

Bed Bugs: The Perfect Insect for IPM

(Integrated Pest Management)



- Inspection / Identification / Monitoring
- Evaluation / Recommendations / Education
- Treatment / Documentation / Follow-up

Bed Bug Program Strategies

1. Have a written plan of attack, a specific program for Bed Bugs...
 - Inspection / Identification / Monitoring
 - Evaluation / Recommendations / Education
 - Treatment / Documentation / Follow-up
2. Make and agree on a plan of action...
3. Communicate that program modifications may be needed as new information unfolds
4. **Educate & train** the client & victims of the infestation
5. Follow-up and be proactive

Inspection & Monitoring

1. Visual
2. Canine
3. Monitoring Devices

















Sculptured Ceiling in Bedroom

Visual Inspections for BBs

- Bedding
 - Seams and Tufts of mattresses
 - Box spring (remove decorative fabric)
 - Cracks and crevices of the headboard, footboard, and bed frame
 - Pillows & pillow cases
 - Bed covers, sheets and mattress covers
 - Decorative items for beds
- Structure
 - Cracks and crevices
 - Wall fixtures; such as pictures, lights, etc.
 - Wall voids
 - Loose wallpaper
 - Baseboards & decorative trim
 - Window & door casings
 - Electrical & switch plates
 - Attics & crawl spaces
 - Heating elements
 - Pipe chases

Visual Inspections for BBs

- Furniture & cabinetries
 - Outside, inside and underneath (remove decorative fabrics)
 - Disassemble elements furniture
- Electronics and decorative items
 - TVs, computers, clock radios, etc.
 - Bookshelves, planters, pictures, etc.



What About the Dogs?



Canine Inspection

- What we want them to do...
 - Indicate on Live Bed Bugs and viable eggs, but not on feces, cast skins and dead Bed Bugs
 - 95% positive rate
 - Indicate on Bed Bugs and not other structural pests such as cockroaches and termites
 - 97.5% positive rate (field study)
 - Detect viable Bed Bug eggs
 - 90%

Pfiester, M., Philip G. Koehler and Roberto M. Pereira. Ability of Bed Bug-Detecting Canines to Locate Live Bed Bugs and Viable Bed Bug Eggs. J. Econ. Entomol. 101(4): 1389-1396 (2008)

Indicating



Advantages & Disadvantages of Canine Inspection

Advantages

- BB dogs are trained to alert on one single viable egg, nymph, or adult.
- Increased accuracy – A certified BB dog team will be accurate almost always above a 95% rate.
- Canine inspection is faster and therefore can cover much more area than human inspectors.

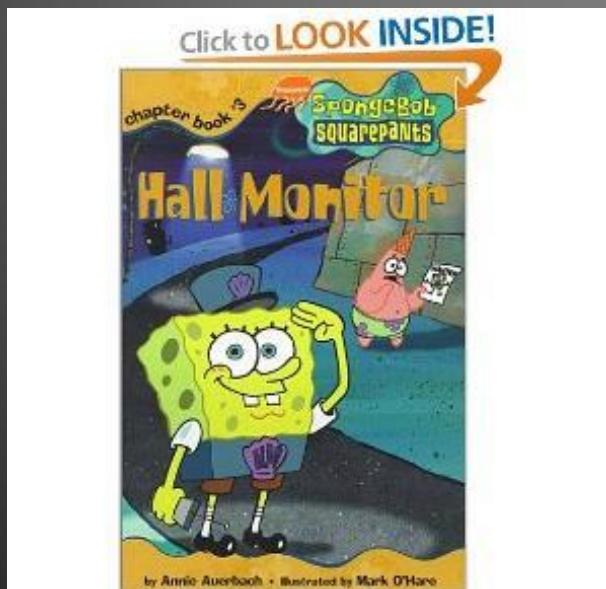
Disadvantages

- The BB dog is only as good as the handler has been trained.
- Dogs can sometimes have “off days” and are subject to cold viruses and illness just like humans.
- Dogs can be distracted by other odors and chemical compounds in a structure
- Cost for a canine inspection for a single home may be prohibitive.

Monitors & Detection Devices



Monitor Lizard



Night Watch Biosensory Monitor

\$400



Bed Bug Beacon

\$50



CLIMBUPTM Insect Interceptor

\$60



CLIMBUPTM Insect Interceptor



Monitoring Devices

Advantages

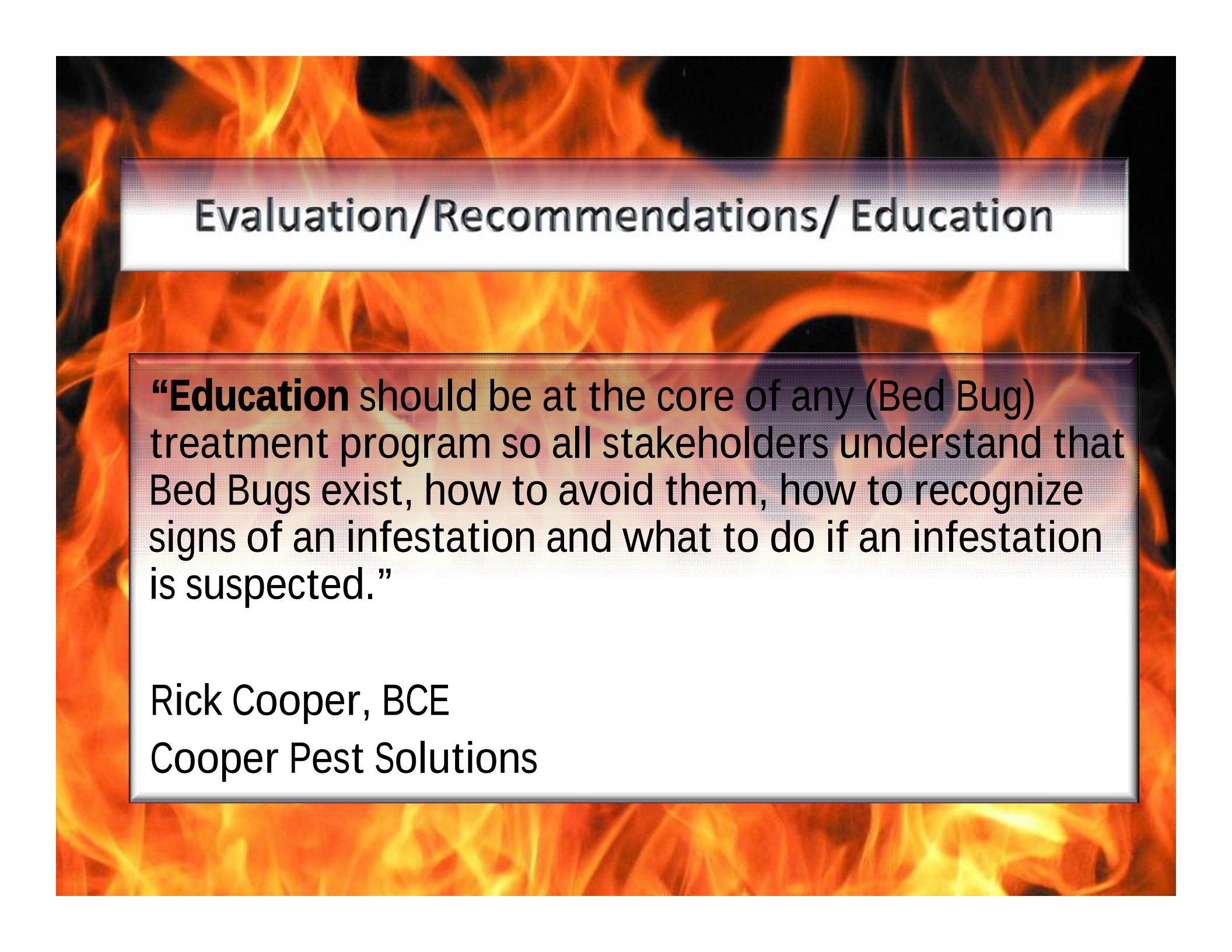
- Fairly small and non-invasive.
- One time cost.
- In heavy to medium infestations, confirmation is usually pretty quick.
- Can be used for long periods of time after the removal of an infestation as a proactive way to monitor for reinfesting BBs.

Disadvantages

- May be of poor quality, or have no reliable test data to support capture claims.
- Many variables exist for these kinds of products. Placement and proximity to BBs is very important for some of these devices to work.
- Not always pet and child proof.
- Can be cost prohibitive, especially if they're untried and do not work.

Monitoring Traps

	Passive Monitoring Methods		Active Monitoring Methods		
	Climbup Interceptors	Homemade Vaseline/Tape	Bedbug Beacon	NightWatch	Homemade Dry Ice
Cost	\$60	\$10	\$50	\$400	\$15
Ease of Setup	Moderately Easy	Moderately Easy	Easy	Easy	Somewhat Difficult
Ease of Use	Easy	Easy	Easy	Easy	Easy
Requires Replenishment	No	No	Yes	Yes	Yes
Safety	Excellent	Good	Good	Good	Ok
Accuracy	Ok	Ok	Good	Good	Good



Evaluation/Recommendations/ Education

“Education should be at the core of any (Bed Bug) treatment program so all stakeholders understand that Bed Bugs exist, how to avoid them, how to recognize signs of an infestation and what to do if an infestation is suspected.”

Rick Cooper, BCE
Cooper Pest Solutions

Education

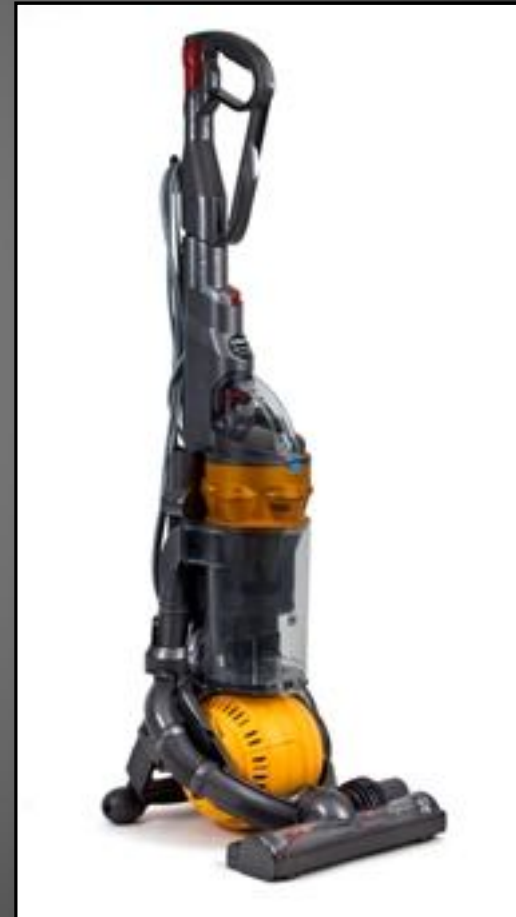


Education Essentials

- Basic Identification and Biology of Bed Bugs
- Sanitation
- Cultural Practices
- Non-chemical methodologies that help prevent, detect and manage BBs
- Treatment Recommendations

Treatment Strategies

- Non-Chemical Methods
 - Physical Removal
 - Vacuuming, brushing...
 - Removal of infested items
 - Exclusion
 - Mattress covers
 - Traditional Insecticide Treatments
 - Heat (steam & dry)
 - Cryogenics (cold)
 - Fumigation (lethal gas)
 - Controlled Atmospheres
 - CO₂, N₂



Mattress and Box Spring Encasements



PROTECT-A-BED®
AUTHORIZED RESELLER
ALLERZIP™
BEDDING ENCASEMENT

WITH  **Patented
BUG
LOCK™**
Secure Seal

Scientifically Proven & Independently
Tested to Eliminate Bed Bugs from Bedding

Traditional Insecticide Treatments



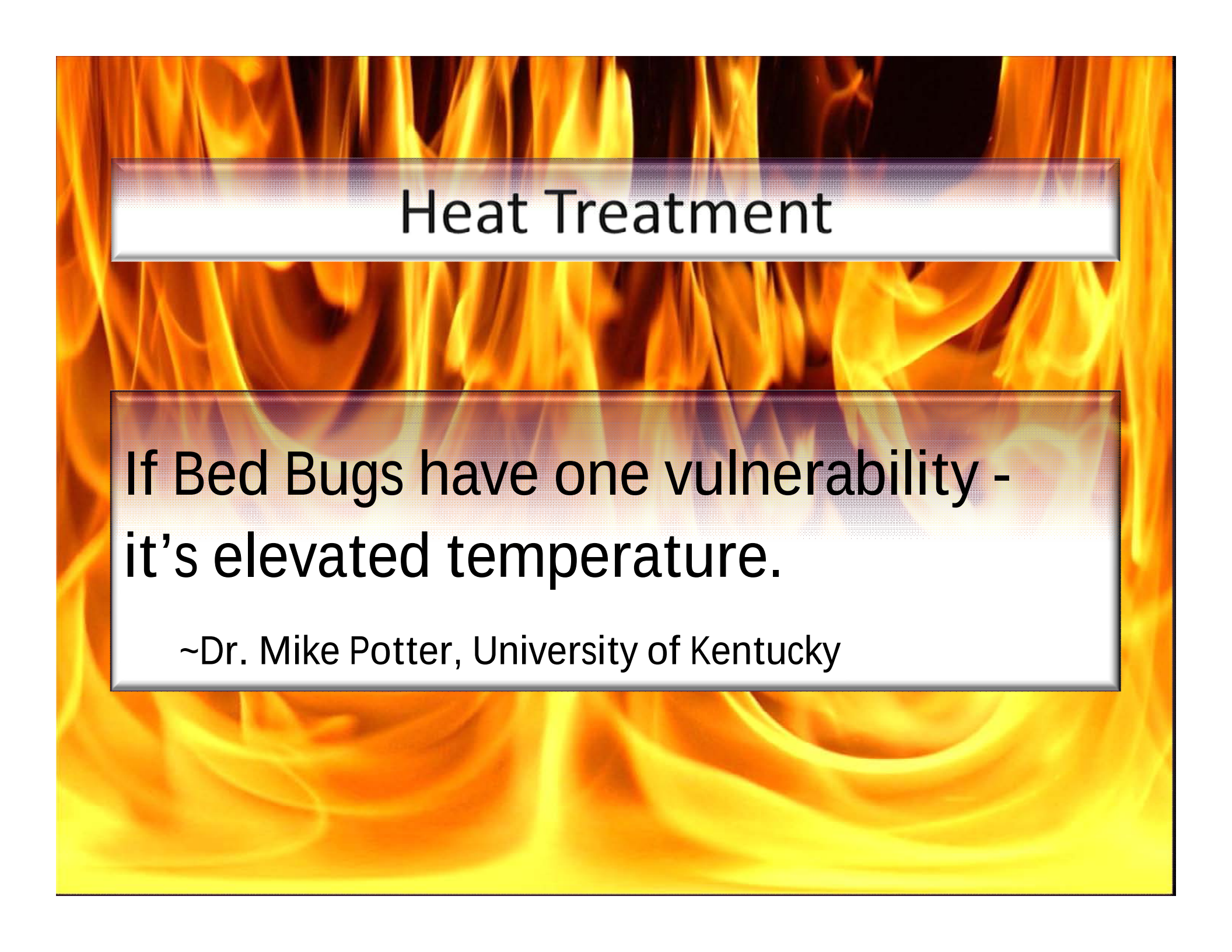
Traditional Insecticide Treatment

Advantages

- Certain products provide a residual effect that maintains control for an extended period of time.
- Applications may be periodic in nature to lessen the chance BBs can re-establish.
- Cost effective for beginning or small BB infestations.

Disadvantages

- Not all living areas and items can be treated with all insecticides.
- Cost are high because of the slow methodical nature and man-hours of the job.
- Residents that have sensitivities to insecticides may not be able to have this type of treatment.
- Poor choice of insecticide chemistry or application by the PMP (missed treatment areas) can result in failure.



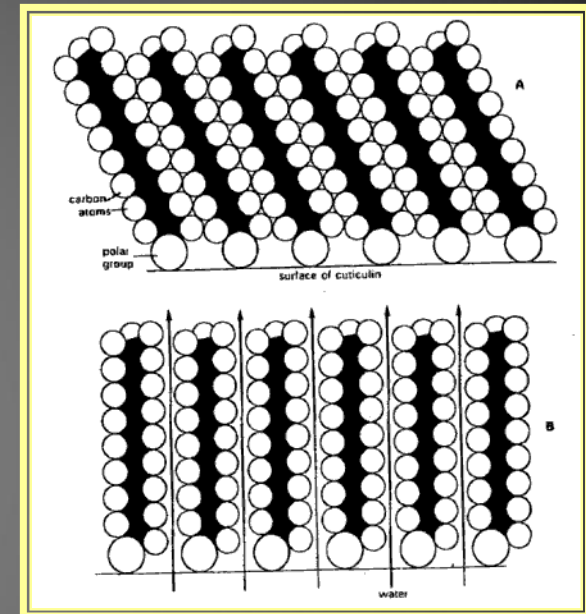
Heat Treatment

If Bed Bugs have one vulnerability -
it's elevated temperature.

~Dr. Mike Potter, University of Kentucky

How Heat Kills Insects

- Dehydration (loss of water through the cuticle)
- Unfolding of Protein molecules and entanglement
- Physiological damage



Temperatures Required to Kill Bed Bugs

Table 1. Mean percentage of initial knockdown and mean percentage of 24-h mortality (SE) among bed bug adults exposed to five different temperatures for varying lengths of time.

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 PFIESTER, AND WAYNE WALKER. **Lethal Effects of Heat and Use of Localized Heat Treatment for Control of Bed Bug Infestations.** J. Econ. Entomol. 102(3): 1182Ð1188 (2009)

University of Minnesota

Unpublished Data*

1. Time versus Temperature Study
2. Threshold behavior and subsequent movement of bed bugs in response to increasing temperatures through **conduction**.
3. Threshold behavior and subsequent movement of bed bugs in response to increasing temperatures through **convection**.
4. Rate of penetration of lethal heat through mattresses, upholstered furniture, exterior walls and other structural elements in two habitat types (apartment, house).

Temperature	Time (minutes)	
	Adults	Eggs
113	90 min	8 hours
118	2 min	90 min
122	0 min	0 min

Kells, Stephen A. Key findings on bed bug behavior at lethal & sub-lethal temperatures.
University of MN. www.thermalremediation.com

Steam Heat Treatment

Steam

Advantages

- Good for small areas where BB are infesting.
- A useful tool where most or all insecticides are not labeled for use, such as bedding.
- Good mortality of all BB stages providing the application is performed well.
- Leaves behind no insecticide residue. Good technology for bedding, etc,

Disadvantages

- Steam cools on contact and may not have the desired temperature to kill eggs if used improperly.
- May not reach hidden insects and eggs in deep cracks and crevices.
- Very slow methodical application subject to applicator error.
- Leaves behind no insecticide residue when they're sometimes needed.



VAPORBLITZ™

Dry Heat Treatment

Dry Heat

Advantages

- Heat expands (it moves/transfers in several ways) to cooler areas.
- Kills all stages of BBs.
- Excellent choice where: 1) the population is high, 2) the infestation area is cluttered, 3) has many places where BB can hide and lay eggs, and 4) where insecticides cannot be used.
- Tenants can re-enter the treatment area shortly after the heat treatment is complete.
- Controlled temperatures will not damage electronics.

Disadvantages

- Can damage items that have low melting points such as: candles, chocolate, etc.
- Many items must be removed and then replaced after the treatment is made. This increases the chance of reinfestation if inspections of returning items are not made.
- Fire alarm and sprinkler systems must be protected from accidental trigger.
- May require insecticides to be applied in certain areas where temperatures do not reach mortality levels.
- Depending on the thermal equipment used, there may be restrictions for the size of the area to be treated.
- May be cost prohibitive if the number of infested units (for example, multi-level apartments) is high.

PackTite



Why Structural Heat Treatment?



Extensive Populations!



Heat Treatment Generator



Heat Treatment Equipment



Heat Treatment Preparation





The End (Probably Not)



© Gene White

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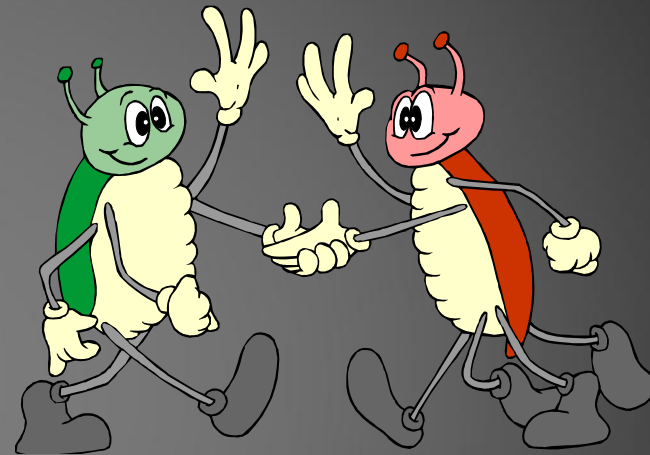
Andy Murdock, ACE

Dr. Mike Potter, BCE

Dr. Jim Sargent, BCE

Mark “Shep” Sheperdigian, BCE

Dr. Eric Smith, BCE



Cryogenic (Cold) Treatment

Cryogenic (Cold) Treatments

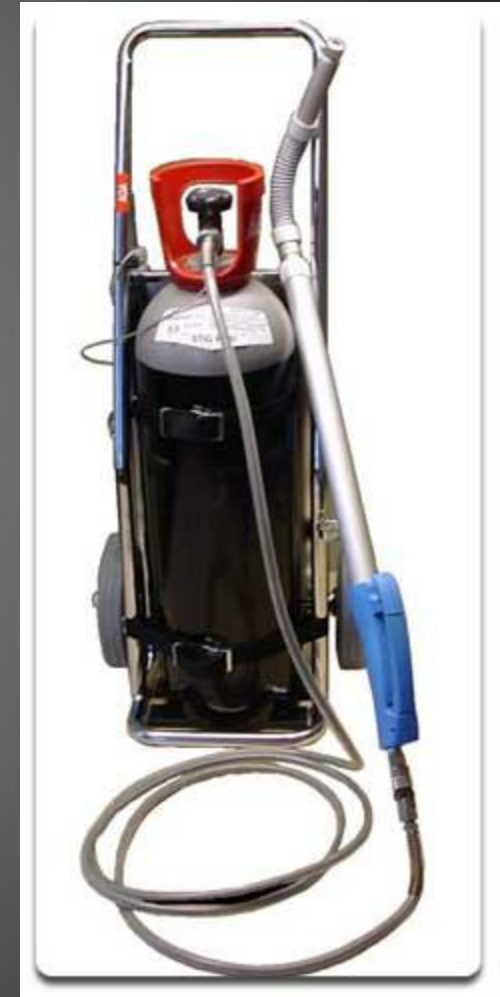
Using cold to kill BBs will work under certain conditions. Because cold does not expand to make the surrounding area also cold, its penetrating capabilities are severely limited.

Advantages

- Mobility of the applicator is good
- Good contact-kill mortality for all BB stages when exposed to freezing.
- No residue after application.

Disadvantages

- The potential to damage surfaces when cold is applied is greater.
- Will not penetrate into deep BB harborages.
- Will damage electronics and like devices on contact.
- Slow methodical application increases man hour costs.
- No insecticide residue after application.



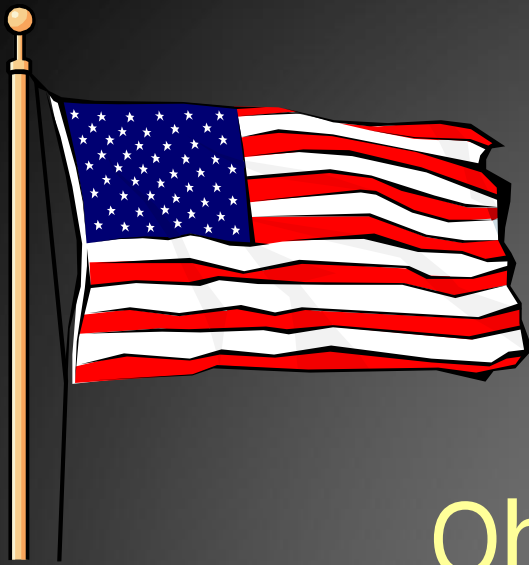
Fumigation

Advantages

- 100% mortality of all stages of BBs when used properly.
- Penetrates all cracks, crevices and voids of a structure.
- Very few items need to be removed from the treatment area.
- Costs may be overall less for multi-dwelling situations (as compared to insecticide and heat).

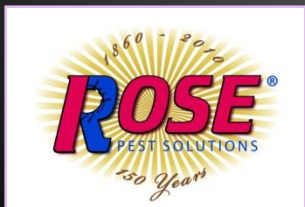
Disadvantages

- Costs for this service are very high and requires specialized technical expertise.
- Extensive preparation to the structure.
- No insecticidal residue left behind to keep BBs from reinfesting the structure in the future.
- Cannot use this treatment technique for a single unit of any multi-dwelling type of structure.
- Occupants must be vacated for a period of time, usually 48-72 hours.



Bed Bug National Anthem

Oh! Say can you see...
any bed bugs on me?
If you do, take a few...
cause' I got them from you!



MPMA Ann Arbor, MI
December 7, 2011

