



Bed Bugs 101

MARY SCHNEIDER



ALASKA NATIVE
TRIBAL HEALTH
CONSORTIUM

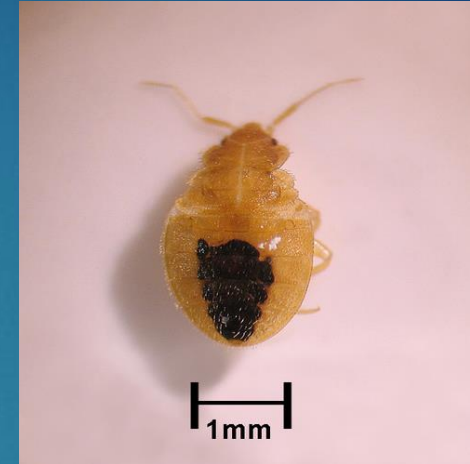
Which of these are bed bugs?



<https://entomology.ca.uky.edu/ef636>



<http://bedbugmutts.com/bed-bug-pictures/65hs9116m8zmkv0n92xnykf2fhy1m1>



<http://bedbugmutts.com/bed-bug-pictures/65hs9116m8zmkv0n92xnykf2fhy1m1>



http://solutionsforyourlife.ufl.edu/bed_bugs/identifyimg.shtml



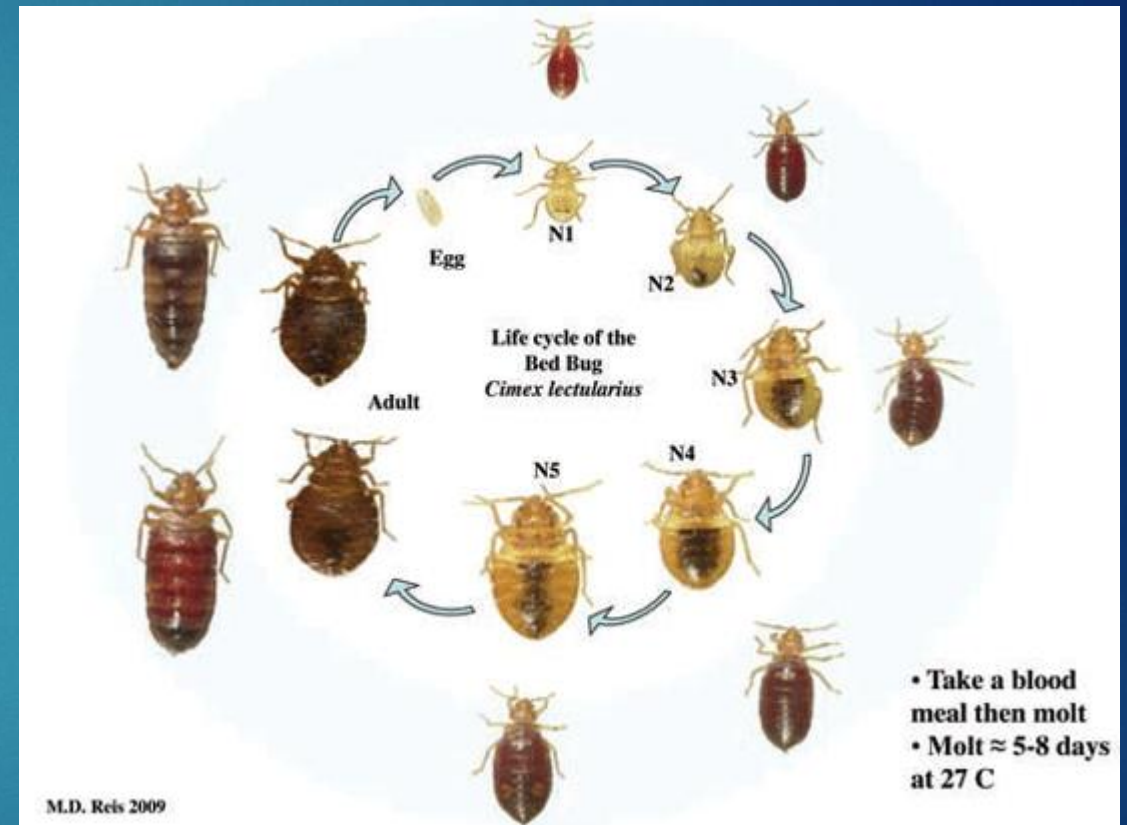
<http://www.bedbugs-cincinnati.com/cincinnati-bed-bug-treatment.html>



<http://www.bed-bugs-handbook.com/picture-of-bed-bugs.html>

Bed Bug Lifecycle

- ▶ 5 developmental stages before becoming an adult
- ▶ Must eat before moving to the next stage
- ▶ Shed their exoskeleton between life stages
- ▶ Egg to an adult in about 37 days (in optimal temperatures)
- ▶ Adults have life span of about 1 year
- ▶ On average bed bugs will die within 70 days without food (maybe longer in cooler temperatures)



Bed Bug Lifecycle



Mating Behavior



- ▶ Unique method of mating called traumatic insemination
- ▶ Females that mate only once will produce 25% more eggs than females that are mated repeatedly
- ▶ **A single mated female brought into a home can cause an infestation without having a male present**
- ▶ Female will eventually run out of sperm and have to mate again to fertilize her eggs

Egg Production

- ▶ Must have a blood meal to produce eggs
- ▶ Produces 1-7 eggs per day for about 10 days after a single blood meal
- ▶ Will not reproduce again without feeding
- ▶ In optimal conditions, 97% of eggs hatch successfully
- ▶ Bed bug population can double every 16 days
- ▶ Lab studies show that more than 80% of all eggs survive to become reproductive adults



Feeding Behavior

- ▶ Come out from hiding to eat, typically at night
- ▶ Attracted to CO₂ and heat
- ▶ Probe skin several times before finding good bloodflow, resulting in several bites from same bug
- ▶ Feed for 5-10 minutes
- ▶ Spend most of their time in hiding, digesting food
- ▶ Usually feed every 3-7 days



<http://www.thesocialsilo.com/2012/12/07/bed-bugs-its-war/>

Bed Bug Bites

- ▶ Bites suggest bed bugs but are not definitive
- ▶ One study found only 30% had a reaction to bed bug bite
- ▶ Another study indicated that 96% had reactions
- ▶ Reaction will vary depending on your immune system and number of bites
- ▶ More evidence is needed than bites to confirm bed bugs



<http://bedbugbites.xyz/bed-bug-bites-pictures/>



<http://eastsideexterminators.biz/bed-bugs/bed-bug-bites.html>

Bed Bug Bites

- My technician's arm one week after feeding **1000s** of bed bugs.



- My arm one week after feeding **60** 2-3rd instar bed bugs.



- My student's arm **1 year** after feeding mixed stage bed bugs.



Bed Bug Evidence– Fecal Spots

- ▶ Blood that has been digested by bed bugs AKA bed bug poop
- ▶ Mattress seams and box spring
- ▶ Bed frame/behind headboard
- ▶ Along tops of baseboards
- ▶ Wall junctures and ceiling
- ▶ Behind pictures on the wall
- ▶ At & behind electrical outlets
- ▶ In curtain seems



<https://bedbugscontrol.wordpress.com/2013/02/04/bed-bugs-on-the-ceiling/>



<http://www.vdacs.virginia.gov/pdf/bb-millerbasics.pdf>



www.bed-bugs.com



http://www.apexpestcontrol.net/?page_id=1320

Bed Bug Evidence– Molted Skins & Bugs

- ▶ Molted skins found in bed bug aggregations or by themselves
- ▶ In a new infestation, bed bug evidence may be very hard to find
- ▶ Only way to confirm an active bed bug infestation is to positively identify actual bed bugs



<http://www.ennypestcontrol.com/bed-bugs.html>



<http://www.vdacs.virginia.gov/pdf/bb-millerbasics.pdf>



<http://www.ennypestcontrol.com/bed-bugs.html>

How bed bugs get into our homes

- ▶ Hitch hiker bug!
- ▶ Travel
- ▶ Used furniture
- ▶ Bed Bugs don't discriminate against rich or poor, clean or dirty



<http://www.nkyhealth.org/Prevent-Bed-Bugs-at-Home.aspx>



<http://www.vdacs.virginia.gov/pdf/bb-millermethods.pdf>

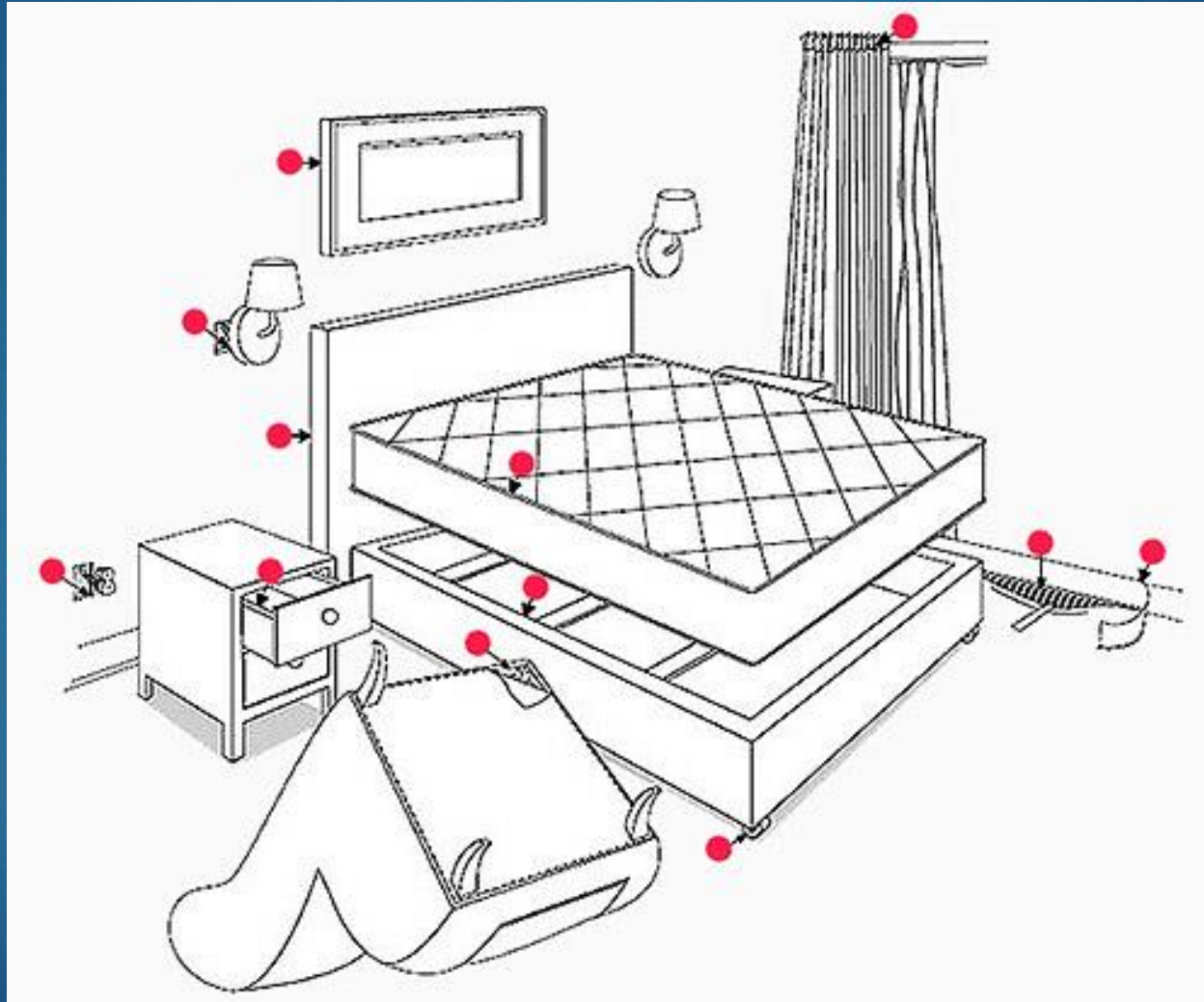


<http://www.bloomberg.com/news/articles/2014-04-03/>

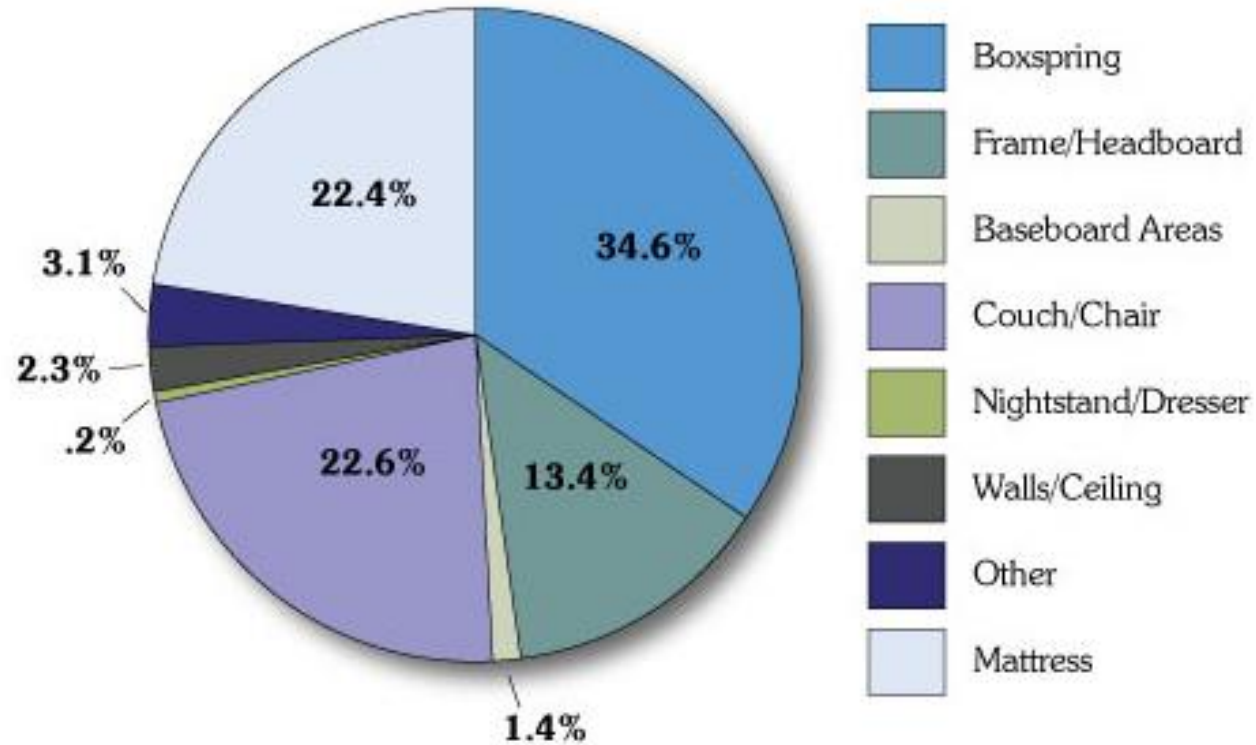
Health Effects

- ▶ Not known to transmit diseases
- ▶ Itching may lead to excessive scratching that may lead to a skin infection
- ▶ Stress
 - ▶ Sleeplessness
 - ▶ Destruction of self-image
 - ▶ Throwing out belongings
- ▶ Misusing pesticides

Inspecting for bed bugs



BED BUG HIDING SPOTS



Distribution of bed bugs found in 13 infested apartments

Source: University of Kentucky

Inspecting for bed bugs



<http://www.bedbugcentral.com/bedbugs101/early-detection>



<http://ehs.iu.edu/topics/pest-management/bed-bugs/>



Copyright © 2011 PJB Pest Management Consulting, LLC.

http://www.bedbuggeneral.com/Professional_Bed_Bug_Inspection_s/98.htm



<http://www.bedbugbully.com/inspect-bed-bugs-boxspring/>



<http://www.bedbugbully.com/detox-your-home-of-bed-bugs-in-20-steps/>

Prevention while traveling

- ▶ Inspect the mattress and box spring
- ▶ If possible, remove the headboard from the wall and inspect the back of it
- ▶ Inspect the luggage stand and place your luggage on it
- ▶ Keep your clothing in your bag; do not place belongings in drawers



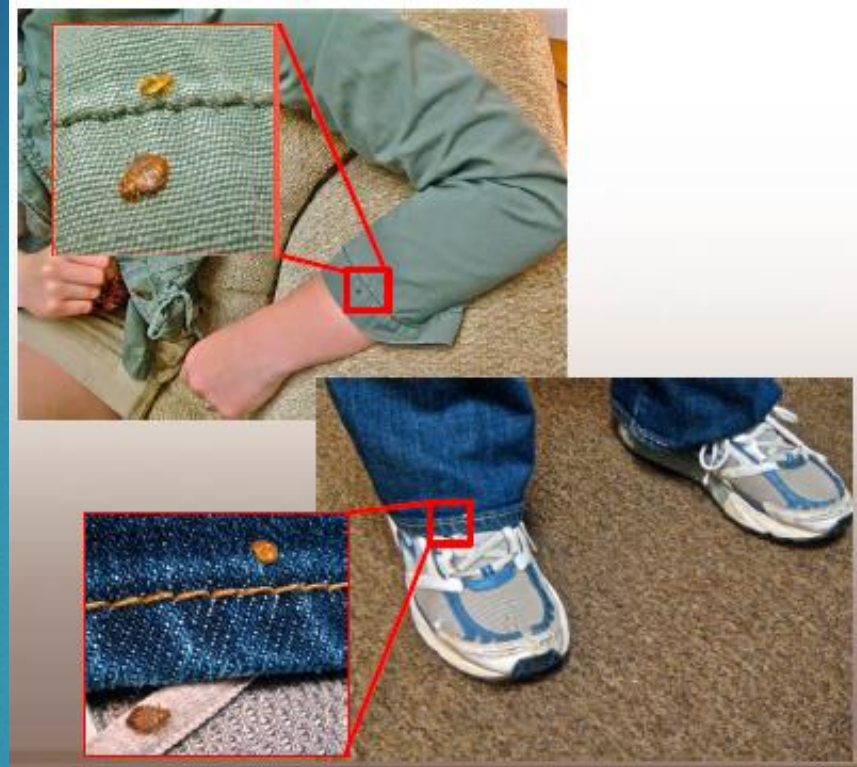
Protecting your home

- ▶ Upon returning home, unpack your luggage immediately
- ▶ Launder all your clothing and dry on high heat for at least 30 minutes
- ▶ 122°F will kill eggs and all bugs
- ▶ Inspect your bag
- ▶ Using a soft duffel style bag will allow you to wash and dry it



Inspect Yourself

- ▶ Before & after leaving an infested home or area
- ▶ Check around buttons, pockets, seams, cuffs, zippers, shoe tread
- ▶ Check your purse, backpack, etc.
- ▶ Wear simple clothing
- ▶ Minimize hiding spots!



Tools for DIY bed bug eradication

- ▶ Flashlight
- ▶ Garbage bags
- ▶ Mattress encasements
- ▶ Sealant/Caulk
- ▶ Monitoring device(s)
- ▶ Vacuum
- ▶ Clothes dryer
- ▶ Steamer
- ▶ Portable heating device
- ▶ Desiccant dust (Diatomaceous earth or CimeXa)
- ▶ Tool for applying desiccant dust
- ▶ N-95 masks



<http://www.kdlg.org>

Flashlight



- ▶ Use flashlight to inspect dark, hard-to-reach areas
- ▶ Check along mattress seams, box spring, bed frame, headboard of bed, along the wall or floor
- ▶ Also useful for squishing any bugs you might find

Garbage Bags

- ▶ Clutter provides lots of places for bed bugs to hide
- ▶ Reducing clutter will greatly improve your chances of eliminating bed bugs
- ▶ Throw away any items you no longer use
- ▶ Place clothes into bags for laundering
- ▶ Inspect items that can't be thrown away or laundered and bag them up. Leave them in bags until your bed bug nightmare is over.
- ▶ Seal bags airtight so that bed bugs cannot enter.



Mattress Encasements

- ▶ Keep you from having to throw your bed away and prevent new bed bugs from infesting your mattress and box spring
- ▶ Make inspection easier
- ▶ Not all covers protect!



Sealant/Caulk

- ▶ If you own your own home, or have permission from your landlord, seal off cracks and crevices with caulk
 - ▶ Around baseboards, cracks in walls, door frames, etc.
- ▶ Eliminates hiding places and paths of travel
- ▶ Helpful to have a caulking gun, it can be a messy job!
- ▶ Always follow the instructions on the label!



<http://goodnightbeds.com/bedbug-survival-guide-how-kill-bedbug-infestation/neighbours>

Climb-Up Monitoring Device

- ▶ Traps used to detect the presence of bed bugs
- ▶ Place under bed and furniture legs to detect and intercept bed bugs as they attempt to climb bed legs to feed on you
- ▶ Can also be placed along walls to capture bed bugs in their path of travel
- ▶ Should be cleaned out monthly to remove any debris
 - ▶ Reapply a light layer of desiccant dust or talcum powder to the inner walls



Vacuum

- ▶ Makes inspections easier
- ▶ Seal used vacuum bag and dispose of outdoors after each cleaning
- ▶ If using a vacuum without a bag, consider using an attachment covered with a panty hose to prevent bed bugs from infesting the vacuum cleaner



<http://tomlinsonbomberger.com/how-to-kill-bed-bugs/>



<http://www.mypmp.net/2016/05/19/recommend-this-method-to-bed-bug-afflicted-clients/>

Clothes Dryer

- ▶ All bed bugs and eggs will die immediately at 122°F
- ▶ A loosely filled dryer set on “high” is capable of killing all bed bug life-stages and their eggs in 30 minutes
- ▶ Using a removable shelf allows you to treat items that can't be tumbled, like leather shoes, handbags, even books.



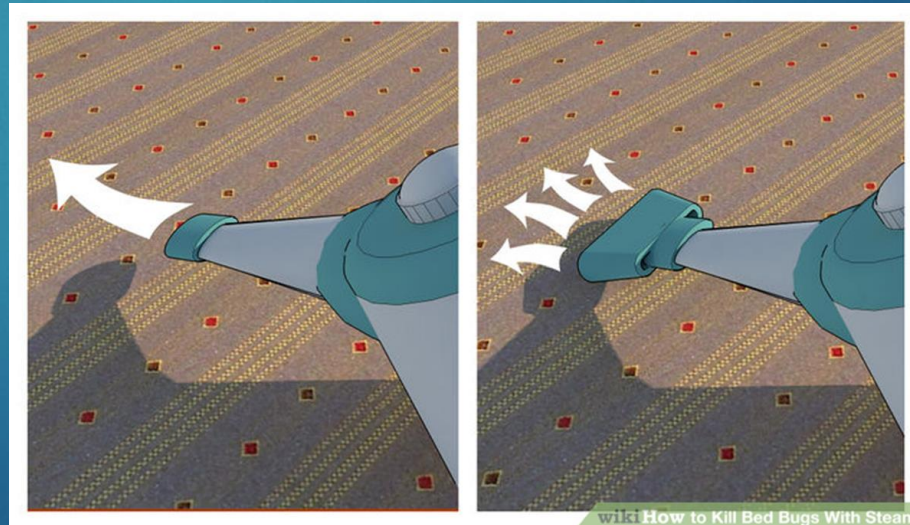
<http://laundry.reviewed.com/content/lg-dlhx4072w-heat-pump-dryer-review>

Steamer

- ▶ Internal temperature of items being steamed needs to reach 122°F
- ▶ The steam head must be large
- ▶ Steaming is slow and labor intensive
- ▶ Steam treatment is a good way to use heat on large furniture that can't be placed in a clothes dryer



<http://bedbugtreatmentsite.com/bed-bug-steamer/>



wikiHow to Kill Bed Bugs With Steam

<http://www.wikihow.com/Kill-Bed-Bugs-With-Steam>

Portable Heating Devices

- ▶ Used to treat luggage, backpacks, clothing, sleeping bags, tools, books, shoes, purses, pillows, furniture, etc.
- ▶ Collapsible devices with an interior heater and exterior heat monitor so that you can see the temperature inside the unit
- ▶ Takes hours to treat infested items
- ▶ Should be monitored at all times for fire safety
- ▶ Check owners manual of any electronic devices before putting them inside a heating device



ZappBug Heater



ZappBug Room

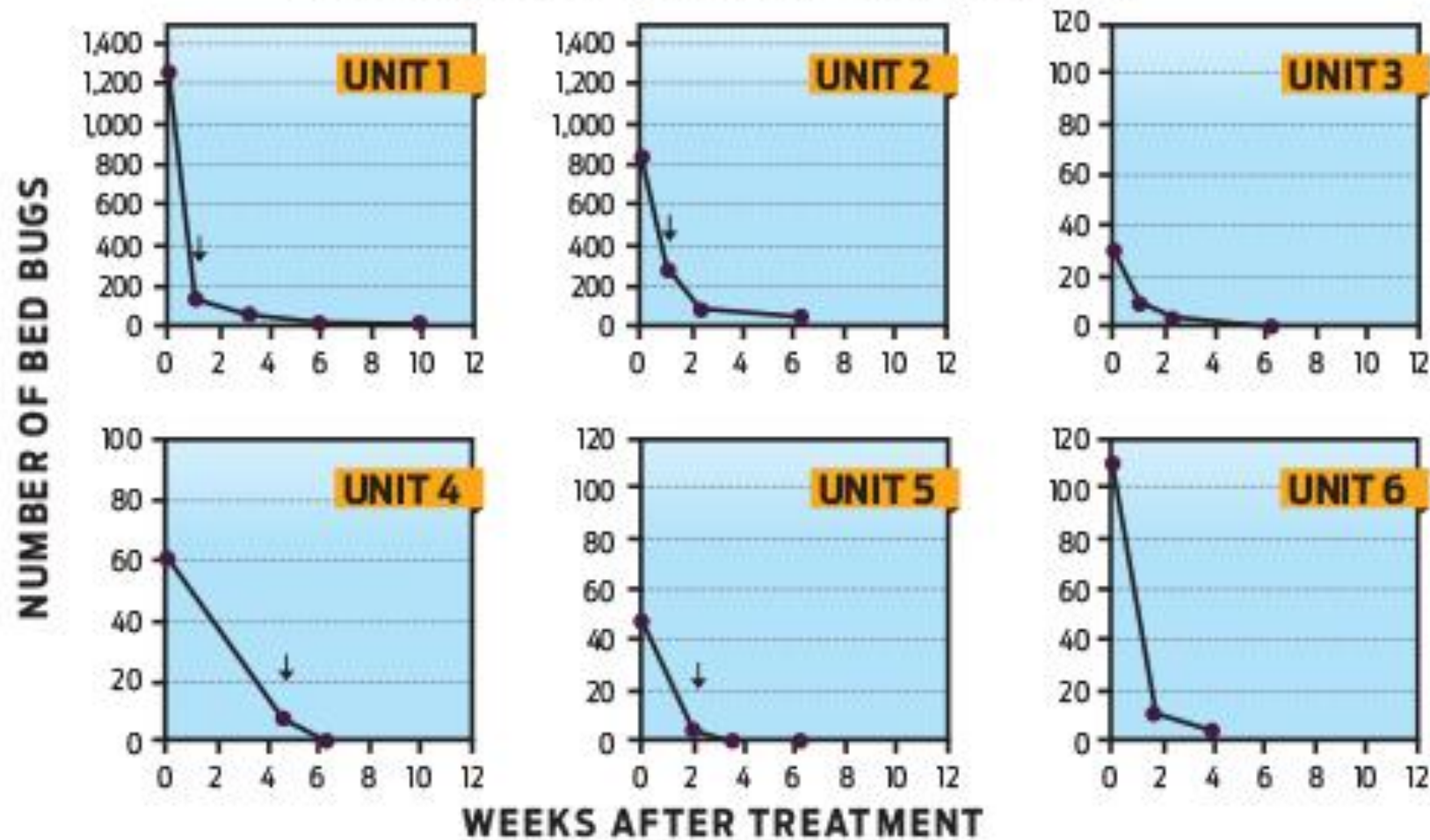
Desiccant Dust-Cimexa

- ▶ CimeXa is a non-repellant low toxicity engineered silica dust
- ▶ Bed bugs walking on dusted surfaces will become covered in the dust
- ▶ Dust absorbs the water and oil on the exoskeleton of the bed bug, causing rapid dehydration and death
- ▶ Kills adults, nymphs, and eggs
- ▶ Typically kills within 24 hours of contact
- ▶ **MUST READ AND FOLLOW THE LABEL!!**



Figure 5. Number of live bed bugs found in six different apartments before and after treatment with silica gel dust. A second application was applied to a few areas in some units as depicted by arrows (). ↓

EFFICACY OF SILICA GEL (6 APARTMENTS)



Tool for applying desiccant dust

- ▶ Can be applied to cracks and crevices along baseboard, interior framework of bed frame, mattresses and box springs, carpets, etc.
- ▶ Evenly disperse dust using a hand duster tool
- ▶ Thin layer of dust does the job
 - ▶ Bugs don't want to climb mountains!
- ▶ Can be applied to Climb-Up monitoring devices as well
- ▶ Should not be used in areas with high air current (walkways, vents, etc.)
- ▶ Remove people with respiratory illnesses from the area when applying.



N-95 masks

- ▶ N-95 masks should be used when applying desiccant dust
- ▶ Can help reduce inhalation of any airborne particles
- ▶ Place the respirator over the nose and mouth and place straps behind the head, then pinch the nose piece
 - ▶ Cup hands around mask and breath out. If you can feel air flowing out, readjust.
 - ▶ People with asthma, COPD, or other respiratory issues should consult their physician before wearing an N-95 mask.



What's wrong with chemical products?



- ▶ Most products will kill some bed bugs if applied directly to the bugs
- ▶ Sprays have low residual efficacy
- ▶ “Bug bombs” move bugs out of one room only to infest another
- ▶ Consumers don’t realize that killing bed bugs we can see is not the problem. Why not just hit each bug with a hammer?
- ▶ Bed bugs are highly resistant to a number of insecticides, and their eggs are impervious to most insecticide formulations
- ▶ Even most, if not all, pest management professionals use some non-chemical methods for bed bug management
- ▶ Bed bugs don’t make you sick, but the poisons used to kill them can!

READ & FOLLOW THE LABEL!

Read the small print

- ▶ Does it have an EPA registration number?
- ▶ Is it intended for indoor use?
- ▶ Is it effective against bed bugs?
- ▶ If a concentrate, do you know how to properly mix it?
- ▶ Where and how is it supposed to be applied?



HOT SHOT



FOGGER⁶ WITH ODOR NEUTRALIZER

Nebulizador con neutralizador de olores⁶

**KILLS ON CONTACT
CONTROLS HEAVY INFESTATIONS**

KEEPS KILLING UP TO 2 MONTHS
Kills Roaches, Fleas, Ants (except Fire Ants), Spiders
* & other listed insects

WON'T LEAVE A WET, MESSY RESIDUE

GUARANTEED! TO WORK, OR
YOUR MONEY BACK*

**KILLS HIDDEN BUGS
PENETRATES INTO CRACKS,
CREVICES & CARPET FIBERS**

*Mata insectos ocultos - Penetra en grietas,
rajaduras y fibras de alfombras*

ONE CAN TREATS
UP TO 2,000 CU FT
CONTAINS 3
(2 OZ) FOGGERS



For Indoor Household/Residential Use Only.
Solo para uso domestico/residencial
en espacios interiores.
Active Ingredients:
Tetramethrin 0.95%
Cypermethrin 0.75%
Other Ingredients 98.30%

**KEEP OUT OF REACH OF CHILDREN
CAUTION** See side panel for additional
precautionary statements.

**MANTÉNGASE FUERA DEL ALCANCE DE LOS NIÑOS
PRECAUCIÓN** Consulte el panel lateral para
las declaraciones y precauciones adicionales.

**INSTRUCCIONES
ESPAÑOL DENTRO
DE LA CAJA**

*For terms of guarantee,
see bottom panel.

**Total Net Wt
6 oz (170 g)**

Indoor Pest



INSTRUCCIONES EN ESPAÑOL
DENTRO DE LA CAJA



FOGGER⁶

WITH
ODOR NEUTRALIZER
Nebulizador con neutralizador de olores

Hot Shot® Fogger⁶ with Odor Neutralizer creates a fine, penetrating mist that reaches deep into cracks and crevices to flush out and kill hidden bugs on contact. When used as directed, the clear, non-staining formula will not harm drapes, upholstery, fabrics, carpeting, bedspreads, floor tiles, wood floors, linens, furniture, walls, clothing, ceilings, shades or blinds. Kills both flying and crawling insects on contact.

— QUICK FACTS —

- Fast acting – works in two hours
- Non-staining, no messy residue
- Coverage: Each can covers 2,000 cu ft of unobstructed space (15.5 ft x 16 ft with 8 ft ceiling). Do not use in rooms 5 ft x 5 ft or smaller. Instead, allow fog to enter from other rooms.

— KILLS —

- | | |
|---------------------------|-----------------------------|
| • Ants (except Fire Ants) | • Palmetto Bugs |
| • Black Carpet Beetles | • Pillbugs |
| • Brown Dog Ticks | • Rice Weevils |
| • Crickets | • Roaches |
| • Earwigs | • Saw Toothed Grain Beetles |
| • Firebrats | • Silverfish |
| • Fleas | • Small Flying Moths |
| • Flies | • Spiders |
| • Gnats | • Waterbugs |
| • Houseflies | |
| • Mosquitoes | |

Does not control Bed Bugs.

— WHERE TO USE —

In enclosed spaces such as:

- | | |
|---------------|-----------------|
| • Apartments | • Crawl Spaces |
| • Attics | • Garages |
| • Barns | • Homes |
| • Basements | • Households |
| • Boat Cabins | • Sheds |
| • Cabins | • Storage Areas |
| • Campers | • Trailers |

Acute Illnesses Associated With Insecticides Used to Control Bed Bugs — Seven States, 2003–2010

United States and internationally (3,5). Bed bug infestations often are treated with insecticides, but insecticide resistance is a problem, and excessive use of insecticides or use of insecticides contrary to label directions can raise the potential for human toxicity. To assess the frequency of illness from insecticides used to control bed bugs, relevant cases from 2003–2010 were sought from the Sentinel Event Notification System for Occupational Risks (SENSOR)-Pesticides program and the New York City Department of Health and Mental Hygiene (NYC DOHMH). Cases were identified in seven states: California, Florida, Michigan, North Carolina, New York, Texas, and Washington. A total of 111 illnesses associated with bed bug–related insecticide use were identified; although 90

Acute Ill **TABLE 3. Contributing factors in acute illnesses associated with insecticides used for bed bug control — seven states, 2003–2010**

Bed Bugs —

Contributing factor	Total	
	No.	(%)*
One or more contributing factors identified [†]	56	(100)
Excessive application	10	(18)
Failure to wash or change pesticide-treated bedding	9	(16)
Notification lacking/ineffective	6	(11)
Failure to vacate premises	5	(9)
Spill/Splash of liquid or dust	4	(7)
Inadequate ventilation [§]	3	(5)
Early reentry	2	(4)
Mixing incompatible chemicals	2	(4)
Improper storage	1	(2)
Label violation not otherwise specified [¶]	16	(29)
No label violation but person still ill	2	(4)

* The sum of proportions exceeds 100 because some cases had more than one contributing factor.

[†] For the remaining 55 (50%) cases, information was insufficient to identify contributing factors for acute illness.

[§] Inadequate ventilation of the treated area resulting from failure to follow label instructions.

[¶] Among these 16 cases, five involved indoor use of an insecticide that was labeled for outdoor use only, eight involved use of an insecticide not labeled for use on a person or for use on bed bugs, one involved insecticide use in an enclosed space, one was in a child who licked the floor near a pesticide application, and in one case, a blind person inadvertently sprayed a piece of furniture, which he touched with his hand, and then put his hand in his mouth.

Symptoms of pesticide poisoning include headache, nausea, vomiting, diarrhea, dizziness, and muscle tremors.

Take home message

- ▶ Take actions to PREVENT getting bed bugs
- ▶ If you have an infestation, don't rely on store-bought chemical products to eliminate the bed bugs
- ▶ If you do use chemicals, READ AND FOLLOW THE LABEL
- ▶ Best to take a, multifaceted, IPM approach to eliminate bed bugs

Questions?



Mary Schneider
Associate Environmental Health Consultant, ANTHC
Phone: 907-729-4006
Email: mdschneider@anthc.org