Bed Bugs are Back!

Photo by Gary D. Alpert, PhD, Harvard University

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Environmental Health Services
Washoe County Health District
Early Origins

Early man likely picked up bugs in caves cohabited with bats

Fossilized bugs have been found at archaeological sites dating back 3550 years. – Egypt

Genetic analysis indicates split between bat bugs and bed bugs may have occurred as far back as *Homo neanderthalensis/Homo erectus* (Balvin 2011)
Bed Bug History

Bed bugs were probably more of an issue for permanent settlements as opposed to nomadic tribes.

As civilization spread so did the bugs.

With the development and implementation of modern heating methods such as radiators, forced air, electric fans, etc. residences became the perfect environment for bed bugs to thrive year round.
By the 1930s and 1940s bed bugs had the potential to become a community wide problem.

It has been estimated that up to 1/3 of households in Europe had some degree of infestation by this time.
Bed Bug History

With the development of pesticides such as DDT and Malathion bed bugs were virtually eliminated in the U.S. following WWII.
Why the resurgence?

Insecticide Resistance?

→ many pesticides are no longer effective against bed bugs, many populations are **highly resistant to pyrethroid based insecticides** *

→ reports of resistance to DDT noted as early as the 1940s**


Why the resurgence?

Increased international travel?

→ Infestations first appeared in hotels

Move from spray pesticides to bait pesticides for roaches, ants, etc.?

→ Sprays provided some control of “non-target” pests and also left a residual

→ Some organophosphates and carbamates effective against bed bugs

NOT APPROVED FOR INDOOR USE!!!!
Infestations on the Rise


Washoe County Health District Environmental Health Services permitted hotels/motel complaints doubled in 2005 due to bed bug calls.
Where are infestations showing up?

- hotels and motels
- multi-family housing
- single family homes
- homeless shelters
- assisted living centers
- hospitals
- university dorms
- public transit
- nursing homes
- child care facilities
- public schools
- movie theaters
- laundromats
- dry cleaners
**Bed Bug Biology**

**Life Cycle of the Bed Bug**

- **Egg**: 1mm long, takes a blood meal then molts.
- **First Stage Larva**: 1.5mm long, takes a blood meal then molts.
- **Second Stage Larva**: 2mm long, takes a blood meal then molts.
- **Third Stage Larva**: 2.5mm long, takes a blood meal then molts.
- **Fourth Stage Larva**: 3mm long, takes a blood meal then molts.
- **Fifth Stage Larva**: 4.5mm long, takes a blood meal then molts.
- **Adult**: 5.5mm long, take repeated blood meals over several weeks. Females lay up to 5 eggs per day, continuously.

*Image* © 2007, J. Austin, Texas A&M University
Maturation rate depends on the temperature
5 weeks to 4 months

At 70 F., 40 adult bed bugs in a room on May 2 will multiply to 5,905 bugs by Nov. 2. (M. Potter, 2007)
Adult bugs

- reddish brown, size of a lentil
- flat as a credit card when unfed
- after feeding, increase in size with elongated, rounded abdomen
Bite Reactions Vary

→ Usually show up as welts
→ Some individuals show no welts (30% to 50%)
→ Welts may not show up for 4-5 days post-bite
Delayed reaction (> 24 hours)
Some biting facts

→ Host does not feel the bite
→ Feeding completed in 3 – 15 minutes
→ Takes a blood meal every 3 – 7 days
→ Most active from 1 am to 6 am
→ Adults can live more than a year without feeding
More biting facts

- Line feeding often noted
- Bugs may probe more than once to find a capillary.
- Bites may look like a rash (multiple probing shows up as tiny, red marks)

- Can travel up to 100 feet in a night but are usually found within 8 feet of host sleeping area.

Photo by Keah Schuenemann, Colorado University at Boulder

Photo by Gary D. Alpert, Harvard University
Bites from heavy infestations

Fletcher et al. 2002
Public Health Issues

→ Not known to vector any disease at this time.

→ Secondary infection possible from scratching, e.g. MRSA *(Burnett, 1986)*

→ Anaphylaxis *(Thomas 2004)*

→ Potential for blood from killed bugs to transmit hepatitis B virus (7 days) and hepatitis C virus (4 days)

Killed bugs only, not bites
Reported associated health problems include discomfort, psychological stress, loss of sleep, exacerbation of cardiac problems, indigestion, etc.
Accurate Identification is Critical
Other biting insects can be found in the home:

- Spider
- Mosquito
- Bat bug
- Flea
- Tick
- Body lice
Related Species

Cimex pilosellus
“Bat Bug”

Cimex lectularius
“Common Bed Bug”

Oeciacus vicarius
“Swallow Bug”
“Bat Bugs”

“Bat bug” – a close relative of the Bed bug.

*Cimex pilosellus* in western US

*Pipistrellus hesperus*  
(Western Pipistrelle bat)  
Collected in Carson City, NV 2011
Don’t diagnose on bites

Bed bug bites can look like bites from other insects.
**Delusions of Parasitosis**

**Ekbom’s Syndrome**

- **Toxic Psychosis** – Usually drug induced (Methamphetamine)
  Removal of the cause removes symptoms

- **Paranoia or Melancholia** – Sometimes induced by onset of menopause or stress. Delusion can become “fixed” with poor prognosis
Locating bugs can be difficult

- Identification of the bugs confirms the source of the problem
- Get professional identification. e.g. health department, pest control operator (PCO), agriculture department, cooperative extension service, etc.
Bed bug signs that you might see

- Fecal spots
- Blood smears
- Cast skins (5 molts)
- Adult bugs
- Nymphal bugs
- Eggs
The most common signs

Cast skins

Rusty blood smears

Fecal spotting

Photos by J. Austin, Texas A & M University
The most difficult to see

Eggs and egg cases

First stage nymph

1 mm long grain of rice cemented in place

“Dust that moves”

The size of a small speck of dust
Where they hide

mattresses and box springs

Inside a recessed screw cavity

behind base molding

2004, M. Potter, U. of Kentucky

copyright, 2004 M. Potter University of Kentucky
Eggs and first stage nymphs in a furniture fold
More hiding places

Stuffed furniture

Clutter under and around beds
In low level infestations

Bugs are especially difficult to identify

People often think they are being bitten by mosquitoes, spiders, or fleas

Nymphal bed bug feeding
Seem to appear suddenly in a living space, especially bed rooms or where people sleep
“Brood Center”

Concentrated pockets with bugs, fecal stains, eggs, egg cases, and cast skins
“Sometimes it is possible to destroy a light infestation by thorough soaking of the bed and other places with high-test gasoline.” (Hunter, 1938)

NOT RECOMMENDED!!!

Always Use Registered Products!

Read and Follow the Labeled Directions!

Use Precautions!
Control and prevention

Established infestations are extremely difficult to eradicate

With full tenant cooperation, complete bed bug elimination ~88% of the time

Without cooperation ~12% of the time
Control and Prevention

Early identification is essential to effective prevention and control!
Control and Prevention

Inspect for bugs pre and post treatment

A good apartment inspection typically takes 1 to 2 hours

A small cluster of bugs, a few eggs or a few nymphs cannot be missed
Control and Prevention
Zippered encasements for mattress and box springs
Control and Prevention

→ Metal bed frames – less favorable to bed bugs
→ Keep clutter to a minimum in the bedroom
Interceptors

Bed bugs
don’t jump or fly

Place mineral oil or
food grade DE in tray
**Control and prevention**

Don’t remove dwellers from their living space!

The bugs can (and will) migrate to find a new host.

Single family homes have been encased and fumigated up to 4 times and still have bed bugs.
Control and Prevention

hot steam – use in cracks of furniture and mattress folds

vacuum – bag and dispose of contents in outdoor trash
Control and prevention

The mattress and bed spring –
To throw away or not throw away?

→ Use best judgment. Holes? Tears? Brooding site?
→ If the mattress must go, treat it first
→ Wrap in plastic to carry to dumpster
→ Spray paint “Bed Bugs” on infested items
→ Lock the dumpster
Control and prevention

Bag up clutter for treatment and removal

Bag up all clothing, bedding, rugs, drapes and wash in hot water

Good room preparation is the key to successful control!
Control and prevention

Wash bedding, clothes, etc. in hot water and dry on high heat.

Put tennis shoes, back packs in a dyer at medium heat for at least 5 minutes.

Do this while room is being treated.
Non-Chemical Control

→ Heat treatments
  Heat chambers or whole room/unit
  Temperatures must reach
  ~113° F to kill nymphs/adults
  ~115° F to kill eggs

→ Cold treatments
  Death point variable,
  ~0° F

→ Carbon Dioxide (atmospheric)
  30% CO₂ for 24 hours at 77°F (Wang et. al. 2012)
Chemical Control

Use an integrated approach (IPM)

→ Due to resistance already developed pesticides should be viewed as the last means of control.
→ Pesticides should only be applied after other means of control have been implemented.

Know your products
→ Read the label
→ Read the MSDS
→ Apply accordingly

http://cfpub.epa.gov/oppref/bedbug/
In hotels, motels, and apartments, all rooms surrounding infested area should be treated.
The biggest obstacle to effective control...

Clutter!
The Health District standard for determining if a room is bed bug free

No bites and no bugs for 60 days post-treatment!
Bed bugs are expert hitchhikers

2004, M. Potter, U. of Kentucky
Protect Yourself

Minimize what you take in the room with you
Protect Yourself

Don’t sit on a bed, sofa, or soft chair.

Find a hard surface to sit on.
Protect Yourself

Leave items in a black plastic garbage bag in the hot sun.

Wash in hot water or place in dryer at medium heat for 5 minutes.
Protect Yourself

Luggage Rack

Suitcase Encasement
Future of Bed Bugs...

Infestations will be common for the foreseeable future

→ Lack of effective pesticides with residual

→ Lack of knowledge

→ Many pesticides no longer approved for indoor use

→ Greater percentage of population on fixed income
Future of Bed Bugs...

→ Non-Chemical Control
  • Heat, cold, CO₂, encasements, interceptors, etc.

NRS 118a
Units must be bed bug free at time of commencement

→ Bed Bug language in lease agreements
Future of Bed Bugs...

- Infestations will continue to be most common in low income multi-unit housing
  - Often lower profit margins for PCOs
  - Treatments can be expensive
  - Time consuming
If it’s stupid and it works, it isn’t stupid
If An Emergency Should Occur ……

Please Call Us.

We Can Help.
Questions?