

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

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## ABSTRACT

Mattress Safe LLC encasement fabrics, a laminate and a stretch material were tested to determine if bed bugs (*Cimex lectularius*) could bite through them. Bed bugs were placed inside mason jars and each of the materials stretched over the mouth and secured in place by the ring lid. Bed bugs readily fed through the stretch material but did not feed through the laminate. Using a mattress encasement manufactured from the laminate material to enclose an infested mattress is a viable solution for preventing bed bug bites.

## INTRODUCTION

The common bed bug (*Cimex lectularius*) (Fig.1) typically infests mattresses, box springs, and bed frames. Mattress encasements have been used for quite some time to protect the fabric, prevent dust mites and allergens, and prolong the life of the mattress. This experiment aims to discover whether mattress encasements could be used as part of a bed bug eradication process. In theory, an infested mattress or box spring can be encased within an escape proof fabric sheath. If bed bugs can neither escape nor feed through the encasement they would succumb to starvation. The key to the success of such an approach is to determine whether the bed bugs can actively feed through the fabric of the encasement.

The encasements can either be constructed entirely of a laminate material or be constructed of a combination of both materials. The dual material encasement would be

laminated from the midpoint of the side of the mattress up over the top surface and the stretch material from the midpoint down covering the bottom of the mattress. The advantage of a dual fabric encasement being that it can fit mattresses of varying heights for a fraction of the cost of a fully laminated version.

The laminate fabric is a weave coated with a thin plastic layer on one side, and ought to be impervious to the feeding tube (proboscis) of the bed bug. The stretch fabric is much more porous and therefore it is likely that bed bugs will be able to feed through it.

## MATERIALS AND METHODS

### *Bed Bug Colony*

*Cimex lectularius* were collected from an infested apartment unit in Burnaby, British Columbia Canada on Saturday March 3<sup>rd</sup>, 2007. The approximate number of individuals collected was 150.



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

The bed bugs were housed in a 1,000ml rigid walled Ziploc container lined with shredded paper and sealed with a screw lid. The colony was not fed for a period of one week leading up to the experiment to ensure the insects would be hungry and apt to feed.

### Bite Test

The laminate material was subdivided into laminate A (plastic side up) and laminate B (plastic side down) to ensure the material was impervious regardless of which direction the bed bugs were feeding from. The materials to be tested; laminate A, laminate B, and stretch, along with a control material (Safeway brand all purpose pantyhose) were cut into 10cm x 10cm squares (Fig. 2). Five adult bed bugs and five first instar nymphs were placed into each of four 250ml Bernardin jam jars. Each jar had one of the materials to be tested stretched across the mouth of the jar and sealed into place via the threaded ring top (Fig. 3).

Each jar was inverted and placed snug against my arm for a period of fifteen minutes (Fig.4). The bed bugs allowed to roam on the material and were observed to determine whether they were actively feeding, probing the material or remaining stationary. After the fifteen minute period the jars were righted and the bed bugs shook to the base of the jar. The lid was removed and the bed bugs observed to determine whether they were able to feed through the material; a swollen or red bed bug indicated feeding had occurred (Fig. 5). This process was replicated a total of five times and all data recorded (Table 1).

## RESULTS

The stretch material and the pantyhose proved to be porous enough to allow the bed bug proboscis to penetrate and feeding by at least one bed bug to occur in all of the trials (Table 1). Conversely, the laminate material, whether plastic side up or plastic side down, was impervious to any bed bug feeding in all of the trials (Table 1).

## DISCUSSION

The bed bugs used in the laminate trials did posture as if trying to feed through the material. It was evident that they could detect the presence of a host and potential food source but were unable to feed through the material. In order to rule out the possibility that the bed bugs in the laminate trials were merely not hungry a trial was conducted with these same bed bugs using pantyhose on the jar. In each case at least four of the six bed bugs that did not feed while in the laminate trial did feed when placed in a pantyhose jar.

While the experiment proved that the stretch material is not impervious to bed bugs biting through, it still may have merit as an encasement material. If the laminate material, which is impervious to bed bug feeding, covers the sleeping surface and the stretch material covers the non-sleeping surface, then the ability of encased bed bugs to feed on a host is greatly diminished.



Figure 2. Materials to be tested cut into 10cm x 10cm squares.



Figure 3. Materials stretched over mason jars and held in place by metal screw ring.



Figure 4. Inverted jar with bed bugs feeding.

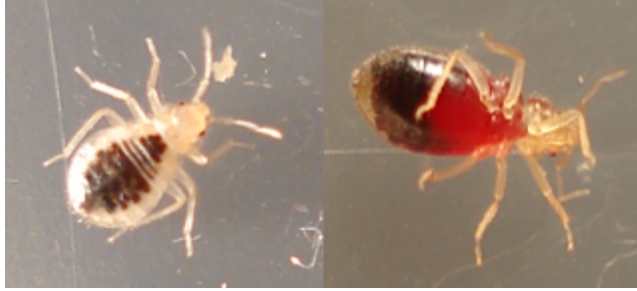


Figure 5. Bed buy nymph before (left) and after (right) feeding.

Future experiments will need to be conducted to determine whether an infested mattress sealed with an encasement can effectively prevent bed bugs from escaping.

Table 1. Bed bug feeding rates through fabrics expressed as x(y) where x represents the number of bed bugs to feed and y represents the percent of bed bugs to feed in the given trial.

Material	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Mean %
Control	10 (100%)	9 (90%)	9 (90%)	10 (100%)	10 (100%)	96
Laminate A	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0
Laminate B	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0
Stretch	8 (80%)	10 (100%)	9 (90%)	9 (90%)	10 (100%)	92