Connecticut Bed Bug Forum IV

December 7, 2010

1:00 to 4:30 PM

Jones Auditorium
Connecticut Agricultural Experiment Station
New Haven, Connecticut
"Don’t Let the Bed Bug Bite Act"

111TH CONGRESS
1ST SESSION H. R. 2248
To establish a grant program to assist States in inspecting hotel rooms for bed bugs, and for other purposes.
IN THE HOUSE OF REPRESENTATIVES
MAY 5, 2009
Mr. BUTTERFIELD (for himself, Mr. YOUNG of Alaska, Mr. CHANDLER, Mr. RUSH, Ms. MCCOLLUM, Ms. CORMINE BROWN of Florida, Mr. COHEN, Mr. MILLER of North Carolina, and Ms. EDDIE BERNICE JOHNSON of Texas) introduced the following bill; which was referred to the Committee on Energy and Commerce, and in addition to the Committee on Financial Services, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned
A BILL
To establish a grant program to assist States in inspecting hotel rooms for bed bugs, and for other purposes.
1 Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, 3 SECTION 1. SHORT TITLE.
4 This Act may be cited as the “Don’t Let the Bed Bugs Bite Act of 2009”.

Congressman Butterfield (D) (North Carolina)

Congressman Young (R) (Alaska)
Congressional Bed Bug Forum
Thursday, November 18, 2010

• Panel 1: Scientific Panel
  • Dr. Dini Miller (Virginia Polytechnic)
  • Dr. Michael Potter (Uni. Kentucky)

• Panel 2: Industry Panel
  • Ms. Missy Henriksen (VP. NPMA)
  • Mr. Brian Hendy (VP Wallick-Hendy Dev.)
  • Mr. Joe McInerney (Chief Oper. Officer AHLA)

• Panel 3: Residential Victim
  • Ms. Silvia Salazar

  • Mr. William Diamond (Deputy Dir. Pesticide Prog. EPA)
  • Dr. Mark Feldlaufer (Research entomologist USDA)
  • Dr. Peter J. Ashley (Director HUD)
  • Mike Potter (Armed Forces Pest Management Board)

• Note: Titles truncated to save space
Projects

- Listserv
- Public outreach
- Health department video
- Best Practices for Bed Bug Management
  Mattress, bedding and upholstered furniture. Guidance document for the reuse/resale and recycling industries in Connecticut
- Document reviewing
- Protocols: including schools, visiting nurses, heath agencies etc.
- Future forums
- EPA grant
- CT Bed Bug Pest Management Professionals service list (NPMA)
Bugs without Borders
Dr. Gale E. Ridge
Connecticut Agricultural Experiment Station

World distribution of bed bugs

Red: Bed bug distribution
White: Not there yet!

Connecticut Bed Bug Forum IV: December 7th, 2010
A long human history with bed bugs resulted in a unique name for the insect in most world languages.

<table>
<thead>
<tr>
<th>Language</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Bed Bug</td>
</tr>
<tr>
<td>Germany</td>
<td>Wandlaus (wall louse)</td>
</tr>
<tr>
<td>Slavic</td>
<td>Pluskwa (flat louse)</td>
</tr>
<tr>
<td>Czech</td>
<td>Stenice (wall)</td>
</tr>
<tr>
<td>Africa</td>
<td>Tihuani</td>
</tr>
<tr>
<td>India</td>
<td>Uddamas (biter)</td>
</tr>
<tr>
<td>Hindu</td>
<td>Mak hun</td>
</tr>
<tr>
<td>Greek</td>
<td>Coris (to bite)</td>
</tr>
<tr>
<td>Latin</td>
<td>Cimex</td>
</tr>
<tr>
<td>French</td>
<td>Punaise (stink)</td>
</tr>
<tr>
<td>Russian</td>
<td>Klop</td>
</tr>
<tr>
<td>Arabic</td>
<td>Buk</td>
</tr>
<tr>
<td>Chinese</td>
<td>Piq-seq (wall louse)</td>
</tr>
<tr>
<td>Japanese</td>
<td>Tokourami (bed louse)</td>
</tr>
<tr>
<td>Spanish</td>
<td>Chinche de Cama</td>
</tr>
</tbody>
</table>

**Adult and Nymphs**

**Size of adults**
Ice age: 20,000 – 10,000 years ago

Caves of Afghanistan: believed point of crossover from bats to humans
Man moves out of caves, builds homes, and bed bugs move in and get comfortable.

The Fertile Crescent in the middle east

Stone architecture mimicking caves
World Trade Routes and bed bug world distribution

Pre-medieval trade routes

Current trade routes

Spice routes
Family portrait

- Adult and nymph
- Adult male
- Adult female
- Newly hatched nymphs and egg cases
Life Cycle

Under good conditions:

At 83-90°F and 75-80% relative humidity
4-5 weeks (egg to egg)
(this can vary depending on temperatures)

- Feed only on blood, usually mammal or bird with piercing sucking mouthparts
- The 5 nymph stages need a blood meal to molt up the next stage
- Adults need blood meals for reproduction

Mating: “Traumatic Insemination”,
The Life Cycle of a Bed Bug

- Egg
- Hatches
- Hungry 1st Instar Nymph
- Blood-fed 1st Instar Nymph
- Molts
- Hungry 2nd Instar Nymph
- Blood-fed 2nd Instar Nymph
- Molts
- Hungry 3rd Instar Nymph
- Blood-fed 3rd Instar Nymph
- Molts
- Hungry 4th Instar Nymph
- Blood-fed 4th Instar Nymph
- Molts
- Hungry 5th Instar Nymph
- Blood-fed 5th Instar Nymph
- Molts
- Adult Female
- Adult Male
- Adults Feed and Mate Multiple Times
- Lays Eggs
- Seeks Host
- Leaves Host Fully Fed

* John F. Anderson
Activity of bed bugs captured in traps during 3 hr intervals (Mellanby 1939)

* John F. Anderson
Average number of days needed by a bed bug to complete one generation at specific temperatures (Johnson 1942)

* John F. Anderson
Bed bug sign

Cluttered apartment

Two types of fecal spots

Detritus

Fecal spotting, in this case, on walls
Look-a-likes: illustrating importance of identification

- Head louse
- Black legged tick
- Cat flea
- Bed bug & varied carpet beetle larva
- Bed bug & varied carpet beetle abdomen
- Shiny spider beetle
- lint
Delusory Parasitosis, Ekbom Syndrome

Match box sign
Similarities Among Complaints and Samples From Clients With Suspected Delusionary Parasitosis: The OSU Plant Pest Diagnostic Clinic Experience
Barbara Bloetscher, Susan C. Jones, David J. Shetlar, and Celeste Welty
The Ohio State University

Abstract
Delusionary parasitosis has been described as a condition in which a person suffers from the illusion that his/her body is infested with an insect or mite. Individuals become overwhelmed with the sensation of tiny creature biting or burrowing into their skin and scalp.

Clients have either been referred to the Ohio State University’s C. Wayne Ellett Plant and Pest Diagnostic Clinic (PPDC) to identify these pest(s), or they have found the Clinic by searching the Internet. Confirmed that they are not crazy, clients send a wide variety of items thought to contain the pest.

Despite the voluminous samples submitted however, most samples contained no arthropod. Instead, samples contained mostly skin, fabric fibers and inorganic debris. Clinic cases showed that females and people over 50 years of age submitted more samples. It was also noted that more samples were received in May (11%) and September (14%) and in the first two quarters of the moon phase.

Introduction

The C. Wayne Ellett Plant and Pest Diagnostic Clinic is a diagnostic laboratory at The Ohio State University, available to industry and residents for plant disease and insect identification. Clients find information about the Clinic through extension offices, OSU websites and fact sheets published at OSU, particularly the HYG FactSheet “Mystery Bugs”.

This study is based upon for-fee samples submitted to the Clinic from 2002-2005 that contained unknown or unseen insects that bit and/or burrowed under the inquirers’ skin, or were suspected to be caused by invisible mites, lice, spiders, chiggers, or biting midges.

The purpose of the study was to classify the types of items submitted. The clients’ demographics (age and sex) were then characterized. The timing of sample submission also was investigated.

Materials and Methods

70 cases involving one or more samples, which clients characterized as containing unknown and unseen insects were submitted to the Clinic from 2002-2005. Clients referred to these pests as no see-ums, invisible mites, lice, spiders, chiggers, or biting midges. Records were also kept of personal communication (letters, telephone calls) from each client.

Samples included:
- $ Human skin, scab fragments, body secretions and hair
- $ Cotton swabs, gauze and tape wiped on skin and scalp
dander, droppings, fur and feathers from pets and livestock
- $ Fabric, fuzz, lint, and similar debris/fragments
- $ Personal clothing items, bedding, carpet fragments
- $ Debris taped on cardboard, stuck on glueboards,
  class slides, vials of alcohol

Results

Despite the numerous samples submitted, only 8% contained biting arthropods (Fig. 1). Furthermore, the clients’ symptoms of excessive bites and rashes over extended periods of time were not consistent with arthropod-related injury.

Mites occasionally invade homes and offices causing rashes and bites, however they cannot survive off their host for months to years. Other arthropods were:
- Hair, mucous
- Lint
- Inorganic Matter
- Arachnids

Items identified included (% of total samples):
- Lint 20.97
- Outdoor insects 6.91
- Indoor insects 12.91
- Plant parts 10.37
- Animal debris 3.46
- Bed bug 2.3
- Skin 7.83
- Scab 6.69
- Mucus 6.0
- Animal debris 3.46
- Parasitic wasps 2.07
- Lint 20.97

McKee’s papilloma is a viral infection of the skin found in rural and forested areas. The Clinic did not find insects or mites as the source of the problem in almost all cases. Instead the samples contained inorganic, inanimate objects commonly found in residences or offices, yet complaints of these symptoms and visible rashes, sores, and bloody scabs plagued the inquirers. It is more likely that stress, contraindications of medication, and health problems contribute to the symptoms. Other causes may exist and should be considered by physicians and psychologists.

Conclusion

The Clinic did not find insects or mites as the source of the problem in almost all cases. Instead the samples contained inorganic, inanimate objects commonly found in residences or offices, yet complaints of these symptoms and visible rashes, sores, and bloody scabs plagued the inquirers. It is more likely that stress, contraindications of medication, and health problems contribute to the symptoms. Other causes may exist and should be considered by physicians and psychologists.
Other types of skin lesions not caused from bed bug feeding

Drug reaction

Mold

Ant stings

Thyroid

Pimple

Cat

Horse

Sheep wool

Feathers

Ant stings

Self inflicted injury
Bed bug feeding sign

Usually feeding patterns are either linear or clustered
Self inflicted lesions made by Ekbom Syndrome sufferer attempting to remove bugs from in the skin
Entomopathogenic fungal research

Stage 1: Initial efficacy tests
Results

1. Immobilized

2. Early stage of fungal development

3. Green fungal spore mats

4. White stage with green spores
Table 1. Percent mortality of *C. lectularius* L. adults exposed to EC formulation of *Metarhizium anisopliae* strains F52 and DWR346 through dip treatment at various concentrations (n = 10 adults/concentration)

<table>
<thead>
<tr>
<th>Concentration (spores/ml)</th>
<th>Strain</th>
<th>Days post treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1.0 x 10^5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1.0 x 10^6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1.0 x 10^7</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>1.0 x 10^8</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>1.0 x 10^9</td>
<td>20.0</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 2. Percent mortality of *C. lectularius* L. adults exposed to EC formulation of *Metarhizium anisopliae* strain F52 through dip, surface and spray applications at various concentrations (n = 20 adults/concentration/exposure time)

<table>
<thead>
<tr>
<th>Concentration (spores/ml)</th>
<th>Rate of application (spores/cm²)</th>
<th>Dip&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Surface</th>
<th>Spray-Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1.0 x 10⁵</td>
<td>1.1 x 10⁵</td>
<td>80.0</td>
<td>100</td>
<td>15.0</td>
</tr>
<tr>
<td>1.0 x 10⁶</td>
<td>1.1 x 10⁴</td>
<td>100</td>
<td>100</td>
<td>15.0</td>
</tr>
<tr>
<td>1.0 x 10⁷</td>
<td>1.1 x 10⁵</td>
<td>100</td>
<td>100</td>
<td>25.0</td>
</tr>
<tr>
<td>1.0 x 10⁸</td>
<td>1.1 x 10⁶</td>
<td>100</td>
<td>100</td>
<td>15.0</td>
</tr>
<tr>
<td>1.0 x 10⁹</td>
<td>1.1 x 10⁷</td>
<td>100</td>
<td>100</td>
<td>30.0</td>
</tr>
</tbody>
</table>

<sup>a</sup>Adults were dipped for 15 seconds in 1 ml of each concentration level from 1.0 x 10⁵ to 1.0 x 10⁹ spores/ml.
Stage 2: Terrariums

Terrariums mimicking field settings

Refuge clustering

Stressed bed bugs
Another human feeding bed bug species?

1. The common bed bug *Cimex lectularius* L.

2. The? *Cimex sp.*

3. The bat bug *Cimex adjunctus* Barber
Arthropods found or “bites” reported

Inspect sleeping area for signs of arthropod activity

Live arthropods present

- No
  - Do not treat premises
  - Resample
  - Examine other possibilities?

Get professional identification

Bed bugs Confirmed

- No bed bugs
  - Actions dependant on ID.

Homeowner

Tenant

Landlord or property manager, hotel, etc.

1. PCO

2. Health Dept.

Attorney
Thank you

Please note: All power point presentations will be posted on our webpage

WWW.CT.GOV/CAES
{On opening page, go to the icon “bed bugs” at the bottom of subject list in blue banner}

If you wish to join the CCABB Listserv please Call (203) 974-8600 or email gale.ridge@ct.gov