



Mold, Moisture, & Air Quality Assessments

Mold Assessment Company License # ACO1035,
Expires 1/15/2022

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Mold Screening Report

Prepared for Charles Lewis

Subject Property: 12053 Oak Forest Lane, Conroe, TX

Date of Inspection: 10/18 and 12/19, 2022

Report prepared by: Darryl Riddle

February 19, 2022

A screening was conducted on the dates listed above at the property referenced above as authorized by Mr. Lewis, hereinafter "Owner". This inspection was performed within the confines and guidelines recommended by the inspector and agreed upon by the owner.

The purpose of these visits and testing was to collect general and non-disturbed air quality data directly relating to potential mold within the residential structure, ultimately producing this initial report designed to communicate that data and provide a foundation from which the balance of the investigation will be conducted, if needed and requested.

To this end we collected air samples (11 interior and 4 exterior) for laboratory analysis by SEEML Labs, Texas Department of Licensing and Registration license # LAB1016. SEEML Labs is accredited through AIHA-LAP, LLC (EMLAP #232339. No intrusive inspections (removal of the structure's permanently installed materials) of walls, ceilings, floors, etc., were performed as part of this work unless expressly requested by the client and authorized by the owner. All areas inspected were at the client's direction and additional areas were not inspected or sampled.

The initial inspection was conducted in accordance with state regulations as well as current industry guidelines and practices. This assessment is not a certificate, assurance, warranty or guarantee of future conditions or performance, but is an assessment of the conditions, which were present and detected on the date(s) of the inspection and at the time inspected.

Background Information:

At the time of the inspection the structure was not occupied.

This home was originally inspected by another inspection company. Although there were no significant elevated mold levels found within the sample findings for ambient air, a few samples collected inside interior walls were found to be elevated according to the other consultant. Considerable debate exists amongst experts regarding the collection and analysis of wall sample and data. This report addresses these issues and these findings.

The data presented within this document represents the airborne mold spore, pollen, and fragment levels within the structure at the exact date and time sampled. These levels can fluctuate significantly and we always recommend redundant testing to confirm levels prior to performing any demolition and prior to making major decisions based on these findings. If this report lists swab sample values understand that they are less fluctuating than air samples, across shorter time frames.

Able Environmental reminds all clients and readers that we are not medical professionals and as prescribed by state law, we do not base our protocols nor reports on medical foundations. Always seek the advice of a medical professional that specializes in illnesses related to environmental exposure if you suspect you are experiencing mold-related illness or if you suspect you have been exposed to mold. Its important to understand that mold affects each person differently and levels acceptable to one person could be highly problematic for another. This report is not designed to determine whether mold is problematic for a given individual(s). Our screenings, investigations, and assessments are designed to determine whether a structure contains mold within the living space air at an abnormal level and whether that mold is potentially originating from within it the home, when possible. These samplings are merely a first step in that process.

A previous and more aggressive sampling was conducted prior. This sampling was designed to determine only the ambient mold spore levels in the home to determine whether any mold points of amplification were adversely affecting the indoor air quality beyond normal industry guidelines.

As it pertains to accuracy, this consultant always recommends a minimum of taking one test in each major room and additionally at each enclosed wet area, e.g. cabinets under sinks. That level was not approved by the client for this testing but had been previously. Further, any areas of higher mold potential recognized during a visual walk-through or other investigation should also be addressed with this or later sampling. Those areas are as follows: Tested recommended areas, no investigation was performed but was recommended. The data within this document has been highlighted for ease of understanding:

-----The lilac highlight indicates a specific mold as having a level indoors greater than the outdoor average but low enough that the consultant can't positively identify it as a product originating from within the home/structure and it is likely low enough that it would not be considered a medical threat by a medical professional(Get M.D. advice from a doctor specializing in this field) for persons not susceptible to mold illness when exposed for a very short time frame.

-----The blue highlight indicates a specific mold as having a level indoors less than that outdoors yet notably higher than the average of other rooms or higher than the average of other molds in other rooms as a ratio of indoor to outdoor spores by type. It would be a level low enough that the consultant can't positively suspect it as a product originating from within the home/structure and it is likely so low that it would not be considered a medical threat by a medical professional to persons not susceptible to mold related illness when exposed for a short time frame. Regardless, it could be indicative of an underlying issue in the home being masked by a higher outdoor level. These are less reliable and must be followed up and fully investigated to validate or invalidate the data.

The data highlighted as either blue or lilac are most useful as medical data for those persons highly sensitized or otherwise susceptible to mold-related illness and as indicator molds to be utilized in more detailed assessments. They may be, but not necessarily are, minor indicators of a colony or reservoir within the structure not significantly affecting the indoor air quality.

-----The yellow highlight indicates a specific mold as having a level indoors greater than the outdoor average and that the consultant suspects as a product originating from within the home/structure. This data represents the most problematic mold levels in the structure and would be the primary data utilized for a typical protocol after confirmation testing, although medically oriented influence from your doctor or other health professional could render the other highlighted data as critical also. Always consult your physician.

Its important to realize that mold can exist within a cavity of a structure and not be detected within an air test. In fact, the same can be true of mold that is visible on a surface though less likely. Environmental conditions, disturbances, growth cycles, and other variables can cause mold spores and/or fragment retention or releases to the interior intermittently, or not at all. Further, highly filtered/treated or settled structures (those without activity and significant airflow) can produce lower levels due to the free mold being settled. Notwithstanding variables affecting release and distribution, larger colonies will produce a greater number of spores to the interior and smaller colonies, the opposite.

Findings and Recommendations:

It was recommended to the owner that follow-up testing/inspection, by this firm, be performed should the results of this testing yield any potentially abnormal issues related to mold.

While previous aggressive testing located potential mold points of amplification, these ambient air samples returned values that were within the standard guidelines. This tells us that even though some mold may have colonized in specific areas of the home within the walls, those colonies, at least at the time of inspection, were not connected to a transport mechanism capable of dislodging/aerosolizing any or enough spores into the ambient interior air to render that air beyond normal values.

Smaller issues impacting only specific portions of the home are typical/normal and were detected as listed on the color coded lab results. This sampling did not yield any other airborne molds that we believe represent a problem for healthy individuals. They are all within normal ranges. Even those present where none of the same mold type was found outdoors were at levels that would not be considered elevated. Those molds found within the previous testing, even though not in, or at least not consistently within the air, could be problematic for persons with mold illnesses. Regardless, I would recommend saving the report to compare against for future checks.

We had previously suggested the attic be sealed and re-insulated. That work was performed.

The other molds highlighted in purple and blue are possibly simple testing anomalies and/or are low enough that they would be considered normal for healthy individuals that do not have respiratory issues and are not otherwise sensitized to mold.

As a general course of action, we recommend redundant testing and follow-up investigations/assessment(s) to confirm all values as they often fluctuate, and also to perform visual and other elements of investigation or assessment. You may also wish to have a confirmation testing performed soon after this testing. Retest all areas with elevated values, if any, to confirm counts prior to performing remediation.

As a general course of action, we always recommend all areas be tested as described in the preceding. Further we recommend more detailed investigation be performed at all areas where visual or test results would suggest current or previous water or mold issues.

We recommend a deeper investigation of all locations where potential water or mold issues are known within the home:

Please contact this office with further questions.



SEEML Reference Number:
H-221018046

Southeast Environmental Microbiology Laboratories

440 Cobia Drive Ste. 1901
Katy, TX. 77494
Phone: (832) 437-2667

The information and data for **Able Environmental** has been checked for thoroughness and accuracy. The following reports are contained within this document:

- | | | | |
|-------------------------------------|---------------------|--------------------------|----------------------------|
| <input type="checkbox"/> | Surface/Bulk Report | <input type="checkbox"/> | Andersen Fungal Report |
| <input checked="" type="checkbox"/> | Spore Trap Report | <input type="checkbox"/> | Quantitative Fungal Report |

Lab Manager Review: Magzoub Ismail Date: 10/18/2022

Thank you for using SEEML laboratories. We strive to provide superior quality and service. SEEML laboratories are accredited through AIHA LAP, LLC (EMLAP #232339) for the analysis of Spore Traps and Surface/Bulk Samples and licensed by the Texas Department of Licensing and Regulation (LAB1016).

The data within this report is reliable to three significant figures. The third significant figure is technically unjustified. In this instance, the third figure is reported as an estimate to facilitate the interpretation by the customer.

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Guidelines for Interpretation:

No accepted quantitative regulatory standards currently exist by which to assess the health risks related to mold and bacterial exposure. Molds and bacteria have been associated with a variety of health effects and sensitivity varies from person to person.

Several organizations, including: the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AIHA); the Indoor Air Quality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease Control (CDC), as well as the California Department of Health Services (CADHS), have all published guidelines for assessment and interpretation of mold resulting from water intrusion in buildings.

Interpretation of the data and information within this document is left to the company, consultant, and/or persons who conducted the fieldwork.

Spore Trap Report

Able Environmental	Date Sampled: 10/18/2022
1309 Illinois St	Date Received: 10/18/2022
South Houston, TX 77587	Date Analyzed: 10/18/2022
713-927-4015	Date Reported: 10/18/2022
	Date Revised:
	Project Name: Chaz Lewis
	Project Address: 12053 Oak Forest Lane
	Project City, State, ZIP: Conroe, TX
	SEEML Reference #: H-221018046

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	1			2			3		
Location	Exterior Front			Exterior Rear			Laundry / Bath Intersection		
Comment/Notes									
Lab Sample ID	H-221018046-135			H-221018046-136			H-221018046-137		
Detection Limit (spores/m ³)	13			13			13		
Hyphal Fragments	3	39		8	104		5	65	
Pollen	2	26		6	78		3	39	
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m ³	%	raw ct.	spores/m ³	%	raw ct.	spores/m ³	%
Alternaria (=Ulocladium)	3	39	2	6	78	2			
Ascospores	24	312	13	40	520	11			
Basidiospores	20	260	11	44	572	12	8	104	14
Bipolaris/Drechslera				1	13	<1			
Chaetomium									
Cladosporium	112	1460	59	156	2030	43	24	312	41
Curvularia				2	26	<1	2	26	3
Epicoccum									
Cercospora	1	13	<1						
Fusarium	4	52	2						
Memnoniella									
Nigrospora				2	26	<1			
Penicillium/Aspergillus	20	260	11	104	1350	29	24	312	41
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	5	65	3	8	104	2			
Spegazzinia	1	13	<1						
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Trichoderma									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces							1	13	2
Background debris (1-5)**	3			3			2		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M³	190	2470		363	4720		59	767	
Revisions:									

Comments:
 Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore. The analytical sensitivity is the spores/m³ divided by the raw count, expressed in spores/m³. The limit of detection is the analytical sensitivity (in spores/m³) multiplied by the sample volume (in liters) divided by 1000 liters.
 *Colorless, other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
 **Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2 = Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.
 ***Ulocladium has been recognized by the International Mycological Association to be equal to Alternaria and so they are reported as one.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
 This report relates only to the samples tested as they were received.
 Respectfully submitted, SEEML

440 Cobia Drive Ste. 1901
 Katy, TX. 77494
 Phone: (832) 437-2667

Magzoub Ismail

Magzoub Ismail, Approved Laboratory Signatory

Spore Trap Report

Able Environmental	Date Sampled: 10/18/2022
1309 Illinois St	Date Received: 10/18/2022
South Houston, TX 77587	Date Analyzed: 10/18/2022
713-927-4015	Date Reported: 10/18/2022
	Date Revised:
	Project Name: Chaz Lewis
	Project Address: 12053 Oak Forest Lane
	Project City, State, ZIP: Conroe, TX
	SEEML Reference #: H-221018046

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	4			5			6		
Location	Kitchen			Center Bed			Game Room		
Comment/Notes									
Lab Sample ID	H-221018046-138			H-221018046-139			H-221018046-140		
Detection Limit (spores/m ³)	13			13			13		
Hyphal Fragments	1	13		6	78		4	52	
Pollen									
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m ³	%	raw ct.	spores/m ³	%	raw ct.	spores/m ³	%
Alternaria (=Ulocladium)							1	13	2
Ascospores	4	52	6						
Basidiospores							4	52	8
Bipolaris/Drechslera	3	39	4	4	52	5	2	26	4
Chaetomium									
Cladosporium	16	208	23	12	156	16	12	156	23
Curvularia	3	39	4	1	13	1	8	104	15
Epicoccum				1	13	1			
Cercospora									
Fusarium									
Memnoniella									
Nigrospora	3	39	4	3	39	4	8	104	15
Penicillium/Aspergillus	40	520	58	52	676	68	16	208	31
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy				4	52	5	1	13	2
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Trichoderma									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	2			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M³	69	897		77	1000		52	676	
Revisions:									

Comments:
 Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore. The analytical sensitivity is the spores/m³ divided by the raw count, expressed in spores/m³. The limit of detection is the analytical sensitivity (in spores/m³) multiplied by the sample volume (in liters) divided by 1000 liters.
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South Houston, TX 77587	Date Analyzed: 10/18/2022
713-927-4015	Date Reported: 10/18/2022
	Date Revised:
	Project Name: Chaz Lewis
	Project Address: 12053 Oak Forest Lane
	Project City, State, ZIP: Conroe, TX
	SEEML Reference #: H-221018046

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	7			8			9		
Location	Bedroom 1			Living			Office		
Comment/Notes									
Lab Sample ID	H-221018046-141			H-221018046-142			H-221018046-143		
Detection Limit (spores/m ³)	13			13			13		
Hyphal Fragments	4	52		9	117		2	26	
Pollen	1	13		1	13		1	13	
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m ³	%	raw ct.	spores/m ³	%	raw ct.	spores/m ³	%
Alternaria (=Ulocladium)				1	13	1			
Ascospores									
Basidiospores	8	104	5	16	208	18			
Bipolaris/Drechslera	1	13	<1	2	26	2			
Chaetomium									
Cladosporium	32	416	20	24	312	27	16	208	31
Curvularia	1	13	<1						
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora				1	13	1			
Penicillium/Aspergillus	112	1460	71	40	520	46	36	468	69
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	13	<1	2	26	2			
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Trichoderma									
Colorless/Other Brown*				1	13	1			
Oidium									
Zygomycetes									
Pithomyces	2	26	1	1	13	1			
Background debris (1-5)**	3			3			2		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M³	157	2050		88	1140		52	676	
Revisions:									

Comments:
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 Respectfully submitted, SEEML

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 Phone: (832) 437-2667

Magzoub Ismail

Magzoub Ismail, Approved Laboratory Signatory

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1309 Illinois St	Date Received: 10/18/2022
South Houston, TX 77587	Date Analyzed: 10/18/2022
713-927-4015	Date Reported: 10/18/2022
	Date Revised:
	Project Name: Chaz Lewis
	Project Address: 12053 Oak Forest Lane
	Project City, State, ZIP: Conroe, TX
	SEEML Reference #: H-221018046

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	10			11					
Location	Master Bed			Master Bath					
Comment/Notes									
Lab Sample ID	H-221018046-144			H-221018046-145					
Detection Limit (spores/m ³)	13			13					
Hyphal Fragments	3	39		3	39				
Pollen									
Spore Trap Used	AOC			AOC					
	raw ct.	spores/m ³	%	raw ct.	spores/m ³	%			
Alternaria (=Ulocladium)				1	13	1			
Ascospores				4	52	6			
Basidiospores	4	52	3						
Bipolaris/Drechslera	2	26	2	3	39	4			
Chaetomium									
Cladosporium	36	468	28	20	260	29			
Curvularia	1	13	<1	5	65	7			
Epicoccum									
Cercospora									
Fusarium									
Memnoniella									
Nigrospora	1	13	<1						
Penicillium/Aspergillus	84	1090	65	28	364	41			
Polythrincium									
Rusts									
Smuts/Periconia/Myxomy	1	13	<1	7	91	10			
Spegazzinia									
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Trichoderma									
Colorless/Other Brown*									
Oidium									
Zygomycetes									
Pithomyces									
Background debris (1-5)**	3			2					
Sample Volume(liters)	75			75					
TOTAL SPORES/M³	129	1680		68	884				
Revisions:									

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Magzoub Ismail

Magzoub Ismail, Approved Laboratory Signatory



SEEML Reference Number:
H-221219010

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Katy, TX. 77494
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The information and data for **Able Environmental** has been checked for thoroughness and accuracy. The following reports are contained within this document:

- | | | | |
|-------------------------------------|---------------------|--------------------------|----------------------------|
| <input type="checkbox"/> | Surface/Bulk Report | <input type="checkbox"/> | Andersen Fungal Report |
| <input checked="" type="checkbox"/> | Spore Trap Report | <input type="checkbox"/> | Quantitative Fungal Report |

Lab Manager Review: Magzoub Ismail Date: 12/19/2022

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Several organizations, including: the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AIHA); the Indoor Air Quality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease Control (CDC), as well as the California Department of Health Services (CADHS), have all published guidelines for assessment and interpretation of mold resulting from water intrusion in buildings.

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1309 Illinois St	Date Received: 12/19/2022
South Houston, TX 77587	Date Analyzed: 12/19/2022
713-927-4015	Date Reported: 12/19/2022
	Date Revised:
	Project Name: Lewis
	Project Address:
	Project City, State, ZIP:
	SEEML Reference #: H-221219010

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	1			2			3		
Location	Exterior Front			Exterior Rear			Front Bed 1		
Comment/Notes									
Lab Sample ID	H-221219010-047			H-221219010-048			H-221219010-049		
Detection Limit (spores/m ³)	13			13			13		
Hyphal Fragments	8	104		7	91		1	13	
Pollen				2	26		2	26	
Spore Trap Used	AOC			AOC			AOC		
	raw ct.	spores/m ³	%	raw ct.	spores/m ³	%	raw ct.	spores/m ³	%
Alternaria (=Ulocladium)	3	39	<1	5	65	<1			
Ascospores	136	1770	10	40	520	4			
Basidiospores	496	6450	37	432	5620	43			
Bipolaris/Drechslera				5	65	<1			
Chaetomium									
Cladosporium	440	5720	33	258	3350	25	4	52	7
Curvularia	3	39	<1	1	13	<1	1	13	2
Epicoccum				1	13	<1			
Cercospora	7	91	<1	8	104	<1			
Fusarium	3	39	<1	1	13	<1			
Memnoniella									
Nigrospora				3	39	<1			
Penicillium/Aspergillus	200	2600	15	184	2390	18	48	624	89
Pyricularia				1	13	<1			
Rusts	3	39	<1	1	13	<1			
Smuts/Periconia/Myxomy	41	533	3	71	923	7			
Spegazzinia				1	13	<1			
Stachybotrys									
Stemphylium									
Tetraploa									
Torula									
Trichoderma									
Colorless/Other Brown*				1	13	<1			
Oidium									
Zygomycetes									
Pithomyces	3	39	<1	1	13	<1	1	13	2
Background debris (1-5)**	3			3			3		
Sample Volume(liters)	75			75			75		
TOTAL SPORES/M³	1335	17400		1014	13200		54	702	
Revisions:									

Comments:
 Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore. The analytical sensitivity is the spores/m³ divided by the raw count, expressed in spores/m³. The limit of detection is the analytical sensitivity (in spores/m³) multiplied by the sample volume (in liters) divided by 1000 liters.
 *Colorless, other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
 **Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2 = Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.
 ***Ulocladium has been recognized by the International Mycological Association to be equal to Alternaria and so they are reported as one.

Disclaimer: The sample results are determined by the sample volume, which is provided by the customer.
 This report relates only to the samples tested as they were received.
 Respectfully submitted, SEEML

440 Cobia Drive Ste. 1901
 Katy, TX. 77494
 Phone: (832) 437-2667

Magzoub Ismail

Magzoub Ismail, Approved Laboratory Signatory

Spore Trap Report

Able Environmental	Date Sampled:
1309 Illinois St	Date Received: 12/19/2022
South Houston, TX 77587	Date Analyzed: 12/19/2022
713-927-4015	Date Reported: 12/19/2022
	Date Revised:
	Project Name: Lewis
	Project Address:
	Project City, State, ZIP:
	SEEML Reference #: H-221219010

TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7

Client Sample ID	4							
Location	Master Bed							
Comment/Notes								
Lab Sample ID	H-221219010-050							
Detection Limit (spores/m ³)	13							
Hyphal Fragments	1	13						
Pollen								
Spore Trap Used	AOC							
	raw ct.	spores/m ³	%					
Alternaria (=Ulocladium)								
Ascospores								
Basidiospores								
Bipolaris/Drechslera	1	13	2					
Chaetomium								
Cladosporium	8	104	16					
Curvularia	3	39	6					
Epicoccum								
Cercospora								
Fusarium								
Memnoniella								
Nigrospora								
Penicillium/Aspergillus	36	468	73					
Polythrincium								
Rusts								
Smuts/Periconia/Myxomy								
Spegazzinia								
Stachybotrys								
Stemphylium								
Tetraploa								
Torula								
Trichoderma								
Colorless/Other Brown*	1	13	2					
Oidium								
Zygomycetes								
Pithomyces								
Background debris (1-5)**	3							
Sample Volume(liters)	75							
TOTAL SPORES/M³	49	637						
Revisions:								

Comments:
 Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore. The analytical sensitivity is the spores/m³ divided by the raw count, expressed in spores/m³. The limit of detection is the analytical sensitivity (in spores/m³) multiplied by the sample volume (in liters) divided by 1000 liters.
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Fungal Descriptions

Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis. The species *Alternaria alternata* can produce tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic. All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings. *Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms. *Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea. Due to the morphological similarity of *Aspergillus* and *Penicillium*, they are not differentiated by microscopic analysis and are reported together.

Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchopulmonary aspergillosis, and other allergic symptoms.

Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchospasms; chronic cases may develop pulmonary emphysema.

Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins but can cause hay fever and asthma.

Memnoniella

Contaminant found most often with *Stachybotrys* on wet cellulose. Forms in chains, but it are very similar to *Stachybotrys* and sometimes is considered to be in the *Stachybotrys* family. Certain species do produce toxins very similar to the ones produced by *Stachybotrys chartarum* and many consider the IAQ importance of *Memnoniella* to be on par with *Stachybotrys*. Allergenic and infectious properties are not well studied.

Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaf's stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

Periconia sp.

Periconia sp. are found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not known to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as *Candelabrum*. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

Stachybotrys sp.

Aw - 0.94, optimum Aw >0.98. Several strains of this fungus (*S. atra*, *S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production. Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.

This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to *Triposporium* and *Diplocladiella*. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. *Rhizopus* and *Mucor* are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including *Syncephalastrum*, *Circinella*, *Mortierella*, *Mycotypha*, *Cunninghamella*, and *Choanephora*. For further information, please see descriptions of these individual genera.

The following table lists mycotoxins that are produced by certain types of fungi:

Fungi	Mycotoxin
<i>Acremonium crotonigenum</i>	Crotocin
<i>Aspergillus favus</i>	Alfatoxin B, cyclopiazonic acid
<i>Aspergillus fumigatus</i>	Fumagilin, gliotoxin
<i>Aspergillus carneus</i>	Citrinin
<i>Aspergillus clavatus</i>	Cytochalasin, patulin
<i>Aspergillus Parasiticus</i>	Alfatoxin B
<i>Aspergillus nomius</i>	Alfatoxin B
<i>Aspergillus niger</i>	Ochratoxin A, malformin, oxalic acid
<i>Acremonium crotonigenum</i>	Crotocin
<i>Aspergillus nidulans</i>	Sterigmatocystin
<i>Aspergillus ochraceus</i>	Ochratoxin A, penicillic acid
<i>Aspergillus versicolor</i>	Sterigmatocystin, 5 ethoxysterigmatocystin
<i>Aspergillus ustus</i>	Ausdiol, austamide, austocystin, brevianamide
<i>Aspergillus terreus</i>	Citreoviridin
<i>Alternaria</i>	Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid
<i>Arthrinium</i>	Nitropropionic acid
<i>Bioploaris</i>	Cytochalasin, sporidesmin, sterigmatocystin
<i>Chaetomium</i>	Chaetoglobosin A,B,C. Sterigmatocystin
<i>Cladosporium</i>	Cladosporic acid
<i>Clavipes purpurea</i>	Ergotism
<i>Cylindrocoryn</i>	Trichothecene
<i>Diplodia</i>	Diplodiatoxin
<i>Fusarium</i>	Trichothecene, zearalenone
<i>Fusarium moniliforme</i>	Fumonisin
<i>Emericella nidulans</i>	Sterigmatocystin
<i>Gliocladium</i>	Gliotoxin
<i>Memnoniella</i>	Griseofulvin, dechlorogriseofulvin, epidechlorogriseofulvin, trichodermin, trichodermol
<i>Myrothecium</i>	Trichothecene
<i>Paecilomyces</i>	Patulin, viriditoxin
<i>Penicillium aurantiocandidum</i>	Penicillic acid
<i>Penicillium aurantiogriseum</i>	Penicillic acid
<i>Penicillium brasilianum</i>	Penicillic acid
<i>Penicillium brevicompactum</i>	Mycophenolic acid
<i>Penicillium camemberti</i>	Cyclopiazonic acid
<i>Penicillium carneum</i>	Mycophenolic acid, Roquefortine C
<i>Penicillium crateriforme</i>	Rubratocin

Fungi	Mycotoxin
<i>Penicillium citrinum</i>	Citrinin
<i>Penicillium commune</i>	Cyclopiazonic acid
<i>Penicillium crustosum</i>	Roquefortine C
<i>Penicillium chrysogenum</i>	Roquefortine C
<i>Penicillium discolor</i>	Chaetoglobosin C
<i>Penicillium expansum</i>	Citrinin, Roquefortine C
<i>Penicillium griseofulvum</i>	Roquefortine C, cyclopiazonic acid, griseofulvin
<i>Penicillium hirsutum</i>	Roquefortine C
<i>Penicillium hordei</i>	Roquefortine C
<i>Penicillium nordicum</i>	Ochratoxin A
<i>Penicillium paneum</i>	Roquefortine C
<i>Penicillium palitans</i>	Cyclopiazonic acid
<i>Penicillium polonicum</i>	Penicillic acid
<i>Penicillium roqueforti</i>	Roquefortine C, Mycophenolic acid
<i>Penicillium veridicatum</i>	Penicillic acid
<i>Penicillium verrucosum</i>	Citrinin, ochratoxin A
<i>Penicillium/ Aspergillus</i>	Patulin
<i>Penicillium/ Aspergillus/Alternaria</i>	Glitoxin
<i>Phomopsis</i>	Macrocyclic trichothecenes
<i>Phoma</i>	Brefeldin, cytochalasin, secalonic acid, tenuazonic acid
<i>Pithomyces</i>	Sporidesmin
<i>Rhizoctonia</i>	Slaframine
<i>Rhizopus</i>	Rhizonin
<i>Sclerotinia</i>	Furanocoumarins
<i>Stachybotrys chartarum</i>	Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene
<i>Torula</i>	Cytotoxins
<i>Trichoderma</i>	Trichodermin, trichodermol, gliotoxin
<i>Trichothecium</i>	Trichothecene
<i>Wallemia</i>	Walleminol
<i>Zygosporium</i>	Cytochalasin

General terms

Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells contact an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

"Black mold"

A poorly defined term. Black mold or toxic black mold has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own. The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin. Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi."

Spore

General term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

Toxic mold

The term "toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.