

**Bed Bugs - Considerations for Health Care and Social Service Providers**  
**Dr. Marcia Anderson, Environmental Protection Agency**  
**A Webber Training Teleclass**

**Bed Bugs**  
**Considerations for Health Care and Social Service Providers**



**Dr. Marcia Anderson**  
Environmental Protection Agency

Hosted by Russell Olmsted  
St. Joseph Mercy Health System, Ann Arbor, Michigan

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[epa.gov/managing-pests-schools](http://epa.gov/managing-pests-schools) | [iprm@epa.gov](mailto:iprm@epa.gov)



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**Presenter**



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U.S. EPA's Center for Integrated Pest Management
- PhD in Environmental Management, Montclair State University
- Degrees in Biology, Landscape Architecture, Environmental Design, and Earth Science Instruction and Curriculum

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## Integrated Pest Management



EPA recommends and promotes the safe use of pesticides and integrated pest management. This includes its use in health care, emergency, elder care, and shelter facilities, as well as schools and community centers.

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## Bed Bug Characteristics

- Aggregate
- Usually active at night
- Attracted to exhaled CO<sub>2</sub>
- Attracted to body temperature
- Most travel 15-20 ft to feed
- Adults can survive >6 months without feeding



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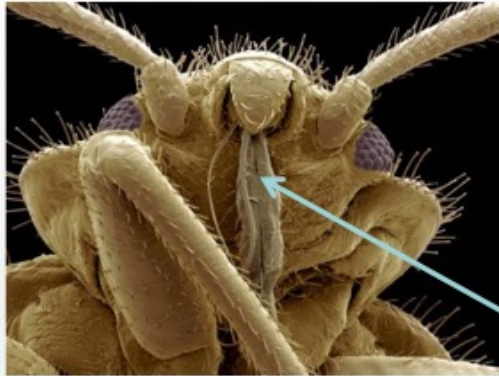
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### How do Bed Bugs Feed?



- Piercing-sucking mouthparts
- Penetrate skin and inject an anesthetic

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### Feeding Habits



**Hungry**  
Flattened from top to bottom



**Feeding**



**Full**  
Bodies expand like an accordion



Penetrate skin with beak and drink blood

**In 10 minutes!**

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## Health Issues

- Varying sensitivity to bites
  - No reaction, itching, welts, rashes, secondary infection
- Types of Reactions
  - no reaction
  - delayed reaction
  - immediate and delayed
  - immediate only
  - true hypersensitivity



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## Public Health Issues and Bed Bugs

- Itchy bites and Inflammation
- Secondary skin infections
- Anemia
- Stress
- Sleeplessness
- Agitation
- Anxiety



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**Other Pests Confused with Bed Bugs**



Scabies - mites that burrow into the skin resulting in lesions and sores

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**Other Pests Confused with Bed Bugs (cont.)**

- Bird mites
- Rodent mites
- Chiggers
- Fleas



chiggers above;  
fleas right



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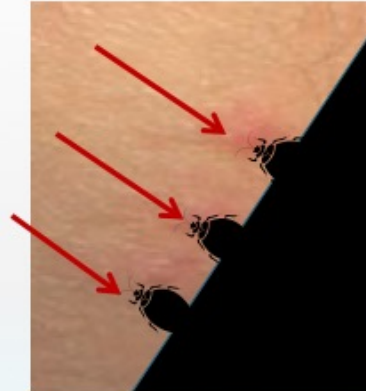


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### Common Truths

- Bed bugs don't burrow under skin like some mites
- Professionals cannot identify bed bug infestations by bites alone
- Bed bugs bites can occur anywhere on the body



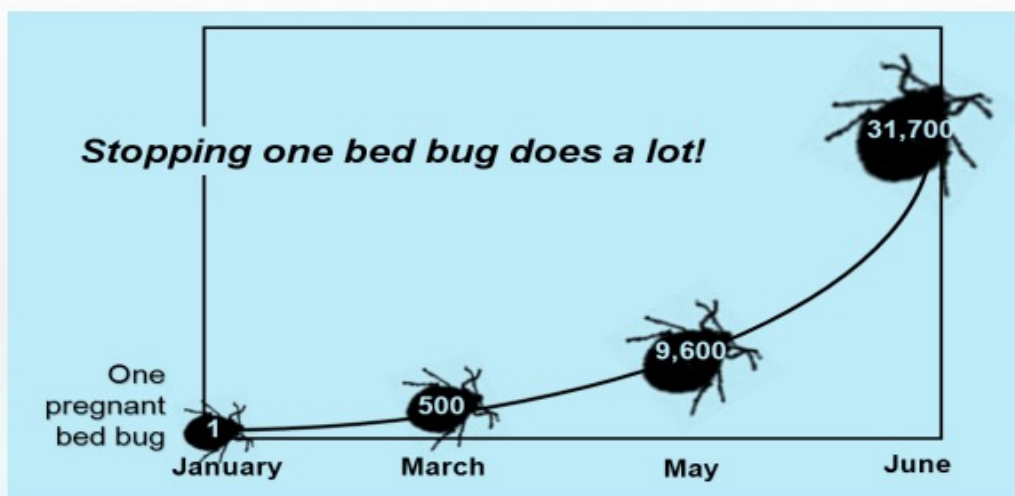
*Linear bites from bed bugs*

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### Propagation



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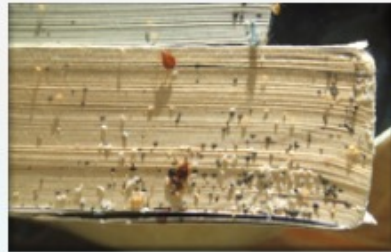
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## Introduction Versus Infestation

- Introduction - a single bug
  - single immature bug
  - single male adult bed bug
  - female – a greater chance of infestation
- Infestation - a reproducing population
  - multiple life stages present
  - eggs present



Introduction - on a purse or backpack



Infestation evident

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Photos: Dini Miller, Virginia Tech

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## These are NOT Grandma's Bed Bugs

### Multiple Types of Resistance

#### Types of resistance:

- Reduced cuticular penetration (thicker cuticles)
- Mechanism to break down toxins (including pesticides)
- Enhanced Mixed Function Oxidase Activity - genetic changes that protect nerve cells from pesticides
- Knock-down resistance



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## I Think I Have Bed Bugs in My Home!

- Do not panic
- Make sure you actually have bed bugs
- Capture one in a clear zip-top bag or jar and have it identified
- Contact your local Environmental Health Office for assistance



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## *An Ounce of Prevention is Worth a Pound Of Cure*



- Take precautions to prevent bed bugs
- EPA recommends using an Integrated Pest Management (IPM) approach
- IPM is smart, sensible, and sustainable approach to pest management

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## IPM Options for Bed Bugs

- Cultural and Sanitation
  - Exclusion
  - Vacuuming
  - Clutter removal
- Non-Chemical
  - Physical – sealing, vacuuming, trapping, encasements
  - Thermal – heat and cold
- Chemical (after or along with non-chemical options)
  - Pesticides
  - A pest management professional is recommended



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## Inspections are Important!



- Inspect area where bed bugs were found
- Include bed area, floors, walls and storage areas
- Inspect closets used to store belongings
- Map bed bug sightings and confirmed findings
- Arrange for an inspection by a pest professional

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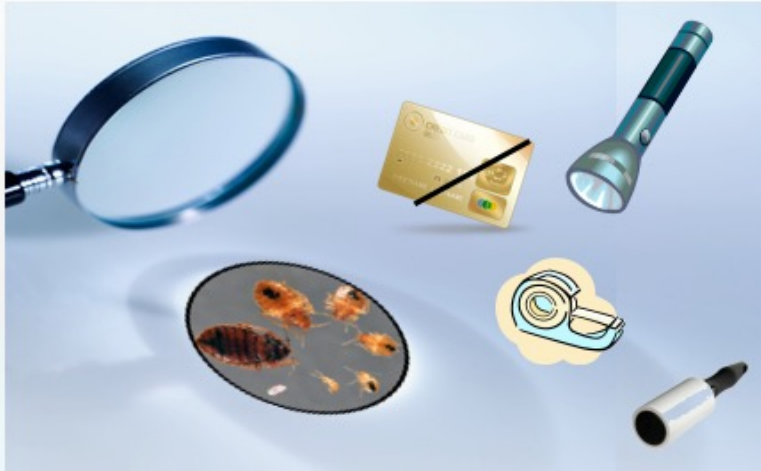
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## Inspecting for Bed Bugs



- Magnifying glass
- Strong flashlight
- Plastic zip bags, lint roller or scotch tape
- Mirror

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## Signs of Bed Bugs

- Dark and rusty colored droppings
- Shed skins
- Blood stains from crushed bugs
- Eggs and casings
- Voided material (tell-tale blood spots)
- Live bed bugs
- Offensive, sweet, musty odor in heavy infestation



Photo: Dini Miller; Virginia Tech

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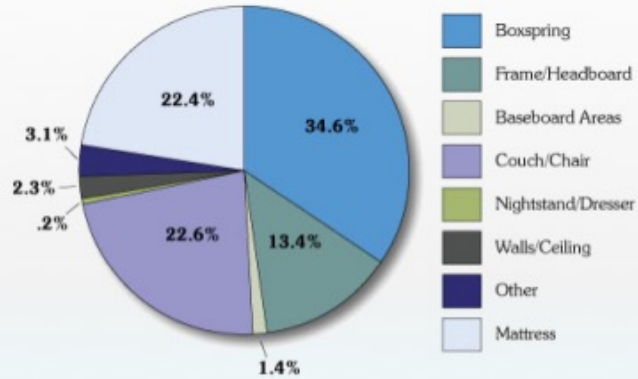
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**Where are Bed Bugs Found?**



>70% in bed-related areas  
 >34% in/on box springs  
 Almost any tiny crack or crevice

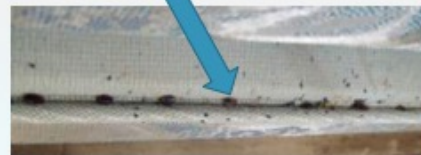
Distribution of bed bugs found in 13 infested apartments  
 Source: University of Kentucky



**Box Spring Infestation**



**Mattress Infestation**



Photos: ChangLu Wang; Rutgers University



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### Plush Furniture Infestations



- Second favorite harborage
- Elderly and infirmed patients tend to spend their entire day on recliners and other upholstered furniture
- Bed bugs can be found under pillows and cushions, in cracks, and along seams

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### Unusual Harborages



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### Where Else Can Bed Bugs Hide?

- Remote controls
- Telephones
- Lamps and alarm clocks
- Computers and other electronics



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### Ways Bed Bugs are Transported



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## Preventing their Spread in Hospitals



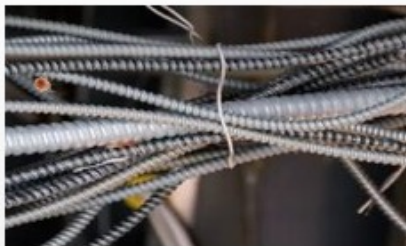
- Place patient belongings in clear plastic bags for duration of their stay
- Daily preventative cleaning permits a thorough inspection of beds:
  - Strip bed
  - Sanitize mattress
  - Clean bed mechanism (raise mattress to access)

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## Bed Bugs Can Walk Through Walls and Floors!



- Walking from an infested area to new territory (*even through walls and to adjacent floors*)
- From one room or apartment to another via pipes, telephone, cable or electrical wires and wall voids
- Walking after dropping off of an infested item that is being discarded

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**Control and Prevention:**  
**Bedding Encasements and Mattress Liners**

- Use encasements or mattress liners on mattresses and box springs
  - Escape-proof encasements trap bed bugs and eggs inside where they eventually die
- Mattress liners
  - treated with a pesticide and kill bed bugs and dust mites crawling on it
  - remain effective even if torn
- Encasements
  - make inspection easier
  - must be kept on for at least one year
  - limit exposure to dust mites

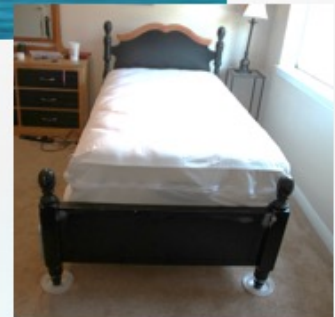


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- Pull the bed away from walls and other furniture
- Keep bedding from touching the floor
- Place an interceptor under each bed leg



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### The Importance of Monitoring



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### Control and Prevention: Moat-Style Interceptors

- Traps bed bugs
- Place under all furniture legs - beds, sofas, chairs
- Keep furniture away from the wall
- Complements other control tactics
- Consult instructions regarding the use of talcum powder
- Inexpensive and easy to purchase



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## Vacuuming – An Effective Control



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- Vacuum daily
  - HEPA vacuum preferred
- Vacuum curtains, walls, closets, and upholstered furniture
- Dispose of filters/bags in sealed plastic bags immediately
- Steam clean floors and rugs regularly

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## Steam Cleaning



- Steam kills bed bugs and eggs
- A short period of heat exposure kills all stages of bed bugs
- Time consuming and the rate varies with temperature
- Surface temp must reach 160–180°F
- The steamer should not blow air forcefully or it may cause bed bugs to scatter (use a diffuser)
- All steam has a high temperature regardless of the size of the steamer
- Do not apply steam to electrical outlets

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**Ambient Heat Treatment**  
 (by pest management professionals)

- Provides complete control when used properly
- Useful in areas where bed bugs can be easily reintroduced
- Popular where unit preparation cannot be done
- Non-toxic but expensive
- Insecticides are still needed around unheated perimeters
- Remove electronics, plants, medicine, perishables, art, pets
- May need permission of local fire department – disable sprinklers
- Service best provided by a pest management professional



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**Ambient Heat Chambers**



**Temperature Time** (minutes)

Temp	Adults	Eggs
113°F	90	480
118°F	2	90
122°F	< 1	< 1

Stephen Kells & Temp-Air (2009)

2 to 8 hours of intense area heating at 120° to 140° F.  
 Sensing temperatures inside the mass is critical.

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## Ineffective Heat Alternatives

- Boosting a home's thermostat
  - Will not reach the required 120°F
- Putting items in black plastic bags and leaving them in the sun or car
  - Will not reach the required 120°F
- Using a propane space heater or fireplace
  - A major cause of fires



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## Carbon Dioxide Freezing

- Kills bed bugs and eggs
- Kill temperature -22° F
- Non-toxic, non-staining, no odor
- Can be applied to most surfaces, including toys and books
- Can be used in all areas of a room, including beds, box springs, furniture, and electrical outlets
- Reaches into bed bug harborages
- Only available from a trained pest management professional
  - Exercise caution if using in enclosed spaces and keep children out of room during treatment
- Allows room to be occupied the same day of treatment



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## Laundry



- Drying is an easy and extremely effective method of killing bed bugs
- Bag infested items
- Use a clean bag for freshly dried items
- Dry clothing, linens and other items that cannot be washed on high heat for 30 minutes
- Do NOT reuse plastic bags if bed bug ridden items were carried in them



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## Pesticides

- Should not be the first action considered
- Multiple treatments are usually necessary as infestations are difficult to control
- If pesticides are needed, they should be targeted and specific
- Hire licensed pest management professionals to apply pesticides effectively and safely
- Use only EPA registered products



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## Pesticide Safety

- Use only EPA registered products (look for EPA Reg. No.) with bed bugs on the label
- Always read, understand, and follow pesticide label "Directions for Use"
- Never use products indoors that are intended for outdoor use
- Using more does not mean better results!
- Consult with your health organization or cooperative extension service for more information on effective bed bug controls



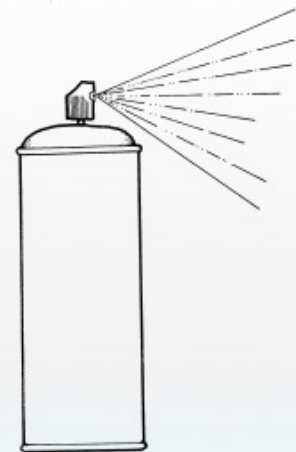
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## Residual Pesticide Sprays

- Many pesticides do not kill eggs
- Most pesticides only kill bed bugs that come in contact the pesticide while it is still wet
- Residual sprays are effective when dry, but they take some time
- Repeated treatments may be needed



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## Insecticidal Desiccant Dusts

- Recommended for use only by professionals
- Must be applied with special duster
- Work better than liquids because they cover the entire bed bug
- Longer residual than liquids
- Useless if wet or misapplied in large amounts
- Cannot be applied where air currents might move dust around
- Last unchanged in wall voids for years in low humidity
- Types:
  - Diatomaceous earth (insecticide grade)
  - Silica dust



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## Silica Gels

- Pulls moisture from the bed bug's shell (cuticle)
- High mortality in 2-3 days
- Low toxicity to mammals
- Good supplement for killing pesticide-resistant bed bugs
- Recommended for application to voids, cavities, behind electrical plates, under carpet or skirting boards, and other non-obvious locations
- May also be applied sparingly round the perimeter of bedrooms and lounge rooms, on bed frames and sofas, or as a fabric-treated "dust band" on furniture legs – according to label



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## Diatomaceous Earth

- A natural, white, powder-like substance that kills insects
- Bed bugs crawl through it and die in 9-15 days
- Only use EPA registered diatomaceous earth labeled for insects, and follow label instructions carefully; DO NOT use “pool grade”
- Apply to cracks and crevices in walls and behind wall plates, using a special duster
- Will kill chemical-resistant bed bugs, but can’t be applied as widely as other products



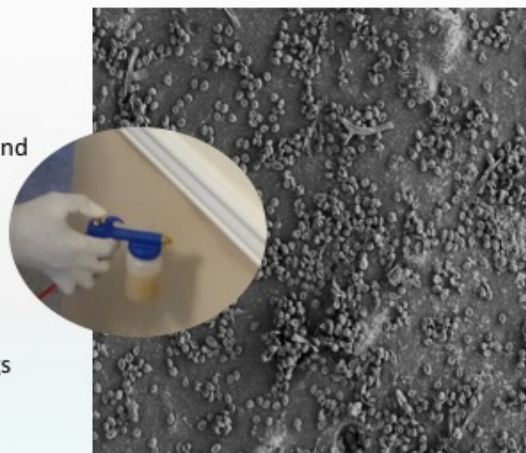
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## Emerging Biocontrol Technology: *Beauveria bassiana*

- *Beauveria bassiana* - mold spores
  - biopesticide
  - causes disease in insects but is harmless to humans and pets
- Application
  - Professional application
  - Specialized equipment and training needed
  - Applied in very low volume
  - Crack and crevice treatment – bed frames, box springs
  - Used as part of an IPM program



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### What Else Will Not Work?

- Raising the indoor temperature of your home using the thermostat or a space heater
- Rubbing alcohol, kerosene and gasoline
- Some natural oils and home remedies
- Agricultural or outdoor pesticides that do not have bed bugs on the label
- Applying pesticides and repellents to clothing and skin
  - There are no pesticides registered for use on clothing and skin that kill or repel bed bugs
- Home freezers unless they can maintain items at 0°F for 3 days



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### Use Caution with Total Release Foggers (bug bombs)

- Creates a toxic fog
- Does not penetrate cracks and crevices
- Leaves residues throughout home
- Many bed bugs are resistant
- Following label directions is critical
- May scatter bed bugs into adjacent rooms or units



EPA info: search "EPA foggers"  
CDC info: [cdc.gov/mmwr/preview/mmwrhtml/mm5741a3.htm](http://cdc.gov/mmwr/preview/mmwrhtml/mm5741a3.htm)

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## Transients and Bed Bugs



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## Shelters: Contain Possessions to Limit Introduction



- What will work in your facility?
- Contain essential possessions in clear plastic storage containers
- Contain non-essential belongings in plastic containers in a storage room
- Label bags and containers to prevent frequent opening

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## Clutter Management is Essential in Shelters



- Limit belongings clients bring into shelters
- Provide bed bug-free toys, books, and play space for children
- Items brought into short-term facilities should be inspected and/or heat-treated
- In short-term shelters, move clients' belongings in plastic storage containers as they relocate to other facilities

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## Part of the Job

Service workers need to be vigilant to avoid transporting bed bugs



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## Preventing Future Introductions

Clutter removal is an essential part of both bed bug and other pest elimination

- Use plastic storage containers
- Store coats, backpacks and purses at the end of the day after visiting potentially infested locations
- Inspect the bottom of empty containers for bed bug hitchhikers



Photo: K.McPherson, EPA.

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## On-the-Job Protection



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- If your profession requires you to visit places known or suspected to have bed bugs:
  - Have a dedicated set of clothes (or pants) for work
  - Bring a folding chair to use in home visits
  - Always wear easily laundered clothing when visiting clients' homes
  - Do not bring bags or personal items
  - Hang your coat on a hanger – not the back of a chair
  - Have a change of clothes in a zip-top bag



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## How Do I Keep From Bringing Bed Bugs Home?



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- At the end of the day, place all outer clothes in a plastic bag. Seal tight.
- Inspect clothing and bottom of shoes before entering your vehicle.
- Place work shoes in a sealable bag. Do not open at home until you dry them in a drier.
- When you arrive home: Wash and/or dry clothes on highest setting for 30 minutes.
- Discard all plastic bags used for bed bug prevention in an outdoor garbage area.
- Vacuum/ wipe down any equipment that may have been at an infested site.



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## Transporting Someone with Bed Bugs

When moving a person from a bed bug infested location:

- Place clothes and personal items in large, clear plastic bags
- Wrap potentially infested equipment (wheel chairs, walkers, etc.) in drum liners
- Use heavy duty plastic bags as seat covers during transport
  - or use plastic coveralls and booties



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## Precautions when Traveling

- Be aware of bed bug hiding places
- Store luggage in bathroom or on top of desk
- Inspect mattress, headboard and upholstered furniture for bed bugs
- Tell the staff/owners if you spot an infestation and request a room change
- When returning home, unpack clothing directly into a washing machine/dryer



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## What to Discard and What to Keep from Infested Locations

### Discard

- Severely infested items of low value that are easily replaced

### Treat and Keep

- mattresses
- box springs
- furniture
- clothes
- shoes
- curtains and drapes
- books
- stuffed animals



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## Educate Staff and Clients

- Tell clients that bed bugs are common in multi-family residences and shelters
- Potential intake question include:
  - Have you stayed in a place where you may have been exposed to bed bugs in the past three months?
  - Has anyone in your family been bitten by bed bugs?
  - Do you have bites or blisters that you're concerned about?
  - Bed bugs, lice, scabies and other pests can cause medical concerns. Do you need help with any pest issues?



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## Have a Plan to Prevent and Eliminate Bed Bugs

- Don't panic!
- Every facility should have a bed bug action plan
- Educate staff and patients
- Assess the situation
- Think through treatment options
  - Cleaning and eliminating bed bug hiding places are important steps
  - Do not immediately reach for a pesticide
- Learn about IPM
- Consider hiring a professional



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**Bed Bug Awareness**

- Provide clients bed bug information verbally and in print
- Recommend clients report bed bug sightings to a facility employee or landlord immediately
- Emphasize the importance of using a dryer to treat belongings
- Use EPA's bed bug clearinghouse: [epa.gov/bedbugs/bed-bug-information-clearinghouse](http://epa.gov/bedbugs/bed-bug-information-clearinghouse)



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**EPA Bed Bug Clearinghouse – [www.epa.gov/bedbugs](http://www.epa.gov/bedbugs)**

**Bed Bugs: Get Them Out and Keep Them Out**



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- [Tackling Bed Bugs: A Starter Guide for Local Government \(PDF\) \(39 pp, 1.5 Mb\)](#) **GET**
- [Bed bug tip of the month: Don't panic and discard your belongings. You can clean or treat most items. \*\*More Tips\*\*](#)
- [Información relacionada disponible en español](#)

**Learn About Bed Bugs**

**Prevent Infestations**

**Get Rid of Bed Bugs**



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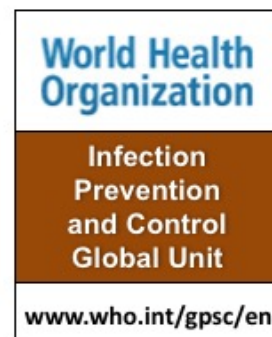
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