

**Connecticut Association
of Housing Code
Enforcement Officials,
Inc.**

**June 7, 2024
9:30 AM**

**Myths and Facts about
Bed Bugs.**

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Bed Bug Evolution.

Bed bugs have been
on this planet far longer than first believed!

15-year international research effort led by
Steffen Roth Bergen, Ondřej Balvín.

Paper: Bed Bugs Evolved Before Their Bat Hosts and Did Not
Co-speciate with Ancient Humans.

Steffen Roth et al., 2019 Current Biology 29. pp. 1847-1853.



Ancestral Bed Bugs 115 – 122mya (Cretaceous Period)

Rejected widely held view that bed bugs evolved on bats. Bed bugs predate bats by at least 30 – 50my.

Bed bugs started their careers on birds (dinosaurs); later bats were added to the menu.

A reverse from usual evolutionary track; bed bugs evolved from being ancient specialists to modern generalist feeders.

Frequent host switchers, and over time expanded their host portfolio.

Even as specialist ancestors, bed bugs bounced between different sub-species of the same host.

Generalist posses' higher level of genetic plasticity than specialists, enabling better survival

Management?.....Oops!!!

Genius tries fiery fix in LI parking lot



HOT WHEELS: Three vehicles go up in flames after a bed-bugged driver sprayed rubbing alcohol and lit a cigarette.

By NATASHA VELEZ
and NATALIE O'NEILL

There has to be a better way to deal with bedbugs.

A squeamish Long Island resident touched off this towering parking-lot inferno — and nearly killed himself — when he tried to rid his rental car of the pests with rubbing alcohol before lighting a cigarette, cops said.

Scott Kemery, 44, of Bridgehampton, dumped the flammable liquid all over the black car's interior at about 5 p.m. Tuesday when he saw the blood suckers

HOW NOT TO KILL BEDBUGS



11

New York Post, Thursday, April 16, 2015

nypost.com



Treat bed bugs as a building problem,
not a personal problem!



Bed Bugs Cause Intense Psychological Distress.

The 5 stages of grief...

1. Denial
2. Anger
3. Bargaining
4. Depression
5. Acceptance



....but no disease transmission!

Bed bugs were wiped out between 1945 & 1950 using DDT and the advent of home appliances.

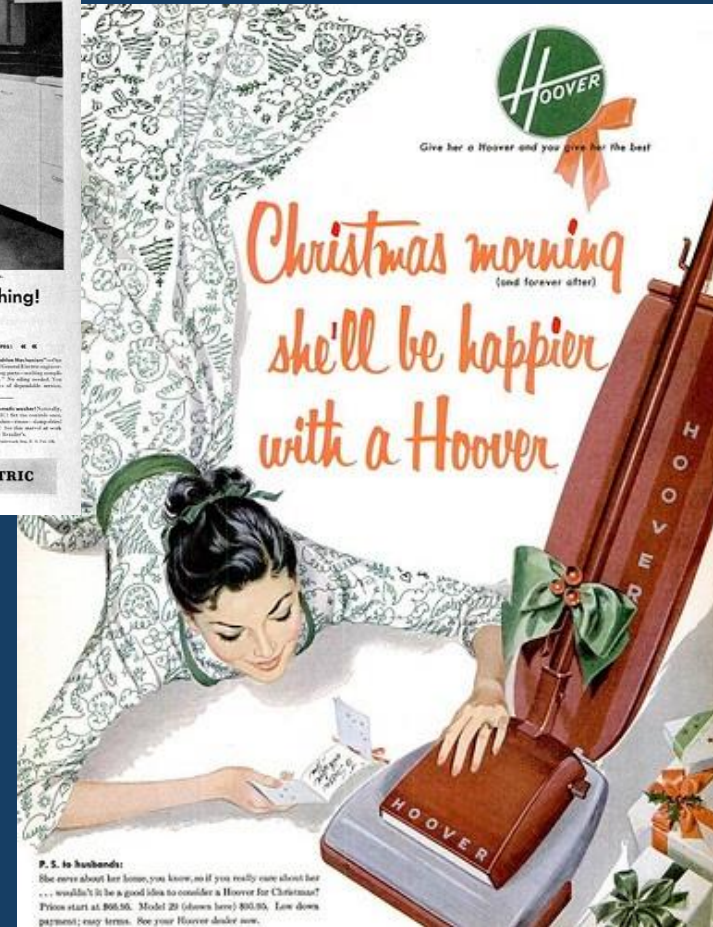
DDT



Building design



Appliances



Then they came back....!



The set up.

1. **“War on drugs”**.....industrialized prison system striking at the poor creating in many cases, paupers' prisons.
2. **Start of world wide web (internet) August 6, 1991.**
3. **North American Free Trade Agreement (NAFTA)1994.**

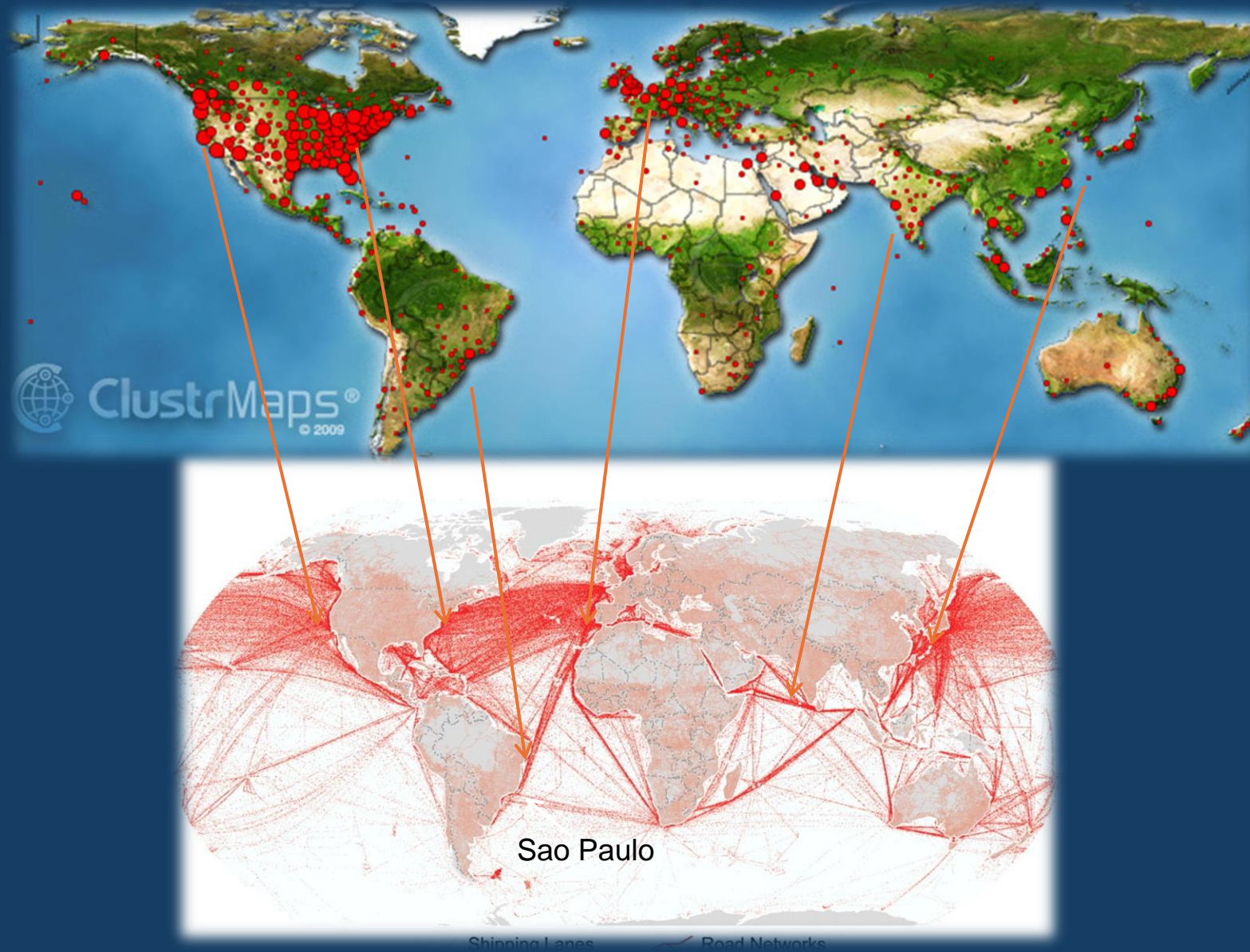
NAFTA promoters argued it would create hundreds of thousands of new high wage U. S. jobs, raise living standards in the U.S., Mexico and Canada, improve environmental conditions and transform Mexico from a poor developing country into a booming new market for U.S. exports.

What actually happened? It launched a race-to-the-bottom in wages, destroyed hundreds of thousands of U.S. jobs, undermine democratic control of domestic policy-making, threatened health, environmental, and food safety standards, and exponentially increased the rapid international shipping trades.

4. **Glass-Steagall Act of 1933 repealed in 1999 freed commercial banks to engage in the investment industry and weakened anti-trust laws.**

The 2008 great recession and lots of bed bugs!

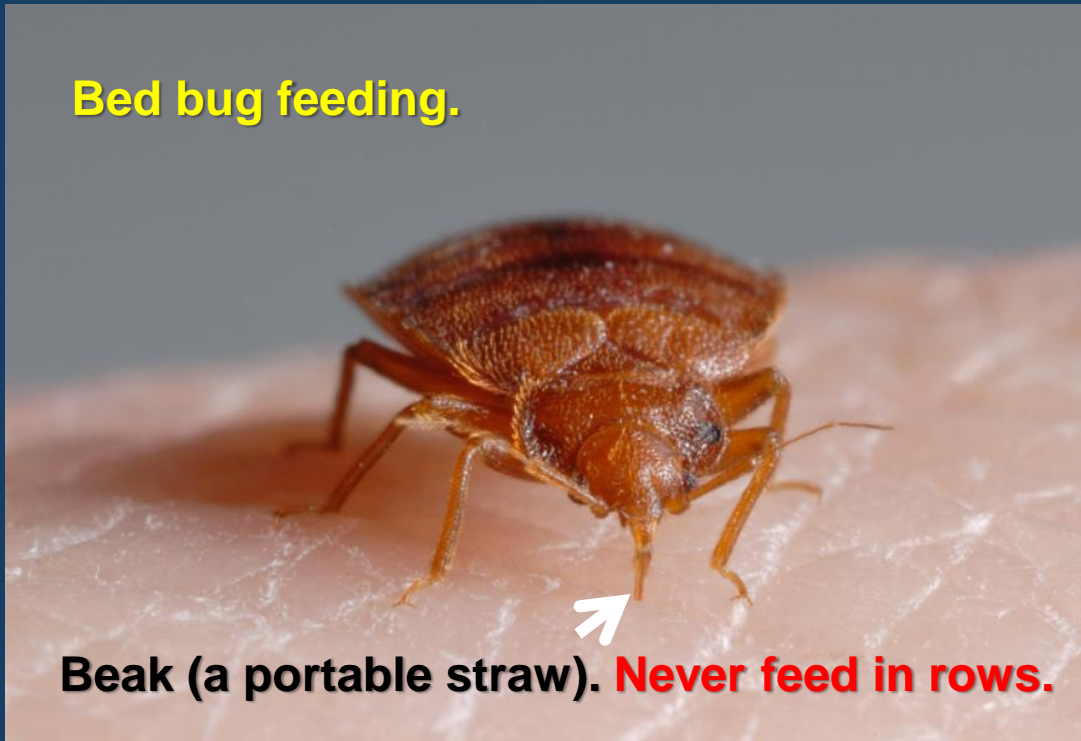
2009 bed bug reporting and shipping trade routes.



Description

- **Shape:** Broadly oval (males are a little narrower than females).
- **Color:** Brown to tan.
- **Size:** Apple seed in size.
- **Feeding:** Piercing sucking mouthparts (bed bugs do not “bite”!).

Bed bug feeding.



Myth: Bed bug feed in rows, “breakfast, lunch, and dinner.”

Adult female.



Engorged adult.



Seven Stages of Development.



Eggs.

5 nymph stages; “instars.”

Adults.

Body Form.

Nymph



Adult female



Adult male



Newly hatched nymphs and egg cases

Bed bugs commute.
Repetitive behavior!

Clustering behavior in a refuge.



Refuge.

Nightstand with fecal spots.

What bug are we dealing with?



Common bed bug *Cimex lectularius* L.

Eastern bat bug *Cimex adjunctus* Barber

Chimney swift bug *Cimexopsis nyctalis* List.

List of attributes bed bugs use to survive.

1. Quiescent with extended inactivity	18. Capacity to learn	34. Apparent torpor
2. Thigmotactic	19. Track host behaviors i.e. resting patterns	35. Traumatic insemination controls gene flow
3. Touch sensitive	20. Multi-stimulus host seeking	36. Genetic plasticity
4. Retreats regardless of danger	21. Efficient directed movement	37. Population uniqueness impeding gene flow
5. Flat profile	22. Air current sensitive	38. Hybrid vigor
6. Camouflage coloration	23. Excellent climbers except when upside down	39. Females often control mating
7. Desiccation resistant	24. Inbreeding resistant	40. Male influence on female fecundity
8. Not hydroscopic	25. Hitchhiking behavior	41. Males mating with fifth instar proto-females
9. Agoraphobic	26. Prey for other building insects	42. Bullying behavior
10. Aggregation behavior	27. Freeze and/or flight response	43. Males mate guard females
11. Stacking behavior	28. Peaking behavior to furtively reconnoiterer	44. Females egg guard
12. Complex pheromone communication	29. Use of exuvae for protection	45. Eggs laid on live insects and carried
13. Mostly photophobic	30. Dependent on human construction	46. Aggregating in high locations
15. Host switching to survive	31. Human anxiety and fragility	47. Heat response difference that is hunger dependent
16. Compulsive beak cleaning	32. Adult & nymph metabolic differences	48. Use of feces for refuge locating
17. Capacity to investigate	33. Pesticide resistance	49. Avoidance of water, easily drowned

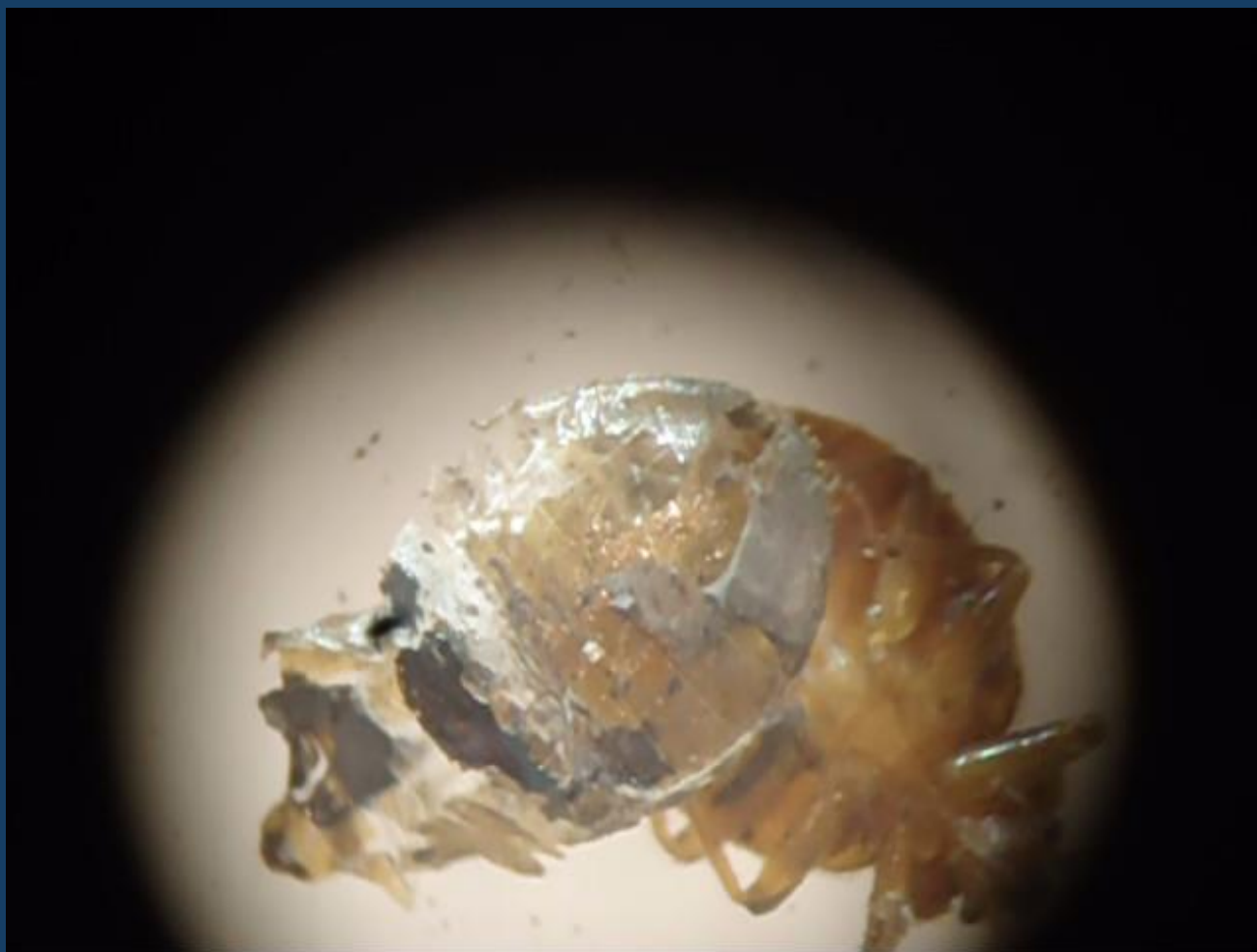
Thigmotaxis.

Bed bugs are driven by a need to touch a solid surface such as a crack.



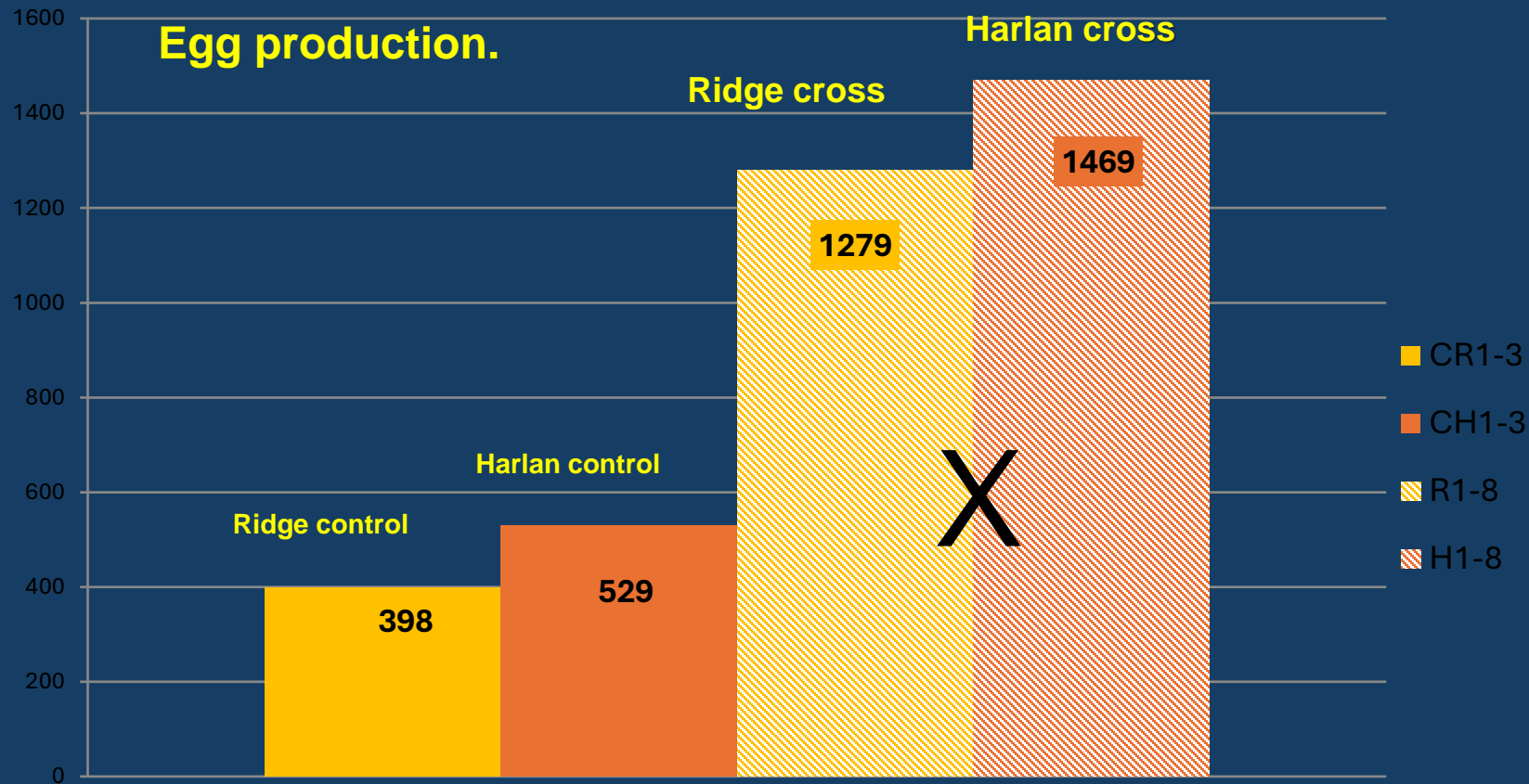
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**Recently fed 1st instar nymph
inside the exuviae (shed skin) of
an older nymph.**

Hybrid vigor. In bed bugs, increased fertility.



Individual egg laying behaviors by females.



Hiding eggs.

Predation. Bed bugs are a food source for many building insects.

Cockroaches hunt bed bugs.



Eaten!



Peeking behavior.



“Cockroaches, those nuisances to ships, are plentiful at St. Helena: and yet, bad as they are, they are more endurable than bugs. Previous to our arrival here in the Chanticleer, we had suffered great inconvenience from the latter, but the cockroaches no sooner made their appearance than the others entirely disappeared. The fact is that the cockroach preys on them, and leaves no signs or vestige of where they have been: so far it is a most valuable insect.”

Webster WHB. 1970. Narrative of a voyage to the Southern Atlantic Ocean in the years 1828, 29, 30 performed in the H. M. sloop Chanticleer. First pub. 1834, Vol I (Page 373). Dawson of Pall Mall, London.



ARTICLE

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OPEN

Unique features of a global human ectoparasite identified through sequencing of the bed bug genome

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Blood feeding.



Sexual competition and mate guarding.

Male mating with a proto-5th instar female nymph.



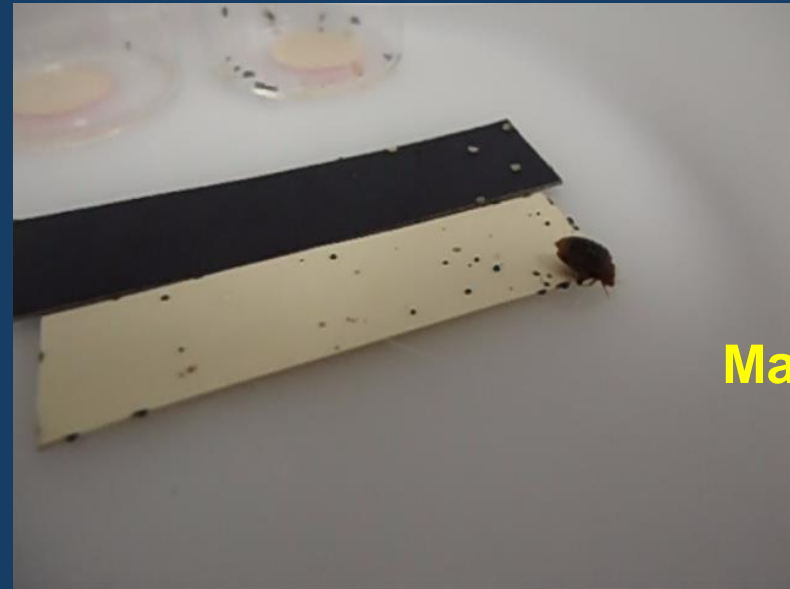
Male competition.



Dorsal guarding.



Lateral guarding.



Mate guarding movie.

Tapping.



Live 1st instar nymph after feeding on an adult.



Sibling 1st instar nymphs with no access to a host. One on left had fed on an older nymph that had been given a blood meal. It had also had a previous meal.

Stacking.



Pesticide resistance by behavior.



**Movie of Irvington, New Jersey
line, dying 24 hours after
exposure to Bifenthrin.
The filter paper was
treated in the center with the outer
edge untreated.**



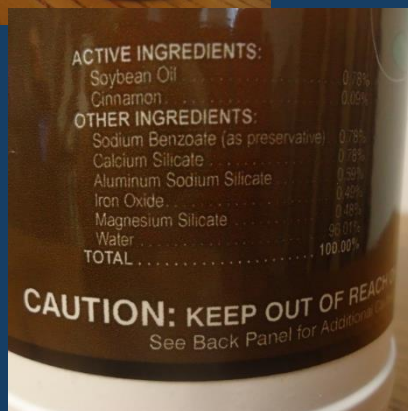
Avoidance behavior.

**Healthy Harlan line, 3 weeks
after exposure to Bifenthrin
treated filter paper.
The filter paper was
treated in the center with the outer
edge untreated.**

Hitch hiking.



Snake Oils and More.



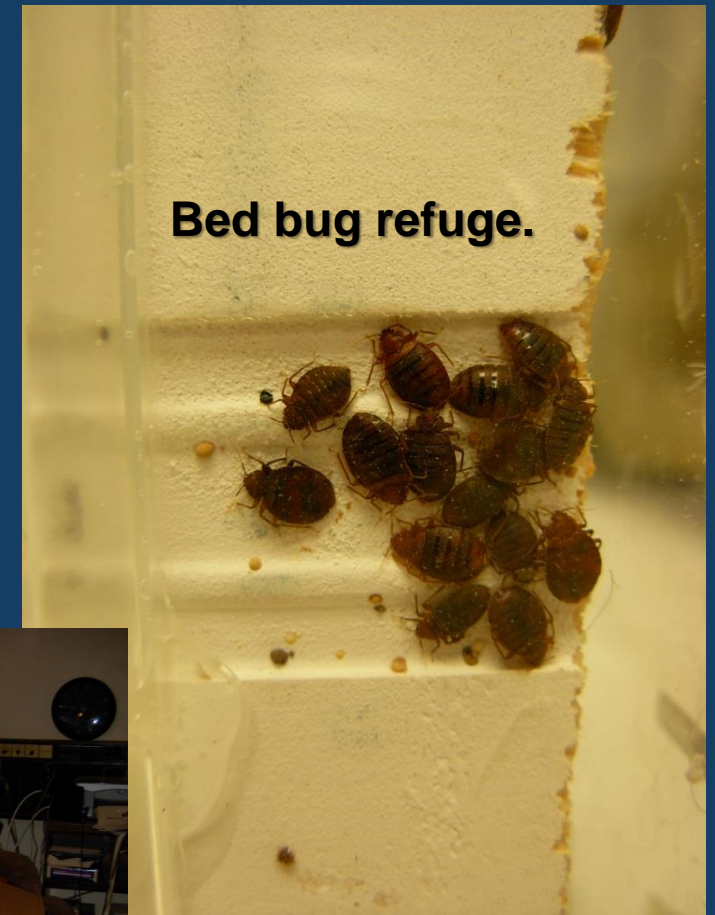
Problem sources.

Downsizing, hoarding, and clutter.

Myth: “Dirty people have bed bugs!”

Anyone can have bed bugs, clean or dirty.

It's all about “clutter” obscuring viewing.



Bulky waste pick up and scavenging.



**Boston Health Department
uses ketchup to
deter mattress scavenging.**

Hoarding



Climbup® bed bug interceptors have a measure of control against small bed bug populations.



International Entomology Meetings, Vancouver, Canada. 2018

Integrated Pest Management (IPM).

Public Education - Bus poster

GIVE BED BUGS THE BOOT.
DALE UNA PATADA A LOS CHINCHES.

DON'T PANIC.
COMMUNICATE
COOPERATE

HELP
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CCA BB
THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION



CimeXa™ Silica Gel



Crevice tool



Caulk Cracks & Crevices along wall zones.

Bed bug resistant furniture.



Suggested strategies.

IDENTIFICATION!!!

Target treatments on cracks and crevices **not clothing!**

If worried, clothing can be put into a dryer (High temp. for 20 minutes).

At the minimum, have a **dryer** on premises.

Vacuum using a crevice tool removes refuge detritus, insects, and eggs.

Repeat every 10 days to intercept insect's biology if not using pesticides.

Do not wash and clean refuges while treating. Bait insects using their own natural odors.

Use bed bug interceptors, metal beds/frames, box spring covers (not mattress covers).

Keep tidy to reduce hiding places.

Caulk cracks and crevices.

Professional duties?.....have an extra set of clothes on hand.

Do not use over the counter (OTC's) pesticides.

Use competent dog teams in routine preemptive inspection practices.

Work with Connecticut family-owned Pest Management Professionals with experience.

Heat treatment as a last resort.



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Award given to Judith R. Dicine (2016).



Attorney Judith R. Dicine

*In grateful thanks for your leadership
and service to the State of Connecticut.
Your efforts were critical in
the passage of the law.*



*The signing of Public Act "Act Concerning the Rights and Responsibilities of Landlords
and Tenants Regarding the Treatment of Bedbug Infestations"*

*Governor Dannel P. Malloy
2 PM Tuesday October 11, 2016
Governors' Office
210 Capital Avenue
Hartford, Connecticut*

Public Act No. 16-51: An act concerning the rights and responsibilities of landlords and tenants regarding the treatment of bed bug infestations.



BED BUGS MEET THE LAW

An Explanation of Public Act 16-51, the New Landlord-Tenant Bed Bug Law



Judith R. Dicine, J.D. , Supv. Ass't State's Atty.

State of Connecticut, Division of Criminal Justice

Office of the Chief State's Attorney – Housing Matters

Presented at Bed Bugs Meet the Law, CCABB Forum X

Frank H. Netter School of Medicine, Quinnipiac University, November 8, 2016

The Landlord-Tenant Bed Bug Legislation CT Bed Bug Public Act 16-51

- ✓ Establishes a framework to identify and treat bed bug infestations in residential rental properties, including public housing but excluding detached, single-family homes.
- ✓ It sets separate duties and responsibilities for landlords and tenants, including notice, inspection, and treatment requirements.
- ✓ It also gives landlords and tenants remedies when the other party fails to comply with these duties and responsibilities.

- **Tenant's (T's) obligation to report**

(Section 1.(b)(1) of the Act).

- T shall promptly notify the Landlord (LL) orally or in writing when T knows or reasonably suspects the T's unit is infested with bed bugs (BB).

- **Landlord's (LL's) obligations and entry rights upon report by T of BB infestation in T's unit**

(Section 1.(b)(1) of the Act, cont.)

- Not later than five (5) business days after receipt of said notice from T, LL shall inspect or obtain an inspection by a qualified inspector, of the T's unit and any contiguous unit LL owns, leases or subleases.
- **IMPORTANT NOTES (see also slide 15 below):**
 - LL or qualified inspector may only enter the T's unit and any contiguous unit to it that LL owns, leases or subleases with T's consent, a court order or under circumstances of emergency per the Act and CGS §47a-16.
 - If T unreasonably refuses entry after 24 hours or more notice, LL and qualified inspector are prohibited from entry unless it is required under circumstances of emergency. Otherwise, LL must petition a court and obtain an order for entry per CGS §47a-18.



Thank you. Questions?

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