



NON-GLP STUDY REPORT

Date: January 2015

Sponsor: Seam Seal International, LLC.
Study: Bed Bug Prevention of ProtectEase Covers 15
Trial: CIMXLE
Sponsor Code: N/A
Test Method: 314-2

REPORT TITLE

Evaluation of the ProtectEase Brand™ Fabrics for Preventing Bed Bug (*Cimex lectularius*) Penetration and Feeding When Presented with a Human Host

STUDY

Bed Bug Prevention of ProtectEase Covers 15

TRIAL

CIMXLE

SPONSOR CODE

N/A

EXPERIMENTAL START DATE

January 8, 2015

EXPERIMENTAL COMPLETION DATE

January 8, 2015

REPORT DATE

January 2015

TEST FACILITY/AUTHORS

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SPONSOR

Seam Seal International, LLC.



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STUDY OBJECTIVE(S):

To evaluate fabrics in preventing bed bug (*Cimex lectularius*) penetration and feeding when presented with a human host.

TEST SUBSTANCE INFORMATION:

#	Test Substance	Lot and/or Batch #	Snell Receipt Code
1	SMS fabric: PESZ3S202 WH; PEQSZ3S202WH; PEKSZ3S202WH	N/A	010715-1-D-SEA
2	MF with TPU fabric: PESZ3S303WH; PEQZ3S303WH; PEKZ3S303WH; METZ5BB311WH; MEFZ5BB311WH; MEQZ5BB311WH; MEKZ5BB311WH	N/A	010715-2-D-SEA
3	Knit with PE fabric: PESZ3S101WH; PEQZ3S101WH; PEKZ3S101WH; METZ5BB111WH; MEFZ5BB111WH; MEQZ5BB111WH; MEKZ5BB111 WH	N/A	010715-3-D-SEA

TEST SYSTEM INFORMATION:

Trial	Test System	Strain	Stage/Age	Source
CIMXLE	Bed Bug (<i>Cimex lectularius</i>)	"Harlan" Susceptible	Mixed	Lab Reared



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TEST DESIGN:

# Reps per Fabric	# Systems per Rep	# Systems per Fabric	# Test Fabrics/ Encasements	Total # Systems	# Test Arenas
1	500+	N/A	3	1500+	3

MATERIALS AND METHODS:

The following is the Snell Scientifics Standardized Testing Method for evaluating the efficacy of fabrics and/or encasement closures when used as barriers against hematophagic arthropods. Further details related to this specific study are described following the test method summary. Select action items and illustrations have been removed from this standardized test method in an effort to make the report more precise and accurate to the study conducted. Any details removed from this test method were deemed irrelevant to the study conducted in this report.

314.1 Materials:

Test Arena Information:

314.1.1 Test Arenas:

314.1.1.1 *“Fabric Feed-Through” Method:* The fabric(s) were secured to pint size glass rearing jar(s) with cardboard harborage inserts.

Test Equipment:

314.1.2 **CO₂ and Regulator:** A standard 20 pound CO₂ cylinder with regulator was used to anesthetize the test systems and sort them into the test arenas. The test systems were allowed to adequately recover from anesthetizing before being exposed to the human host. Any additional transfers required after exposure to the test substances was conducted using methods that did not involve anesthetizing.

314.1.3 **Intermediate Sorting/Transfer Containers:** Additional sorting and transfer containers were used to aid in moving the test systems from the primary rearing/collection containers and into the test arenas.

314.1.4 **Timing Equipment:** Timing equipment was used as needed to assist in the timing when exposing the test systems to the human host.

314.1.5 **Test Subject (feeding attractant):** Human subject to attract the bed bugs.



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314.2 Methods:

“Fabric Feed-Through” Method:

- 314.2.1 The pint size jars were equipped with the test fabrics by placing the fabric over the open end of the jar and securing the outer screw on lid over the fabric.
- 314.2.2 The pint jars were equipped with cardboard inserts that provided harborage for the bed bugs and also allowed access for the bed bugs to travel from the bottom of the jar to the lid/fabric area of the jar.
- 314.2.3 Each jar contained 500+ various sized bed bugs (1st instars – adults), eggs, and debris.
- 314.2.4 The various bed bug stages were necessary to evaluate the possibility of different sized mouth parts penetrating and feeding through the test fabrics.
- 314.2.5 The bed bugs selected for use in the study were starved for at least 5 days prior to testing. All of the test systems were confirmed to be of “good vigor” (alive) prior to exposure to the test substance(s).
- 314.2.6 To conduct the “feed through” evaluations against the fabric(s), the fabric(s) (attached to the jar with bed bugs) were held to human body parts (inside arm area) for 15 minutes.
- 314.2.7 Indications of feeding were any “obvious feeding sensations” that were felt during the evaluations, any noticeable feed marks observed on the human, and visual signs of feeding (swelling and noticeable blood inside the abdomen) observed in the bed bugs.
- 314.2.8 Feeding through the test fabrics was documented as the estimated number that fed during the evaluation.

Test Photographs:

- 314.2.9 The evaluations using the described methods followed the photographs in the Appendix A: Photograph section of the report.

Environmental Conditions:

- 314.2.10 The test systems were tested under ambient laboratory conditions.
- 314.2.11 Average environmental conditions recorded during the study:
 - 314.2.11.1 Laboratory: Temperature: 70°F Humidity: 35%



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RESULTS / DISCUSSION:

The purpose of this study was only to evaluate if the fabrics would act as a barrier and prevent bed bugs (*Cimex lectularius*) from penetrating through and feeding on a human host. This study does not represent a “real world” scenario in regards to using fabrics, encasements, and/or other bedding materials as a method for preventing, controlling, or reducing bed bug infestations.

As is illustrated in Table 1, the ProtectEase Brand™ SMS, MF with TPU, and the Knit with PE fabrics all passed the “feed-through” evaluation. Each fabric prevented all stages of bed bugs from penetrating through and feeding on the human host during the individual 15 minute evaluations.

CONCLUSION:

The results of the study indicate that the ProtectEase Brand™ SMS, MF with TPU, and the Knit with PE fabrics are effective at preventing bed bug (*Cimex lectularius*) feeding.

Disclaimer: Snell Scientifics does not intend for the data or conclusions contained in this report to be construed as an endorsement of any of the test substances evaluated in this study. Unofficial changes made to the report, such as changing the test substance information, sponsor of the study, or the data will result in the invalidation of this report.



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TABLES:

Table 1.

Fabric Feed Through Method					
Test Substance	Exposure Time	Bed Bug Stage	Approx #	# Fed	# Escaped
SMS Fabric	15 min	Mixed	500+	0	0
MF with TPU Fabric	15 min	Mixed	500+	0	0
Knit with PE Fabric	15 min	Mixed	500+	0	0

Photograph 3. Knit PE Fabric



Photograph 4. Fabric on Bed Bug Jar



Photograph 5. Bed Bugs and Debris inside Jar



Photograph 6. Bed Bug Jar/Fabric held to Host Arm





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NON-GLP STUDY DETAILS

Date: 01/08/15

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TEST DESIGN:

# Reps per Fabric	# Systems per Rep	# Systems per Fabric	# Test Fabrics/ Encasements	Total # Systems	# Test Arenas
1	500+	N/A	3	1500+	3

TEST ARENA INFORMATION:

"Fabric Feed-Through" Method:

1. Fabric sections are to be sealed onto pint jars containing bed bugs.
2. Expose the fabric/jar to a human body part for 15 minutes.
3. Monitor for any feeding.

OBSERVATION METHODS:

Observation Times: 15 minutes

Author: Todd Smith Signature:

Date: 01/08/15

Principle Investigator Signature:

Date: 01/08/15



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Sponsor: Seam Seal International, LLC. TM#: 314-2 Page 1 of 1
Study: Bed Bug Prevention of ProtectEase Covers 15 Trial: CIMXLE
Test Arena Info: The fabric was sealed on a pint jar containing bed bugs. Test System: Bed Bugs (Cimex lectularius) Strain/Stage/Age: Susceptible Strain / Mixed
Start Date/Environmental Conditions: Rep #s: # Date(s): 01/08/15 Laboratory: Temp (F): 70 RH%: 55

Table with 7 columns: Rep, Exposure Time, Bed Bug Stage, Approx #, # Fed, # Escaped, # Blood Spots on Fabric. Row A: 15 min, Mixed, 500+, 0, 0, 0. Initials: TS, Date: 01/08/15.

Table with 7 columns: Rep, Exposure Time, Bed Bug Stage, Approx #, # Fed, # Escaped, # Blood Spots on Fabric. Row A: 15 min, Mixed, 500+, 0, 0, 0. Initials: TS, Date: 01/08/15.

Table with 7 columns: Rep, Exposure Time, Bed Bug Stage, Approx #, # Fed, # Escaped, # Blood Spots on Fabric. Row A: 15 min, Mixed, 500+, 0, 0, 0. Initials: TS, Date: 01/08/15.

Name: Eric Snel Signature: [Signature] Date(s): 01/08/15 Role: Primary Researcher
Name: Todd Smith Signature: [Signature] Date(s): 01/08/15 Role: Data Recorder