

# Bed Bugs – Resurgence of an Old Pest: Biology & Ecology



Dr. Bill Donahue

# History of the Bed Bug

Cimicidae - Where did they come from?

## Swallows



Where To From There?

## Bats



# There Goes the Neighborhood!



Common bed bug (*Cimex lectularius*) Tropical bed bug (*Cimex hemipterus*)



# Common Names of Bed Bugs

**Over 50 common names have been recorded including**

- Red coats
- Crimson Rambler
- Wall louse
- Wallpaper flounders
- Mahogany flat

# Human Pest



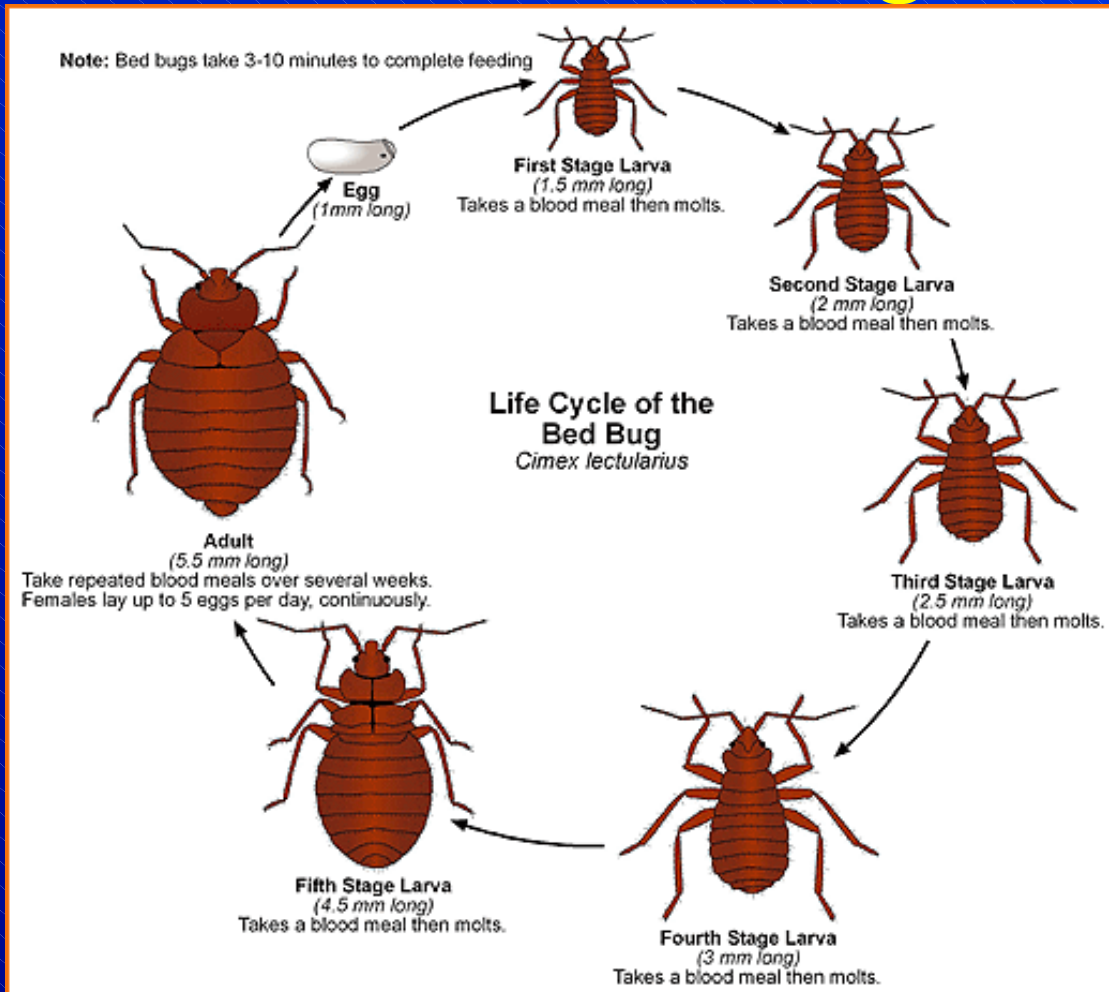
A Global Problem



# Bed Bugs Universally Detested

- Feed mostly at night, but can feed at any time of day
- Sweet musty odor from scent glands
- Blood spots on bedding – frass
- 1939 – Greater London 4 million people troubled by bed bugs
- Just 12 years ago, most entomologists had never seen bed bugs

# Common Bed Bug- *Cimex lectularius*



## Their Life Cycle



- Eggs hatch in 6-10 Days
- 5 nymphal instars
- 4-5 weeks for complete life cycle – egg to egg

# Hatch Rates and Embryo Development



## Hatch Rates:

Harlan: 99.1%

Earl: 97.2%

Cincinnati: 97.9%



## Average Length of Embryo Development:

Harlan: 6.9 – 7.0 days

Earl: 6.7-7.2 days

Cincinnati: 6.9 – 7.2 days

**1<sup>st</sup> instar nymph – adult: ~5 weeks**



Nymphs are tiny!  
Magnified 45X



# Feeding Behavior



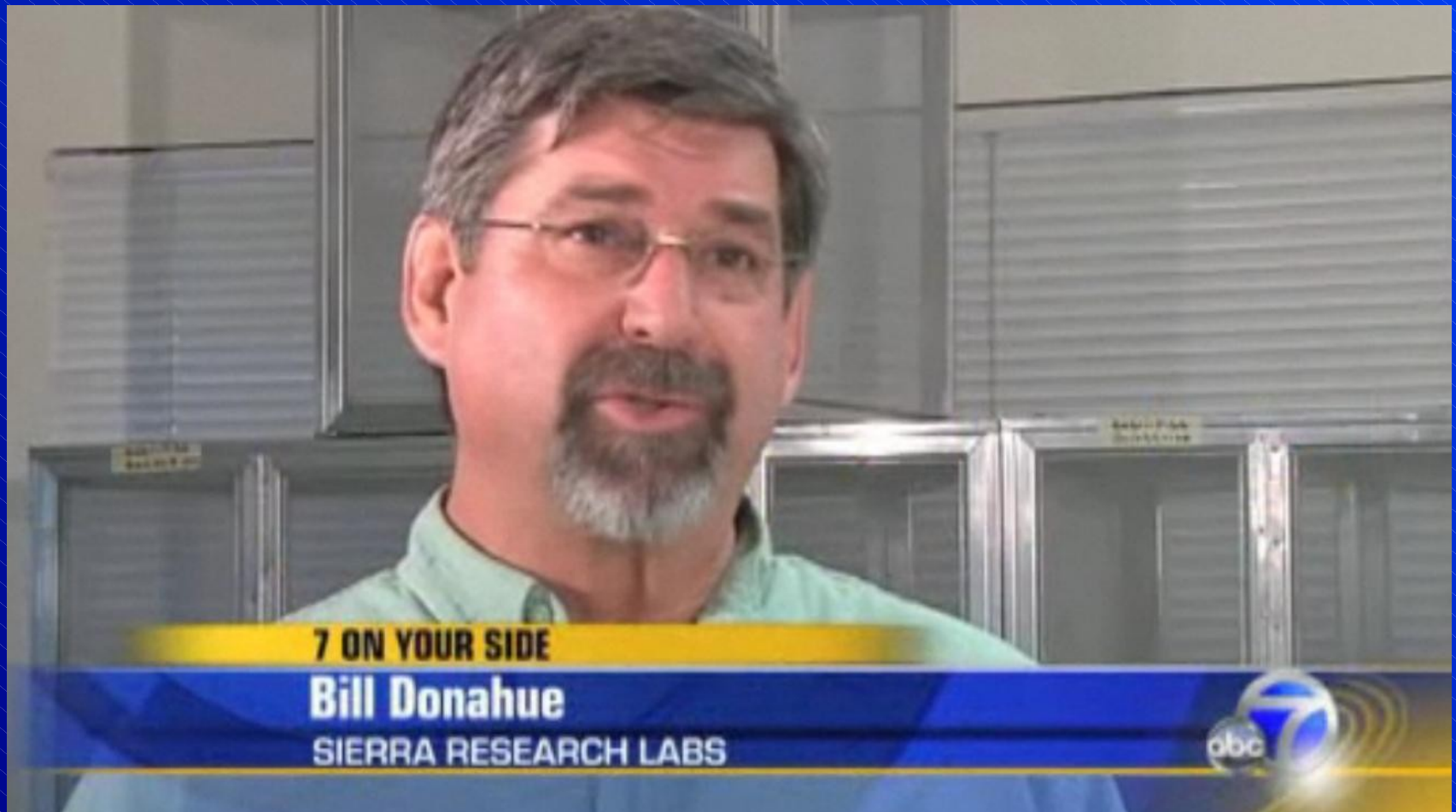


# Product Testing and the Media



# Media Portrayal

<http://abclocal.go.com/kgo/video?id=8442396>





# Human Impact

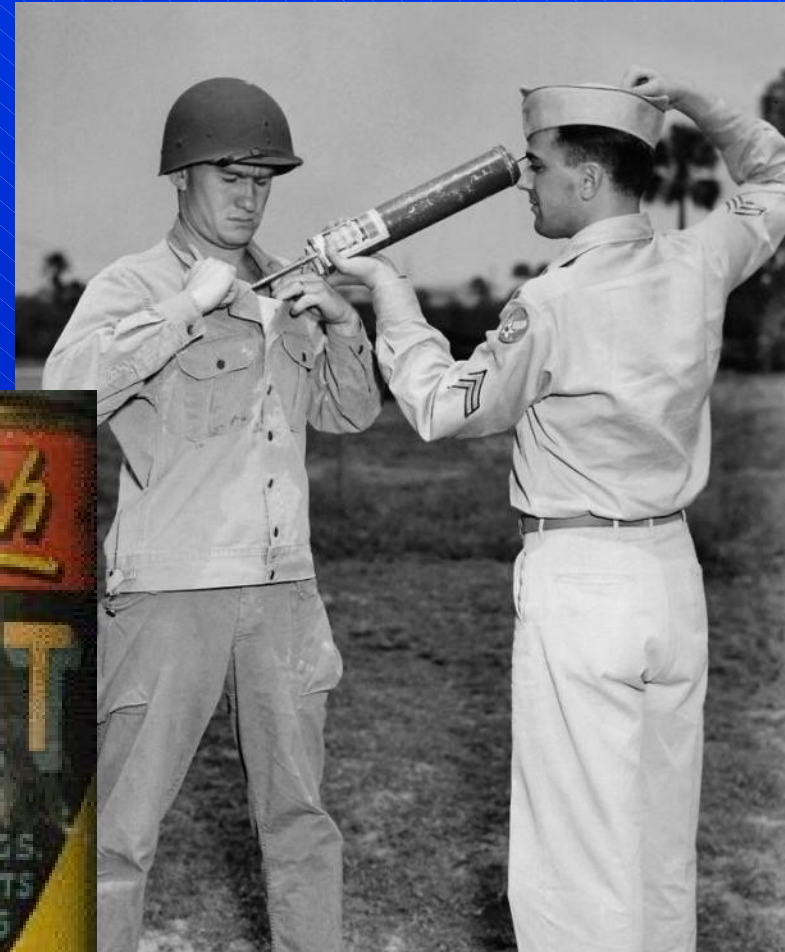
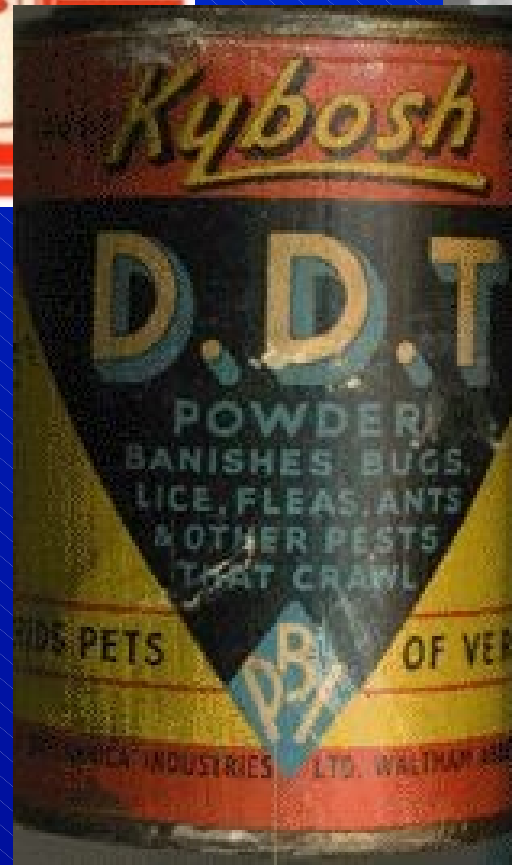
Heavy infestations can cause great distress  
in peoples day to day lives.



# The Way It Was



DDT was hailed as “the miracle insecticide” and “almost perfect control product for this pest”



Resistance was observed after only 5 years of use.

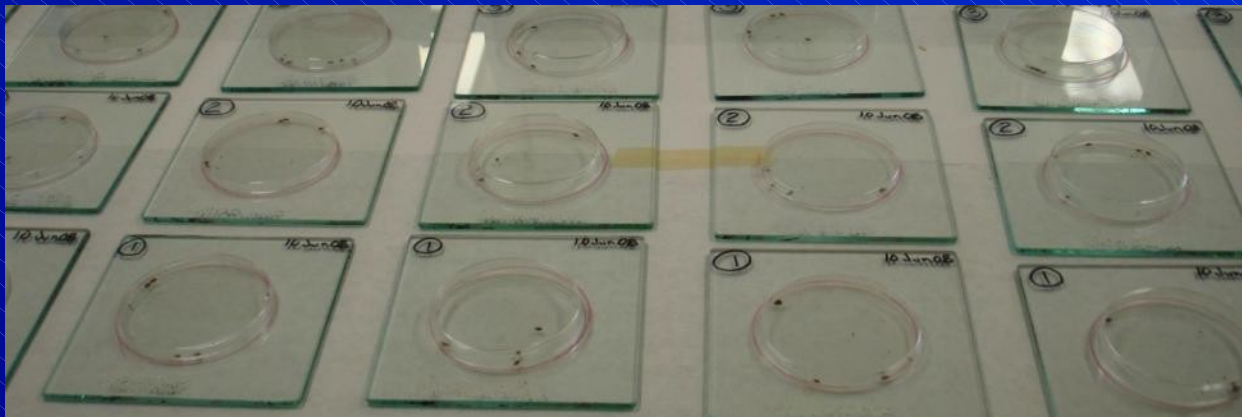


# Insecticide Resistance

- 1930's – 40's: DDT insecticide of choice
- 1952-1956 DDT resistance wide spread
- 1950's: Malathion insecticide of choice
- 1960-2000: Low incidence of bed bugs world wide
- 1990's: Pyrethroids insecticides of choice

# Permethrin Dose Response Test

- Concentrations: 0.5%, 0.05% and 0.005% permethrin (EC formulation)
- 1 mL test substance applied inside a wax outline of a 9 cm circle on a glass panel
- 10 bed bugs per replicate, covered with a 100 x 15 mm Petri dish lid
- KD/Mortality: 15, 30, 45, 60 min, 2, 4, and 24, 48, 72, and 96 hr





# Logarithmic Regression of the Knockdown (approximately LD<sub>50</sub>) of Laboratory and Field Strains of *Cimex lectularius* Exposed to Permethrin at Selected Concentrations

Harlan (15 min)

Conc.	% KD
0.005%	31.0%
0.05%	73.0%
0.50%	96.7%

Cincy (1 hr)

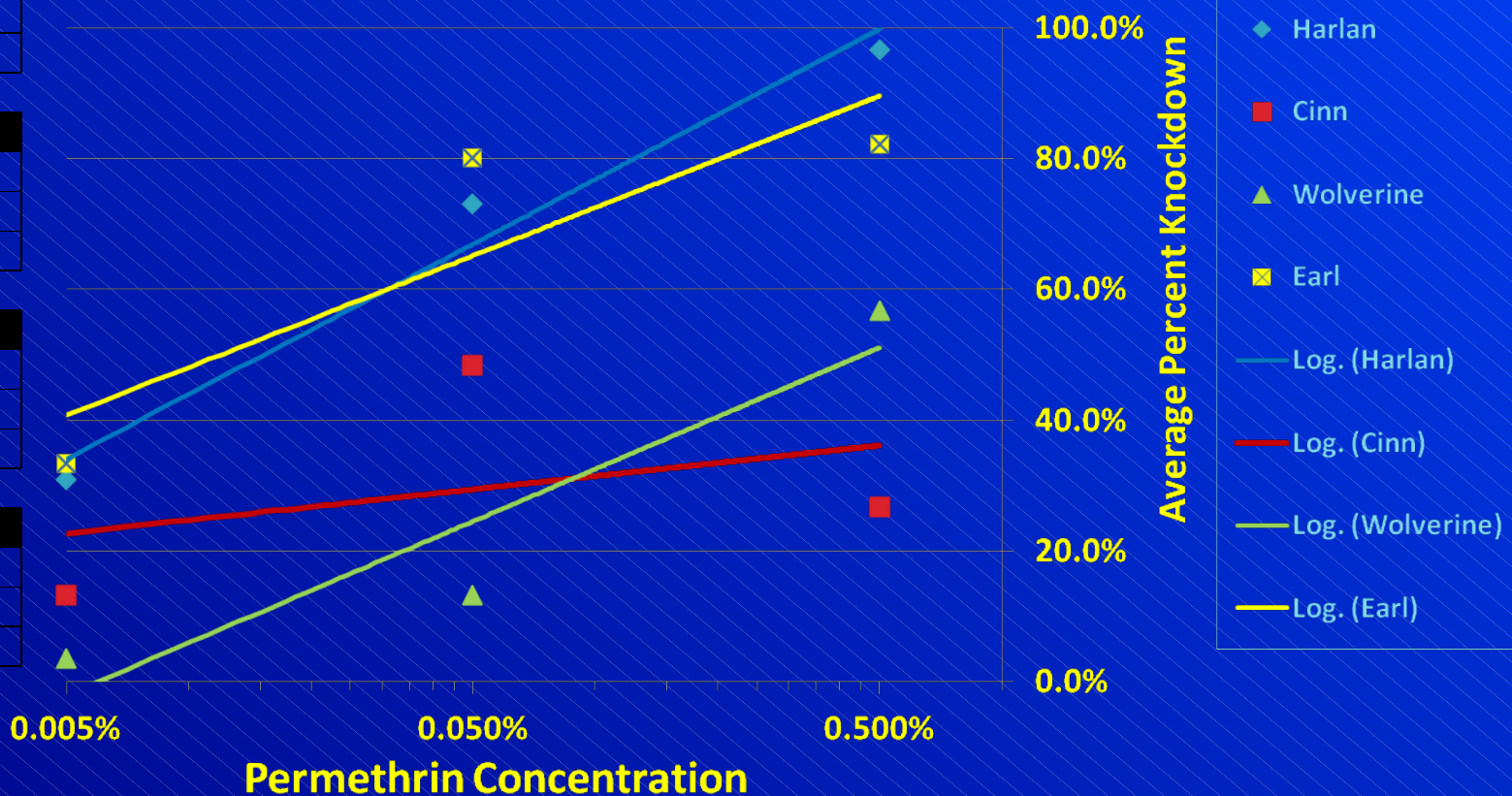
Conc.	% KD
0.005%	13.3%
0.05%	48.3%
0.50%	26.7%

Wolverine (4 hr)

Conc.	% KD
0.005%	3.6%
0.05%	13.3%
0.50%	56.7%

Earl (1 hr)

Conc.	% KD
0.005%	33.3%
0.05%	80.0%
0.50%	82.1%



# Where do we find them?



Bed bugs are typically found in places like this...



This



And even this



# Resurgence of Bed Bugs

- Increase global travel
- Lacks quarantine efforts
- No social or economic barriers
- Decrease in residual pesticide applications
- Product shift to baits – Ants, Cockroaches
- Insecticide Resistance

# Medical Importance of Bed Bugs

- Prefer humans but will readily feed on birds, rodents, and other mammals – Pets?
- Naturally infected with 27 human pathogens

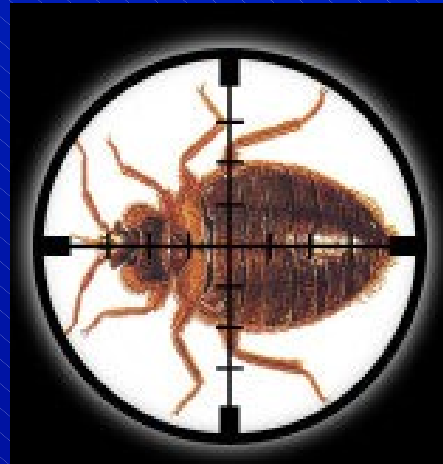
BUT!!!

- Not proven to biologically transmit even **ONE** human pathogen!
- Itching and inflamed hypersensitivity – “Sensitivity Syndrome”
- Blood loss not usually a problem



# Integrated Pest Management

- Proper Identification
- Education and Cooperation
- Thorough Inspection
- Control Measures: Chemical & Non-Chemical
- Follow-Up



# Monitoring is the key!



Traps



Leave no object  
untreated

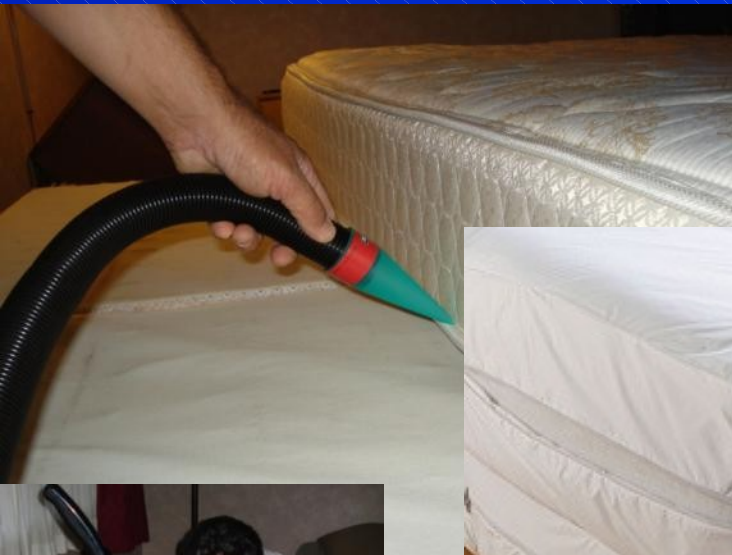


# New Pesticides and Products

- Dusts
- Liquid Concentrates
- Foggers: Py + PBO
- Aerosols: IGR's
- Traps
- Natural Products



# Alternative Methods



Center  
Well

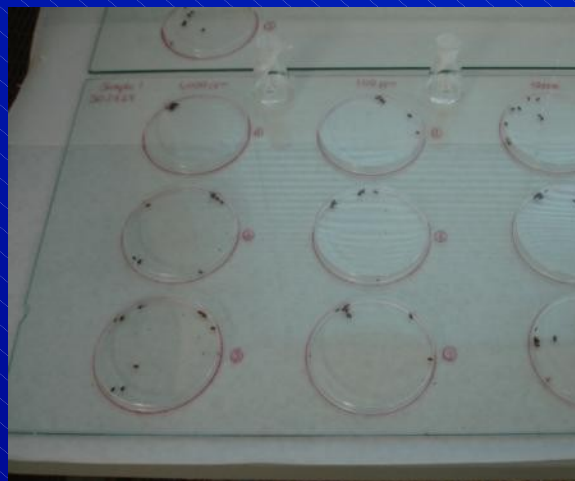
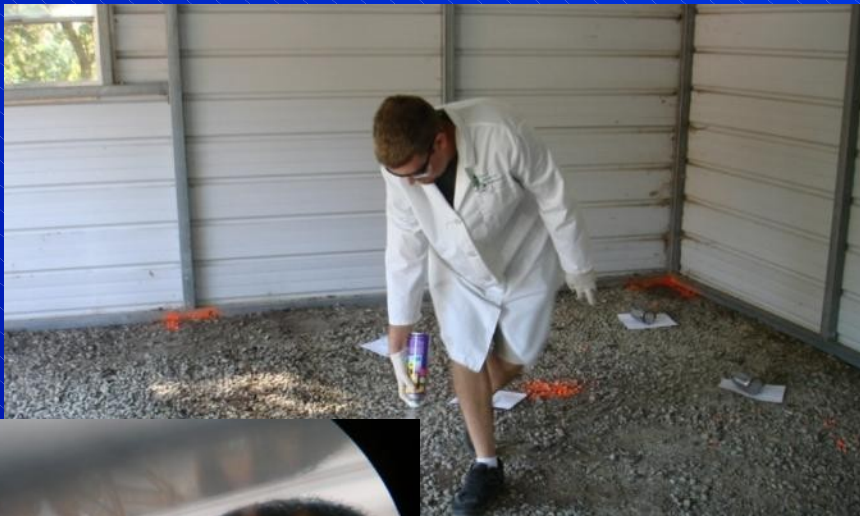
Outer  
Pitfall



- Heat Treatments
- Cold Treatments
- Vacuuming
- Natural Enemies
- Cultural Practices e.g. reduce harborage, physical barriers, discard infested items



# Research



- Product Development
- New Methods
- Label Expansion

# The Lighter Side

Good Night, Sleep Tight,  
Don't Let the Bedbugs Bite!

Diane deGroat



**B.Z. Toons**

by Brian Zalkowski

www.bztoons.com



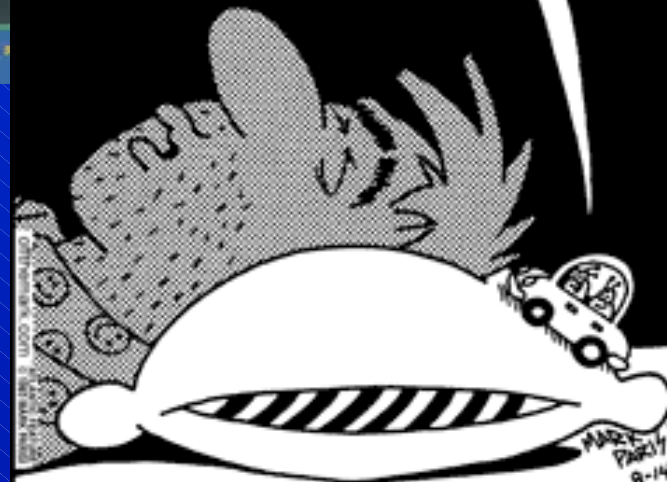
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Well, good night, sleep tight, and don't let the bed bugs bite.

**off the mark.com**

by Mark Parisi

OKAY, WE'RE HERE!  
THE WARM SIDE OF THE  
PILLOW!



BEDBUGS ON VACATION

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# Any Questions?

