

# Building-Wide Bed Bug Management



Researchers from Rutgers and Purdue found that a building-wide bed bug IPM program is the best long-term solution to chronic infestations in multi-unit dwellings.

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**T**he greatest challenge in bed bug control probably lies in the chronic infestations in multi-unit dwellings. Eliminating a single infestation is relatively easy when proper strategies are used and ample service time is committed. Eradicating all bed bug infestations in a building when many infestations are present is much more challenging.

Bed bugs spread easily between neighboring units through active dispersal, resident relocation and resident social activities (see [www.pctonline.com](http://www.pctonline.com) for additional information). Different resident attitudes and collaboration levels

affect the speed of elimination. Unreported infestations foster high populations and increase the time required to eliminate an infestation. Asynchronous treatment schedules provide bed bugs opportunities to spread to other units before being eliminated. From our surveys in apartment buildings in Indiana and New Jersey, up to 45 percent of the units in multi-unit dwellings had bed bugs. None of the communities were able to successfully eliminate bed bugs despite the constant control effort invested by the building management. It is therefore necessary to look for more effective ways to reduce infestation rates and reduce the long-term cost associated with bed bug control.

We initiated a bed bug IPM study in a low-income, senior-citizen-occupied building in Indianapolis. In the first phase of the study, we relied on residents, management staff and PMPs to implement a building-wide bed bug treatment program using multiple control techniques. At six months after the first program, we initiated a second building-wide bed bug treatment program. The difference from the first program was that the researchers implemented all components of the IPM program. The program duration was 2½ months. By comparing the results from the two programs, we showed that both IPM programs resulted in high reduction in bed bug count. The researcher-executed IPM program resulted in a high level of control within a short period of time. In contrast, lack of interest of the involved parties and cursory treatment in the first IPM program resulted in much poorer reduction in bed bug infestation rate and population levels.

**STUDY SITE.** The study was conducted in a 223-unit, one-bedroom apartment building occupied by low-income seniors. The building has been infested with bed bugs since 2006. During 2008-10, Purdue researchers conducted various studies to monitor bed bug infestations, evaluate various control techniques, and educate the staff and residents. A pest control contractor serviced the building once a month and treated bed bug infestations based on resident complaints.

**FIRST IPM PROGRAM.** We initiated this study by training the building maintenance staff on using a steam machine to treat bed bug-infested furniture, installing mattress encasements once an infestation was found and assisting residents in de-cluttering. We



Applying steam to mattresses and box springs is an effective and safe control method.

then delivered a seminar to the housing authority staff about bed bug biology, prevention and control. A brochure on bed bug biology and management was distributed to each resident in the building.

The researchers installed ClimbUp interceptors under the legs of beds and sofas in units with suspected/reported infestations and monitored every two to four weeks until no bugs were found, then a visual inspection was conducted to confirm their absence. The monitoring results were sent to the building manager every two to four weeks. The researchers visited about 20-30 units every two to four weeks. Therefore, an infestation might have existed for a few months before being monitored and identified.

A total of 136 apartments were monitored and treated from July 2010 to March 2012. The rest of the occupied apartments were not monitored. The researchers treated many of the identified infestations using BASF's Phantom SC (0.5 percent chlorfenapyr), BASF's Phantom aerosol (0.5 percent chlorfenapyr), BASF's Alpine dust (0.25 percent dinotefuran, 95 percent diatomaceous earth) or Bayer's Tempo dust (1 percent cyfluthrin) for immediate relief of the residents (the pest control contractor only visited the building once a month). The staff or the researchers reminded the tenants to launder linens regularly (at least weekly), reduce clutter and discard difficult-to-treat furniture if their apartments had bed bugs.

The pest control contractor serviced the building monthly. During each service, pest control technicians spent about two days in the building inspecting and treating the units with pest problems (cockroaches, bed bugs, rodents, ants, spiders, etc). On average, only

a few minutes were spent in each apartment. They did not install or examine intercepting devices. They did not visually inspect or treat for bed bugs unless requested from the management office. The contractor used Bayer's Temprid SC (0.075 percent solution) and/or Phantom SC to treat bed bug infestations.

A building renovation project started about six months after the start of the study. By June 2012, only 135 occupied apartments were present. A building-wide survey was conducted in June 2012 to evaluate the IPM program on bed bug infestation reduction. We placed an average of four ClimbUp interceptors under the bed or sofa legs. We did not install interceptors both under beds and sofas due to a shortage of supplies on the installation date. The interceptors were inspected two weeks later. If no bed bugs were found in the interceptors, then a visual inspection of the furniture was conducted. The number of bed bugs found during visual inspections was categorized as low (1-10), medium (11-50) and high (more than 50).

**SECOND IPM PROGRAM.** A high percentage of apartments were still infested in the survey conducted in June 2012. Thus, a second building-wide IPM program was conducted by Purdue University researchers between Feb. 19, 2013, and May 5, 2013. The goals were to: 1) demonstrate a more effective treatment program and 2) further reduce the infestation rate. Researchers installed ClimbUp interceptors in 48 apartments and checked them after two weeks.

The 48 apartments either had bed bugs during the June 2012 survey or were reported by residents with possible infestations. An average of eight ClimbUp interceptors



were installed under furniture legs. Within a week after identifying infestations using ClimbUp interceptors and visual inspections, researchers treated the apartments with a combination of mattress encasements (if not already present), applying steam, and applying insecticide dust and/or spray. The insecticides used included: BASF's MotherEarth D (100 percent diatomaceous earth dust), BASF's Alpine Dust, BASF's Phantom aerosol, BASF's Alpine aerosol (0.5 percent dinotefuran), Bayer's Temprid SC or FMC's Transport GHP (0.11 percent solution). MotherEarth D or Alpine Dust was applied along perimeters of the rooms in all infested units. Aerosols also were applied directly onto live bed bugs during visual inspections. Transport and/or Temprid SC spray was applied to cracks and crevices according to the labels.

**RESULTS: FIRST PROGRAM.** Among the 136 apartments that received monitoring between July 2010 and March 2012, 67 apart-

ments (49 percent) were confirmed to have an infestation and 30 (45 percent) of them had more than 10 bed bugs. The median number of bed bugs was 10. Sixty-six apartments were treated by the PMP and the researchers during this period. Among them, bed bug numbers based on interceptor counts and visual inspections were reduced to zero from 40 apartments while the apartments were occupied, 25 apartments became vacant or in renovation while bed bugs were still present, two apartments were still infested and were occupied in March 2012. It should be noted that for those apartments where the bed bug counts reduced to zero, we did not continue to monitor or only monitored one more time after no bugs were found.

The building-wide survey conducted in June 2012 revealed 30 apartments (22 percent) were infested. Among them, 13 were detected by interceptors, 17 were detected by visual inspections; 16 percent had more than 10 bed bugs based on inspection or interceptor counts. Thus, the bed bug management

program reduced the infestation rate by 55 percent (from 49 percent to 22 percent). The percentage of infested apartments with more than 10 bed bugs reduced 64 percent (from 45 percent to 16 percent).

**RESULTS: SECOND PROGRAM.** Thirty-three apartments were found with bed bugs during the study period. Among them, eight infestations were discovered at a later stage and were not included in the data analysis. Twenty-five infestations were treated and monitored biweekly at least four times (about eight weeks) by Purdue University researchers. The mean (min-max) number of bed bugs per apartment based on interceptor counts before treatments was 5.5 (range: 1-25). Among them, only five apartments had more than 10 bed bugs per apartment. After four follow-up visits, no bed bugs were detected in 24 (96 percent) treated infestations based on interceptors and visual inspections. Among these 24 units, no bed bugs were detected for at least two or more



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consecutive visits (four to six weeks) in 21 treated infestations. A total of 169 g dust, 320 ml liquid spray and 77 man hours were used for treating and monitoring the 25 units. The amount of aerosol used was not recorded.

**DISCUSSION.** The first building-wide bed bug IPM program resulted in 55 percent reduction in the infestation rate. At the end of the project, 22 percent of the apartments still had bed bugs. Resident turnover, long treatment intervals (every month or longer), cursory treatment (a few minutes per apartment) by the contractor, and infrequent monitoring were all contributing factors to the mediocre results.

In contrast, the 96 percent elimination rate within a 2½ months period in the second building-wide IPM program is impressive. The difference in the second program from the first is the researchers identified and treated all infested units in a short period of time; followed a strict biweekly follow-up schedule; and treated carefully using mul-

iple tools and methods. Another contributing factor might be that all infestations had relatively low number of bed bugs (1-25 per apartment). The lack of high numbers was a result of the first building-wide IPM program, which reduced the bed bug numbers.

The study demonstrated several points for a successful bed bug management program: periodic monitoring is critical in identifying infestations early; both interceptors and visual inspections are important for determining eradication; and careful treatment and follow-up monitoring is essential. A survey of 15 housing authorities in New Jersey in 2010 found that all of them cited the lack of resident cooperation as an obstacle in carrying out bed bug control. This was also the case in the current study. Yet, with due diligence and an effective protocol, we proved a highly successful bed bug program can be achieved in low-income communities. A similar program led by in-house licensed pest control technicians in Jersey City Housing Authority (New Jersey) reduced the bed

bug infestation rate by 89 percent after a 12-month period (Cooper et al, unpublished data). These results provide evidence that a building-wide bed bug IPM program is a long-term solution to chronic bed bug infestations in multi-unit dwellings. **PCT**

*Authors' Acknowledgements: This study was sponsored by U.S. Department of Housing and Urban Development Healthy Homes Technical Studies Program. We thank Mahmoud Abou El-Nour, Adam Salyer, Jesse Hoteling and Aaron Meyers for their assistance in the building-wide bed bug IPM program. We also thank Michael Robinson, Sally Collins and Gerald McGuire from the Indianapolis Housing Association for access to the study site.*

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