

Bed Bugs and Their Management in the U.S.

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Bed Bug Resurgence in North America

- From 2004 to 2008
 - New York City: 192 to 9,213 bed bug complaints
 - Baltimore city: bed bug calls increased 26 times
- More common in multi-unit dwellings than single family units.





Public Attitudes about Bed Bug Infestations

- From over reaction to no reaction.
 - Some people would throw away furniture, pay > \$1,000 to eliminate bed bugs
 - Some people never report bed bug infestations for fear of being evicted or high cost of pest control

Public Awareness about Bed Bug Infestations

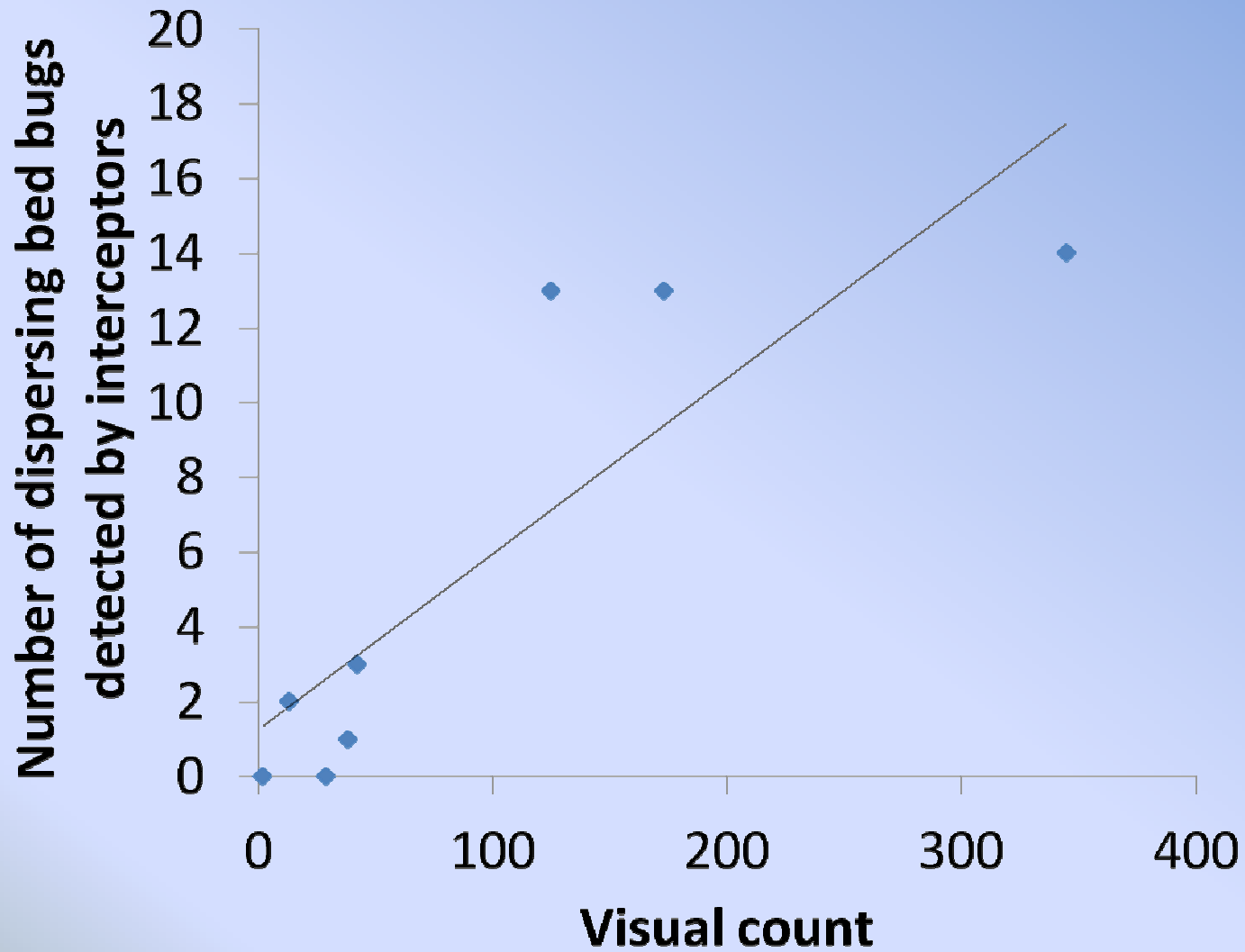
- 50% of the interviewed residents were unaware of the existing infestations in their homes.
- Common misconceptions about bed bug bites:
 - Allergic reactions
 - Mosquito bites
 - Spiders bites
 - Others

Causes of Bed Bug Spread

1. Active dispersal
2. Passive dispersal
 - Visiting infested apartments
 - Bringing in infested furniture
 - Resident relocation within a building
 - Using infested wheelchair in common areas of buildings



Frequency of Bed Bug Dispersal



Government Responses to Bed Bug Infestations

- Legislations in several states to mandate landlords pay for bed bug treatments
- Restricting the sale of used mattresses
- Task forces or coalitions for bed bugs
- Financial assistance to low-income people
- Research funding from federal agencies

Chemical Control Methods

- Sprays
 - Pyrethrins and pyrethroids
 - Silicon dioxide
 - Chlorfenapyr
 - Hydroprene (Insect growth regulator)
 - Alcohol
- Dusts
 - Pyrethrins
 - Diatomaceous earth
- Fumigant
 - Sulfuryl fluoride
 - Dichlorvos

Common Practices by Professionals

- A combination of dust and spray
- IGR is often combined with pyrethroids, but data on its field effectiveness are lacking.
- Two or three follow-up treatments are common.
- Control costs range from a few hundred USD to > \$1,000 per apartment (house).
- Companies only guarantee for about 3 months



Common Chemical Approaches by Residents

- Low income people often use over-the-counter products that do not have a label for bed bugs
 - Bleach, ammonia, alcohol, insecticide aerosols, boric acid dust, etc.



Common Chemical Approaches by Residents (continued)

- Some people purchase chemicals from internet vendors
 - Diatomaceous earth dust
 - Pyrethroids
- Some people are more concerned about pesticide contamination and prefer non-chemical methods

Non-Chemical Control Methods

- Disposal of infested items
- Installing mattress encasements
- Laundering
- Vacuuming
- Installing bed bug interceptors under furniture legs
- Applying hot steam
- Cold treatment (Cryonite®)
- Whole house heat treatment



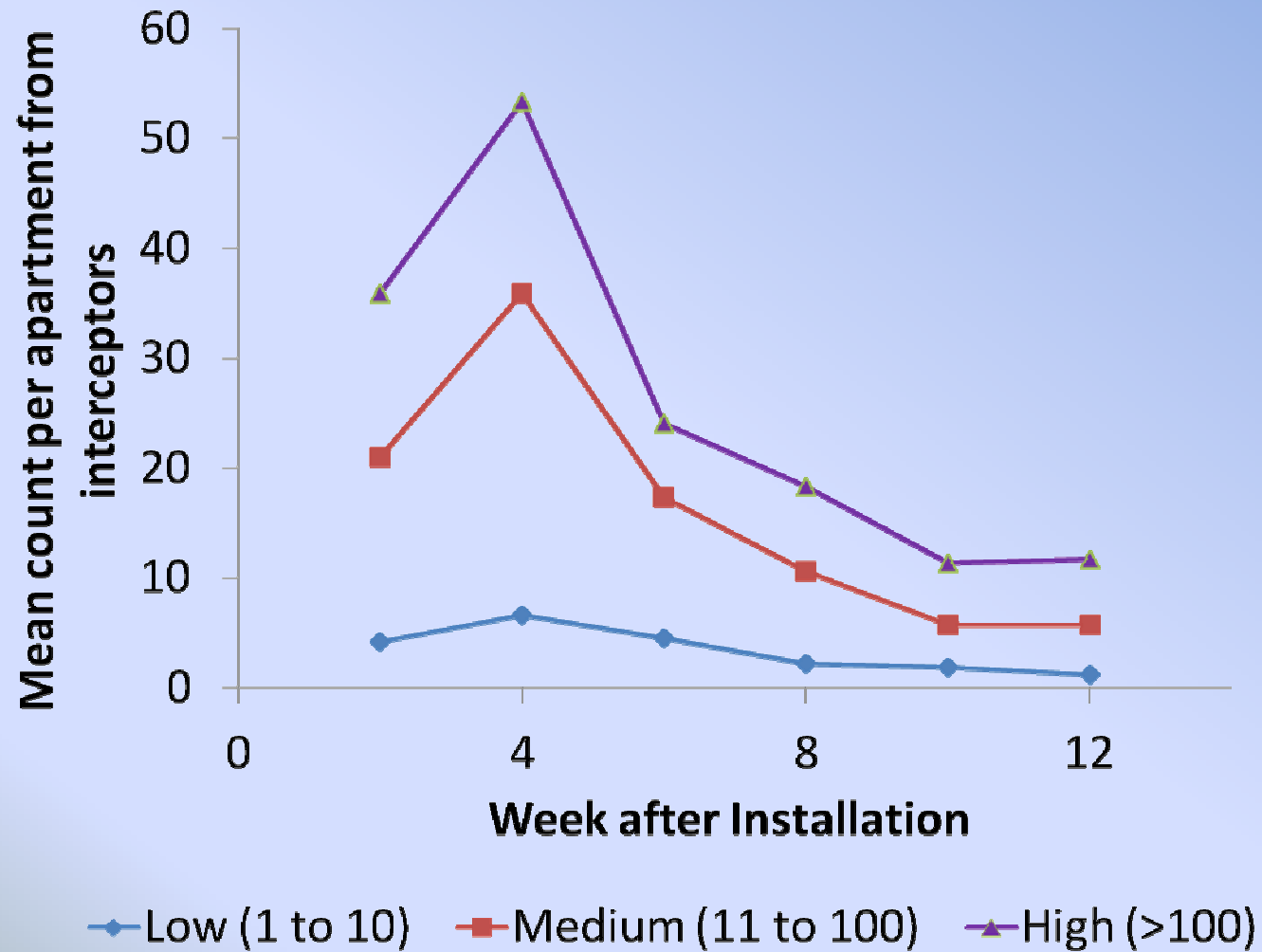
Common Practices by Professionals

- Education
 - Resident preparation
- Inspection
 - Visual inspection
 - Installing interceptors
 - Using canine scent dogs
- Non-chemical
 - Hot steam
 - Encasement
- Chemical

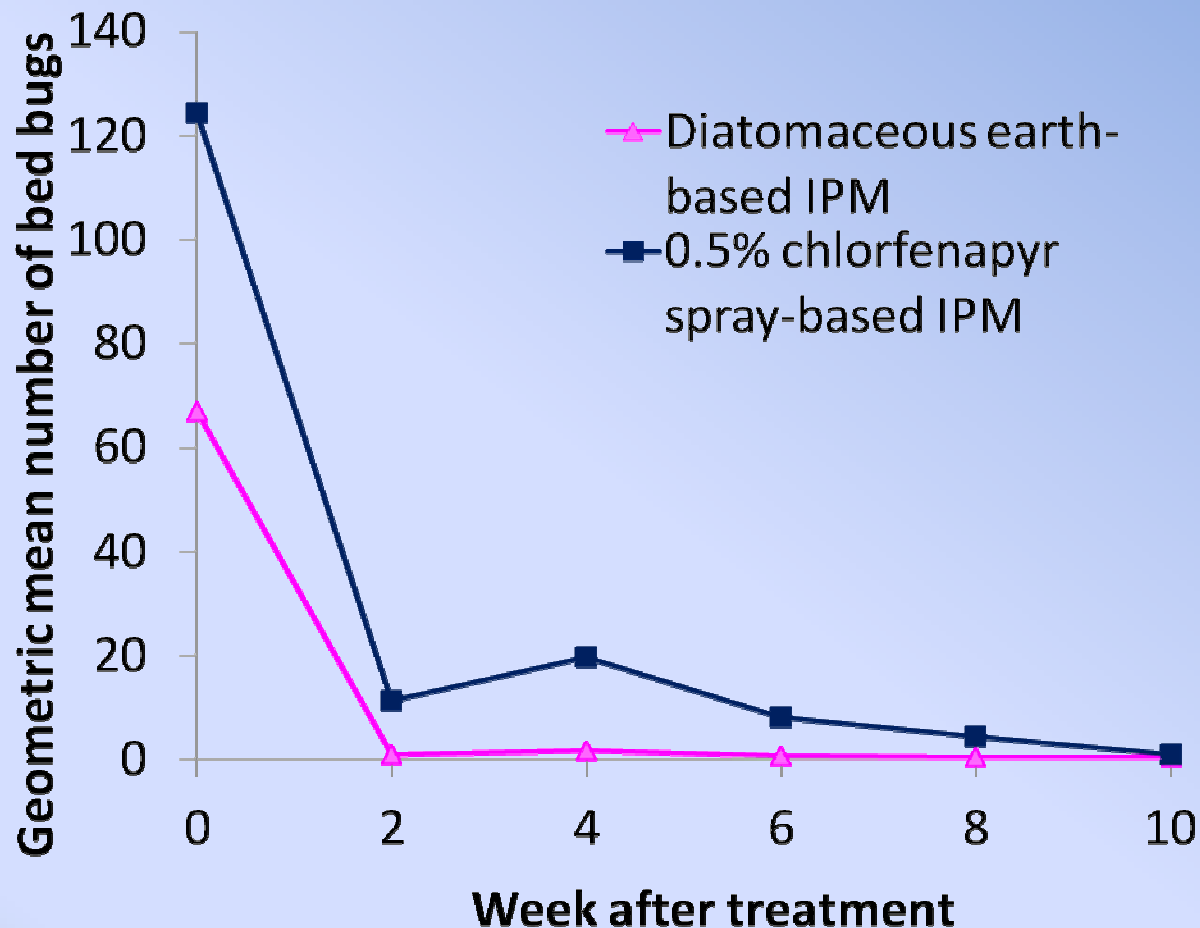




Effectiveness of a Contractor's Service



Effectiveness of Two IPM Programs



Wang et al. 2009. *J. Med. Entomol.* 46: 566-571

Key to success

- Education
- Monitoring
- Building-wide management
- Using multiple tools

Bed Bug Monitoring Techniques

- Climbup™ Interceptor
- Active monitors
 - Dry ice trap, NightWatch, CDC3000.
- Detection dogs

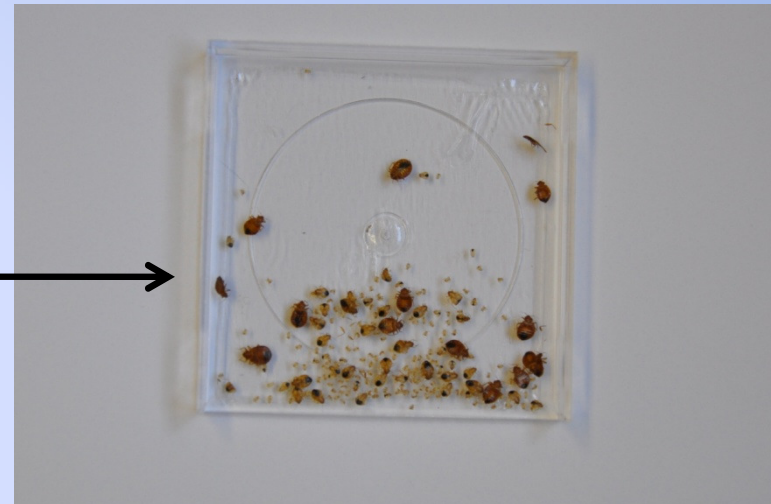
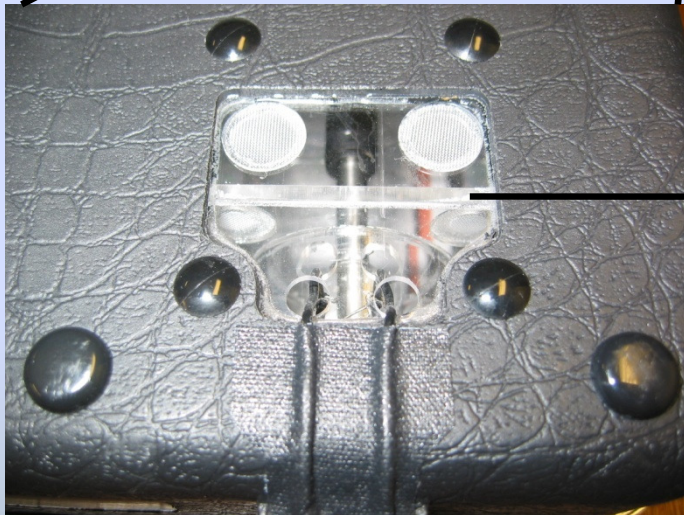




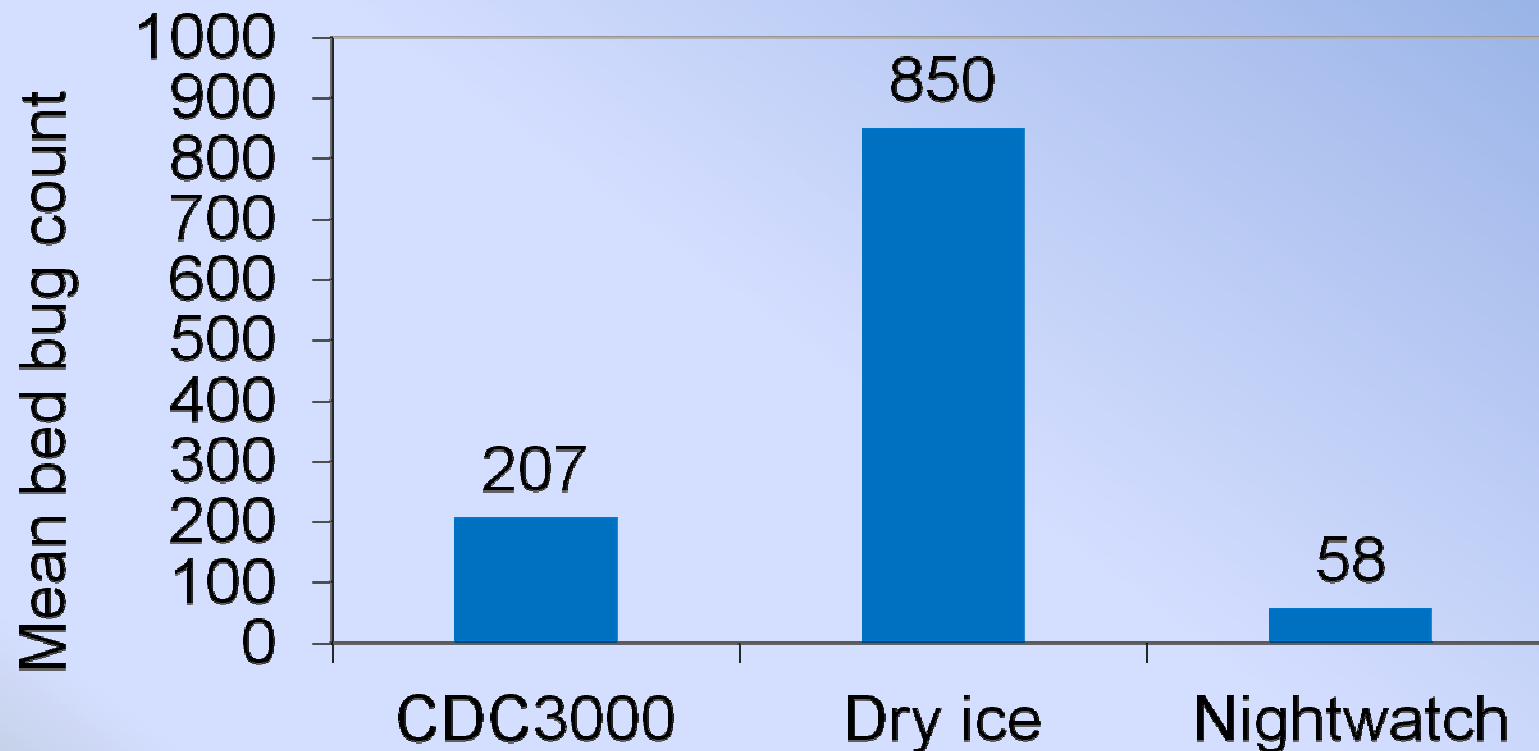




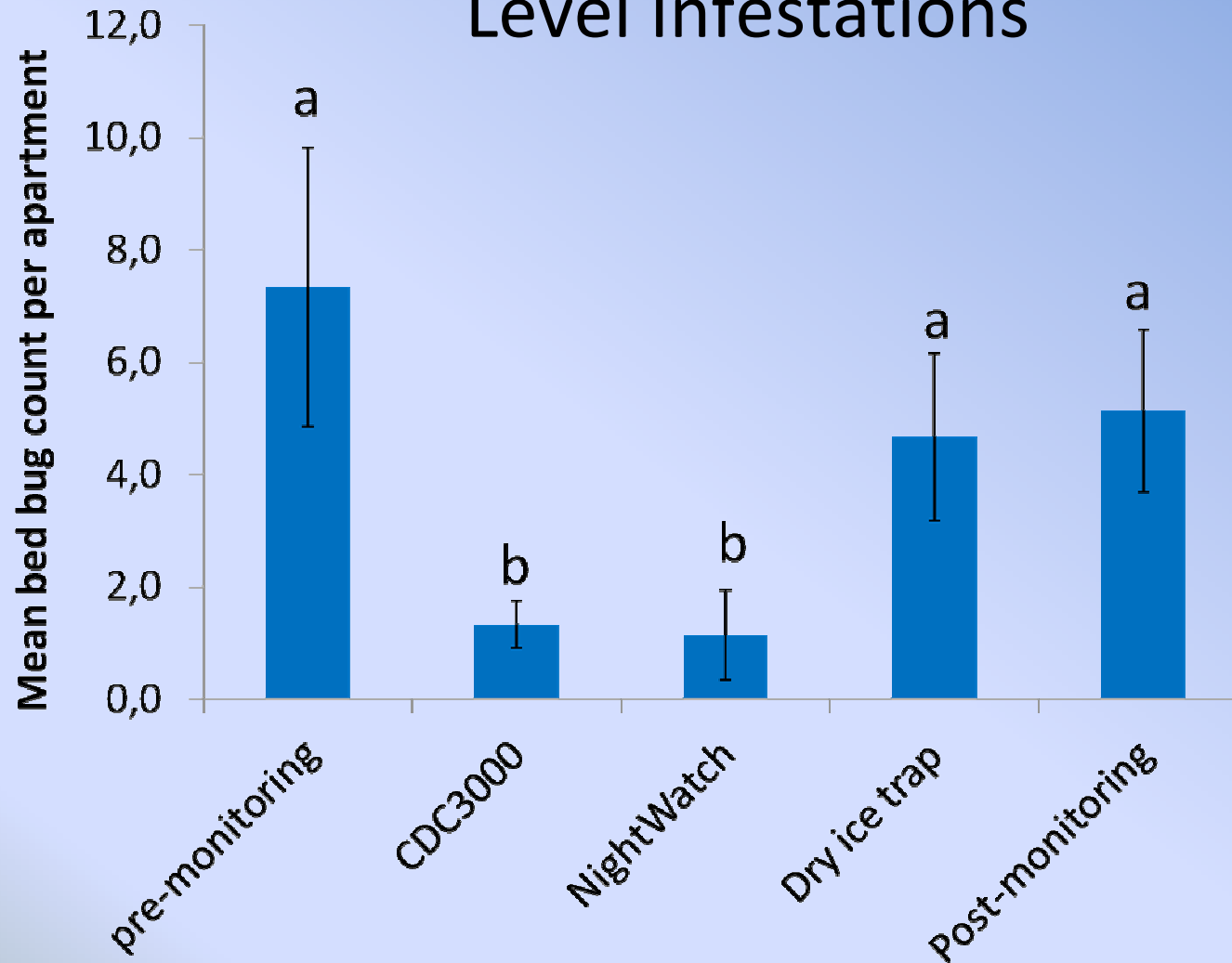
CDC3000™
(Cimex Science, LLC)



Effectiveness of monitoring devices for estimating bed bug populations (mean visual count = 809 per apartment)



Effectiveness of Monitors for Detecting Low-Level Infestations



Challenges

- Contractors
 - Low-cost, low quality control
- Residents
 - Lack of awareness
 - Unintentional spread of bed bugs
 - Do not cooperate

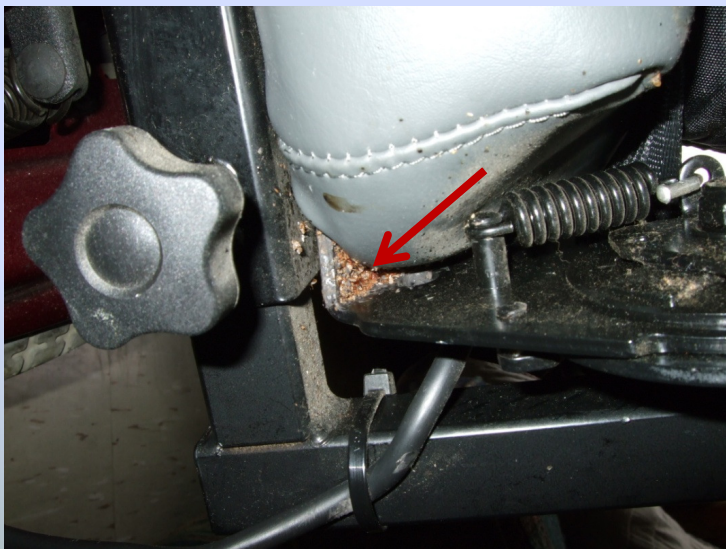
Case 1

- 551 bed bugs were trapped under furniture within 4 weeks period.
- Resident did not know the infestation.
- He thought the itching and red spots on his body were allergic reactions to deodorant.
- He traveled > 4 days per week.



Case 2

- > 3,000 estimated number of bed bugs in the apartment
- Resident used an infested wheel chair in the common area on daily basis.
- Resident was unable to wash clothing



Case 2 (continued)

- An infested wooden chair was discarded, but showed up in another apartment in the building.



Challenges Ahead!

