

Bed bug biology

- Insects that feed only on blood
- Small (about size of apple seed), translucent to brown in color, flat and good at hiding
- Live in our homes and hitchhike in our belongings



How do bed bugs feed?

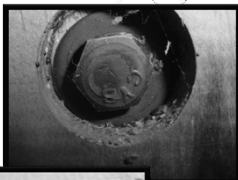
- Bed bugs have "beak-like" mouthparts
- Bed bugs find people by seeking out warmth and carbon dioxide
- Bed bugs will come out of their hiding places late at night
- Most people cannot feel bed bug bites
- Bed bug bites may look like many other types of insect bite



Where do bed bugs live?

Not just in the bed!!

- In and amongst furniture, electronics, and the structure of the home
- Near where they feed, usually within two-meters
- Hide in any crack or crevice larger than the edge of a credit card
- Do not like to be disturbed



Why are bed bugs a problem now?

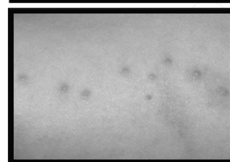
- Increases in global travel and commerce
- Lack of public knowledge
- Lack of institutional knowledge
- Bed bugs have gained resistance to commonly used insecticides



Common Skin Reactions

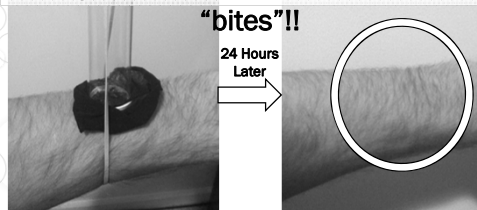
Reaction times and severity may change with repeated exposures, some people react immediately, some people have delayed reaction:

- No reaction w/barely visible bite
 - There is some evidence that older individuals have depressed reaction to bed bug bites
- 2-5 mm itchy, red, raised, inflamed lesions
 - Usually resolve within a week (if bed bugs are eradicated)
- Some patients experience complex skin reactions (hypersensitivity, secondary bacterial infection, keloid formation, etc)



Reaction to Bites

NEVER base a treatment decision solely on the presence or absence of "bites"!!



Are there skin treatments for bed bug bites?

There are some skin creams/lotions that can safely help relieve the symptoms of bed bug bites.

Antihistamine creams: help with itching and reaction to the bites

Antibiotic creams: help if bites are infected

Topical Steroids: help to relieve inflammation



However, the long term solution is to get rid of the bed bugs.



Are there skin treatments to kill or repel bed bugs?

DO NOT USE head lice or scabies treatments for bed bugs

- Bed bugs **DO NOT** live on people, they live in our environment
- These products will not kill or repel bed bugs
- These treatments are not intended to be used over and over again, they could make you sick

Bug repellent products do not work to keep bed bugs away



What are the health risks?

Bites

- Reactions to bites may vary widely
- The most common symptom is itchy welts

Secondary Infection

- Scratching welts may cause infection

Psychological

- Anxiety and unhealthy stress
- Sleeplessness
- Phantom Itching

Anemia has been reported in children and older adults who have been severely bitten

Bed bugs and stress

- Bed bug infestations may cause severe stress and anxiety
 - Loss of sleep
 - Decreased work productivity
 - Stressors to social relationships
 - Economic hardship
- The stresses of bed bug infestations may lead people to dangerous activities that may harm themselves



Extreme Measures



FDNY Warns Don't Use Gasoline Products On Bedbugs

Queens fire officials last month issued a warning to borough residents to steer clear of gasoline or gasoline products to fight bedbug infestation at home. FDNY officials said residents in Astoria have called 911 to report a gasoline odor coming from adjacent apartments in their buildings. Firefighters responding to the calls discovered several incidents where residents poured gasoline on mattresses to kill bedbugs. Allegedly a number of people, following dangerous, misleading advice had wiped gasoline on their own arms and their children's arms to stop the bedbugs from biting, officials said. Such incidents involving the use of extremely flammable gasoline prompted FDNY officials to issue the warning about fatal consequences that could result from the misguided use of gasoline to battle bedbugs. "This is not the first time we have issued this warning," a fire spokesperson said. "We warn people over and over, just how dangerous it is to use gasoline or gasoline-based products in the home, but they don't listen." Sources said, "Gasoline is a highly explosive compound that could ignite, pop and start a fatal

Challenges in Bed Bug Control

Bed bugs are now common in Michigan's communities. Recent, high-profile, examples include schools, senior housing, and libraries.



- Education
- Identifying infestations early
- Infestations spreading to public institutions
- Pesticide resistance
- Promoting a coordinated, cooperative approach to bed bug control
- COST

Bed bugs on the rise

- Online survey consisting of 32 questions
- Participation requests mailed to 6972 contacts in the professional pest management industry
- 251 completed surveys (3.6% response rate)
- Respondents represented companies ranging in size from fewer than 10 individuals to thousands of employees

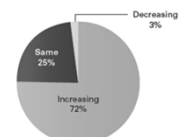


Potter et al. (2013)

Bed bugs on the rise

- 99.6% respondents indicated their company treated, or were asked to treat for bed bugs in the past year (95% in 2010)
- 72% respondents said infestations were increasing, 25% staying the same

FIGURE 3. OVER THE PAST YEAR, DO YOU FEEL THE INCIDENCE OF BED BUGS IN YOUR REGION IS ...?

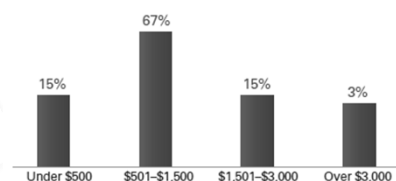


Bed bugs on the rise

Location	2013 response (%)	2010 response (%)
Apartments	98	90
Single family	96	90
Hotels/Motels	75	67
College dorms	47	35
Shelters	47	31
Nursing homes	46	25
Schools/Day cares	41	10
Office buildings	36	18
Hospitals	33	12
Doctor/outpatient clinics	26	23
Transportation	21	9

Cost

FIG 9. WHAT WAS THE AVERAGE AMOUNT YOUR RESIDENTIAL CUSTOMERS (SINGLE FAMILY HOMES) SPENT TREATING BED BUGS IN 2012?



So they can be anywhere, what is the most common way they spread?

One of the biggest reasons for bed bugs spreading is when people don't know about the risks, or when people don't acknowledge the infestation and report and/or treat that infestation.

The list below shows common ways that people can get bed bugs:

- Bringing used, uninspected and untreated items into the home
- Visiting a residence that has a bed bug infestation
- Staying in a hotel/motel that does not inspect or treat their rooms appropriately
- In multi-family housing, bed bugs will spread to adjacent units through visiting, on items, or through walls



So What is Working in Bed Bug Control?!



What NOT to do!

Do NOT:

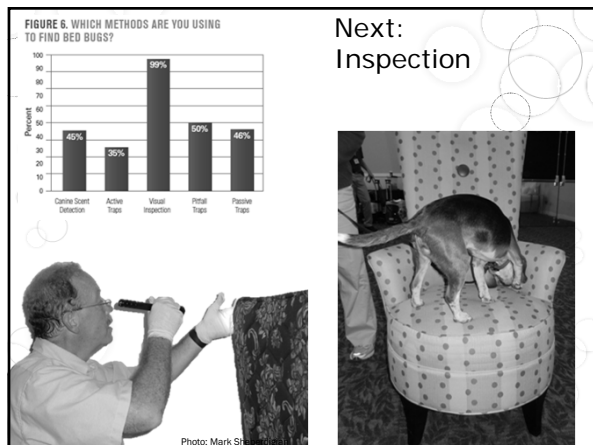
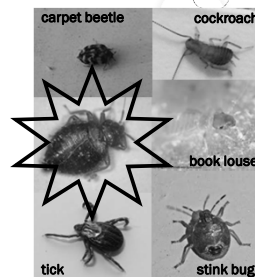
- Treat your home with any pesticide until you have identified a pest
- Immediately throw out your bed or other furniture
 - Most furniture can be treated and saved
 - If you simply replace furniture, bed bugs will infest the new furniture
- Purchase bug bombs for bed bug control
 - Bug bombs are not effective for bed bug control; they may spread bed bugs further
- Move out of your home or apartment
 - You will bring the bed bugs with you

FIRST:

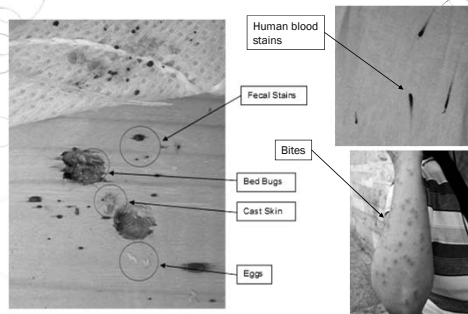
Make sure you really do have bed bugs

Which is the bedbug?

MSU Diagnostic Services (pestid.msu.edu) and many pest control companies may identify bed bugs for free.



Bed bug evidence



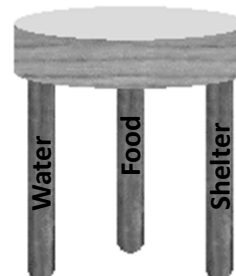
Integrated Pest Management

Seeks to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment

1. Inspect the home
2. Identify the pest
3. Prepare for treatment
4. Treat with safe and effective methods
5. Evaluate your progress

What All Pests Need

- Food
- Water
- Shelter



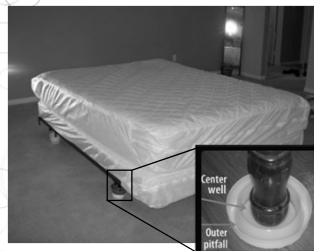
Deny them shelter: Physical removal of bed bugs

- The vacuum can be your best friend!
- Use a brush or crevice attachment with a scraping motion to dislodge bed bugs or eggs
- You can use a knee-high stocking to catch bed bugs in the vacuum hose before they go into the bag or canister
- Dispose of the vacuum bag or the canister contents in a sealed plastic bag outside!



Deny them food: Make your bed an island

Combine this technique with physical removal to deny bed bugs a victim. This can knock-down the population of bugs considerably.



- Move bed away from wall
- Clean bed frame and headboard/footboard
- Zippered encasements on mattress AND box spring
- Cups under legs of bed
- Freshly washed bedding
- that doesn't hang onto the floor

Before you treat for bed bugs, answer these questions:

- ☒ Is this treatment safe to use in this location?
- ☒ Do I have what I need to use this treatment safely?
- ☒ Will this treatment be effective in this location?



Deny them water: Control tactic - Heat

- Bed bugs are susceptible to high temperatures
- Temperatures above 118°F can be deadly within one minute!
- Clothes dryers can be very effective for soft items such as clothes, bedding, stuffed animals, etc.

Temp (C) (F)	Time (min)	% knockdown	% mortality
(49) 118.4	1	100	100
(47) 116.6	2.5	100	100
(45) 113.0	3.5	100	83
(43) 109.4	25	100	100
(41) 105.8	100	100	100

ROBERTO M. PEREIRA,1 PHILIP G. KOEHLER, MARGIE PRIESTER, AND WAYNE WALKER. Lethal Effects of Heat and Use of Localized Heat Treatment for Control of Bed Bug Infestations. J. Econ. Entomol. 102(3): 118201188 (2009)



Whole house treatment



Container treatment

Deny them water: Control tactic - Heat

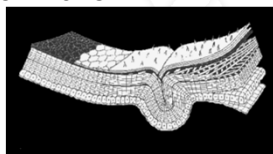
Advantages: Effective for treating moderate to heavy infestations, client cooperation is not as important as for other treatments, job done in one day, can treat almost anything (i.e. electronics, clothes)

Disadvantages: Expensive, need a crew to set-up and tear-down equipment, learning curve for efficacy, tenants need to leave room for extended period, fire suppression system questions, gives false sense of 100% kill

Best Situation to Use: Rooms that are NOT overly cluttered and that have > 25 bed bugs, or if reducing pesticide use is important

Deny them water:
Control tactic - Conventional Pesticides

DUST FORMULATIONS



Applying dusts to cracks and crevices in the room and furniture is the most effective form of insecticide treatment. Silica and diatomaceous earth dusts cause bed bugs to desiccate (dry out), and may be combined with neurotoxic chemicals.

Control tactic - Conventional Pesticides LIQUID FORMULATIONS



Liquid insecticides are also an option for areas where dusts are not recommended. Unfortunately, bed bugs are becoming resistant to many of the most commonly used liquid insecticides containing pyrethroid compounds. Pyrethroid compounds are synthetic versions of the natural insecticides produced by the Chrysanthemum flower.



Control tactics: Conventional Pesticides

Advantages: Effective for treating small to medium infestations, very economical, quickest treatment, leaves a residual (in some cases for a year or more--dusts)

Disadvantages: Will need to plan on at LEAST 2-3 follow-ups for control, treatment must be detailed, often requires tenant cooperation for success, resistance may be a factor, NOT all items can be treated (i.e. clothes, electronics)

Best Situation to Use: Infestations that were caught early on, or as a component in a more comprehensive treatment plan with other strategies

Treatment Challenge: Not All Living Spaces are Created Equal!



Control tactics - Vacuuming/Steaming



Steam can help to kill bed bugs hiding in structures or furniture:

- Steamer must be moved slowly to achieve upper thermal tolerance of bed bugs
- Steam penetrates cracks/crevices further than through plush/upholstered furniture
- Non-chemical technology



Vacuuming is a great, non-chemical way to eliminate bed bugs:

- Knock-down population of bugs when first detected
- Can be used repeatedly
- Must dispose of vacuum bag, or canister contents outdoors
- May want to "quarantine" vacuum while eradicating bed bugs
- Non-chemical technology

Control tactics - Vacuuming/Steaming

Advantages: Reusable and very cheap after initial investment, non-chemical control technique (sensitive areas)

Disadvantages: Not likely to provide 100% control, minimal penetration into materials, time consuming, disposal concerns (for vacuum), can't treat electronic items (steam)

Best Situation to Use: Heavy infestations to reduce them to a more manageable size, a suspected introduction before there is a breeding population, or a tiny newly-established infestation as the sole control technique (with follow-up monitoring, of course!)

Control tactic - Monitor traps



Control Tactics: Monitor traps

Advantages: Reusable, available to catch bugs 24/7, can prevent early introductions from becoming infestations, (may be cheap)

Disadvantages: Require resident cooperation for effectiveness, can NOT tell with 100% accuracy if bugs are present or not, don't fit under all furniture/beds, will **not** likely establish control when used alone, not aesthetically pleasing, numerous visits to check them if part of a program (may be expensive)

Best Situation to Use: Whenever possible! Especially when bed bugs are suspected of being in more than one unit

Responding to bed bug complaints: Sample Scenarios

Scenario #1



- You receive a complaint from a local apartment tenant that there is a bed bug infestation in their building. The entire household (including two young children) have received bites, and they have found several live bed bugs. The tenant suspects that the unit next door is also infested. The tenant reports that when she complained to the landlord, he gave them a 6 pack of "bug bombs" and told them to throw away their beds. The family would like to move out, but they cannot afford to do so at this time.

Several issues to consider

- Prevent dangerous misuse of pesticides
 - Bug bombs are not appropriate for bed bugs
 - Young children are particularly vulnerable to pesticide misuse
- Make sure the landlord/property manager has been told
 - May need to help educate the landlord
 - Encourage neighbors to also report
- Suggest measures to improve the temporary living situation
 - Launder bedding, vacuum, isolate the bed (don't need to throw beds away)
 - Avoid spreading bed bugs when you go out
- Recommend keeping records/documentation regarding landlord-tenant interactions and what has been done
 - Will be useful if enforcement or legal counsel gets involved
- Refer them to local housing code enforcement or other appropriate authorities
 - VERY HELPFUL to compile a list of local enforcement agencies

What NOT to do!

- Treat a home with any pesticide until you have identified a pest
- Immediately throw out the bed or other furniture
 - Most furniture can be treated and saved
 - If you simply replace furniture, bed bugs will infest the new furniture
- Purchase bug bombs for bed bug control
 - Bug bombs are not effective for bed bug control; they may spread bed bugs further
- Move out of your home or apartment
 - You will bring the bed bugs with you

Agencies who may be able to help

- Owner of the infested building
- Local buildings dept or code enforcement office
- Local housing authority
- Federal HUD
- LARA
- MDARD
- Michigan Attorney General
- Local health department
- Your state representative



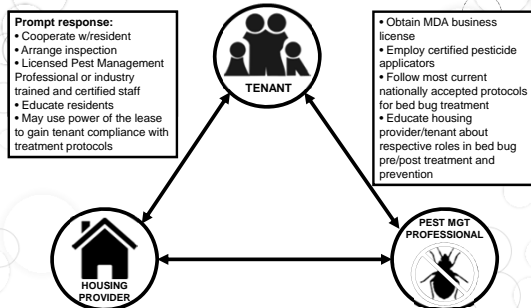
Helping clients with bed bugs

- Subsidized Housing
 - Alert the landlord or property manager first
 - If you feel you are not getting appropriate services, you may wish to call your Section 8 or subsidy granting agency for assistance
 - Local code compliance or buildings and safety office in your city/township to file a complaint
 - REMEMBER that cooperation is necessary for bed bug control
- Market rentals
 - Alert the landlord or property manager first
 - If response is inadequate, contact the local code compliance or buildings and safety office in your city/township to file a complaint
 - REMEMBER that cooperation is necessary for bed bug control

Helping clients with bed bugs

- Homeowners (non-rental housing)
 - May be eligible for State Emergency Relief (SER)
 - Homeowners are the ONLY group that can try to treat themselves
- Facilities (nursing home, long-term care facility, adult foster care, or other)
 - Contact the facility management about the bed bugs
 - If response is inadequate, contact the local code compliance or buildings and safety office in your city/township to file a complaint
 - You may also contact the appropriate regulatory/licensing department at the State level. www.michigan.gov/lara
 - REMEMBER that cooperation is necessary for bed bug control

Managing bed bugs in multi-unit housing requires cooperation



Scenario #2



- You receive a complaint about bed bugs in a local hotel. A traveler who was visiting the area stayed in the hotel, and woke up the next morning with bites which he assumed were from mosquitos. After returning home, the traveler was told by a friend that the bites looked like they were from bed bugs. The traveler calls the local health department to report that the hotel is infested.

Several issues to consider

- Is this really bed bugs?
 - Can't tell for sure from bites alone
- Has the hotel been notified? How did they respond?
 - Most hotels take bed bug complaints seriously
 - At minimum, the room should be inspected
- No state-level regulation of hotel rooms
 - Local health departments can choose to respond
 - Team up with local housing code enforcement
- What about the traveler's home?

Scenario #3

- Your health department has received several complaints of bed bug bites from tenants of a Michigan Department of Corrections residential work-release center. The tenants report that the center has had a serious bed bug infestation for several months. A follow-up call with MDCH reveals that they have also received calls regarding the facility.



Several issues to consider

- Is there confirmed presence of bed bugs?
- Has the facility management been made aware of the problem?
- What is the facility doing to address the problem?
 - Does their approach seem to be working?
- Some populations are particularly vulnerable since they do not have any housing choice
- If there is inadequate response on the facilities' part, is there a licensing agency/regulatory agency that may be able to "encourage" compliance?

Role of Local Health Departments

- Often, multiple agencies try to foist these problems onto each other
- It often takes a team approach to address an infestation
 - Local health departments have broad authority
 - Licensing or regulatory agencies may also have authority
 - May need someone else with expertise on bed bugs
- There are several examples where this approach has been used successfully in Michigan!

How can I avoid bed bugs during home visits?

- Plan ahead
- Ask the client if there are bed bugs in the home
- Bring as few items as possible into the home
- Avoid the most high-risk areas of the home (bedrooms, couches, etc.)
- Check your shoes, clothing, and belongings after leaving
- Help clients with infestations to get treatment



Online information and resources

MICHIGAN

www.michigan.gov/bedbugs



NATIONAL

www.epa.gov



The Bed Bug Information Clearinghouse

The information on this page is intended to help states, communities, and consumers in effort to control bed bug infestations. We want you to get the best information that is available on the bug without risk to a variety of sources.

How We Choose What to Include in the Clearinghouse

The Bed Bug Information Clearinghouse currently includes only material from:

- Federal agencies
- State and local governments
- Educational institutions
- Universities

When reviewing material for inclusion in the Clearinghouse, we consider:

- The accuracy of information
- The timeliness of the information
- The appropriateness of the audience
- How well the information is communicated, i.e., clarity of language, graphics, format

If you would like us to consider including your material in the Bed Bug Information Clearinghouse