Herbert Layman, BS, SM, CIEC
Microbial consultant

Customer: Firewater Response
Address: 1130 Lebanon Rd.
Pittsburgh, PA 15122
Contact: Stefan Schaming
Customer Project: Penn Hills Elementary
Survey Date: August 17, 2022
Report Date: August 22, 2022

Project Summary

Herbert Layman, BS, SM, CIEC; Microbial Consultant was contacted by Stefan Schaming of Firewater Response concerning a mold issue in the Penn Hills Elementary School, Pittsburgh, PA. As related to the investigator by Chris Martin of Firewater Response, several rooms in the school had experienced high relative humidity with subsequent mold growth on desktops, ceiling diffusers, etc. in those rooms. The mold was remediated by Firewater prior to the site visit by the investigator. Most of the classrooms have their own heating, ventilation, air conditioning (HVAC) systems but maintaining a balanced air supply to the numerous classrooms of the school has been an ongoing issue. The project was scheduled and completed on August 17, 2022. Digital photographs are supplied in order to visualize the areas sampled at the school.

Field Summary

Penn Hills Elementary was built in 2014 and 1200 students attend grades K-5. Spore trap air samples were collected in the classrooms. Elevated relative humidity readings were noted and recorded in some of the sampled rooms. Chris Martin of Firewater Response accompanied Herb Layman during the collection of the mold samples.

Table 1. Ambient conditions as measured with a GE Digital Protimeter.

Area/Room	*Temperature ºF*	*Relative Humidity*
Classroom 116	69.0º	47,4 %
Classroom 118	69.0º	46.8 %
Classroom 121	66.1º	44.8 %
Classroom 110	65.2º	**63.5 %**
Classroom 150	66.5º	**64.3 %**
Classroom 222	67.4º	**61.8 %**
Classroom 201B	67.5º	58.4 %
Classroom 130	73.7º	43.7 %
Outdoor – Front Entrance	73.2º	64.0 %

Table 1 shows the ambient measurements from the sampled areas. Increased relative humidity readings were noted in classrooms 110, 150, and 222. Although 60% is at the top of the range for recommended relative humidity according to the specification of the American Society of Heating, Refrigeration and Air Conditioning Engineers (*ASHRAE Standard 55 – Thermal Comfort Standard for Commercial Buildings*). Indoor relative humidity should be maintained between 35% and 50% year-round. However, in the winter months in the absence of humidification, low indoor relative humidity readings may be recorded (<30% RH).

Sampling Plan

A sampling plan was adopted to test the hypothesis that the airborne level of fungal spores in the air of the classrooms would show a **"normal fungal ecology"** after a walk-through, visual assessment, and collection of a spore trap air samples for mold.

The following sampling plan was adopted:

Table 2. Sampling Plan

Area	*Sample #*	*Air-O-Cell Spore Trap*
Classroom 116	A-1	X
Classroom 118	A-2	X
Classroom 121	A-3	X
Classroom 110	A-4	X
Classroom 150	A-5	X
Classroom 222	A-6	X
Classroom 201B	A-7	X
Classroom 130	A-8	X
Outdoor – Front Entrance	A-9	X
Field Blank	A-10	X

The air samples were collected on Air-O-Cell spore trap cassettes using a Zefon Biopump™ calibrated at 15 liters per minute (calibration of the pump was performed at the site before the initial sample was collected). Indoor spore trap air samples were collected for five minutes producing 75-liter samples. The outdoor sample was collected for two minutes producing a 30-liter sample. A field blank spore trap cassette was included with the sample set for quality assurance purposes to ensure that no cross contamination occurred during the handling or analytical process.

The samples were transported to the laboratory the same day and received in good condition.

Laboratory Results

Laboratory results are included below. All samples were analyzed at U.S. Micro-Solutions, Inc. Environmental Microbiology Laboratory. The laboratory is accredited by the American Industrial Hygiene Association (AIHA-LAP, LLC) for the analysis of fungi and bacteria in environmental samples.

Table 3. Air Samples (Spore Trap Counts)

Area or Room	*Total Spore Count (spores/m^3 of air*	*Rank Order Assessment Predominant Mold Genera*
Classroom 116	143	64% Basidiospores 18% Ascospores 9% *Cladosporium* spp. 9% *Pithomyces* spp.
Classroom 118	13	100% Ascospores
Classroom 121	26	50% Basidiospores 50% *Cladosporium* spp.
Classroom 110	13	100% Basidiospores
Classroom 150	91	43% *Cladosporium* spp. 29% Basidiospores 14% *Aspergillus/Penicillium* like conidia 14% *Pithomyces* spp.
Classroom 222	26	50% *Aspergillus/Penicillium* like conidia 50% Basidiospores
Classroom 201B	52	75% *Cladosporium* spp. 25% Basidiospores
Classroom 130	26	100% *Cladosporium* spp.
Outdoor – Front Entrance	198	83% Basidiospores 17% Ascospores
Field Blank	-	No particulates or spores noted

Field Impression & Interpretation

This investigator uses criteria from various sources when evaluating indoor environments. Published working papers include documents from professional industrial hygienists, microbiologists, and indoor environmental scientists, e.g., *Recognition, Evaluation, and Control of Indoor Mold, 2nd* Edition (*AIHA – 2020*), and the *Institute of Inspection, Cleaning and Restoration Certification's (IICRC) S-520/2015 Standard for Professional Mold Remediation 3rd Ed.* The investigator also applies knowledge gained from numerous past investigations in determining when laboratory and visual results indicate a normal fungal ecology for each type of structure.

Indoor to outdoor (distribution) – Generally, is it favorable to have lower indoor spore counts as compared to outdoor spore counts and to see similar types and

distribution of fungi indoors and outdoors. The results of the air samples represent a short sampling time frame and should not be considered an exposure assessment. There are no methods currently available for assessing the health effects of human exposure to mold. These air tests are area sampling of the school and provide an indication as to the fungal ecology of the indoor environment. This project involved spore trap air samples and a visual assessment of the school. The predominant spore type in the classrooms was basidiospores and this represents the infiltration of outdoor air (via HVAC) into the classrooms and hallways. At this time of the year, the outdoor air usually reveals the predominance of basidiospores, *Cladosporium* spores, and ascospores.

The results of the spore trap air samples indicate "**acceptable levels**" of mold spores at the time of the sampling and it represents a **Condition 1** or a **"normal fungal ecology"** as stated in the *Institute of Inspection, Cleaning and Restoration Certification's ANSI/IICRC S-520-2015 Standard for Professional Mold Remediation 3rd* Edition. A **Condition 1** is defined as "an indoor environment that may have settled spores, fungal fragments or traces of actual growth whose identity, location, and quantity are reflective of a normal fungal ecology for a similar indoor environment." Therefore, the hypothesis that the air samples for mold spores in the school represent a **"normal fungal ecology"** or a **Condition 1** has been proven.

Recommendations

Recommendations are based upon scientific findings from laboratory and visual data. As with any recommendation, no one single action is guaranteed to eliminate building-related complaints.

1. Annual maintenance on the HVAC systems should be performed including changing of the air filters.
2. Indoor relative humidity should be maintained between 35% and 50% year-round. Maintaining these levels discourages mold growth. Maintaining humidity levels below 50% will also inhibit the reproductive cycle of dust mites. Further, dust mites cannot survive humidity levels below 45%. Dust mites are a major allergen source for people in indoor environments.

All opinions discussed in this report are expressed within a reasonable degree of expert certainty.

Contact

Questions regarding this report should be directed to Herb Layman at 412-576-0284. No portion of this report may be released to or discussed with third parties without the expressed written permission of the customer. USMS personnel are restricted by internal confidentiality policies from discussing this project with any individual other than the "Customer Contact" listed herein. The Customer Contact may specify other individuals with whom USMS personnel may discuss sample results by completing a waiver of confidentiality form, which is available from the laboratory by calling 724-853-4047.

Herbert Layman, BS, SM, CIEC
Investigator, Microbial Consultant

U.S. Micro-Solutions, Inc. * 302 Unity Plaza * Latrobe, PA 15650
Phone: (724) 853-4047 Fax: (724) 853-4049 AIHA-LAP, LLC EMLAP # 103009
www.usmslab.com

Customer Name:	**Firewater Response**	**Sample Date:**	**August 17, 2022**
Customer Address:	**1130 Lebanon Rd**	**Date Received:**	**August 17, 2022**
	Pittsburgh, PA 15122	**Date of Report:**	**August 22, 2022**
Customer Phone:	**(412) 551-6865**	**Fax:**	
PO Number:		**Attention:**	**Stefan Shaming**
Project Name/Number:	**Penn Hills Elementary**		

Customer sample numbers below are uniquely identified by prefixing Laboratory # 88420-22

Airborne Spore Trap Analysis - Air-O-Cell
Analytical Method: MIC 01

Total Volume (L)		**75**				**75**				**75**			
Sample Number		**A-1**				**A-2**				**A-3**			
Location:		**Room 116**				**Room 118**				**Room 121**			
Particle ID		**Raw ct.**	**AS**	**Spores/m³**	**%**	**Raw ct.**	**AS**	**Spores/m³**	**%**	**Raw ct.**	**AS**	**Spores/m³**	**%**
Alternaria-like													
Ascospores		2	13	**26**	18%	1	13	**13**	100%				
Aspergillus/Penicillium-like													
Basidiospores		7	13	**91**	64%					1	13	**13**	50%
Bipolaris/Drechslera													
Cercospora													
Chaetomium-like													
Cladosporium		1	13	**13**	9%					1	13	**13**	50%
Curvularia													
Epicoccum													
Helicomyces													
Nigrospora													
Oidium													
Pithomyces		1	13	**13**	9%								
Polythrincium													
Rusts													
Smuts/ Myxomycetes													
Stachybotrys													
Torula													
Trichoderma-like													
Unidentified dematiaceous conidia													
Unidentified hyaline conidia													
Total Mold (Spores/m³ of air)		11		**143**		1		**13**		2		**26**	
Pollen		1	13	**13**		0	13	< **13**		0	13	< **13**	
Hyphal Fragments													
Insect Fragments													
Plant Fragments													
Skin Cell Fragments		1				1				1			
Debris		1				1				1			
Analyst Initials		BM				BM				BM			
Date Analyzed		08/17/22				08/17/22				08/17/22			
Exp Date of Cassette:		05/2023				05/2023				05/2023			

Entire trace analyzed. Samples are in good condition unless otherwise noted. Results relate only to the samples tested as received. Results are reported as calculated. For biological data, the first and/or second digit should be considered significant. Total percentage may not equal 100% due to rounding. Percentages reported as 0% are greater than 0 and less than 0.5%. The *Aspergillus/Penicllium* -like category cannot be differentiated by non-viable sampling methods. Results are not blank corrected.
Blank Lines = None Detected

Technical Manager: Deanna L Kiska

Deanna L. Kiska, Ph.D.

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Airborne Spore Trap Analysis - Air-O-Cell
Analytical Method: MIC 01

Total Volume (L)		**75**				**75**				**75**			
Sample Number		**A-4**				**A-5**				**A-6**			
Location:		**Room 110**				**Room 150**				**Room 222**			
Particle ID		**Raw ct.**	**AS**	**Spores/m³**	**%**	**Raw ct.**	**AS**	**Spores/m³**	**%**	**Raw ct.**	**AS**	**Spores/m³**	**%**
Alternaria-like													
Ascospores													
Aspergillus/Penicillium-like						1	13	**13**	14%	1	13	**13**	50%
Basidiospores		1	13	**13**	100%	2	13	**26**	29%	1	13	**13**	50%
Bipolaris/Drechslera													
Cercospora													
Chaetomium-like													
Cladosporium						3	13	**39**	43%				
Curvularia													
Epicoccum													
Helicomyces													
Nigrospora													
Oidium													
Pithomyces						1	13	**13**	14%				
Polythrincium													
Rusts													
Smuts/ Myxomycetes													
Stachybotrys													
Torula													
Trichoderma-like													
Unidentified dematiaceous conidia													
Unidentified hyaline conidia													
Total Mold (Spores/m³ of air)		1		**13**		7		**91**		2		**26**	
Pollen		0	13	< **13**		1	13	**13**		0	13	< **13**	
Hyphal Fragments													
Insect Fragments													
Plant Fragments													
Skin Cell Fragments		1				1				1			
Debris		1				1				1			
Analyst Initials		BM				BM				BM			
Date Analyzed		08/17/22				08/17/22				08/17/22			
Exp Date of Cassette:		05/2023				05/2023				05/2023			

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PO Number:		**Attention:**	**Stefan Shaming**
Project Name/Number:	**Penn Hills Elementary**		

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Airborne Spore Trap Analysis - Air-O-Cell
Analytical Method: MIC 01

Total Volume (L)		**75**				**75**				**30**			
Sample Number		**A-7**				**A-8**				**A-9**			
Location:		**Room 201B**				**Room 130**				**Front Entrance - Outdoor**			
Particle ID		**Raw ct.**	**AS**	**Spores/m³**	**%**	**Raw ct.**	**AS**	**Spores/m³**	**%**	**Raw ct.**	**AS**	**Spores/m³**	**%**
Alternaria-like													
Ascospores										1	33	**33**	17%
Aspergillus/Penicillium-like													
Basidiospores		1	13	**13**	25%					5	33	**165**	83%
Bipolaris/Drechslera													
Cercospora													
Chaetomium-like													
Cladosporium		3	13	**39**	75%	2	13	**26**	100%				
Curvularia													
Epicoccum													
Helicomyces													
Nigrospora													
Oidium													
Pithomyces													
Polythrincium													
Rusts													
Smuts/ Myxomycetes													
Stachybotrys													
Torula													
Trichoderma-like													
Unidentified dematiaceous conidia													
Unidentified hyaline conidia													
Total Mold (Spores/m³ of air)		4		**52**		2		**26**		6		**198**	
Pollen		1	13	**13**		2	13	**26**		0	33	< **33**	
Hyphal Fragments													
Insect Fragments													
Plant Fragments													
Skin Cell Fragments		1				1				1			
Debris		1				1				1			
Analyst Initials		BM				BM				BM			
Date Analyzed		08/17/22				08/17/22				08/17/22			
Exp Date of Cassette:		05/2023				05/2023				05/2023			

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	Pittsburgh, PA 15122	**Date of Report:**	**August 22, 2022**
Customer Phone:	**(412) 551-6865**	**Fax:**	
PO Number:		**Attention:**	**Stefan Shaming**
Project Name/Number:	**Penn Hills Elementary**		

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Airborne Spore Trap Analysis - Air-O-Cell
Analytical Method: MIC 01

Total Volume (L)		**N/A**											
Sample Number		**A-10**											
Location:		**Field Blank**											
Particle ID		**Raw ct.**	**AS**	**Spores/m³**	**%**	**Raw ct.**	**AS**	**Spores/m³**	**%**	**Raw ct.**	**AS**	**Spores/m³**	**%**
Alternaria-like													
Ascospores													
Aspergillus/Penicillium-like													
Basidiospores													
Bipolaris/Drechslera													
Cercospora													
Chaetomium-like													
Cladosporium													
Curvularia													
Epicoccum													
Helicomyces													
Nigrospora													
Oidium													
Pithomyces													
Polythrincium													
Rusts													
Smuts/ Myxomycetes													
Stachybotrys													
Torula													
Trichoderma-like													
Unidentified dematiaceous conidia													
Unidentified hyaline conidia													
Total Mold (Spores/m³ of air)													
Pollen													
Hyphal Fragments													
Insect Fragments													
Plant Fragments													
Skin Cell Fragments		0											
Debris		0											
Analyst Initials		BM											
Date Analyzed		08/17/22											
Exp Date of Cassette:		05/2023											

Entire trace analyzed. Samples are in good condition unless otherwise noted. Results relate only to the samples tested as received. Results are reported as calculated. For biological data, the first and/or second digit should be considered significant. Total percentage may not equal 100% due to rounding. Percentages reported as 0% are greater than 0 and less than 0.5%. The *Aspergillus/Penicllium* -like category cannot be differentiated by non-viable sampling methods. Results are not blank corrected.
Blank Lines = None Detected

Technical Manager: Deanna L Kiska

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End of Report

U.S. Micro-Solutions, Inc.

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NY ELAP #12055

LABORATORY TEST REQUEST – CHAIN OF CUSTODY

Customer Name: Firewater Response	Phone #: 412-551-6865	FAX #:	
Address: 1130 Lebanon Rd	City: Pittsburgh	State: PA	Zip: 15122
Attention To: Stefan Shaming	E-Mail: stefan@firewaterresponse.com		
Sample Obtained By: Herb Layman	Results: ☐ FAX ■ E-Mail	PO#	Proposal #
Project Name/Number: Penn Hills Elementary			

Turn-Around-Time: (Spore Trap & DME Only)*
Standard (48-72 hr) ☐ Next Day (24 hr, M-F) ☐ Same Day (6 hr, M-F) ☑ 3-Hour (M-F) ☐ Saturday ☐

Comments:

Sample #	Sample Date	Sample Time	Sample Code	Analysis Code	Sample Location & Description	Sample Volume/Area
A-1	08/17/22	9:00 AM	ST	SPT	Room 116	75L
A-2	08/17/22	9:08 AM	ST	SPT	Room 118	75L
A-3	08/17/22	9:15 AM	ST	SPT	Room 121	75L
A-4	08/17/22	9:25 AM	ST	SPT	Room 110	75L
A-5	08/17/22	9:35 AM	ST	SPT	Room 150	75L
A-6	08/17/22	9:45 AM	ST	SPT	Room 222	75L
A-7	08/17/22	9:55 AM	ST	SPT	Room 201B	75L
A-8	08/17/22	10:03 AM	ST	SPT	Room 130	75L

Relinquished By (Customer MUST sign): Herb Layman — Date & Time: 8-17-22 11:30 AM

Received By – Lab Use Only — Date & Time: 08/17/22 1130 — Lab #: 85480.22

Sample Code	
A	Air Plate
B	Bulk
ST	Spore Trap
S	Swab
W	Water
T	Tape
O	Other

Analysis Code			
DME	Direct Microscopic Exam	COL	Colilert – Presence/absence of *E. coli*, coliforms
SPT	Spore Trap ☐ Allergenco-D ■ AirOCell ☐ M5	HPC	Heterotrophic Plate Count
FUNG	Fungal Culture – Counts w/ Identification	MYC	Mycobacteria Culture (nontuberculous)
BACT	Bacterial Culture – Counts w/ Identification	MRSA	Methicillin-resistant *Staphylococcus aureus* Culture
BACT24	Bacterial Culture (24 hr) - Counts w/ presence/absence of gram-negatives	DUO	Duodenoscope Culture
SS24	Sewage Screen (24 hr) - Presence/absence *E. coli, coliforms, enterococci (fecal streptococci)*	HCU	Heater/Cooler Water Culture *includes nontuberculous mycobacteria and HPC*
IDS	Species Identification by MALDI-TOF	OPP	Opportunistic Pathogen Panel (or separate) PSA - *Pseudomonas aeruginosa* Culture BURK - *Burkholderia cepacia* complex Culture ACIN - *Acinetobacter* Culture
BART	Microbially Influenced Corrosion Panel *Iron-related, sulfate-reducing, slime-forming bacteria*		

*All samples received after 1:00 p.m. Monday-Friday will be considered received the NEXT business day.
Same Day and Next Day samples received on Saturday will be reported on Monday and Tuesday, respectively.

U.S. Micro-Solutions, Inc.
302 Unity Plaza
Latrobe, PA 15650
P: 724-853-4047 F: 724-853-4049

LABORATORY TEST REQUEST – CHAIN OF CUSTODY
Additional Samples

Customer Name: Firewater Response | Project Name/Number: Penn Hills Elementary

Sample #	Sample Date / Time		Sample Code	Analysis Code	Sample Location & Description	Sample Volume/Area
A-9	08/17/22	10:15 AM	ST	SPT	Front Entrance - Outdoor	30L
A-10	08/17/22	10:10 AM	ST	SPT	Field Blank	N/A

Received By – Lab Use Only	Date & Time	Lab #
	08/17/22 1130	8842022