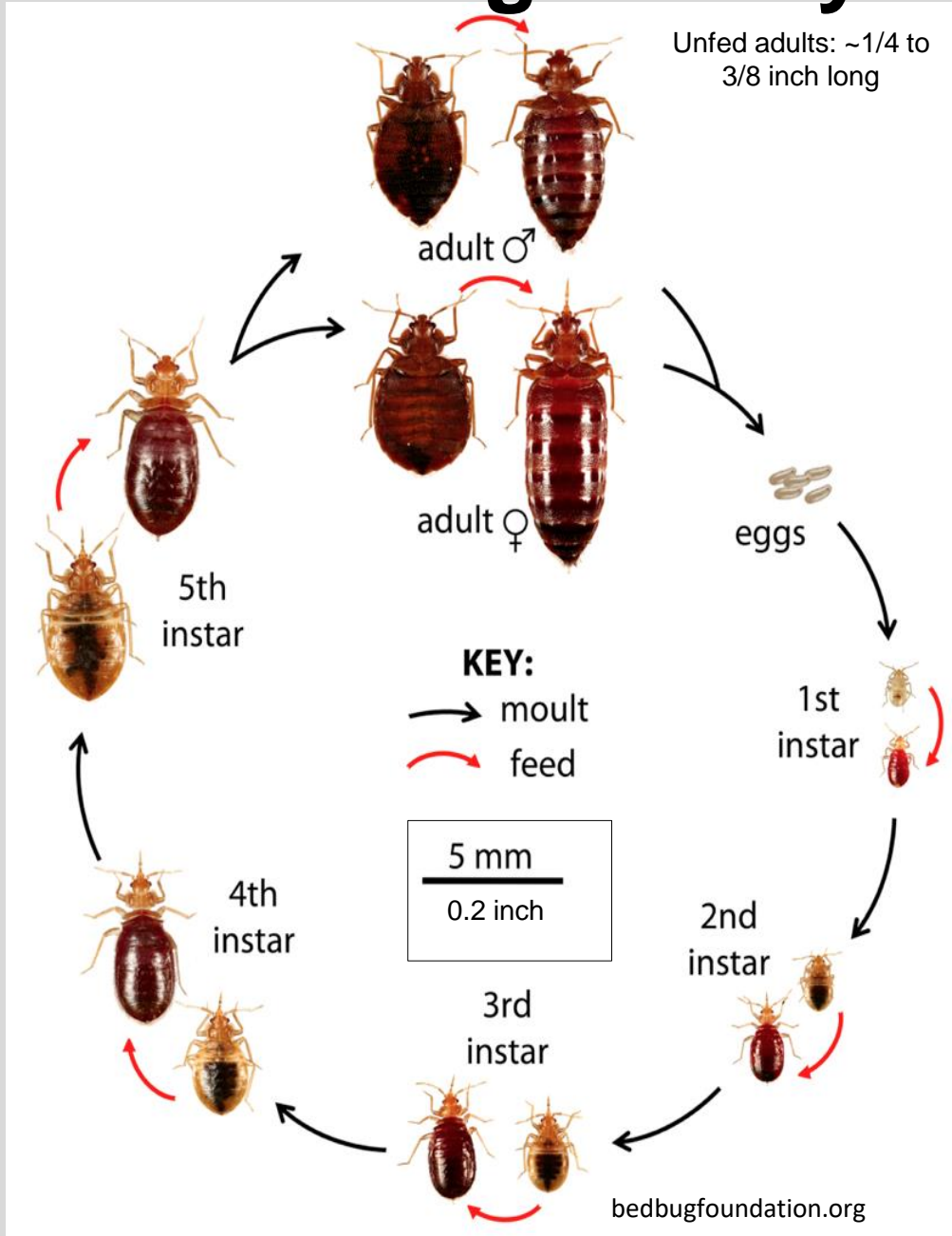


Not caused by bad housekeeping!!
BED BUGS CAN HAPPEN TO ANYONE!

The Bed Bug Life Cycle

**Total developmental
time (egg to adult):**

**21 days @ 86°F
120 days @ 65°F**



Life History Characteristics Show That Bed Bug Numbers Can Quickly Skyrocket ... (Early Detection and Treatment are Very Important)

❖ Eggs



- Glued in place
- 1 – 12 eggs / day / female
- A single female can produce ~150 eggs
- Hatch in 6 – 17 days

❖ Nymphs (immature bugs)



- Five nymphal stages
- Require a blood meal in order to grow

❖ Adults (males & females)



- Require repeated blood meals
- Can live 12 – 18 months
- Can survive months of starvation

Some Basics of Bed Bug Management

- **Early detection and treatment are very important.**
- **Bed bug control typically is much faster and less expensive when the infestation is detected early.**

BED BUG HABITS



Cannot fly



Can walk very fast



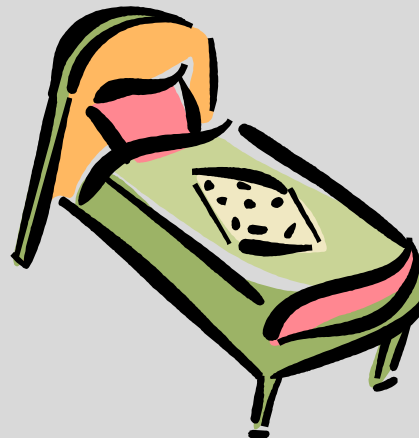
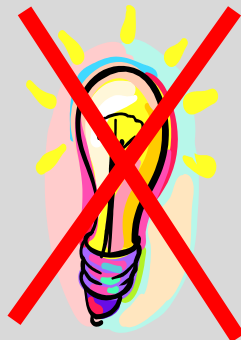
Typically hide during the day in dark, protected sites (esp. cracks & crevices)



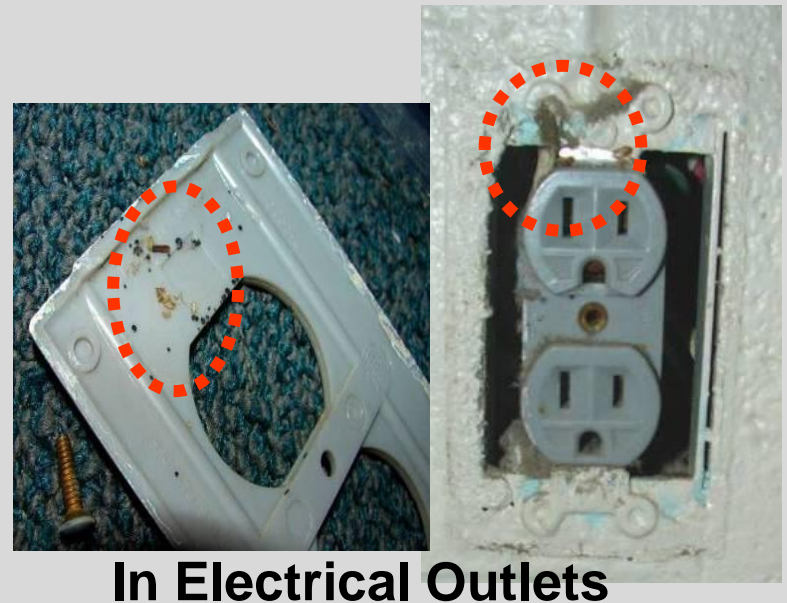
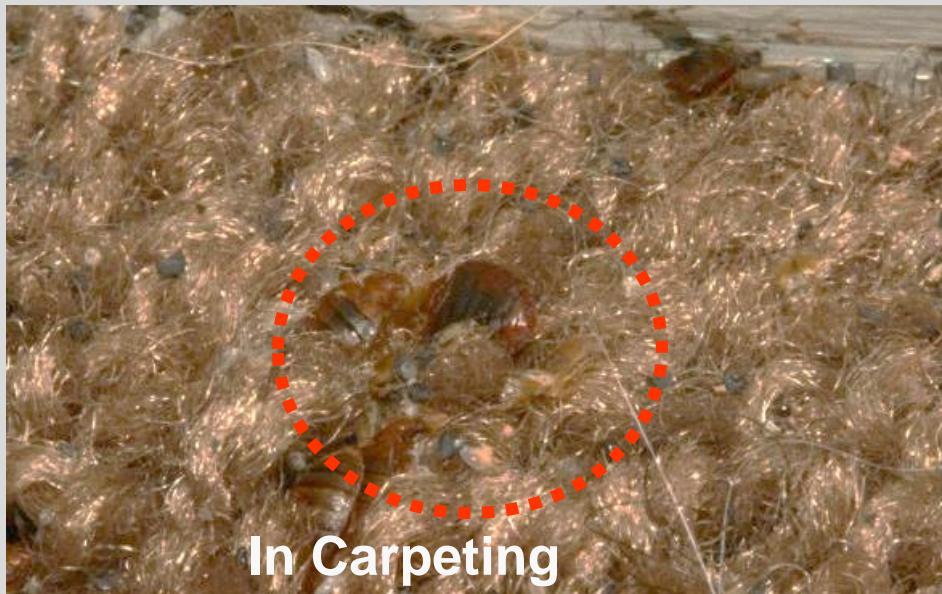
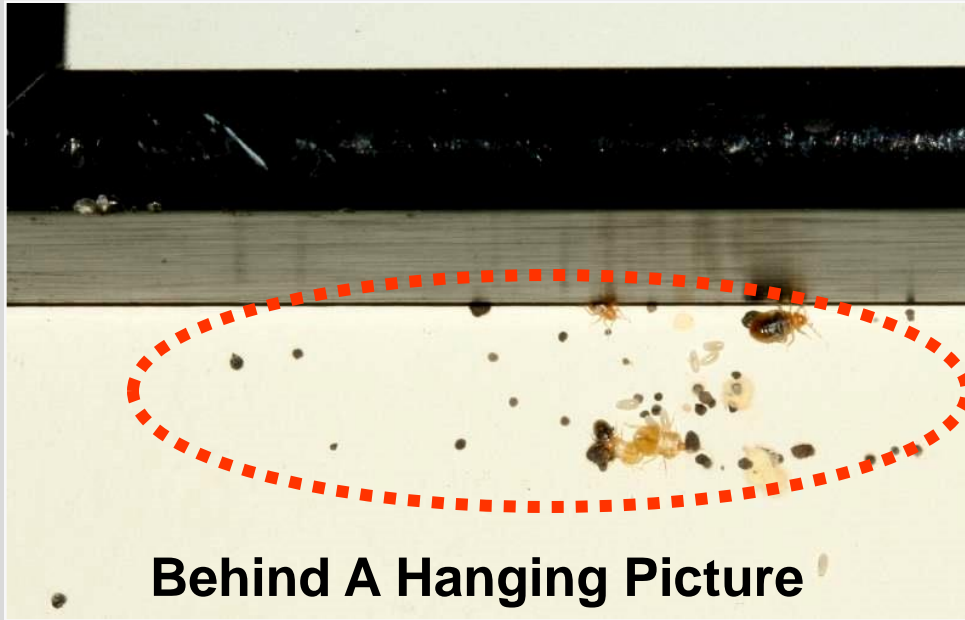
Prefer fabric, wood, and paper surfaces



Can cling tightly to surfaces

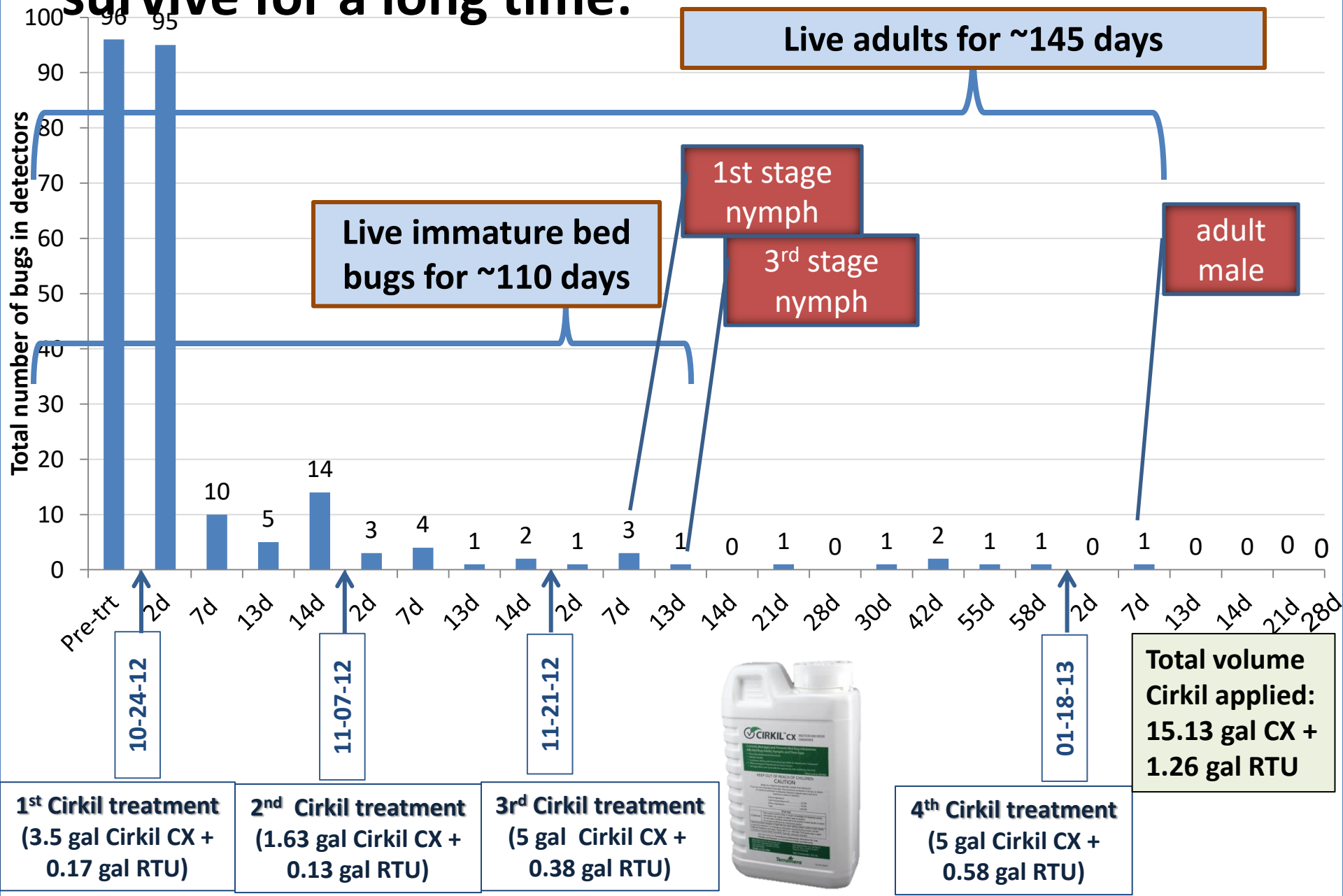


Some bed bug hiding places

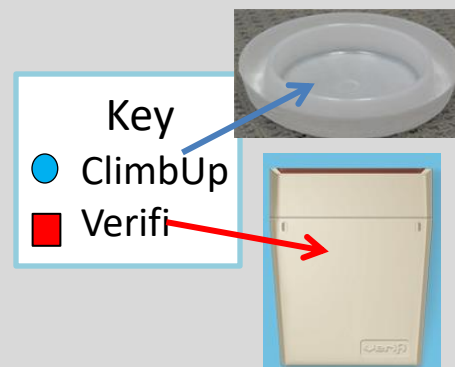


starved bed bugs can survive for a long time:

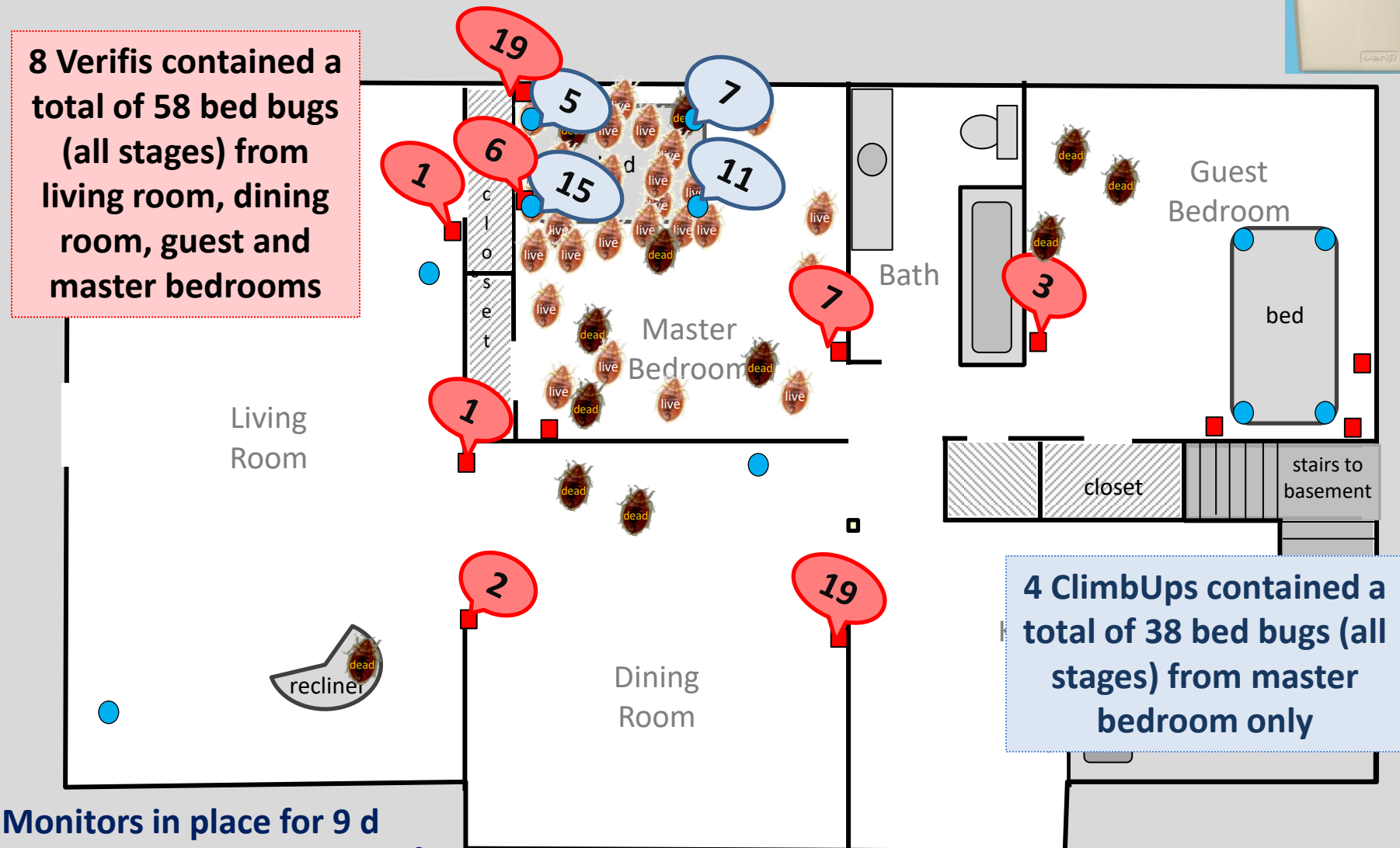
Home vacated: late August 2012
Home temperature: 65-70°F (18-21°C)



Bed bug movement in vacant home— Assessment with Monitoring Devices



8 Verifis contained a total of 58 bed bugs (all stages) from living room, dining room, guest and master bedrooms



Monitors in place for 9 d
Home temperature: 65-70°F (18-21°C)

RESEARCH ARTICLE

Mark-Release-Recapture Reveals Extensive Movement of Bed Bugs (*Cimex lectularius* L.) within and between Apartments

Richard Cooper*, Changlu Wang, Narinderpal Singh

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OPEN ACCESS

Citation: Cooper R, Wang C, Singh N (2015) Mark-Release-Recapture Reveals Extensive Movement of Bed Bugs (*Cimex lectularius* L.) within and between Apartments. PLoS ONE 10(9): e0136462. doi:10.1371/journal.pone.0136462

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Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Abstract

Understanding movement and dispersal of the common bed bug (*Cimex lectularius* L.) under field conditions is important in the control of infestations and for managing the spread of bed bugs to new locations. We investigated bed bug movement within and between apartments using mark-release-recapture (m-r-r) technique combined with apartment-wide monitoring using pitfall-style interceptors. Bed bugs were collected, marked, and released in six apartments. The distribution of marked and unmarked bed bugs in these apartments and their 24 neighboring units were monitored over 32 days. Extensive movement of marked bed bugs within and between apartments occurred regardless of the number of bed bugs released or presence/absence of a host. Comparison of marked and unmarked bed bug distributions confirms that the extensive bed bug activity observed was not an artifact of the m-r-r technique used. Marked bed bugs were recovered in apartments neighboring five of six m-r-r apartments. Their dispersal rates at 14 or 15 d were 0.0–5.0%. The estimated number of bed bugs per apartment in the six m-r-r apartments was 2,433–14,291 at 4–7 d after release. Longevity of bed bugs in the absence of a host was recorded in a vacant apartment. Marked large nymphs (3rd–5th instar), adult females, and adult males continued to be recovered up to 57, 113, and 134 d after host absence, respectively. Among the naturally existing unmarked bed bugs, unfed small nymphs (1st–2nd instar) were recovered up to 134 d; large nymphs and adults were still found at 155 d when the study ended. Our findings provide important insight into the behavioral ecology of bed bugs in infested apartments and have significant implications in regards to eradication programs and managing the spread of bed bugs within multi-occupancy dwellings.

Sampling, Distribution, Dispersal

Protein Self-Marking by Ectoparasites: A Case Study Using Bed Bugs (Hemiptera: Cimicidae)

Frances S. Sivakoff,^{1,2} Susan C. Jones,¹ Scott A. Machtley,³ and James R. Hagler³

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Abstract

The ability to mark individuals is a critical feature of many entomological investigations, including dispersal studies. Insect dispersal is generally investigated using mark–release–recapture techniques, whereby marked individuals are released at a known location and then captured at a measured distance. Ectoparasite dispersal has historically been challenging to study, in part because of the ethical concerns associated with releasing marked individuals. Here, we introduce the protein self-marking technique, whereby ectoparasites mark themselves in the field by feeding on the blood of an introduced host. We demonstrate the potential of this technique using laboratory-reared bed bugs (*Cimex lectularius* L.) that marked themselves by feeding on either rabbit or chicken blood. We then used enzyme-linked immunosorbent assays to detect host-specific blood serum proteins in bed bugs. We assessed these protein markers' ability to 1) distinctively identify marked individuals, 2) persist following multiple feedings on an alternate diet, 3) persist over time across a range of temperatures, and 4) transfer from marked to unmarked individuals. Protein markers were detectable in bed bugs before and after molting, remained detectable after multiple feedings on an alternate diet, persisted regardless of whether an individual was starved or fed on an alternate diet following original mark acquisition, and did not transfer between individuals. The duration of detectability depended on temperature. Our results suggest that protein self-marking is an effective technique for marking bed bugs and holds promise for use in dispersal studies of ectoparasitic insects.

Key words: *Cimex lectularius*, dispersal, immunomarking, mark–release–recapture

Bed bugs are very good **hitchhikers!**

Bed bugs can be moved from one place to another by hiding in:



- luggage
- furniture
- bedding
- backpacks, purses, briefcases
- clothing
- ...

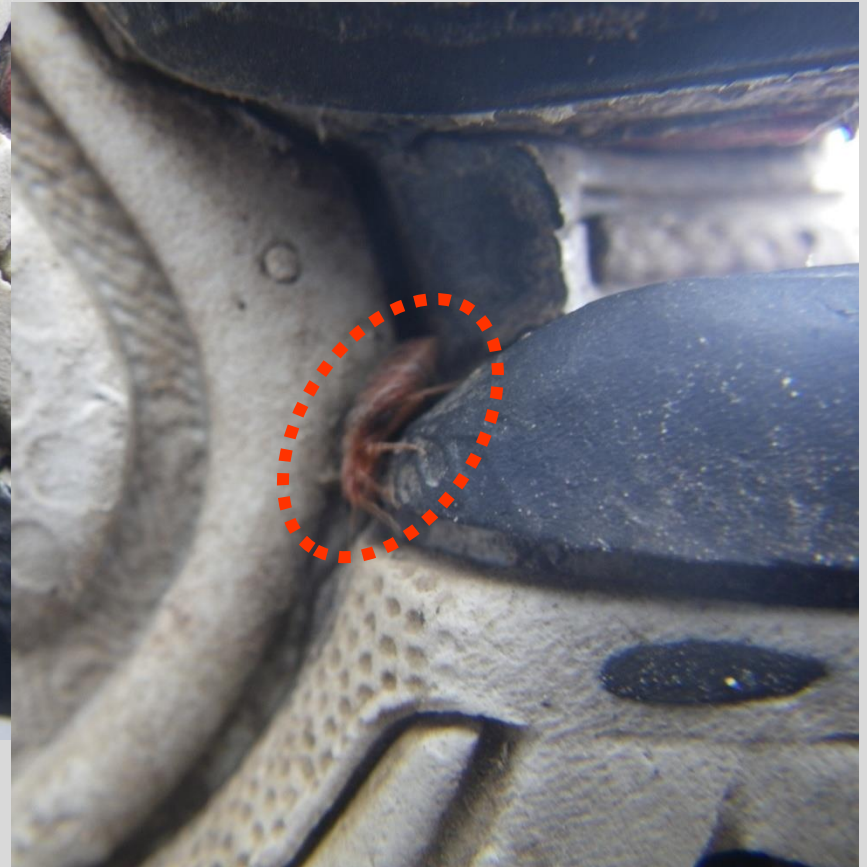
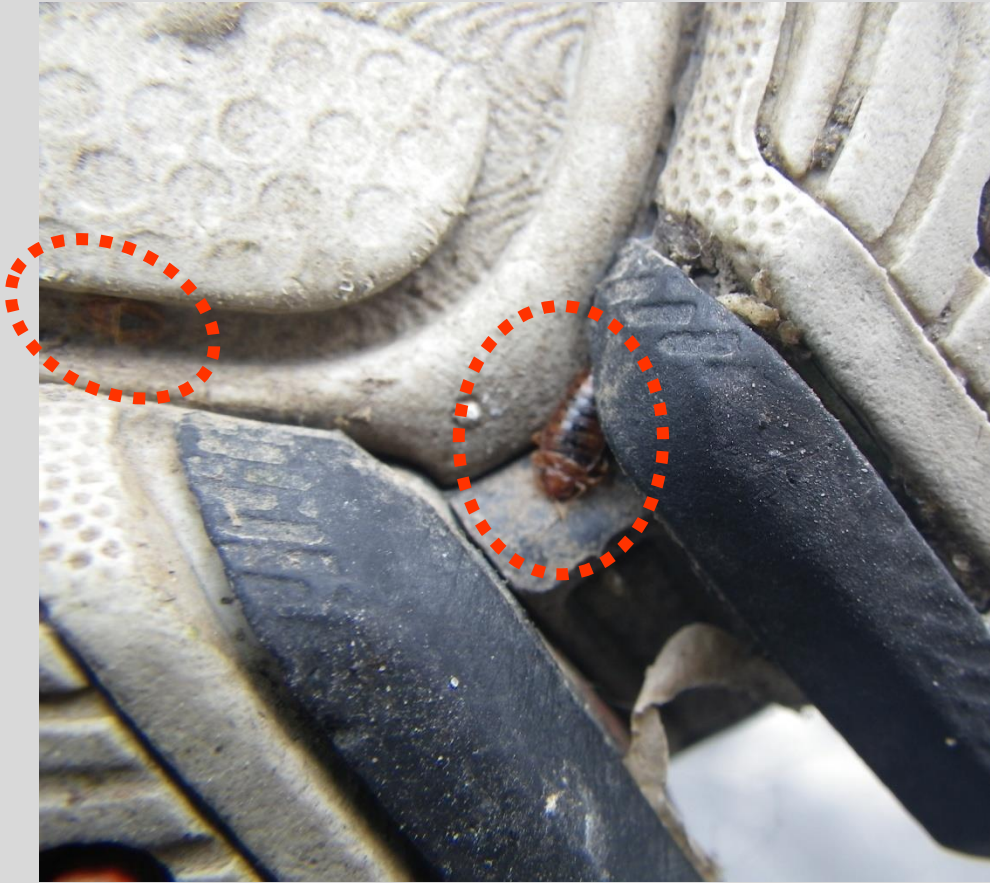


--Bed Bug Hitchhikers— in walker & wheelchair



Photos courtesy of General Pest Control Co.

--Bed Bug Hitchhikers— in shoe tread



Bed Bugs In Public Facilities

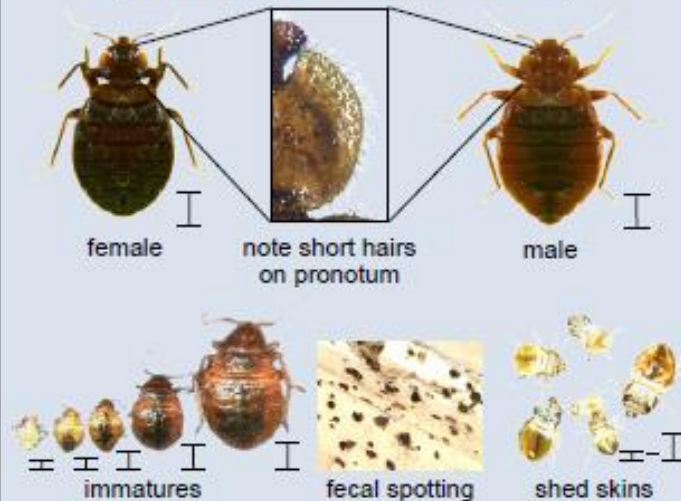


- Brought in by visitors, staff, etc.
- Brought in on clothing, coats, shoes, purses, briefcases, wheelchairs, walkers, etc.
- Bugs then crawl into the facilities' chairs, carpeting, equipment, etc.
- A single bed bug does not warrant panic or business closure!
 - Early identification is very important
 - Capture a bug for positive identification

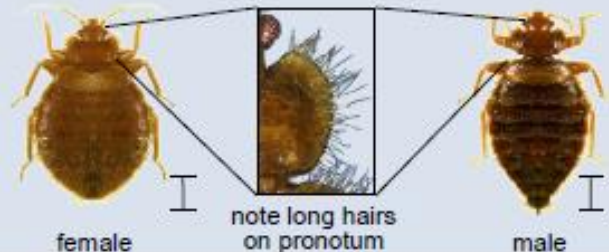
OHIO STATE UNIVERSITY EXTENSION

Household Insect Identification Card

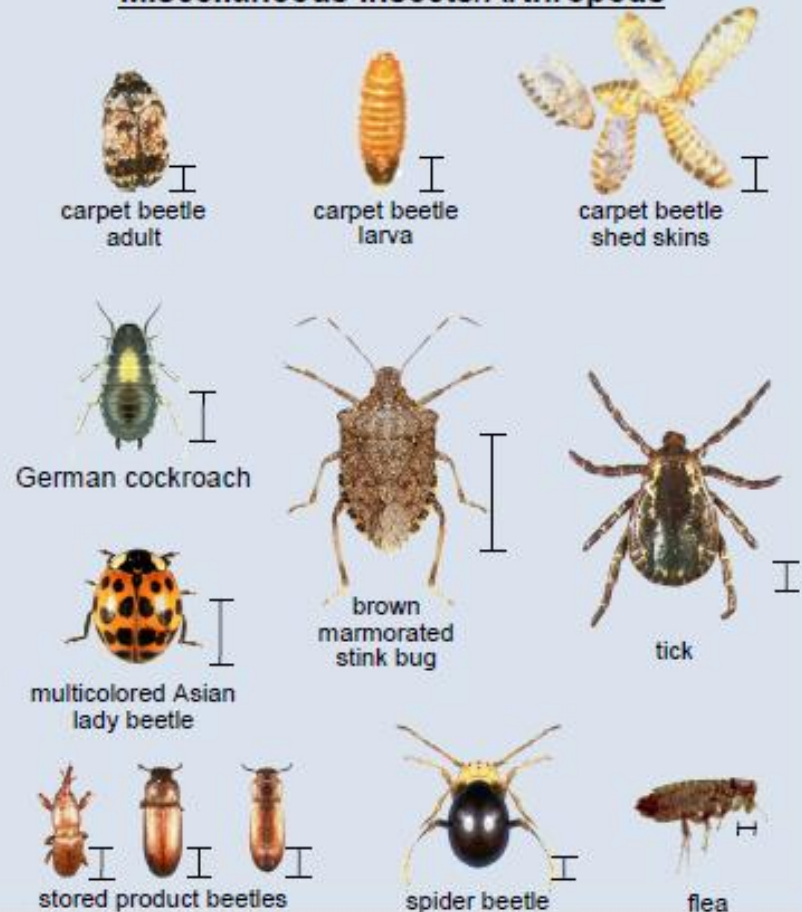
Bed Bug (*Cimex lectularius*)



Bat Bug (*Cimex adjunctus*)



Miscellaneous Insects/Arthropods



Scale bar to lower right of each insect indicates actual size.

CFAES-1001-16

S.C. Jones, D.J. DeGirolamo, J.L. Bryant

Supported in part by National Institute of Food and Agriculture, Hatch project 211891, and state and federal funds appropriated to the Ohio Agricultural Research and Development Center, The Ohio State University.

- A pictorial guide for recognizing bed bugs and other household pests
- Information on integrated pest management (IPM) strategies

Tips for Bed Bug Prevention and Control



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Correctly Identify the Insect:

- See *photos on reverse*
- Contact Ohio State University's Pest Diagnostic Clinic (ppdc.osu.edu)

Bed Bug Habits:

- Prefer to feed at night on human blood
- Hide during the day
- Hide in cracks, crevices and dark places
- Cannot fly, but walk very fast
- Can survive several months without feeding if a host is absent

Inspecting for Bed Bugs:

- Use a bright flashlight
- Look for the bugs and their dark spotting and shed skins (*see photos on reverse*)
- Carefully inspect bedrooms and main living areas where people rest or sleep, focusing on:
 - * Mattress seams, box springs, and bed frame
 - * Behind hanging pictures, baseboards, moldings, and loosened wallpaper
 - * Inside electronics (e.g., smoke detectors, thermostats, electrical outlets, etc.)
 - * Top, sides, underside, and interior of furniture
 - * Carpet tack strip (underneath carpet edges)

Travelers' Tips:

- **When preparing to leave:**
 - * Travel very light
 - * Put all items into tightly sealed plastic bags inside suitcase
 - * Be sure to take extra plastic bags so you can isolate clean, dirty, and newly purchased clothing
- **During your trip:**
 - * Carefully inspect your room for signs of bed bugs
 - * Change rooms if you find any signs of bed bugs
 - * Never store luggage on the floor or bed
 - * Keep your clothes in your suitcases, not in provided chest-of-drawers
- **When arriving home:**
 - * Do NOT take luggage inside bedrooms or living rooms
 - * If possible, launder all clothing in your luggage
 - * Store empty luggage inside sealed plastic bags

Control:

- Act immediately
- Eliminate clutter
- Caulk or seal cracks and crevices
- Launder bedding, clothes, etc.
 - * Wash in hot water (120°F [49°C] minimum)
 - * Drier set on medium to hot setting (30 minutes minimum)
 - * Confine clean items inside sealed plastic bags
- Do not use "bug bombs"
- Do-it-yourself bed bug control is very difficult
- Consider hiring an exterminator
 - * Make sure the exterminator is licensed
 - * Get at least 3 estimates before choosing an exterminator
 - * Bed bug control takes considerable time and effort

Provided by The Ohio State University Extension Integrated Pest Management Program

CFAES-1001-16

S.C. Jones, D.J. DeGirolamo, J.L. Bryant

--A pictorial guide for recognizing bed bugs and other household pests
--Information on integrated pest management (IPM) strategies

OSU Bed Bug Website

<http://u.osu.edu/bedbugs>



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BED BUGS



HOME

GALLERIES ▾

RESEARCH ▾

FAQ

RESOURCES ▾

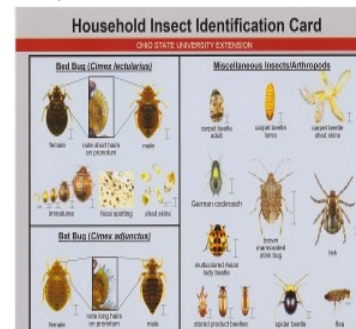
CONTACT

Home

This website is an outreach effort that seeks to increase public awareness of bed bugs and effective strategies for managing them. Funding for the website was provided by a grant from The Ohio State University Extension Integrated Pest Management Program.

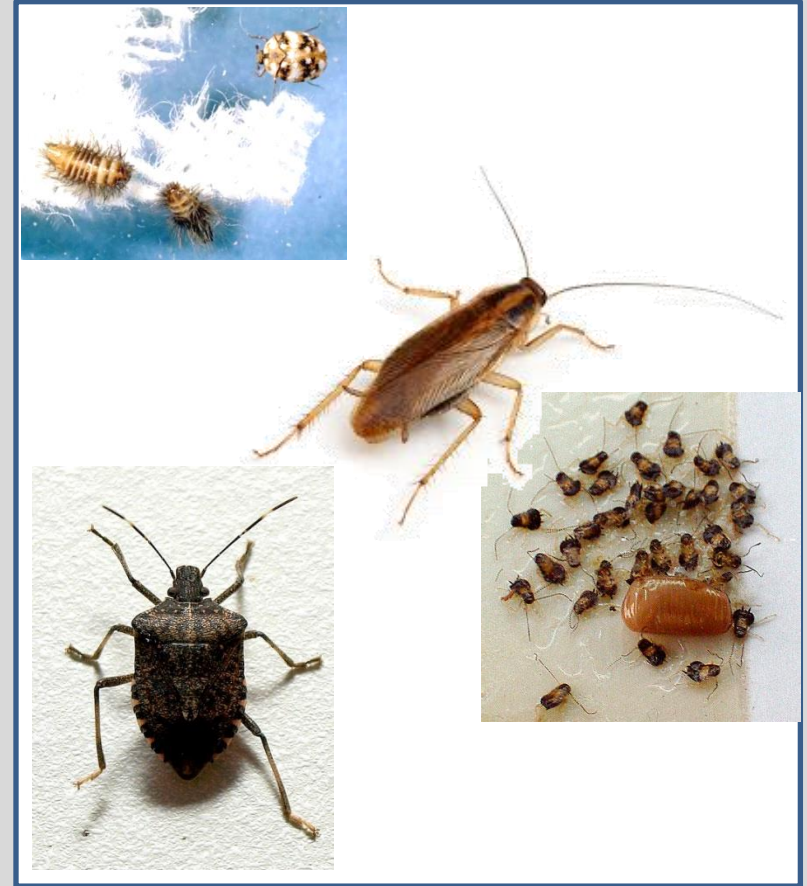
Humans continue to be significantly impacted by bed bugs, which began to re-emerge in the late 1990s as important household pests in developed countries around the world. Bed bugs are small blood-sucking insects that negatively impact public health and well-being of all socioeconomic classes. Bed bugs are easily transported, and they have become a major problem over a relatively short period of time in diverse residential and commercial settings. If left untreated or improperly treated, bed bug populations rapidly increase and infestations can quickly spread to impact others.

Compared to other insects, bed bugs are more difficult and expensive to control. Bed bugs necessitate multiple integrated pest management (IPM) strategies that often require professional pest management services. However, in part due to the high cost of professional bed bug control, the public has increasingly turned to over-the-counter (OTC) chemical products as a low cost alternative for bed bugs. Public expectations of these products can range from total eradication to simple decontamination, yet the vast majority of OTC chemical products are contact toxicants that have negligible impacts on bed bug infestations.



OSU Survey: Common Bed Bug “Imposters”


- Carpet beetles
- Cockroaches (esp. nymphs)
- Stink bugs
- Others, less common
 - Bat bugs
 - Other insects
 - Non-insects



About 15% of customers ask for bed bug treatment when they have a different pest

OSU Bed Bug Website



<http://u.osu.edu/bedbugs>

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BED BUGS

HOME **GALLERIES** RESEARCH ▼ FAQ RESOURCES ▼ CONTACT

Bed Bugs



bed bug (L) bat bug (R) head and prothorax comparison

black carpet beetle
Attagenus unicolor



Know your Pest: Carpet Beetles

**Larval hairs can cause
dermatitis in humans**

- easily mistaken for bed bugs
- multiple symptoms including itching (pruritus) and rash-- groups of spots; or red, inflamed skin with or without blisters
- complaints of being bitten by something causing an intense itching and rash
- in some people, irritation of respiratory tract and eyes

furniture carpet beetle
Anthrenus flavipes



varied carpet beetle

Anthrenus verbasci

Carpet Beetles

- Larvae feed on animal materials
 - woolens, carpets, furs, hides, feathers, horns, bones, hair, silk, fish meal, insect pupae, dead insects
 - cause surface damage, misc. holes, uneven areas
- Larvae also feed on plant materials
 - rye meal, corn, red pepper, rice, flour, wheat
- Adults feed primarily on pollen & nectar (esp. *Spiraea* spp. & crape myrtle); pollen is required for egg production



Bridal wreath spirea



Japanese spirea



Crape myrtle

Recognize the telltale signs of bed bugs!

- Black fecal spots
- Shed skins & eggshells
- Live bed bugs (nymphs & adults)
- Blood stains from crushed bugs
- Welts on exposed skin
- Distinctive “buggy” odor (in severe infestations)



Bed Bug Prevention

- Recognize the telltale signs of bed bugs
- Take measures to reduce the risk of getting bed bugs
- Prevent bugs from spreading to new sites



INTEGRATED PEST MANAGEMENT (IPM) :

Correctly identify the pest

+

Conduct a thorough inspection

+

Use sanitation measures

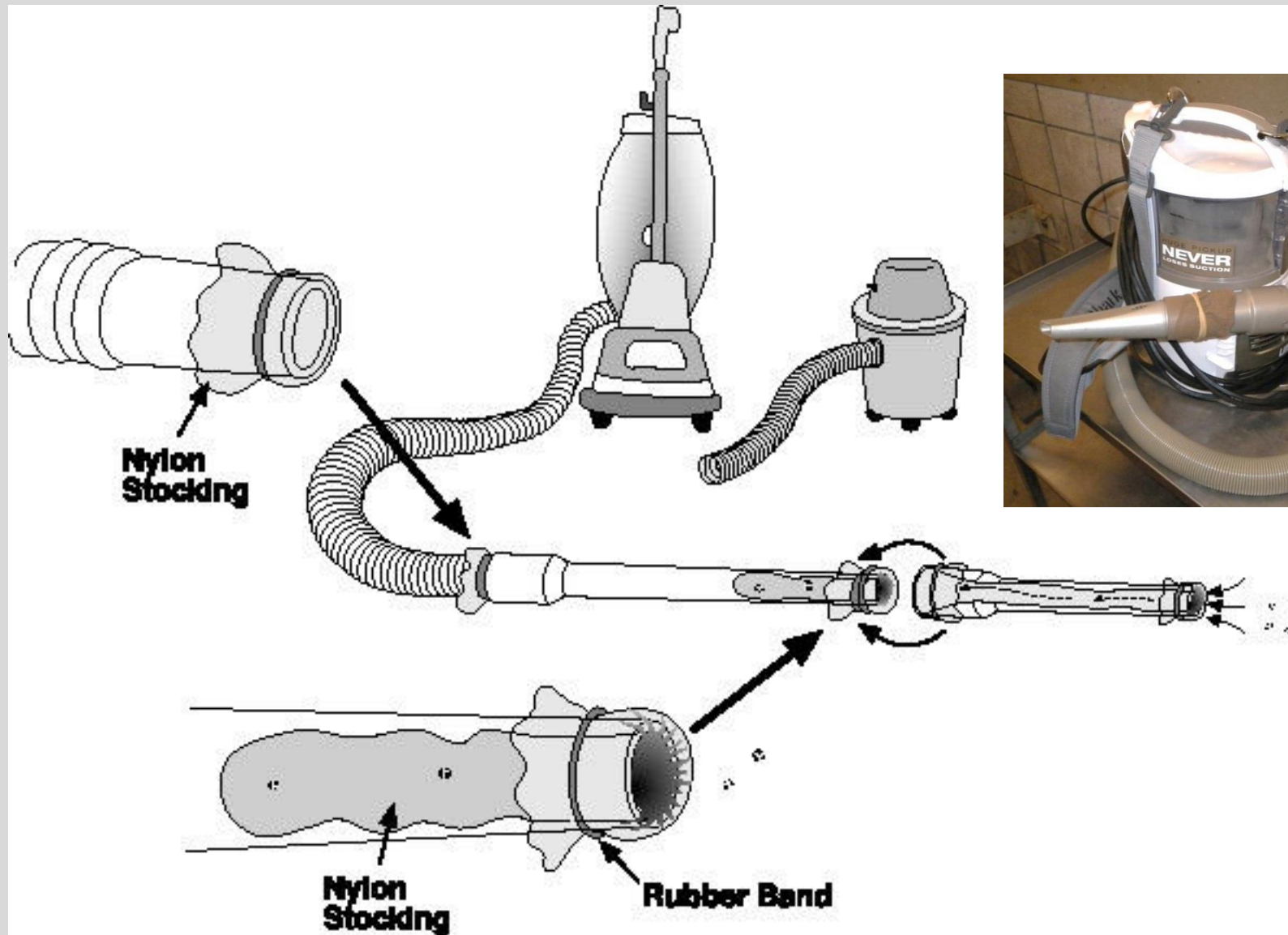
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Use non-chemical measures

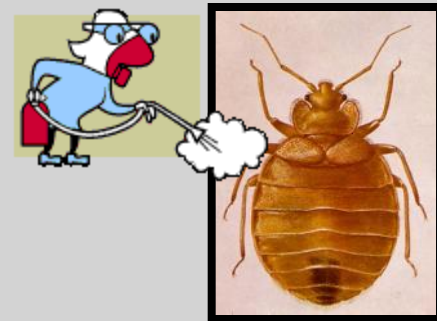
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Apply insecticides to targeted sites

Vacuuming to contain bed bugs



Treatment Options



- Insecticide treatment (dusts, liquids, aerosols)
 - Residual insecticide products are essential

- Fumigation (sulfuryl fluoride)
 - Important to include residual insecticide product(s)

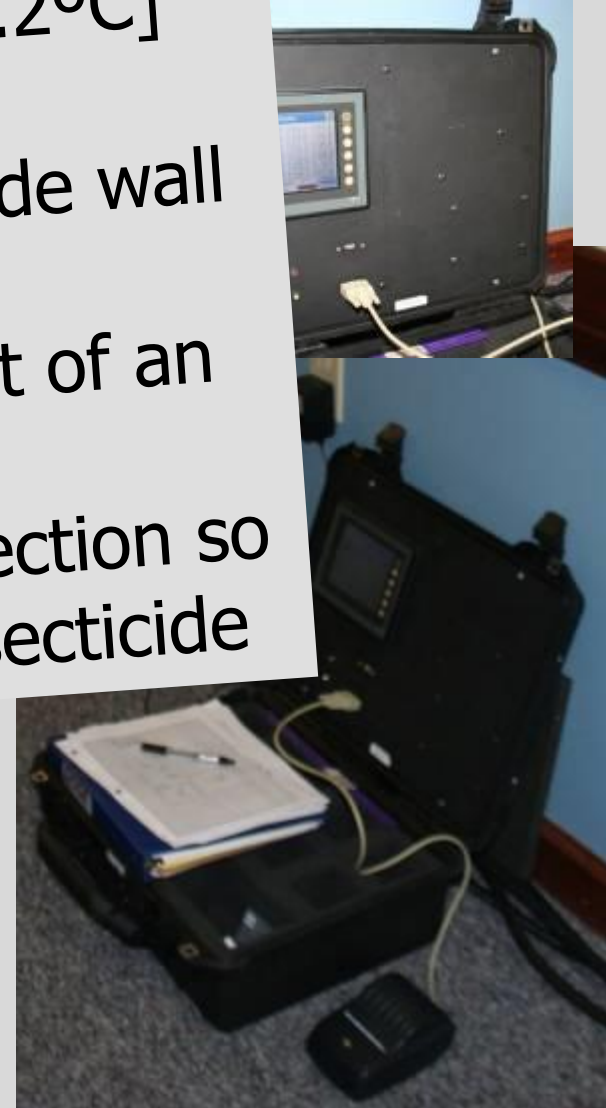
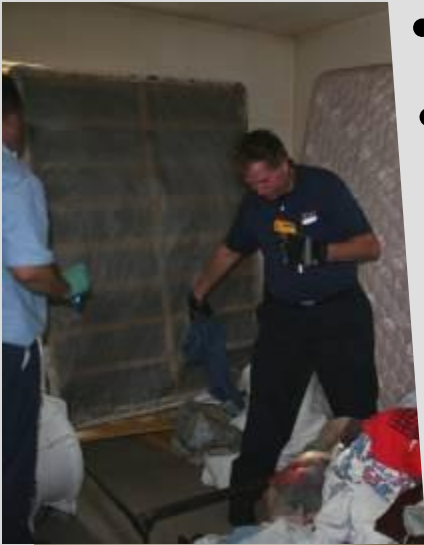


- Heat treatment (whole structure, container)
 - Important to include residual insecticide product(s)



Whole Room Heat Treatment

- Typically a 6-8 hour process
- Temperature: 135°F [57.2°C]
- It's essential to have temperature probes inside wall voids, furniture, etc.
- Double or more the cost of an insecticide treatment
- Offers no residual protection so useful to include an insecticide



Some measures to help reduce the number of bed bugs:

Steaming

- Commercial steam unit preferable
- Dry steam preferable (less moisture)
- Surface temperature should be ~176°F (80°C)
- Steam immediately kills bed bugs & eggs
- Requires working slowly and thoroughly
- Steam can penetrate many fabrics & padding
 - Some materials too thick for heat transfer
- Prolonged drying time (use fan, dehumidifier, natural ventilation)
- No residual protection



Cold Treatment

*Not a standalone measure
against bed bugs.*



CRYONITE



Mortality, fecundity and development among bed bugs (*Cimex lectularius*) exposed to prolonged, intermediate cold stress

Bjørn A Rukke, Morten Hage and Anders Aak* *Department of Pest Control, Norwegian Institute of Public Health, Nydalen, Oslo, Norway

Abstract

- All bed bugs died after 3 weeks of exposure at temperatures below 19 °F (−7°C).
- Prolonged exposure to low temperatures caused detrimental effects (fewer eggs, less egg hatch, and reduced molting) in bed bugs both during and after cold treatment.
- Three weeks of cold treatment time at temperatures below 19 °F (−7°C) can kill bed bugs in small items.

Keywords: bed bug; cold treatment; mortality; fecundity; development; IPM

Some Basics of Bed Bug Management Using Insecticides



- Residual insecticides are essential!!!
- There is no single “magic bullet”
- Bed bug control is time-intensive and labor-intensive
- Spot treat all harborage sites

Some newer insecticides for use against bed bugs:

Active Ingredient (insecticide class)	Product Name(s)
Imidacloprid + β-cyfluthrin (neonicotinoid + pyrethroid)	Temprid® SC
Acetamiprid + bifenthrin (neonicotinoid + pyrethroid)	Transport® Mikron Transport® GHP
Thiamethoxam + λ-cyhalothrin (neonicotinoid + pyrethroid)	Tandem®
Dinotefuran + diatomaceous earth (neonicotinoid + silica dioxide)	Prescription Treatment Alpine® Dust Alpine® PI
Chlorfenapyr (halogenated pyrrole)	Phantom® SC Phantom® PI
Amorphous silica gel	CimeXa™
Clothianidin + metofluthrin + PBO (neonicotinoid + pyrethroid + synergist)	CrossFire®

NOTE

Laboratory Assays of Various Insecticides Against Bed Bugs (Hemiptera: Cimicidae) and Their Eggs¹

Jerome Goddard²

Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology, Box 9775, Mississippi State, Mississippi 39762 USA

J. Entomol. Sci. 48(1): 65-69 (January 2013)

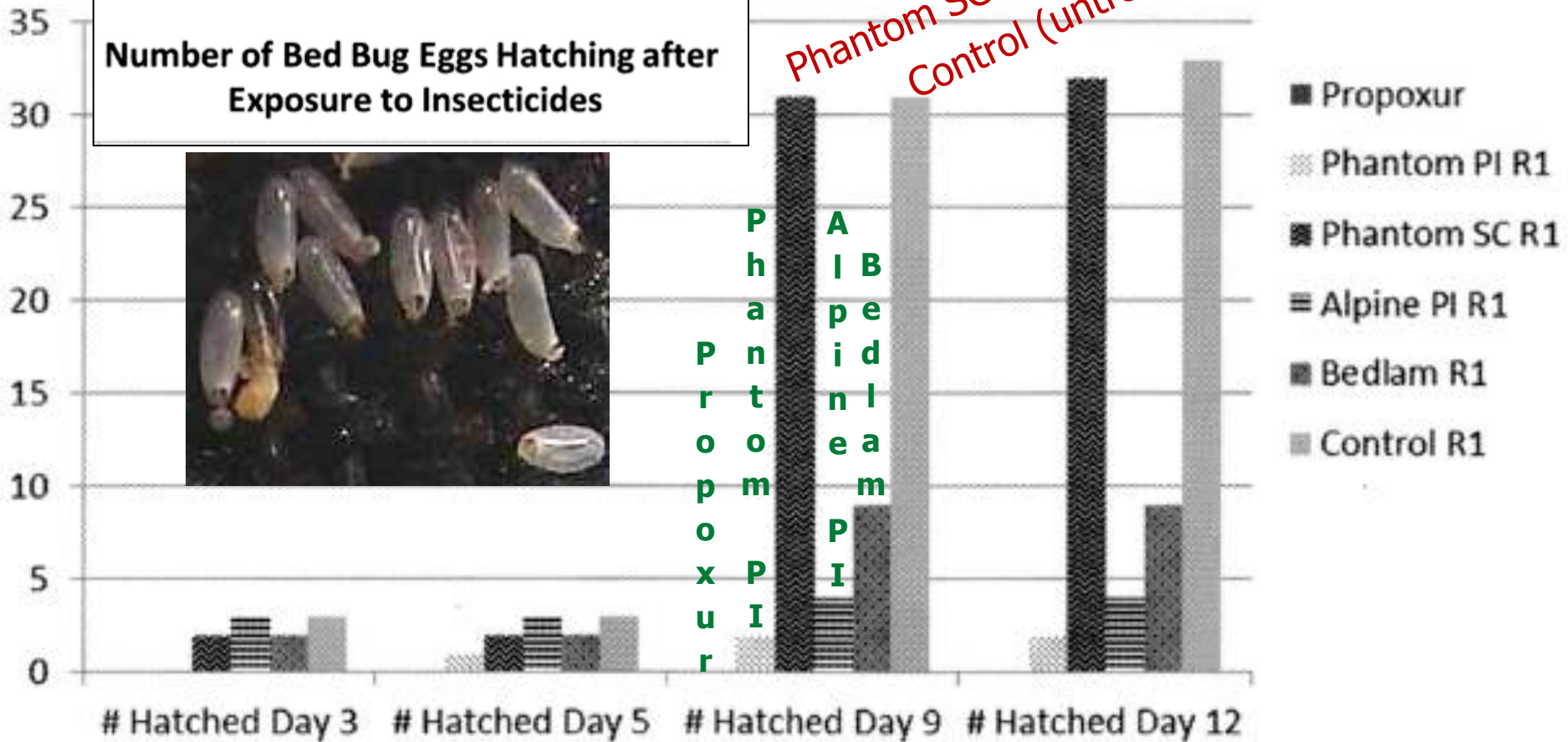
Insecticides Don't Always Kill Bed Bug Eggs



Number of Bed Bug Eggs Hatching after Exposure to Insecticides



Phantom SC
Control (untreated)



Silica Gel – Promising Desiccant Dust

Journal of Economic Entomology, 109(4), 2016, 1819–1826

doi: 10.1093/jee/tow129

Advance Access Publication Date: 4 July 2016

Research article

Household and Structural Insects

OXFORD

Comparative Efficacy of Selected Dust Insecticides for Controlling *Cimex lectularius* (Hemiptera: Cimicidae)

Narinderpal Singh,¹ Changlu Wang,^{1,2} Desen Wang,^{1,3} Richard Cooper,¹ and Chen Zha¹

Of eight insecticide dusts tested against bed bugs, “Only CimeXa (silica gel) dust caused 100% mortality from all three exposure methods.”

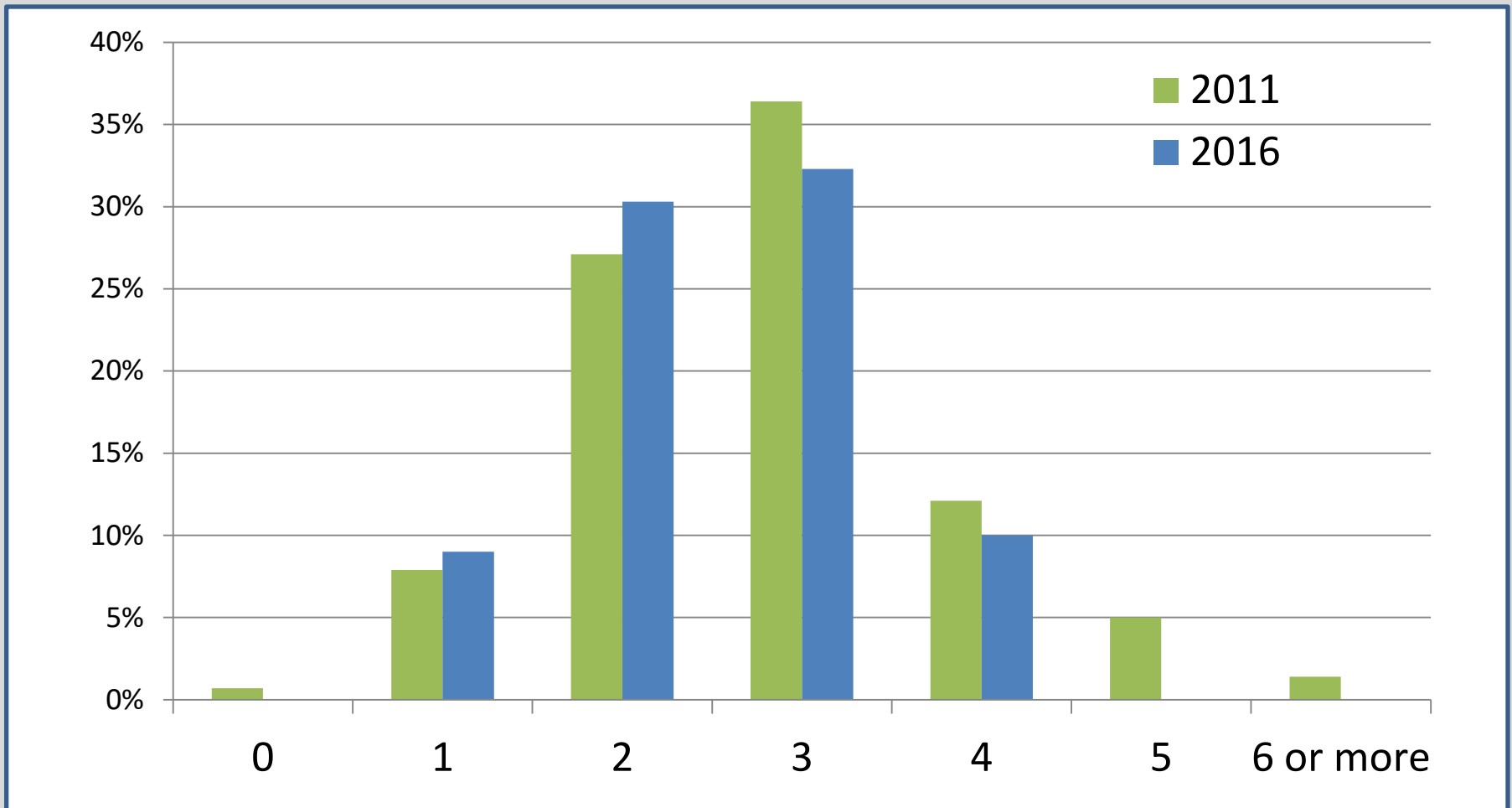
- 1) **brief exposure**—bed bugs crossed a 1-in-wide dust-treated band
- 2) **forced exposure**—bed bugs were continuously exposed to a dust-treated substrate
- 3) **choice exposure**—bed bugs were given a choice to stay on either dust-treated or untreated surface

Some Basics of Bed Bug Management Using Insecticides

- Bed bug control typically takes several treatments (average of 2 to 3 trts)
- It is important to use several different formulations (dusts, sprays, etc.), and often, several different insecticides



OSU Survey: Visits Needed per Infestation



Clustered around average of 2-3 visits per infestation

Consider hiring a professional pest control company for bed bug work

- Make sure properly licensed
- Check for satisfied customer references that relate to bed bug control
- Determine if they will be doing many of the things that you learn today

OH Dept. of Agriculture
Pesticide Regulation Section
614-728-6987; 800-282-1955
<http://www.agri.ohio.gov>

BUYER BEWARE:

Grocery store insect sprays won't eliminate a bed bug infestation!



- **Must be sprayed directly on the bed bugs ('kills on contact')**
- **Most bugs are hiding and WILL NOT be killed**
- **Little or no residual activity (the chemical breaks down quickly)**

BUYER BEWARE:

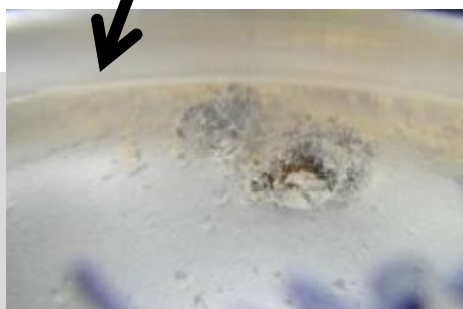
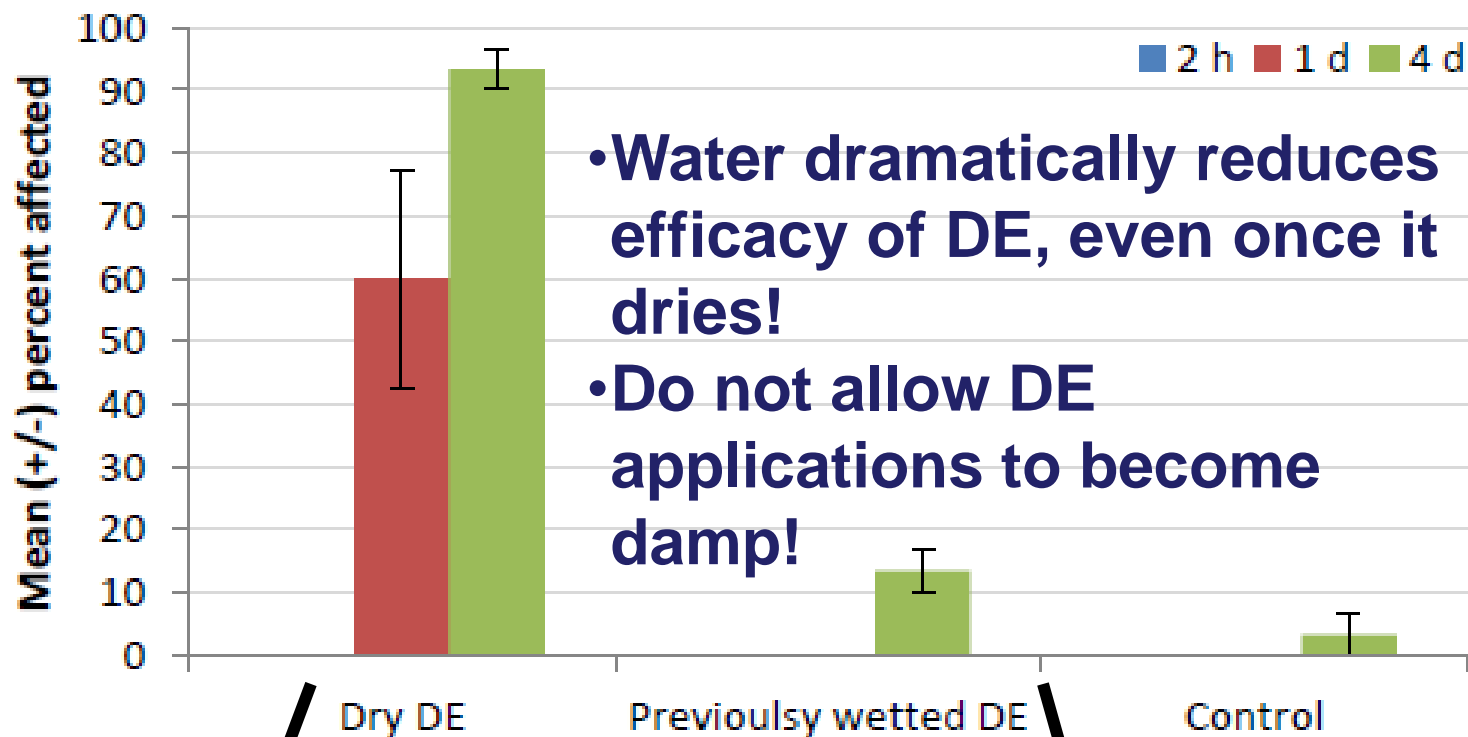
Boric acid products don't work!

- Boric acid does not kill bed bugs.
- Boric acid is a stomach poison that must be eaten by an insect.

**Remember that bed bugs feed only
on blood.**

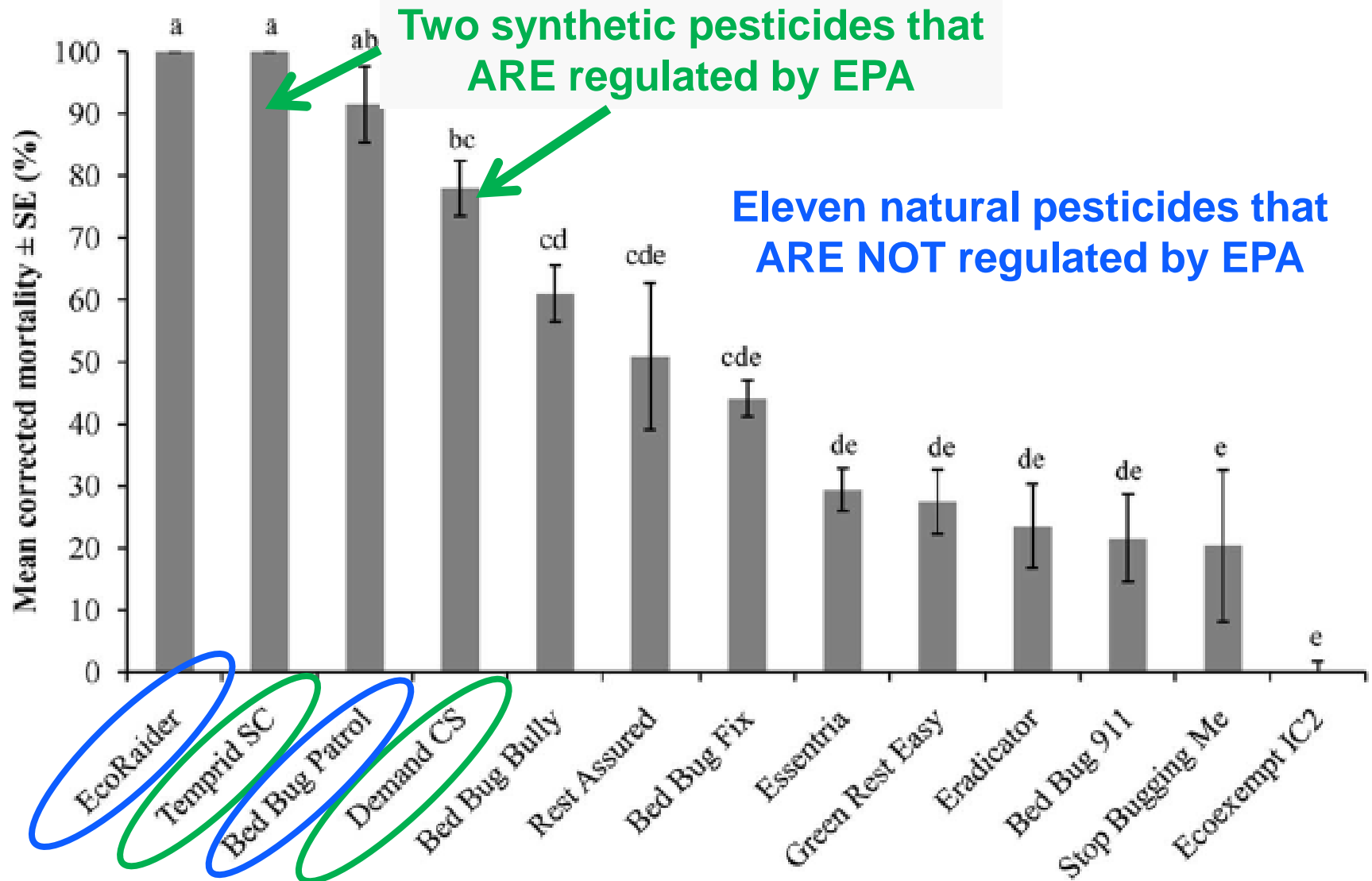
— OSU Research Study —

Efficacy of Diatomaceous Earth Against Bed Bugs




Rutgers Univ. 2014 Study

Percentage of dead bed bug nymphs at 10 days after being directly sprayed



Article

Testing a Threshold-Based Bed Bug Management Approach in Apartment Buildings

Narinderpal Singh ^{1,*}, Changlu Wang ^{1,*} , Chen Zha ¹, Richard Cooper ¹ and Mark Robson ²

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- A threshold-based management approach (1–12 bed bugs vs >12 bed bugs) using a non-chemical only approach or a non-chemical plus chemical approach eliminated bed bugs in a similar amount of time as a chemical-only approach.
- A threshold-based management approach eliminated bed bugs using little to no pesticide.

August 2010



Joint Statement on Bed Bug Control in the United States from the U.S. Centers for Disease Control and Prevention (CDC) and the U.S. Environmental Protection Agency (EPA)

Introduction and Purpose

The Centers for Disease Control and Prevention (CDC) and the U.S. Environmental Protection Agency (EPA) developed this document to highlight emerging public health issues associated with bed bugs (*Cimex lectularius*) in communities throughout the United States.

Bed bugs (Photo 1) have been common in U.S. history. Although bed bug populations dropped dramatically during the mid-20th century (1), the United States is one of many countries now experiencing an alarming resurgence in the population of bed bugs. Though the exact cause is not known, experts suspect the resurgence is associated with increased resistance of bed bugs to available pesticides, greater international and domestic travel, lack of knowledge regarding control of bed bugs due to their

prolonged absence, and the continuing decline or elimination of effective vector/pest control programs at state and local public health agencies.

In recent years, public health agencies across the country have been overwhelmed by complaints about bed bugs. An integrated approach to bed bug control involving federal, state, tribal and local public health professionals, together with pest management professionals, housing authorities and private citizens, will promote development and understanding of the best methods for managing and controlling bed bugs and preventing future infestations. Research, training and public education are critical to an effective strategy for reducing public health issues associated with the resurgence of bed bug populations.

Impact of Bed Bugs on Public Health

Although bed bugs are not known to transmit disease, they are a pest of significant public health importance. Bed bugs fit into a category of blood-sucking ectoparasites (external parasites) similar to head lice (*Pediculus humanus capitis*). Bed bugs, like head lice, feed on the blood of humans but are not believed to transmit disease. Other ectoparasites, such as body lice (*Pediculus humanus corporis*), are known to transmit several serious diseases. Differences in the biology of similar species of pests, such as body lice and head lice (or bed bugs) can greatly impact the ability of pests to transmit disease.



Photo 1. Bed Bug. Photo courtesy of Dr. Harold Harlan, Armed Forces Pest Management Board Image Library

CDC & EPA Joint Statement

Bed bugs are a
pest of significant
public health
importance!

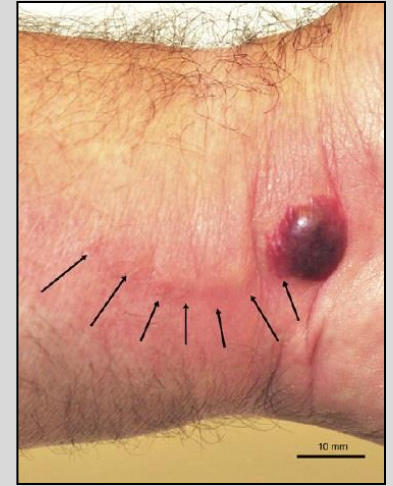
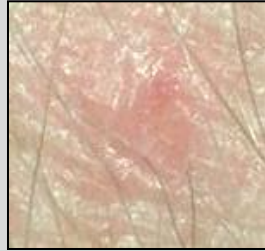
http://www.cdc.gov/nceh/ehs/Publications/Bed_Bugs_CDC-EPA_Statement.htm

<http://www.epa.gov/pesticides/bedbugs/>

Bed Bug Bites

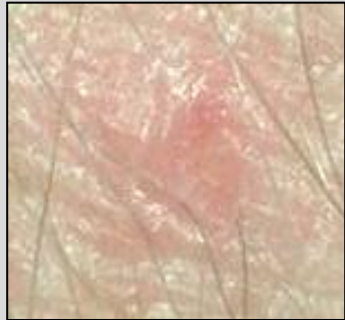
- Skin reactions (avg = 7 of 10 people)

- Redness
- Welts
- Itching



- Resemble bites from other insects & arthropods
- Typically no red spot at the center (such as with fleas and black flies)
- Typically occur on exposed skin
 - Neck and face; shoulders and arms; back; etc.
- Rarely occur on the palms or soles (such as with scabies mites)
- Often occur in rows or groups
- Confirmation based on finding bed bug evidence

Health Effects from Bed Bugs



- Skin reactions (7 of 10 people on avg.)
 - Redness
 - Welts
 - Itching
- Secondary bacterial infections
- Anemia
- Asthma
- Anaphylactic shock
- Psychological effects
- Sleeplessness
- Agitation
- Anxiety
- Insecticide exposure
- ...

REVIEW

Bed bugs and possible transmission of human pathogens: a systematic review

Olivia Lai¹ · Derek Ho² · Sharon Glick³ · Jared Jagdeo^{2,3,4}

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- So far, no studies have shown evidence that bed bugs are able to spread human diseases.
- Some studies have shown cimicids (bed bug relatives) can transmit disease to birds or bats.
- Certain human diseases can survive in bed bugs in the laboratory – a worrying sign.
- Even without spreading disease, bed bugs can cause health problems.

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international travelers reached 1.1 billion (leisure tourists accounted for 53 %) and is estimated to reach 1.8 billion by 2030 [45]. Travelers are at a particular risk for infestation, as bed bugs have been detected in aircraft, boats, trains, and hotels [12]. The global bed bug population is estimated to be increasing by 100–500 % annually [3]. In one nationwide survey, 99.6 % of United States (U.S.) pest professionals reported that they have treated bed bugs in the past year, and 68 % of U.S. pest professionals reported that bed bugs are the most challenging pest to treat [30].

Tips for Employees That Make Home Visits



Tyvek boot covers



Tyvek coveralls

- Minimize items to be carried inside
- Don't sit on beds, upholstered furniture, or the floor
- Do a self-inspection immediately after departing (thoroughly inspect shoes)
- Change into fresh clothing ASAP
(consider keeping a change of clothes at work)
- Bag used items (seal the bag)
- Dissolvable laundry bags are an option
- Disinfect clothing by laundering & drying



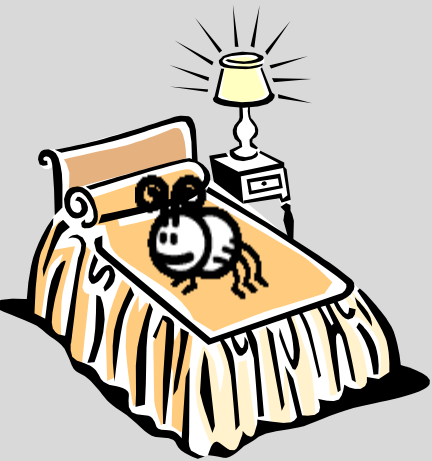
Disinfect Items by ★★★ Laundering & Drying ★★★ (kills all bed bug life stages)

Launder clothing

- Wash in hot water ($\geq 120^{\circ}\text{F}$)
- Use drier on hot setting (≥ 30 mins.)
- Dry clean items



**Did you check for signs
of bed bugs in your
hotel/motel room when
you last traveled?**



BED BUG PREVENTION FOR TRAVELERS

**Make it STANDARD PRACTICE to check
for bed bugs in hotel/motel rooms!**

- Pull back the bedding and look for black fecal spots on mattress & box springs (especially seams)
- Carefully examine the underside of the bed skirt
- Look for bb signs along bed frame (especially head board)
- Open nightstand drawers and look for bb signs along inner and outer edges
- Look for bb signs along baseboards



DON'T STAY IN A ROOM THAT HAS BB SIGNS

BED BUG PREVENTION FOR TRAVELERS

Reduce the chances of getting bed bugs from hotel/motel rooms!

- Keep clothes in your zipped suitcase
 - Don't keep clothes in hotel chest-of-drawers
 - OK to hang clothes in closet
- Don't store your suitcase on the bed, floor, or upholstered furniture
- Keep your suitcase on the luggage rack (after first inspecting it for bb signs)
- The bathroom (tub) is the best place to store your items!

SCIENTIFIC REPORTS

OPEN


Bed bug aggregation on dirty laundry: a mechanism for passive dispersal

Received: 6 March 2017

Accepted: 14 July 2017

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*The Department of Animal and Plant Sciences, The University of Sheffield, Sheffield, UK

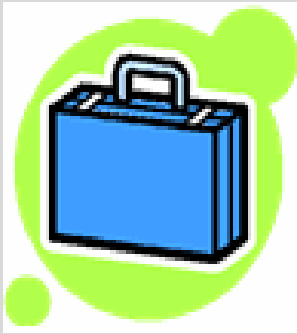
William T. Hentley , Ben Webster, Sophie E. F. Evison & Michael T. Siva-Jothy *

- Bed bugs were drawn to dirty clothing rather than clean clothing.
- Dirty clothes in a hotel room may attract resident bed bugs and thereby spread an infestation to travelers.

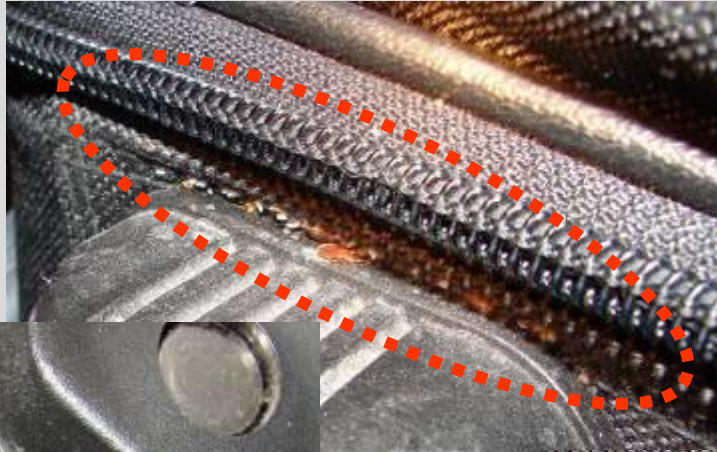
BED BUG PREVENTION AT HOME

Don't bring infested items home!

- **Inspect clothing and luggage of travelers**
- **Inspect secondhand beds, bedding, furniture, & clothing**



--Bed Bug Hitchhikers— in luggage



Rapid killing of bed bugs (*Cimex lectularius* L.) on surfaces using heat: application to luggage

Catherine Loudon* *Department of Ecology and Evolutionary Biology,
University of California Irvine, Irvine, CA, USA

Abstract

- Bed bugs on the outside of suitcases died within 6 minutes of exposure to 158°–167°F (70°–75°C).
- Hidden bed bugs (under luggage flaps or piping) also died.
- Bed bugs on the exterior of luggage tended to stay there rather than moving to the inside of the luggage.
- Routine brief heat treatment of suitcase exteriors may be effective at limiting the spread of bed bugs via luggage.

Keywords: bed bug; heat treatment; travel; control; *Cimex lectularius*

OSU Bed Bug Website

<http://u.osu.edu/bedbugs>



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES

BED BUGS

HOME GALLERIES ▾ RESEARCH ▾ **FAQ** RESOURCES

FAQ

Are bed bugs large enough to be seen?

What do bed bugs eat?

Will bed bugs feed on my pets?

Everyone else in my household is getting bitten, so why aren't the b

Why don't the bites on my friends look exactly alike?

Are bed bugs public health pests?

Do bed bugs spread disease?

Will bed bugs live on my body?

Am I likely to pick up bed bugs from a co-worker in my office?

Size and Physical Characteristics

Are bed bugs large enough to be seen?

Yes, bed bug eggs, **nymphs**, and adults can all be seen with the naked eye (assuming normal vision). The eggs and newly hatched nymphs (1st instar nymphs) are only 1/16 of an inch long (about 1 mm). The 5 nymphal stages are successively larger, with adult bed bugs being about a fifth of an inch long (about 4 to 5 mm). Some people find it useful to compare adult bed bugs to the size and shape of an apple seed, with nymphs roughly the size and shape of sesame seeds.

People often do not see bed bugs because these insects typically hide during the day and come out at nighttime when they feed. During the day, you need to search thoroughly to find bed bugs hiding in cracks and crevices, on the underside of furniture, along mattress seams, and in other tight spaces.

How big can a bed bug get?

Adult bed bugs are about a fifth of an inch long (about 4 to 5 mm). Once they feed on blood, they become longer and fatter, about double their normal length. However, bed bugs do not become 'giant' sized, like swollen ticks.

Coming Winter 2017...

OSU's Bed Bug Field Guide

- Free mobile app
- Bed bug identification, biology, and IPM strategies at your fingertips



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- OSU Urban Entomology team

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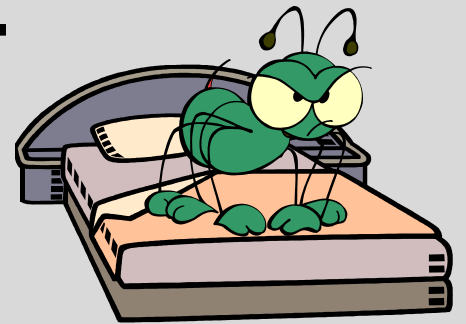
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- Extension IPM Program

Thank You!



Sleep tight,
and don't let the ...
... well, you know the rest



Questions?

