Report Title:
Evaluation of Bargoose Zipper with Tape Seal in Preventing Bed Bug *(Cimex lectularius)* Penetrating and Feeding

Study:
Bed Bug Prevention of Mattress Covers 2010

Trial:
Escape/Feed Through Prevention of Zipper/Closure Seals

Experimental Start Date:
February 15, 2010

Experimental Completion Date:
February 15, 2010

Report Date:
March 2010

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Objective(s):

To determine the efficacy of Bargoose Zipper with Tape Seal in preventing bed bug *(Cimex lectularius)* penetrating and feeding.

Test Substances:

1. Bargoose Zipper w/ Tape Seal (Snell Code: 020210-1-D-BAR)

Materials and Methods:

The following is the Snell Scientifics Standardized Testing Method for evaluating the efficacy of fabric and closures as barriers to 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:

314.1.1 6" Dia. PVC Pipe end.
314.1.2 Fabrics- zipper enclosures.
314.1.3 Dark surface used to evaluate eggs or debris from the shake through method.
314.1.4 Feeding attractant – Human subject to attract bed bugs.
314.1.5 CO2 and regulator – standard 20 pound cylinders and gas regulator - used for anesthetizing insects (as necessary, depending on species).
314.1.6 Intermediate transfer/holding chambers – used for housing insects after they have been removed from their primary breeding housing. Intermediate chambers were used to anesthetize insects and sort them into jars.
314.1.7 Count down timer – used to accurately measure exposure times.

314.2 Methods:

314.2.1 6" PVC pipes were equipped with the test fabrics by:
- Zipper/Fabric inserts were sealed onto the pipe end with clear silicon and an outer PVC ring.

314.2.2 For evaluating zipper or seam areas of enclosures, 500 bed bugs (1st instars – adults), eggs, and debris were placed inside the PVC pipes.

314.2.3 Various sized bed bugs allowed for evaluating the possibility of different sized mouth parts feeding through the test fabrics.

314.2.4 Bed bugs used for feed through tests were starved for at least 7 days prior to testing.

314.2.5 Zipper or seam enclosures were held to human body parts to evaluate the ability of the bed bugs to feed through the zippers.

314.2.6 Following the zipper feed-through method, the PVC pipes were inverted and shaken over a dark surface for approximately 30 seconds.

314.2.7 Debris collected on the dark surface was evaluated under a microscope to confirm if eggs were able to pass through.

314.2.8 If feeding through the zipper was suspected, the bed bugs were inspected under a microscope for visual signs of feeding.

314.2.9 Zipper enclosures were documented as the ability for bed bugs to feed through the zippers (yes/no), # fed, and quantitative amounts of debris shaken through the zipper enclosures (ex. # 1st instars, # eggs, ect.).

314.2.10 Additional Testing Details Not Fully Described in Standard Protocols:

Test Set-Up: The evaluations in this test followed Test Photographs 1-7.

Replicates:
Specimen Stage: Mixed
Strain: Susceptible
# of Reps: 1
# of Specimens/Rep: ~500

Source of Test Specimens: Test specimens were laboratory reared prior to testing.

Conditions in Test Room: Temperature: 78 ° F Humidity: 26%

Confirming Test Systems Condition:

All test specimens were confirmed 'alive' 2 times prior to treatment:

1) The specimens were removed from the lab colonies by transferring only live specimens into the transfer containers.

2) After all specimens were transferred into the 6" PVC pipe end; they were confirmed to be alive before continuing with the study.

Results / Discussion:

The results of this study are tabulated in Tables 1-2. Table 1 illustrates the results of the "Shake Through" method used to evaluate if the bed bugs *(Cimex lectularius)* and debris could be shaken through the Bargoose Zipper with Tape Seal. Table 2 illustrates the results from the "Feed Through" method, which was used to evaluate if the zipper with tape seal could prevent bed bugs from escaping or penetrating the zipper and feeding on the human host.

As is displayed in each of the tables, the Bargoose Zipper with Tape Seal passed both test methods. At no point during the 2 evaluations did bed bugs or debris pass through the zipper encasement and the zipper system was successful in preventing the bed bugs from penetrating and feeding through onto the human host during the 15 minute evaluation. Therefore, the Bargoose Zipper with Tape Seal can be considered a successful bed bug *(Cimex lectularius)* containment system.

Tables:

Table 1.

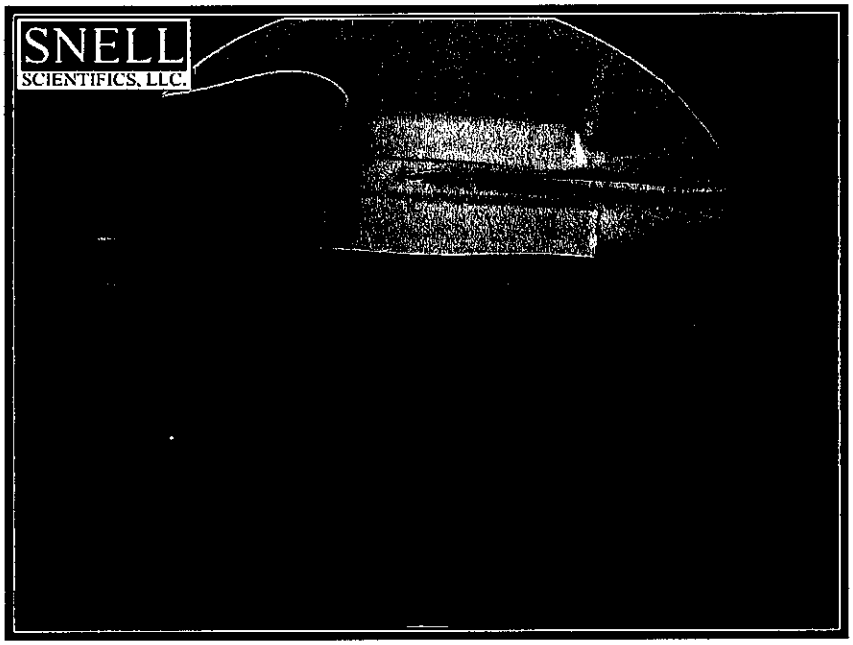
Zipper Shake Through Method: Zipper with tape seal					
Rep	Exposure Time	Bed Bug Stage	Approx # of Stage	# Shaken Thru or (Yes/No)	# Escaped
A	30 second	Mixed	~ 500	0	0

Table 2.

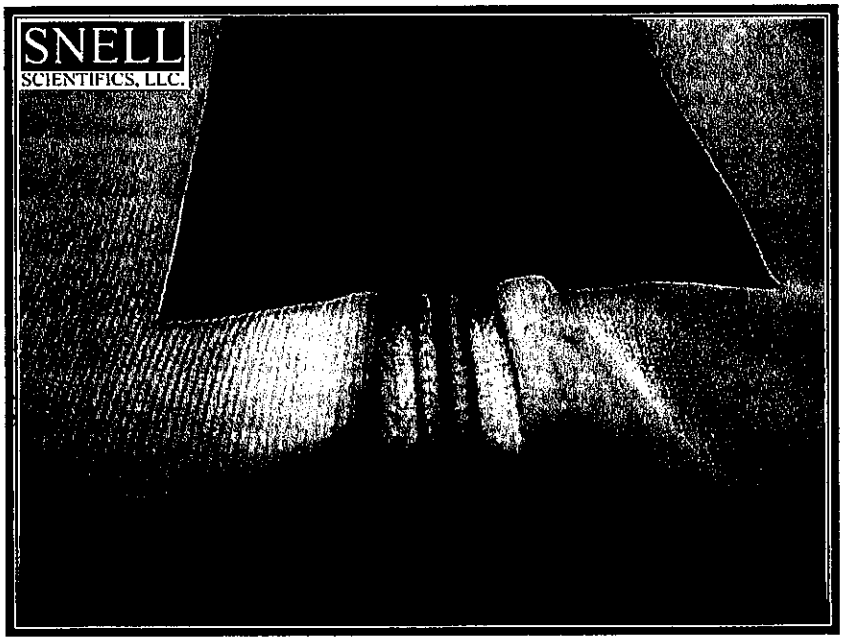
Zipper feed Through Method: Zipper with tape seal					
Rep	Exposure Time	Bed Bug Stage	Approx # of Stage	# Fed	# Escaped
A	15 minute	Mixed	~ 500	0	0

Appendix A: Photographs

Photograph 1. Zipper w/ Tape Seal



Photograph 2. Tape Seal Covering the Zipper



Photograph 3. Zipper/Fabric Section Sealed over a 6" PVC Pipe

Photograph 4. Inside of PVC Pipe with Zipper/Fabric

Photograph 5. Bed Bugs, Eggs, and Debris Inside The Zipper/PVC Pipe

Photograph 6. Zipper Section being Held to the Human Host

Photograph 7. Bed Bug Feed Through Method

Appendix B: Raw Data

Snell Scientifics LLC: Additional Test Details - Non GLP Tests **2/10/2010**

Client: **Bargoose Home Textiles**
Project: **Bed Bug Prevention of Mattress Covers 2010**

Contact: Diane Rattner

Files: Data File: BargooseBBZipper10
Worksheet: BB Zipper
Report File: BargooseBBZipper10

Test Products Received: 2/2/2010

The Evaluations in this Study Followed TM#: 314-2.00

Test setup details: **Prevention of escapes through closure seals (zippers)**

- Zipper end sections are to be sealed into a 6" Dia. PVC Pipe end
- Zipper/Fabric is seated to the pipe end with silicon (to prevent escapes from end of pipe) and an outer ring (to keep fabric pulled tight over end).
- Enclose unfed 1st instar bedbugs, bed bug eggs, adults and debris inside jar (at least 7 day unfed)
- Shake jar over a clean surface(~30 sec.) and monitor for eggs and debris falling through the zippers

Feed through Method

- Expose zipper to body part for 15 minutes
- Monitor for any feeding

Species/Replicates:

Test Species	Stage/Age	# Reps	# per Rep	# per Product	# Test Products	Total # Specimens	# Test Arenas
Bed Bugs (susceptible)	Mixed	1	~ 500	N/A	1	~ 500	1

Source of Test Specimens: Laboratory reared

Insect Exposure time: 30 second "shake through" test
15 minutes to a body part

Observation Times: Shake through: 30 seconds
Feed through: 15 minutes

Test Products:

1. Bargoose Zipper w/ Tape Seal (Snell Code: 020210-1-D-BAR)

Additional Test Details Preparer: Todd Smith

Preparer Signature: _____ **Date:** 02/15/10

Primary Researcher Signature: _____ **Date:** 2/15/10

SNELL SCIENTIFICS, LLC.

Sponsor: Bargoose Home Textiles Date: March 2010
Study: Bed Bug Prevention of Mattress Covers 2010
Trial: Escape/Feed Through Prevention of Zipper/Closure Seals
Test Method: 314-2.00

Sponsor: Bargoose Home Textiles TM#: 314-2 Page 1 of 1

Study / Trial: Bed Bug Prevention Test System: Bed Bugs (SUS Strain)

Asterisk	* =
Details:	** =

Arena Details: Zipper Section Sealed to 6" Dia PVC Pipe

Other Details:

Rep #'s: 4 Date(s): 02/15/10 Temp (F): 78 RH %: 32%
Rep #'s: Date(s): Temp (F): RH %:

Fabric Feed Through Method:

Rep	Exposure Time	Bed Bug Stage	Approx # of Stage	# Fed	# Escaped
A					
B					
Initials					
Date:					

Zipper Shake Through Method: Zipper w/ Tape Seal

Rep	Exposure Time	Bed Bug Stage	Approx # of Stage	# Shaken Thru or (Yes/No)	# Escaped
A	30 sec	Mixed	~500	0	0
B					
Initials	TS	TS	TS	TS	TS
Date:	02/15/10	02/15/10	02/15/10	02/15/10	02/15/10

Zipper feed Through Method: Zipper w/ Tape Seal

Rep	Exposure Time	Bed Bug Stage	Approx # of Stage	# Fed	# Escaped
A	15min	Mixed	~500	0	0
B					
Initials	TS	TS	TS	TS	TS
Date:	02/15/10	02/15/10	02/15/10	02/15/10	02/15/10

Researcher(s):
Name Eric Snell Signature: Date(s): 2/15/10 Role: Proj. Ld.
Name Todd Smith Signature: Date(s): 02/15/10 Role: Tech.

Appendix C: Test Substance Receiving Log

Snell Scientifics, LLC. Test Substance Receipt Log

Arrival Date	Test Substance Sponsor/Study	Substance Snell Sci. Code:	Test Substance (Trade name, % AI, formulation)	Lot/Batch #	EPA Reg. #	Amnt. Recd	Container Type	Shipper	Packaging Condition	Photo Taken (y/n)	MSDS Provided (y/n)	MSDS Down-loaded (y/n)	MSDS Logged (y/n)	Storage Location	Initials
2/22/2010	Bargoose Home Textiles BB Zipper 10	020210-1-D-BAR	Zipper w/ Tape Seal	N/A	N/A	1	bag	UPS	Good	y	n	n	n	D	