Mattress Recycling Council®

Prevalence of Mold and Bacteria Content in Recycled Mattress Materials

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Executive Summary

This study evaluated the prevalence and potential health risks of residual mold and bacterial contamination present in the outer quilt layer and the underlying foam layer in post-consumer mattresses. Samples were analyzed to assess whether mattress age and disposal location influenced contamination levels.

Among the five mattresses evaluated in this study, one had a concerning level of mold contamination. Another had a somewhat less concerning bacteria count. The findings emphasize the importance of keeping mattresses in a clean and dry environment through collection, transportation and recycling processes to improve the quality of these feedstocks for secondary use applications. However, such precautions cannot eliminate the risks posed by mattresses that are already contaminated at the point of disposal.

Current visual inspection protocols have proven effective in preventing cross-contamination within recycling facilities. The development of a standardized and efficient analytical method for mold detection, coupled with a sanitization process for reclaimed mattress components could further enhance worker safety and increase material recovery efforts.

Introduction

In a May 2024 study by UCLA[1], samples of foam (from comfort foam layers underneath the quilt) were subjected to mild aging conditions to assess the growth of mold and bacteria – all samples experienced rapid increases in both. This led the researchers to make a general conclusion that exposure of mattresses to moisture and dampness over their lifetime is conducive to active mold and bacteria growth in post-consumer foam.

A 2025 follow-up study was initiated to determine if residual mold and bacteria contamination levels are significant enough to be a potential health risk. Samples were selected to determine if mattress age and location at the time of disposal had an impact on contamination levels. Both the outermost quilt layer and the underlying foam layer were evaluated.

Sample Collection

Foam and quilt samples were collected from five mattresses in two California recycling locations. As follows:

From a Northern California Recycling Facility

1. Quilt and next layer of foam from a 14-year-old mattress
2. Quilt and next layer of foam from a 7-year-old mattress
3. Quilt and next layer of foam from a 10-year-old mattress

From a Southern California Recycling Facility

4. Quilt and next layer of foam from a 17-year-old mattress
5. Quilt and next layer of foam from a 7-year-old mattress

Example of a mattress quilt panel and foam samples.

Each collected sample was marked and placed in a separate enclosed plastic bag to minimize the risk of cross-contamination. Samples were then shipped to the EMSL independent test lab for analysis. Micro-SOP-202 and Micro-SOP-134 test methods were used for testing fungi and bacteria, respectively.

Results and Discussion

Like the UCLA study, the method selected determines the number of colony forming units (CFU) per square inch of material. Though this method does not determine the type of mold or bacteria, it is considered a simple, useful step to indicate whether overall levels represent a hygienic concern. Test findings are listed in Table 1.

Table 1. Mold & Bacteria Test Data					
Sample	Location	Material	Age	Fungi Count	Bacteria Count
1	SoCal	Quilt	7	3,700	290,000
2	SoCal	Quilt	14	380	2,500
3	SoCal	Foam	7	730	20,200
4	SoCal	Foam	14	55	250
5	NorCal	Quilt	17	1,220	5,900
6	NorCal	Quilt	10	6,200	8,200
7	NorCal	Quilt	7	6,800	12,100
8	NorCal	Foam	17	675	1,300
9	NorCal	Foam	10	208,000	16,100
10	NorCal	Foam	7	520	820
Averages		**All Data**		**Outliers Excluded**	
		Fungi Count	**Bacteria Count**	**Fungi Count**	**Bacteria Count**
SoCal		1,216	78,238	1,216	7,650
NorCal		37,236	7,403	3,083	7,403
Quilt		3,660	63,740	3,660	7,175
Foam		41,996	7,734	495	7,734
Age					
7		2,938	80,780	2,938	11,040
10		107,100	12,150	6,200	12,150
>13		583	2,250	583	2,488

Guidelines from the Centers for Disease Control[2] (CDC), National Science Foundation (NSF) and EMSL's interpretation guide (see appendix) were used to interpret the significance of the findings. The EMSL document summarizes the EPA's findings on mold growth and mitigation strategies[3]. Unfortunately, there are no universally accepted standards for mold or bacterial surface contamination.

Mold

According to EMSL's guideline document, mold counts <10,000 CFU/sq.in. are considered normal background mold levels. Mold counts >100,000 CFU/sq. in. would be considered "concerning" with active mold growth prone to sporulation.

Only one sample, foam taken from a 10-year-old mattress in northern California, tested above the active mold growth threshold. The remaining samples tested below the background threshold. With the limited number of samples tested, we were unable to identify any statistically significant correlation between mold levels and mattress age, material type and sample location. Excluding the one outlier, quilt layers had a higher average level of mold than foam. However, further testing would be required to determine whether the difference is statistically significant.

Bacteria

The CDC provides recommendations for laundry and bedding infection control in Health-Care facilities. They conclude that bacteria counts >5,000 CFU/sq. in. would be considered non-hygienic and considered a risk for infection transfer. For perspective however, the NSF determined that one week after washing, the bacteria count in bed linens can increase to >3,000,000 CFU/sq.in.

Six of the ten samples tested above the 5,000 CFU threshold. One 7-year-old mattress quilt sampled from southern California had a concerning bacteria count of 290,000 CFU/sq.in. It should be noted, however, that the threshold is a more demanding healthcare guideline and that background bacteria counts are much lower than in typical household settings (e.g. a kitchen sink). Given our limited testing, we were unable to identify any correlation between mattress age, material, or sample location and bacteria count.

Mitigation

The EPA recommends that biocides or bleach are effective means to kill mold colonies. Moisture control and proper ventilation are essential to limit mold propagation and indoor humidity should be well below 60% (ideally between 30% and 50%). Porous materials should be discarded if they become moldy.

According to the CDC, beds can be decontaminated for bacteria by subjecting the material to high heat,113°F to 194°F for one hour.

References

1. Microsoft Word - UCLA Mattress Foam Characterization Final Report
2. G. Laundry and Bedding | Infection Control | CDC
3. Mold | US EPA

Appendix

EMSL Guidance for Interpretation of Mold Culture Results

Industrial hygienists, and other IAQ professionals use the following arbitrary numbers for guidance in interpreting microbial survey results.

The final mold interpretation should not be based solely on numbers! Information gathered from the walk-through investigation of the area is very significant, including sources of moisture or high humidity, and signs of visible mold growth. In air samples, it is important to consider the type and concentration of fungi indoors, as compared to outdoors or a non-complaint area. One should consider the indoor: outdoor fungal count ratio, the presence/absence of certain fungi indoors versus outdoors, the genus/species of predominant fungi indoors versus outdoors, and whether the fungi detected indoors are allergenic and/or toxigenic.

Bioaerosol

<250 CFU/m3 Low/Normal

250-1,000 CFU/m3 Moderate/Borderline

>1,000 CFU/m3 Active Growth/Sporulation

>5,000 CFU/m3 Very Active Growth/Sporulation

Swab/Wipe

<100 CFU/in2 No Growth/Background

<10,000 CFU/in2 Low/Normal Growth

10,000-100,000 CFU/in2 Moderate Growth

100,000-1,000,000 CFU/in2 Active Growth/Sporulation

>1,000,000 CFU/in2 Very Active Growth/Sporulation

Bulk substrate

<100 CFU/g No Growth

<25,000 CFU/g Low/Normal Growth

25,000-200,000 CFU/g Moderate Growth

200,000-1,000,000 CFU/g Active Growth/Sporulation

>1,000,000 CFU/g Very Active Growth/Sporulation

Micro-vac Dust

<5,000 CFU/ft2 Low/Normal

5,000-25,000 CFU/ft2 Moderate/Borderline

25,000-75,000 CFU/ft2 Active Growth/Sporulation

>75,000 CFU/ft2 Very Active Growth/Sporulation

Definitions

CFU = Colony Forming Unit

Colony = A mass of branching hyphae with or without spores, generally of one species and potentially started from one spore, cell, or propagule.