Bed Bugs

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Bed Bugs

Bed bugs are True bugs in the Order Hemiptera

- Belong to the Family Cimicidae, all cimicids are obligate blood feeders. Includes bed bugs, bat bugs and swallow bugs.

- Bed bugs probably lived in caves and fed on birds, bats and probably any warm blooded animal that slept in a cave.

- Bed bugs added humans to their host list when humans climbed out of trees and moved in caves.

- They have been feeding on us ever since and we have transported bed bugs all over the world.
Bed Bugs

May be confused with Bat bugs

Bed bugs and Bat bugs are nearly identical.

The length of the hairs on the lateral margins of the prothorax will separate them.
Bed Bugs

Bed Bug Resurgence

Common pest in the US at the turn of the century.

Essentially eradicated from homes in 1940-50 due to DDT, but probably survived in bat roosts and chicken houses.

Resurgence began in late 1990’s.

Epidemic proportions by mid-oughts (2000’s).

Resistance documented to DDT, malathion, carbamates and pyrethroids.
Bed Bugs

Doonesbury November 18, 2010

Bed Bugs are now common media stars
Bed Bugs

Why are Bed bugs back?

• International travel?

• Switch to baits for controlling roaches and ants?

• Insecticide resistance?

• Build up of bed bug “reservoirs” in motels, apartment buildings, etc.

• One survey of PCO’s pointed to foreigners as the #1 reason for bed bug resurgence, which is not true as there were enough bed bugs here in the good ol’ US of A to seed the epidemic.

World–wide resurgence: Pest control operators report a 100-500% increase in bed bug jobs in US, Europe, and Singapore.
Bed Bug behavior

- They are obligate parasites – they suck our blood which is their only source of nutrition and water.

- Aggregate in cracks and crevices digesting their meals.

- Most will be located within 5 feet of bed or where people sleep but some will travel many yards to get to a host.

- If hungry they usually become active between midnight and 5:00 am, but will feed during the day if starved and host is present.

- Stimulated by increase of CO$_2$ in the room.
Bed Bugs

Bed Bug Feeding

• Prefer to bite without crawling on host.

• Probe the skin to find a capillary space that allows the blood to flow rapidly.

• May probe the skin several times before feeding.

• Feeds for 5-10 minutes.

• After feeding, leaves the host to hide, digest meal and mate.

• Bed bugs usually feed every 3-7 days.

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Biology

• Most of the time, the majority of the population is hiding and digesting their last meal.

• Old literature claims that adults live for 1 year without feeding.

• However, recent research indicates that all life stages live only ~70 days without feeding.

• However, they can live longer at cool temperatures <40º F.

May void part of previous meal while feeding
Mating Behavior

• Right after adults take a blood meal they become very interested in mating, particularly the males.

• Mating is accomplished through traumatic insemination as females do not have genital openings.

• The male punctures the female’s exoskeleton near a specialized organ on her right side, called the Organ of Berlese.

• Females may be mated with as many as 5 different males.

• Females can begin to produce eggs within one day of mating.
Bed Bugs

Consequences of traumatic insemination

The female’s body must heal from this wound.

Females are known to leave aggregations to avoid amorous males and repeated matings.

The process of healing from mating has an impact on the female’s ability to produce eggs. Females that mate only once will produce 25% more eggs than females that are mated repeatedly.
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Why is this important?

• A single mated female brought into a home can start an infestation without a male being present.

• She will continue to lay eggs as long as she has regular blood meals.

• The female will eventually run out of sperm, and will have to mate again to fertilize her eggs.

• However, she is incestuous and will mate with her own sons when they become adults.
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Egg Production

• The total number of eggs a female can produce is dependent on feeding frequency.

• After taking a blood meal the females produce 5-20 eggs over the course of 10 days.

• She can not reproduce again without feeding.

These eggs are about to hatch (~5 days old). You can see the eye spots of the developing nymphs.
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Population Growth

• Eggs can be laid singly or in groups.

• Over 95% of all eggs will hatch successfully.

• Females in the laboratory begin to die after about 9 feedings.

• Average female produces ~113 eggs in her lifetime (older literature says 500).

• Under optimal conditions the population can double in ~16 days.

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Why is this important?

Bite rates:

If bed bugs feed every 7 days then victims can be expected to be bitten 10 times a night when only 70 bed bugs present.

If 350 bed bugs are present then victims can expect to be bitten 50 times a night.

Heavy infestations of bed bugs can number in the thousands.

It’s enough to give one the willies for sure.
Newly hatched nymphs will need a blood meal within ~ 3 days before they start to die.

- The early death is most likely due to dehydration (moisture loss) rather than starvation.

- Many first instars probably die because their egg was laid too far from a host.

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Bed Bug Basics

Bed bug lifecycle

Bed bugs go through 5 nymphal stages called instars before they become adults.

Each instar or stage requires a blood meal to molt to the next stage. If no host present it does not molt.

Each instar takes about 5-8 days before molting to the next stage.

First instar nymph to adult in ~37 days.

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**Bed Bugs**

**Adult Life Span**

- Under laboratory conditions an adult bed bug at >70º F will live between 99 and 300 days.

- We do not know how long a bed bug will live in someone’s home or apartment (several months).

- Conditions are difficult in human dwellings (finding food, temperature and humidity, insecticides, being crushed etc.).

- Resistant bed bugs have shorter life spans and reproduce less than non-resistant bugs.
The Signs of Bed Bug Presence

• Bed bugs are brought in via traveling, visitors or used furniture.

• First indicator is usually unexplained itchy red welts.

• Tiny brownish-red stains (bed bug excrement) on light colored sheets.

• Bites suggest bed bugs but are not definitive.

• First bite requires 10-14 days for reaction to occur, bites react faster after that.
Bed Bugs
Bite Reactions (the first indicator)

30% of those bitten do not react although some may develop severe reactions with successive bites.
Bed bugs can be hard to find therefore inspections need to be comprehensive and intensive.
Bed Bugs

Bed Bug Evidence

Look for bugs, fecal spots, molts (cast skins) and eggs near where people sleep.

• Mattress seams and along mattress piping, especially at the corners.

• Between mattress and box springs.

• Wood frame of the box springs.

• Behind the head board.

• Along the tops of baseboards and cracks between walls and baseboards.

• In the crack between carpet edge and baseboards.
Bed Bug Evidence – where to look

• Crack in walls, ceilings and floors.

• Night stands, bookshelves and other furniture near bed.

• Ceiling/wall corners.

• Behind pictures on the wall, especially those above the bed.

• At and behind electrical outlet covers and switch plates.

• In curtain seams and folds.

• Cracks along window/door frames and trim.

This fecal smears are blood that has gone through the gut of the bed bug.

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Bed Bug Evidence

• In a new infestation, bed bug evidence may be very hard to find because of small numbers of bed bugs present.

• If nymphs are present, there is always the potential to find molted skins.

• The molted skins can be found in bed bug aggregations or by themselves.

Fecal stains on the backside on a headboard

An accumulation of light colored cast skins on carpet.
Why bed bugs are difficult to control?

• They are resistant to most insecticides (pyrethroids) used against them.

• Most products (pyrethroids) do not provide residual activity – product needs to be sprayed directly on the bed bugs in order to kill them.

• No insecticide spray will kill bed bug eggs.

• Most products (pyrethroids) available to homeowners at box stores and local hardware stores have limited effectiveness.
Bed Bugs

Why bed bugs are difficult to control?

• Most do-it-yourselfers do not have proper training in bed bug control.

• Bed bugs hide deep in cracks, crevices, hidden nooks and crannies most of the time.
Bed Bugs

Why bed bugs are difficult to control?

- Our homes are cluttered with our belongings.
- Our homes can be messy.

The first step in any bed bug control effort should be clutter removal and/or organization followed by a thorough cleaning of the dwelling with special emphasis on the bedrooms or other areas where people sleep.
Why bed bugs are difficult to control?

• Control efforts may not be comprehensive – detailed inspections are needed to determine where bed bugs are hiding.

• All of their hiding places need to be discovered and treated persistently.
Bed Bugs

Why bed bugs are difficult to control?

Control efforts may not be aggressive enough.

• Rarely, if ever, are bed bugs controlled with a single insecticide application.

• Bed bug treatments need to be repeated at two week intervals to kill newly hatched nymphs until infestation is eradicated.

• Problem populations require multiple tactics including insecticides, steam or heat treatments.
Bed Bug Basics

Preventing Bed Bugs

Bed bugs cannot fly. They have to be brought into homes.

Do not bring used mattresses and box springs home.

Do not bring used furniture home.

If you discard bed bug infested furniture, then please use a can of red spray paint and mark it with

BED BUGS

so others don’t salvage infested furniture.

Discreetly discuss with over night visitors any bed bug problems they might have. This can be a touchy subject. Inspect bedrooms after they visit.
Bed Bug Basics

Preventing Bed Bugs

Be alert when traveling!

Inspect Hotel/Motel Rooms before unpacking.

Most will be in or near the bed.

Roll back the bedding
Inspect Mattress & Box springs
Inspect Headboards
Inspect Artwork above the bed
Inspect Bed side tables

Inspect closets before hanging up clothes.

Don’t use drawers – keep your items in your suitcase.

Place suitcases in large garbage bags that cinch/ close tightly – keep bagged suitcases in bathroom over night.
Bed Bugs

Immediate relief from bed bug bites in an infested dwelling.

Thoroughly vacuum or otherwise clean the mattress, box springs, frame and headboard to remove bed bugs and their eggs.

This requires an intensive inspection effort and a persistent attention to detail.

Bed bugs will survive inside the vacuum so be sure to remove vacuum cleaner bag and discard it in a tightly seal plastic bag.
Immediate relief from bed bug bites in an infested dwelling.

Place bedding in dryer at high setting (140 °F) for 40 minutes. Bedding does not need to washed to kill bed bugs.

Bed cleaning and bedding drying should be repeated weekly until numbers of bites subside and all bed bugs are removed.
Bed Bugs

Immediate relief from bed bug bites in an infested dwelling.

Use mattress covers and box spring covers to keep hidden bed bugs inside the cover and away from sleeping food items.
Bed Bugs

Immediate relief from bed bug bites in an infested dwelling.

Use traps under bed frame legs to keep bed bugs from climbing onto bed. Keep bed away from walls and furniture.

The ClimbUp® insect interceptor forms a barrier between floor and bed. Bed bugs approaching bed from room will climb up exterior surface and fall into the outer pitfall ring. Bed bugs climbing down from bed will be found in center well.

Keep bed and bedding from touching walls, floors and nearby furniture to prevent bed bugs from migrating to bed.
Dr. Philip G. Koehler with the Department of Entomology & Nematology at the University of Florida, offers the following checklist on how to leave the bed bugs behind for residents temporarily leaving their dwelling for bed bug treatment.

• Take as few items as possible when leaving the residence for the bed bug treatment.

• Place all items in sealed tubs or plastic garbage bags.

• For all fabric items that will be taken out of the residence, place in dryer with high heat (140°F) before returning them to the residence.

• Do not return any boxes, suitcases, back packs, gym bags, or any similar items that came from the infested residence to pack belongings.

• Do not place washed or packed items on furniture (beds, sofas, dressers, tables, etc.) or flooring (carpets or rugs) that may be infested with bed bugs.

• Make sure bed bugs are not in pet cages and pet bedding.
See an excellent presentation on bed bugs by Dr. Koehler including some new products he’s testing to control bed bugs at:

http://entnemdept.ifas.ufl.edu/sepmc/SEPMC2011/Meeting_Handouts_files/BedbugsInUS-1.pdf