

RESEARCH UPDATE 1

The first part of the mattress barrier cloth research results have been returned by the laboratory. The results provide some interesting and surprising preliminary answers, but at the same time, they raise additional questions, which need additional research.

EXECUTIVE SUMMARY

On April 12, 2017, mattress dust samples were collected from a contaminated mattress that had been wrapped and stored for several months. This was actually the second time the mattress had been tested. The results from the first and second test agreed and confirmed that the mattress had been contaminated with high levels of DNA from *Aspergillus flavus* (1,700 sp eq/mg - spore equivalents per milligram of dust) and *Penicillium spinulosum* (1400 sp eq/mg). Both of these organisms are indicators that the mattress was exposed to a contaminated environment. The mattress was reported to have been new when it was introduced into the contaminated home, and it was used for seven months prior to being identified as being contaminated.

Aspergillus flavus is a toxigenic organism that can produce the carcinogenic mycotoxin aflatoxin. *Penicillium spinulosum* can result in allergic reactions in sensitive individuals.

METHOD

A measured area of the mattress was micro-vacuumed using a hand-held pump and collection cassette. The micro-vacuuuming was performed directly on the top surface of the mattress. The results showed a total of 6.2 milligrams of dust were collected per square foot of mattress sampled.

Eight different pre-manufactured dust mite pillow barrier cloths were purchased and tested without laundering. In addition, a standard pillow case was tested to see how conventional bedding compared to specially manufactured barrier cloth. Finally, a sample of Tyvek[®] material commonly used for protective suits for workers performing mold remediation was included. Each of these ten materials was sequentially tested by inserting the material in a large embroidery hoop and then micro-vacuuuming the mattress through the barrier cloth. Each of the ten materials was tested in exactly the same way. A video briefly showing the mattress dust collection process has been posted on the internet at this link <http://www.johncbanta.com/videos>.

Fine dust was able to be collected from all ten materials. It is possible that some of the dust came from the test material itself and not through the material from the contaminated mattress. The laboratory has been asked to save any dust that was not used as a part of the analysis. This will allow it to be examined microscopically to hopefully determine what was in the dust. Weighing the dust collected through the ten materials showed between 0.025 and 2.2 milligrams of dust were collected per square foot.

- The worst performer with the highest amount of dust (2.2 mg/ft²) was collected from a 100% polyester barrier advertised as being designed to reduce dust mites and allergen. I have concluded that the dust was coming through the barrier from the mattress because the dust also contained the highest amount of mold DNA (*A. Flavus* 750 sp eq /mg and *P. spinulosum* 420 sp eq /mg). Although this was the worst performing of the barriers, it still reduced the amount of dust collected from the mattress by 65% and the amount of mold specific DNA for the two organisms by 62%.
- The standard pillow case with a 200 thread count made of 60% polyester and 40% cotton was the second worst performer. It reduced the total collected fine dust collected per square foot by 74% and the amount of mold specific DNA for the two organisms by 75%.

- The 100% cotton barrier only partially blocked the mold specific DNA. It reduced the total fine dust collected per square foot by 90%, but only reduced the amount of mold specific DNA for the two organisms by 77%.
- There were four best performers in terms of the amount of dust reduction through the barrier (0.025 mg/ft²); however, two of the four best performers also had some chemical in them that inhibited the DNA and prevented the mold specific analysis from being successful. Because of the inhibition, it is not possible to say if the mold DNA was blocked by the barriers. The nature of this inhibition reaction needs additional research.
- The two best performers that did not exhibit any inhibition were in a tie with 0.025 mg/ft² of dust collected by the micro-vacuuming. This is a whopping 99.6% reduction. They also both showed no mold specific DNA in the results. One was a commercially available dust mite/allergen barrier with 88% polyester and 12% nylon. The other was Tyvek[®] suit material. This was a comforting finding since remediation workers use these suits on a regular basis as a part of their personal protective equipment.
- I also found the results of a third barrier very interesting. This barrier was manufactured with a 100% cotton cover on the outside and a 100% silk liner on the inside. It reduced the total fine dust collected per square foot by 96% and no mold specific DNA was detected in the sample. It is possible that the fine dust collected from this barrier material was from the barrier material itself and did not come from the contaminated mattress. If the dust turns out to be fibers collected from the barrier, then that would make the silk lined cotton barrier the best choice for persons wanting a natural material for their mattress barrier. I believe this barrier is worthy of additional research. I am checking with the laboratory to see if there is sufficient dust for it to be examined microscopically to determine the types of particles present in the dust. Once the laboratory lets me know how much the microscopic analysis will cost, we will be able to include that in our next round of fund-raising.

I think you may be interested in knowing about one of the quality assurance methods used by the laboratory to make the determination that there was something interfering with the results. When the laboratory ran our samples, they spiked them with a known quantity of mold specific DNA for a type of mold that was not a part of our study. When the machine spits out the results the amount of spiked DNA identified needs to match the amount of DNA they added to the sample. If the amounts do not match, then something has interfered with the results. If it interfered with the known spiked amounts, then it would have also interfered with the mold specific DNA from the mattress dust we were studying.

ADDITIONAL QUESTIONS RAISED BY THE RESEARCH

Over the next few days, I will be pondering these results further and deciding how to go about answering the questions that have become apparent based on this study. A few things immediately come to mind:

- What chemical treatment or material was present in three barrier materials that inhibited the mold specific DNA?
- What was in the dust that was collected from the barrier cloths? Was it particulate released by the unwashed barriers cloth or did it penetrate through the barrier cloth from the contaminated mattress.
- Will washing the barriers in soap and water remove the inhibitor?
- How does washing affect the barrier materials? Does it result in the material losing some of its ability to block mold specific DNA?

I want to thank you again for your support in conducting these baseline studies. It has reminded me how much I enjoy figuring out the answers to these types of questions. It has also shown me the value in using crowd-funding to finance the research that is so important in figuring out what really works and perhaps more importantly what doesn't work.

I am estimating that an additional \$2500.00 is needed to help answer these additional questions. Please tell your friends and acquaintances that are affected by mold about this research. If they make a contribution to help fund additional research they too can receive this vital information.

Thank you again for your generous support

John C Banta

<https://igg.me/at/MoldControlledMattress>

Research Update 2

In Research Update 1, I told you about the preliminary findings for the Phase 2 study on different types of mattress barrier cloths. This update is about the Phase 1 mattress cleaning study.

Some of the results from the Phase 1 study (replication of a Taiwanese study using mold specific DNA) have been returned from the laboratory and have already raised an additional important question. It appears that daily HEPA vacuuming is able to significantly reduce the amount of mold specific DNA that is able to be removed from the mattress. Here's the question: Are there significant quantities of mold specific DNA that have bound with the mattress materials so that the vacuum dust results don't identify the presence of the remaining contamination? In order to help visualize what is happening with mold contamination in the mattress I have begun another phase of preliminary research I will call Phase 1a.

On May 25, 2017 a small amount of GloGerm™ powder was added to a section of foam rubber inside the mattress.



GloGerm™ is a florescent powder that glows when it is exposed to black light. The particle size for the GloGerm™ is approximately 5.0 microns, which is about the same size as many smaller molds spores.



This image shows the GloGerm™ fluorescing when exposed to UV light after it was spread in the layer between the mattress foam and top cover.



After several weeks of daily vacuuming the GloGerm™ powder is starting to show up on the surface of the mattress. This shows that mold size particles are able to migrate from the foam rubber through this particular mattress to the surface.

I will be checking the mattress again next week to recheck the mattress with the UV light.
Thank you for your help funding this research! Please tell your friends about it with this link:
<https://igq.me/at/MoldControlledMattress>.

John C. Banta