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!

I’ve got a bad feeling about buying this cave

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

1st 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 people's 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 worldwide
- 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$_{50}$) of Laboratory and Field Strains of *Cimex lectularius* Exposed to Permethrin at Selected Concentrations

<table>
<thead>
<tr>
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<th>Conc.</th>
<th>% KD</th>
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<tbody>
<tr>
<td>Harlan (15 min)</td>
<td>0.005%</td>
<td>31.0%</td>
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<td>0.05%</td>
<td>73.0%</td>
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<td>0.50%</td>
<td>96.7%</td>
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<td>Cincy (1 hr)</td>
<td>0.005%</td>
<td>13.3%</td>
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<td>0.05%</td>
<td>48.3%</td>
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<td>0.50%</td>
<td>26.7%</td>
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<td>Wolverine (4 hr)</td>
<td>0.005%</td>
<td>3.6%</td>
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<td>13.3%</td>
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<td></td>
<td>0.50%</td>
<td>56.7%</td>
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<tr>
<td>Earl (1 hr)</td>
<td>0.005%</td>
<td>33.3%</td>
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<td>0.05%</td>
<td>80.0%</td>
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<td>0.50%</td>
<td>82.1%</td>
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![Graph showing logarithmic regression of knockdown for different strains and concentrations of permethrin.](attachment:image.png)
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!

Leave no object unturned

Traps

Leave no object unturned
New Pesticides and Products

• Dusts
• Liquid Concentrates
• Foggers: Py + PBO
• Aerosols: IGR’s
• Traps
• Natural Products
Alternative Methods

- 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

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

off the mark.com

OKAY, WE'RE HERE!
The warm side of the pillow!

BEDBUGS ON VACATION
Any Questions?

Can Stop Bed Bugs!