Effectiveness of Mattress Safe LLC Encasements for the Prevention of Bed Bug (*Cimex lectularius*) Damage

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ABSTRACT

Mattress Safe LLC encasements manufactured from a laminate or laminate-stretch material were tested to determine if bed bugs (*Cimex lectularius*) could penetrate or escape them. Bed bugs were placed inside and outside encasements fitted over foam blocks and observed to determine whether or not they could penetrate or escape the encasement. Bed bugs readily found harbourage areas on the encasement fabric but do not appear able to penetrate or escape the encasements. Using a Mattress Safe LLC encasement for the purpose of protecting the mattress from bed bug fecal spots, cast skins, or harbourage spaces is viable.

INTRODUCTION

The common bed bug (*Cimex lectularius*) (Fig.1) typically infests mattresses, box springs, and bed frames. This experiment aims to discover whether mattress encasements could be used as part of a bed bug exclusion or inclusion process. In theory, an encased mattress or box spring would exclude bed bugs from infesting them and protect against the resultant damage associated with such an infestation. In addition, bed bugs trapped in an encasement would be subject to starvation. Mattress Safe LLC has concluded via independent testing that the laminate material used to manufacture their encasements will prevent stains on the fabric of a mattress. Their waterproof design ensures that bed bug fecal matter (blood) will not bleed through and damage the mattress.

Figure 1. Adult bed bug (*Cimex lectularius*).

The success of an encasement protecting a mattress from bed bug related damage relies on its ability to prevent bed bugs from penetrating inside it.

MATERIALS AND METHODS

Bed Bug Colony

Cimex lectularius were collected from an infested apartment unit in Vancouver, British Columbia Canada on Sunday March 4th, 2007. The approximate number of individuals collected was 350.

The bed bugs were housed in a 1,000ml rigid walled Ziploc container lined with shredded paper and sealed with a screw lid.

Penetration-Escape Test

Six foam blocks (approximately 38cm x 28cm x 18cm) were used to simulate mattresses. The encasements were fitted over the blocks in the following fashion (Fig.2).

Figure 2. Bed bugs inside encasement.

Block 1: Full laminate encasement fully zipped up with 25 adult and 25 nymph bed bugs inside
Block 2: Full laminate encasement fully zipped up with 25 adult and 25 nymph bed bugs outside
Block 3: Laminate-Stretch encasement fully zipped up with 25 adult and 25 nymph bed bugs inside
Block 4: Laminate-Stretch encasement fully zipped up with 25 adult and 25 nymph bed bugs outside
Control 1: Laminate encasement fully unzipped with 25 adult and 25 nymph bed bugs inside
Control 2: Laminate encasement fully unzipped with 25 adult and 25 nymph bed bugs outside

Each of the replicates was placed inside XL Ziploc bags (60cm x 50cm), sealed tightly and stored at room temperature with 12 hours of artificial light and 12 hours of darkness per day. The replicates were observed once per week at the same time of day for a four week period to determine the number of bed bugs on the inside and outside of the encasement.

RESULTS

The blocks that were encased and fully zipped up maintained the bed bugs in their original starting position 100% of the time (Table 1). The bed bugs used for the two control blocks exhibited migration behaviour between the inside and outside of the encasement (Table 1). The results suggest that bed bugs move between the inside and outside of the encasement given the opportunity to do so.

DISCUSSION

Prevention

The results of this experiment demonstrate that an encased mattress or box spring is protected from being infested by bed bugs and subsequently from damage associated with them. Hotels with rooms that become infested with bed bugs often need to discard mattresses and box springs due to the damage caused by blood stains and fecal matter. The incorporation of mattress encasements could prove to be a cost effective method of preventing damage caused by bed bugs and minimize available harbourage spaces.

Treatment

It would be advantageous to encase an infested box spring or mattress as part of an elimination procedure. Bed bugs are notoriously difficult to eliminate from box springs as they contain ample harbourage spaces that are often inaccessible to pest control treatment. Mattresses and box springs could be encased subjecting trapped bed bugs to starvation and preventing them from spreading.

Table 1. Bed bug penetration into, or escape out of, Mattress Safe LLC encasements expressed as x(y) where x represents the number of bed bugs inside and y represents the number of bed bugs outside the encasement.

Replicate	Week 1	Week 2	Week 3	Week 4	Mean %
Block 1	50 (0)	50 (0)	50 (0)	50 (0)	100 (0)
Block 2	0 (50)	0 (50)	0 (50)	0 (50)	0 (100)
Block 3	50 (0)	50 (0)	50 (0)	50 (0)	100 (0)
Block 4	0 (50)	0 (50)	0 (50)	0 (50)	0 (100)
Control 1	38 (12)	36 (14)	40 (10)	40 (10)	77 (23)
Control 2	22 (28)	24 (26)	29 (21)	28 (22)	51.5 (48.5)