Dealing With Bed Bugs—The New Reality

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What will you learn today?

- Some myths about bed bugs
- How to recognize bed bugs
- How to protect yourself from bed bugs
- What to do if you have bed bugs
- Treatment options for bed bugs
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 Most Bed Bug-Infested Cities in the U.S.--2016

Bed bugs can be found in:

- Apartment buildings
- Single-family homes
- Hotels and motels
- Assisted living facilities
- Office buildings
- Retail stores
- Movie theaters
- Libraries
- Schools
- Public transportation
- Hospitals
Bed Bugs In Public Facilities

- Brought in by visitors, staff, etc.
- Brought in on clothing, coats, shoes, bags, 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!
--Bed Bug Hitchhikers—
in walker & wheelchair

Photos courtesy of General Pest Control Co.
Bed Bug Hitchhikers—
in shoe tread

Total of 13 bed bugs
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Control of Bed Bugs In Public Facilities

• *Early identification is very important*
  • Staff should be trained re. what to look for
  • Maintenance and cleaning crews should be on the lookout for telltale signs of bed bugs
• *Capture a bug for positive identification*
A pictorial guide for recognizing bed bugs and other household pests

http://u.osu.edu/bedbugs
Resources

Additional information about bed bugs and other invasive species can be found using the following links.

Multilingual Information
Cornell University Cooperative Extension bed bug website
http://nyc.cce.cornell.edu/UrbanEnvironment/FAQsHotTopics/Pages/BedBugs.aspx
Information in Italian, Creole, Spanish, Russian, Chinese, Mgoon, and English

State of Virginia website with bed bug resources
Information in Spanish and English

University of California at Berkley bed bug evolution website
http://evolution.berkeley.edu/evolibrary/news/100901_bedbugs
Information in Spanish and English

University of Kentucky bed bug website
http://www2.ca.uky.edu/entomology/entfacts/ef636.asp
Information in Spanish and English
IDENTIFICATION SERVICES

Ohio State University Pest Diagnostic Clinic

- Fee for identification services ($20 per insect sample)
- ID wide variety of insects, arthropods, plant diseases, etc.
- Online submission form: http://ppdc.osu.edu

614-292-5006
What shouldn’t you do for a bed bug problem?

Typically, you shouldn’t dispose of furniture.

• Bed bugs will fall off the furniture as you are moving it, hence spreading the problem.
• Infested furniture usually can be treated.
• Bed bugs can quickly infest replacement furniture.
• Items placed on the curb often are picked up and reused, thereby spreading bed bugs to other households.
INTEGRATED PEST MANAGEMENT (IPM) PROCEDURES:

- Correctly identify the pest
- Conduct a thorough inspection
- Use sanitation measures
- Use non-chemical measures
- Apply insecticides to targeted sites
BED BUG HABITS

- Typically hide during the day in dark, protected sites (esp. cracks & crevices)
- Can cling tightly to surfaces
- Cannot fly or jump
- Can walk very fast
Some bed bug hiding places

Behind A Hanging Picture

In Furniture

In Carpeting

In Electrical Outlets
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
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)
Telltale Signs of Bed Bugs Behind Baseboards
Telltale Signs of Bed Bugs in Mattresses and Box Springs
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
Treatment of Bites

• Topical or systemic antihistamine or anti-inflammatory medications
• Do NOT use topical insecticides such as for scabies and head lice
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
  - ...

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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/
Tips for Employees That Make Home Visits

• 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 (≥120°F)
• Use drier on hot setting (≥30 mins.)
• Dry clean items

Bag disinfected 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!
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
Treatment Options

- Insecticides
- Residual products (dust, liquid, aerosols)
- Fumigation (sulfuryl fluoride)
- Heat treatment (whole structure, container)
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-Sniffing Dogs

- Dog and handler should be specially trained and certified
- Enable rapid inspections
- Useful for large-scale inspections
- Expensive
- Much variability among canine detection firms (10–100% accuracy; mean accuracy 44%; 15% false positives [Cooper et al. 2014 JEE 107:2171-2181])
Sticky Traps

Sticky traps have low levels of effectiveness in capturing bed bugs.

Bed Bug Pitfall Traps

ClimbUp Interceptor

LightsOut Interceptor

BB Stop Pitfall Trap
The Bed Bug Life Cycle

Total developmental time (egg to adult):

21 days @ 86°F
120 days @ 65°F

Unfed adults: ~1/4 to 3/8 inch long
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
"If I ignore the bed bug problem, it will eventually go away."

Fiction!!!

If untreated, the bed bug problem will become MUCH worse.

Fact!!!
Treatment Options

- Insecticides
- Residual products (dust, liquid, aerosols)
- Fumigation (sulfuryl fluoride)

- Heat treatment (whole structure, container)
Whole Room Heat Treatment

- Typically a 6-8 hour process
- Temperature: 135°F [57.2°C]
- Double or more the cost of an insecticide treatment
- Offers no residual protection so useful to include an insecticide
Some Basics of Bed Bug Management Using Insecticides

- Bed bug control is time-intensive and labor-intensive.
- A thorough inspection to locate all bed bug harborages is critical.
- Spot treat all harborage sites.
Some Basics of Bed Bug Management Using Insecticides

- Residual insecticides are very important
- Low impact products are an option (diatomaceous earth, silica gel, insect growth regulators [IGRs] {but recent research indicates that IGRs are not very effective against bed bugs})
Some newer insecticides for use against bed bugs:

<table>
<thead>
<tr>
<th>Active Ingredient (insecticide class)</th>
<th>Product Name(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Imidacloprid + β-cyfluthrin</strong> (neonicotinoid + pyrethroid)</td>
<td>Temprid® SC</td>
</tr>
</tbody>
</table>
| **Chlorfenapyr** (halogenated pyrrole) | Phantom® SC  
Phantom® PI |
| **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 |
| **Amorphous silica gel** | CimeXa™ |
Efficacy of Diatomaceous Earth Against Bed Bugs

- Water dramatically reduces efficacy of DE, even once it dries!
- Do not allow DE applications to become damp!

— OSU Research Study —
Some Basics of Bed Bug Management Using Insecticides

- There is no single “magic bullet”
- Bed bug control typically takes several treatments (average of 3 trts)
- It is important to use several different formulations (dusts, sprays, etc.), and often, several different insecticides
- Don’t keep using the same insecticide (rotate insecticide use)
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

INTEGRATED PEST MANAGEMENT (IPM) PROCEDURES:

Correctly identify the pest

+ Conduct a thorough inspection

+ Use sanitation measures

+ Use non-chemical measures

+ Apply insecticides to targeted sites
Some measures to help reduce the number of bed bugs:

Use a heavy-duty vacuum cleaner.

- Use a high efficiency particulate air (HEPA) filtered vacuum cleaner.
- It is useful to reduce the number of bed bugs. (A scraping action with the attachment is needed to remove eggs.)
- It is useful for cracks & crevices.
- Dispose of the vacuum bag afterwards.
- Remember that an on-site vacuum can serve as a harborage for bed bugs.
Vacuuming to contain bed bugs

Jones and Boggs. 2001. OSU Fact Sheet HYG-2158.
What can I do to help solve a bed bug infestation?

Laundner bedding, clothing, etc.!

- Wash in hot water (≥120°F)
- Drier on hot setting (≥30 mins.)

It is important to keep disinfected items bagged while bed bug eradication efforts are on-going at your residence.
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
Insecticides

• DO NOT apply insecticide sprays to
  • Human skin
  • Clothing
  • Bed linens
  • Bedding

Products containing DEET repel bed bugs only for short periods of time
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.
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)
DON’T use bug bombs for bed bugs!
Bug bombs can worsen a bed bug problem!

- "Bug Bombs" work very poorly against crawling insects
- Few bugs will be killed!
- "Bug Bombs" can cause bed bugs (and cockroaches) to scatter!!!
Over-the-Counter Foggers ("Bug Bombs")

Ineffectiveness of Over-the-Counter Total-Release Foggers Against the Bed Bug (Heteroptera: Cimicidae)

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J. Econ. Entomol. 105(3): 957–963 (2012); DOI: http://dx.doi.org/10.1603/EC12037

ABSTRACT Field-collected bed bugs (Cimex lectularius L.) showed little, if any, adverse effects after 2-h direct exposure to the aerosolized pyrethroid(s) from three over-the-counter total-release foggers (‘bug bombs’ or ‘foggers’): Hotshot Bedbug and Flea Foger, Spectracide Bug Stop Indoor Foger, and Eliminator Indoor Foger. One field-collected population, EPM, was an exception in that there was significant mortality at 5–7 d when bugs out in the open had been exposed to the Spectracide Foger; mortality was low when these bugs had access to an optional harborage, a situation observed for all field-collected populations when exposed to the three foggers. Even the Harlan strain, the long-term laboratory population that is susceptible to pyrethroids and that served as an internal control in these experiments, was unaffected if the bugs were covered by a thin cloth layer that blocked harborage. In residences and other settings, the majority of bed bugs hide in protected sites where they will not be directly contacted by the insecticide mist from foggers. This study shows that scientific data supporting the position that total-release foggers should not be used for control of bed bugs, because 1) many field-collected bed bugs are resistant to pyrethroids and they are not affected by brief exposure to low concentrations of pyrethrins and/or pyrethrin-derivatives by foggers; and 2) there is minimal, if any, insecticide penetration into typical bed bug habitats. This study provides strong evidence that Hotshot Bedbug and Flea Foger, Spectracide Bug Stop Indoor Foger, and Eliminator Indoor Foger were ineffective as bed bug control.
Efficacy of Commercially Available Ultrasonic Pest Repellent Devices to Affect Behavior of Bed Bugs (Hemiptera: Cimicidae)

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Abstract: Little is known about the behavior of bed bugs, Cimex lectularius L. (Hemiptera: Cimicidae), although many species are known to occur in arenas where ultrasonic repellant devices are located. Our results confirm that bed bugs are attracted to bed bugs nearby and control ultrasonic devices are less effective in repelling bed bugs. Key Words: bed bugs, ultrasonic devices, Cimex lectularius.
Words of caution regarding over-the-counter ‘natural products’ for bed bug control:

- Exempt from Environmental Protection Agency (EPA) registration
- EPA requires no efficacy data
- Claims often based on “satisfied customers”—be sure to ask for their research data and evaluate it carefully
- Botanical (plant based) products often have a strong odor
- Botanical products often have limited, if any, residual activity
Rutgers Univ. 2014 Study

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

Two synthetic pesticides that ARE regulated by EPA

Eleven natural pesticides that ARE NOT regulated by EPA
--Summary--

Bed Bug Workshop

• Dispelled some myths about bed bugs
• How to recognize bed bugs
• Measures to protect yourself from bed bugs
• What to do if you have bed bugs
• Treatment options for bed bugs
Thank You!

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