

In February 2015, M&M Environmental conducted a large-scale study of *ActiveGuard* Mattress Liners in senior living facilities.

By Timothy Wong

PROTECTION THAT LASTS

Editor's note: The following article was written by Timothy Wong, director at M&M Environmental. Additional reporting was done by PCT staff.

A large-scale field demonstration was conducted in senior living facilities located in New York City to evaluate the value of installing *ActiveGuard* Mattress Liners, impregnated with the insecticide permethrin, for the control of bed bugs. This demonstration was managed by M&M Environmental, a professional pest management firm located in the New York City area. The housing selected comprised facilities within the JASA group (Jewish Association Serving the Aged). Because M&M has been providing bed bug control services to this senior popula-

tion, the firm's representatives wanted to see if *ActiveGuard*, by killing bed bugs directly, could prevent or retard early reinfestations, which can lead to an eventual full-blown infestation within this sensitive population of residents.

"The Far Rockaway JASA location is comprised of five complexes with over 1,200 units in residential senior housing," Timothy Wong, technical director for M&M Environmental, said. "Due to the sheer size of the complex and number of random bed bug infestations, we thought that the volume of units in this complex would provide for an excellent case study environment and allow us to have control samples as well. This was the first time the product was introduced to this complex."

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METHODS & MATERIALS. M&M spent more than 1,000 man-hours managing this demonstration over an eight-month period of time. Five facilities, containing about 1,000 units, were selected for the demonstration. All of the facilities had a similar bed bug infestation history and all shared a common dining area and community center. It should be noted that the majority of residents did not use English as their primary language, thus communication issues were a variable in the field test.

“Ninety-five percent of the residents in these complexes spoke only Russian so we had to find a translator to accompany us,” Wong said.

Bed bugs that re-infest units where ActiveGuard Mattress Liners had been installed on the mattresses eventually die.

The first step in the demonstration was to assess these 1,000 units to identify candidate test residences. Based upon resident cooperation and the ability to obtain access to units, 370 units were selected. Bed Bug Defender interceptors, which caught and retained bed bugs, were placed under the bed legs of every bed and inspected after two weeks.

Three hundred units with no bed bugs (based upon interceptor catch) were selected for this demonstration. Units dropped out of the demonstration because of residents’ unwillingness to participate, discarding of interceptors, resident relocation or the death of residents. As a result, the final number of units eventually investigated was reduced to 210.

“We anticipated that since all the residents were seniors they would mostly be home during the weekday but that wasn’t the case, and as a result, we had to keep going back to many units,” Wong said. “Some residents would tamper with the interceptors and we would have to find replacement candidates.”

These 210 units were divided into three groups of 70 units each, based largely on whether the unit had a previous history with bed bugs. Units from each of the five facilities were represented in every group.

Wong has been using ActiveGuard Mattress Liners for five years.

The three arms of this demonstration in-

cluded treatment application to two sets of units (Group 1 and 2) with a control (Group 3) as defined by:

Group 1: These units had a previous history of bed bugs, were previously treated (three or more months in the past) with insecticides and/or heat but were now deemed clear of bed bugs by lack of a positive interceptor signal. The beds in these units were fitted (defined as a treatment) with ActiveGuard Mattress Liners.

Group 2: These units had no history of bed bugs, were deemed clear of bed bugs by lack of a positive interceptor signal. These beds were fitted (defined as a treatment) with ActiveGuard Mattress Liners.

Group 3: These units had no history of bed bugs, were deemed clear of bed bugs by lack of a positive interceptor signal, and did not receive ActiveGuard Mattress Liners. This group functioned as the “control group.” Because there were no control measures in place, there was some concern that this group of residents might use some OTC (over-the-counter) insecticides if bed bugs were introduced.

Each unit contained from one to three beds and all four bed sizes (twin, full, queen and king) were represented. The interceptors, still in place, were cleaned to remove bed bugs (if any) when the ActiveGuard Mattress Liners were installed.

The three groups were established and Groups 1 and 2 were treated (with only ActiveGuard Mattress Liners) from October 2013 to January 2014. All of the 210 units were inspected by an inspector from April to May 2014 and each unit was graded based upon the bed bug catch found in the interceptors after five to eight months.

Bed bug treatment records were later inspected and the number of bed bug treatments completed was recorded from among the 210 test units after the demonstration was completed between May 2014 and October 2014 to determine if the ActiveGuard Mattress Liners continued to provide bed bug control for the test units. These bed bug treatments were specifically requested by unit residents.

RESULTS. The results of the inspection placed any given unit into one of three categories: (A) was a unit with only dead bed bugs; (B) was a unit with at least one live bed bug (all of these units contained at least 80 percent dead bed bugs); and (C) was a unit with no bed bugs at all. (Table

1, page 89.)

There were 70 test units within each Test Group. Bed bugs had five to eight months to infest any given unit.

Group 1, with a previous bed bug history, had more bed bug incidents (Category A + B = 28 percent) compared to

the nearly identical bed bug incidence rate of the two groups (2 and 3) without bed bug history (20 percent and 19 percent) respectively.

The arrival time of any bed bug introduction can significantly influence when control would occur in Test Groups 1 and 2 (both with ActiveGuard Mattress Liners) as the bed bugs must first be exposed to the treated fabric before eventual death. Those units in Category B, where 80 percent of the found bed bugs were already dead, were likely still in the process of being killed by the ActiveGuard Mattress Liners that can result post 72 hours+ after contact.

Interestingly, the two groups with ActiveGuard Mattress Liners installed (Groups 1 and 2) had the same small number of units (three each) with at least one live bed bug compared to Group 3, the control group, which had twice as many units with at least one live bed bug. If Groups 1 and 2 (both with ActiveGuard Mattress Liners) are combined, only six (4 percent of 140 units) had live bed bugs, compared to Group 3 (control) where seven (10 percent of 70 units) had live bed bugs. (Table 2, page 89.)

Because Group 3, the control group, had relatively as many units with all dead bed bugs as it did with at least one live bed bug, and no bed bug control measures were provided to that group to produce dead bed bugs, it would appear that these residents were likely using OTC insecticides to provide some level of control within those units with bed bug incidents. The application of OTC insecticides by residents usually results in poor control (as exhibited by the large number of units with live bed bugs within Group 3) because of lack of training and the selection of insecticides used. Insecticide applications that generate poor bed bug control promote the development of insecticide resistance in that population. Using ActiveGuard Mattress Liners provides a level of control that should preclude the need to use of OTC insecticides in similar scenarios.

Again, if Groups 1 and 2 (both with ActiveGuard Mattress Liners) are combined, seven (5 percent of 140 units) were treated compared to the control group where eight (11 percent of 70 units) were treated. (Table 2.)

DISCUSSION. The results of this dem-



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Category

Test Group	A	B	C
1	17 (24%)	3 (4%)	50 (72%)
2	11 (16%)	3 (4%)	56 (80%)
3	6 (9%)	7 (10%)	57 (81%)

Table 1: Units in which bed bugs were found in bed bug interceptors based upon inspection from April to May 2014.

onstration (Tables 1 and 2) indicated that units fitted with *ActiveGuard* Mattress Liners were about 50 percent less likely to contain live bed bugs or require a bed bug treatment compared to units without *ActiveGuard* Mattress Liners. Fewer bed bugs and treatments would result in significant savings from a management perspective. Note that all of the units fitted with *ActiveGuard* Mattress Liners received those liners months after any chemical or heat treatment. Installing *ActiveGuard* Mattress Liners as the last step in an Integrated Pest Management (IPM)

insecticide or heat treatment program would result in an even better outcome from the standpoint of bed bug control and re-infestation.

The results of this demonstration also indicated bed bugs that re-infest units where *ActiveGuard* Mattress Liners had been installed on the mattresses eventually die. *ActiveGuard* kills bed bugs for two years but it kills slowly (over several days) compared to other control measures. These results were similar to the results obtained from thousands of hotel rooms (with bed bug histories) where bed bug incident rates have been significantly reduced through the installation of *ActiveGuard* Mattress Liners on the beds (Ballard et al 2011, Ballard, 2011, Fenner 2016).

As *ActiveGuard* Mattress Liners are not repellent to bed bugs (Jones et al., 2013), bed bugs actively rest on the treated fabric.

In addition to the bed bug mortality that results from exposure to the treated fabric, there are other sub-lethal effects that have a negative impact on the growth of a bed bug infestation, such as significant reduction in feeding, even in highly resistant bed bug populations (Jones et al, 2013; S. Jones, 2014, personal communication). These negative effect(s) further work to reduce the bed bug population through time, even in highly resistant bed bug populations with 100 percent control usually resulting. Research continues to focus

Category

Test Group	A	B	C
1	0	3	2
2	1	0	1
3	5	1	2

Table 2. The number of units where the residents requested treatment for bed bugs between May 2014 and October 2014.

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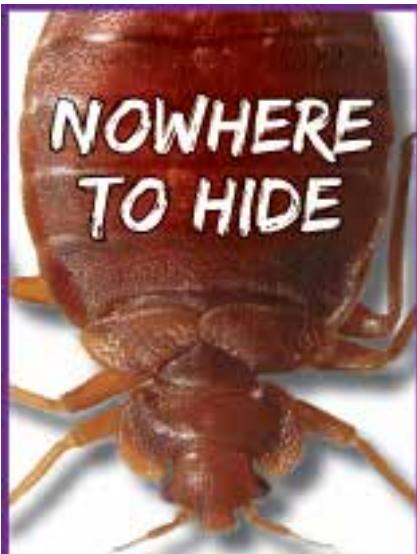
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Top row and bottom left: M&M's Quality Control Manager Charles Alaimo must prop up the mattress in order to install a typical bed bug mattress encasement. The ActiveGuard Mattress Liner is a fitted cover so it is never necessary to lift or prop up the mattress (bottom right).

on the markedly limited egg production as a result of the significant reduction in feeding after bed bugs are exposed to ActiveGuard Mattress Liners (Jones et al., 2015).

CONCLUSIONS. ActiveGuard Mattress Liners, when installed on the beds in uninfested units, can provide an excellent, cost-effective control of future bed bug incidents as a stand-alone preventive strategy in the control of bed bugs. Previous history of bed bug infestation appeared to increase the odds of a unit having a future bed bug incident.

ActiveGuard, whether installed in a room with previous bed bug activity history or not, appeared to prevent any incident from transforming into an infestation requiring treatment. This is certainly most evident in those rooms with an incident history that had previously transformed into an infestation requiring treatment. **PCT**

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