eurofins | Built Environment Testing

Report for:

Mr. Chad Johnson
Eastern Washington University
312 Eagle Lane
EH&S, 002 Martin Hall
Cheney, WA 99004

Regarding: Eurofins Aerotech Built Environment Testing, Inc.
Project: JFK Library; Air Quality Sampling of 2 Sites in and aroudn JFK Libray
EML ID: 3862244

Approved by:

Business Unit Manager
Joshua Cox

Dates of Analysis:
Spore trap analysis: 11-26-2024

Service SOPs: Spore trap analysis (EB-MY-S-1038)
AIHA LAP, LLC accredited service, Lab ID #102297

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Eurofins Aerotech Built Environment Testing, Inc.
1501 West Knudsen Drive, Phoenix, AZ 85027
(800) 651-4802 www.eurofinsus.com/Built

Client: Eastern Washington University
C/O: Mr. Chad Johnson
Re: JFK Library; Air Quality Sampling of 2 Sites in and aroudn JFK Libray

Date of Sampling: 11-20-2024
Date of Receipt: 11-22-2024
Date of Report: 11-26-2024

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	3920 8561: JFK Inside Room U20		3920 8564: Outside Air @ JFK Back Loading Dock	
Comments (see below)	None		None	
Lab ID-Version‡:	19117234-1		19117236-1	
Analysis Date:	11/26/2024		11/26/2024	
	raw ct.	spores/m3	raw ct.	spores/m3
Alternaria			1	53
Ascospores			8	430
Basidiospores			3	160
Botrytis				
Chaetomium				
Cladosporium	2	110	9	480
Curvularia				
Epicoccum				
Fusarium				
Myrothecium				
Nigrospora				
Other colorless				
Penicillium/Aspergillus types†	3	160	2	110
Pithomyces				
Rusts				
Smuts, Periconia, Myxomycetes	1	53	1	53
Stachybotrys				
Stemphylium				
Torula				
Ulocladium				
Zygomycetes				
Background debris (1-4+)	2+		1+	
Hyphal fragments/m3	< 13		< 13	
Pollen/m3	< 13		13	
Skin cells (1-4+)	1+		< 1+	
Sample volume (liters)	75		75	
§ TOTAL SPORES/m3		320		1,300

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 spores of *Aspergillus* and *Penicillium* (and others such as *Acremonium*, *Paecilomyces*) are small and round with very few distinguishing characteristics. They cannot be differentiated by non-viable sampling methods. Also, some species with very small spores are easily missed, and may be undercounted.
††Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher than reported. It is important to account for samples volumes when evaluating dust levels.

The analytical sensitivity is the spores/m^3 divided by the raw count, expressed in spores/m^3, per spore and per sample.

For more information regarding analytical sensitivity, please contact QA by calling the laboratory.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".
§ Total Spores/m3 has been rounded to two significant figures to reflect analytical precision.

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SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

PROJECT ANALYST AND SIGNATORY REPORT

Project Analyst

Analyst: Braidin Herman

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Project: JFK Library; Air Quality Sampling of 2 Sites in and aroudn JFK Libray
EML ID: 3862244

Approved by:

Business Unit Manager
Joshua Cox

Dates of Analysis:
Spore trap analysis: 11-26-2024

Service SOPs: Spore trap analysis (EB-MY-S-1038)
AIHA LAP, LLC accredited service, Lab ID #102297

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Date of Sampling: 11-20-2024
Date of Receipt: 11-22-2024
Date of Report: 11-26-2024

SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

Location:	3920 8561: JFK Inside Room U20				3920 8564: Outside Air @ JFK Back Loading Dock			
Comments (see below)	None				None			
Lab ID-Version‡:	19117234-1				19117236-1			
Analysis Date:	11/26/2024				11/26/2024			
Sample volume (liters)	75				75			
Background debris (1-4+)	2+				1+			
	raw ct.	Count/m3	DL/m3*	%	raw ct.	Count/m3	DL/m3*	%
Hyphal fragments								
Pollen					1	13	13	n/a
§ TOTAL FUNGAL SPORES	6	320	n/a	100	24	1,300	n/a	100
Alternaria					1	53	53	4
Ascospores					8	430	53	33
Basidiospores					3	160	53	13
Chaetomium								
Cladosporium	2	110	53	33	9	480	53	38
Penicillium/Aspergillus types	3	160	53	50	2	110	53	8
Rusts								
Smuts, Periconia, Myxomycetes	1	53	53	17	1	53	53	4
Stachybotrys								
Stemphylium								
Torula								
Ulocladium								
Zygomycetes								

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/m^3 divided by the raw count, expressed in spores/m^3, per spore and per sample.

*The detection limit/limit of detection (DL) per cubic meter (m3) has been rounded to two significant figures to reflect analytical precision.

††Background debris indicates the amount of non-biological particulate matter present on the trace (dust in the air) and the resulting visibility for the analyst. It is rated from 1+ (low) to 4+ (high). Counts from areas with 4+ background debris should be regarded as minimal counts and may be higher than reported. It is important to account for samples volumes when evaluating dust levels.

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§ Total Fungal Spores has been rounded to two significant figures to reflect analytical precision.

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SPORE TRAP REPORT: NON-VIABLE METHODOLOGY

PROJECT ANALYST AND SIGNATORY REPORT

Project Analyst

Analyst: Braidin Herman

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Project: JFK Library; Air Quality Sampling of 2 Sites in and aroudn JFK Libray
EML ID: 3862244

Approved by:

Business Unit Manager
Joshua Cox

Dates of Analysis:
Spore trap analysis other particles-Supplement: 11-26-2024

Service SOPs: Spore trap analysis other particles-Supplement (EM-MY-S-1038)
AIHA LAP, LLC accredited service, Lab ID #102297

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Date of Sampling: 11-20-2024
Date of Receipt: 11-22-2024
Date of Report: 11-26-2024

OTHER BIOLOGICAL PARTICLES REPORT: NON-VIABLE METHODOLOGY

Location:	3920 8561: JFK Inside Room U20		3920 8564: Outside Air @ JFK Back Loading Dock	
Comments (see below)	None		None	
Lab ID-Version‡:	19117235-1		19117237-1	
	raw ct.	particles/m3	raw ct.	particles/m3
POLLEN				
Elm (Ulmus)				
Eucalyptus (Eucalyptus)				
Grass (Poaceae)				
Mulberry (Morus)				
Oak (Quercus)				
Other			1	13
Pine (Pinaceae)				
Ragweed (Ambrosieae)				
Sycamore (Platanus)				
OTHER PLANT				
Algae				
Diatoms				
Fern, moss, etc. spores				
Other (wood, trichomes, etc.)				
OTHER PARTICLES:				
ANIMAL				
Epithelial (skin) cells	50	2,700	2	110
Hair				
Insect parts				
Mites				
FUNGI				
Hyphal fragments				
NON-BIOLOGICAL				
Cellulose fibers	28	1,500	5	270
Glass fiber				
Synthetic fibers	4	210	2	110
Background debris (1-4+)†	2+		1+	
Sample volume (liters)	75		75	

Comments:

The analytical sensitivity is the spores/m3 divided by the raw count. The limit of detection is the analytical sensitivity multiplied by the sample volume divided by 1000.

Carbonaceous particles include soot and other combustion products. In most instances a detailed analysis of soot can be accomplished using scanning electron microscopy.

Note: Interpretation is left to the company and/or persons who conducted the field work.

† Background debris is an indication of the amounts of non-biological particulate matter present on the slide (dust in the air) and is graded from 1+ to 4+ with 4+ indicating the largest amounts. To evaluate dust levels it is important to account for differences in sample volume.

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OTHER BIOLOGICAL PARTICLES REPORT: NON-VIABLE METHODOLOGY

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Analyst: Braidin Herman

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MoldRANGE™, Local Climate; Extended Outdoor Comparison

Outdoor Location: 3920 8564, Outside Air @ JFK Back Loading Dock

Fungi Identified	Outdoor data	Typical Outdoor Data for: November in Northwest† EMLab Regional Climate code¹ A Annual Temp, A Elev., B Rain, A Temp. Range (n‡=571)						Typical Outdoor Data for: The entire year in Northwest† EMLab Regional Climate code¹ A Annual Temp, A Elev., B Rain, A Temp. Range (n‡=7571)					
Project zip code 99004	spores/m3	very low	low	med	high	very high	freq %	very low	low	med	high	very high	freq %
Generally able to grow indoors*													
Alternaria	53	13	13	27	53	75	22	13	13	27	67	110	28
Bipolaris/Drechslera group	-	-	-	-	-	-	3	13	13	13	27	53	4
Chaetomium	-	7	13	13	27	49	6	7	13	13	27	53	7
Cladosporium	480	53	110	320	1,100	2,000	85	53	110	320	1,000	1,900	86
Curvularia	-	-	-	-	-	-	2	13	13	13	40	53	3
Nigrospora	-	-	-	-	-	-	3	13	13	13	27	53	3
Penicillium/Aspergillus types	110	53	67	200	480	870	79	44	53	160	430	690	76
Stachybotrys	-	-	-	-	-	-	2	13	13	13	53	120	1
Torula	-	-	-	-	-	-	2	13	13	22	53	67	5
Seldom found growing indoors**													
Ascospores	430	53	67	270	1,000	1,700	82	40	53	160	590	1,200	78
Basidiospores	160	67	160	670	5,100	16,000	92	53	110	370	1,600	3,400	91
Rusts	-	13	13	27	53	180	12	13	13	27	53	93	12
Smuts, Periconia, Myxomycetes	53	13	27	80	320	570	70	13	27	110	590	1,300	68
§ TOTAL SPORES/m3	1,300												

¹EMLab Regional Climate codes are a climate classification scheme for regional geographic areas containing multiple states. The MoldRANGE™ Local Climate report uses the sampling location zip code to identify the EMLab Regional Climate code in that area. Using information available from the NOAA weather database, the EMLab Regional Climate code sharpens the precision of the MoldRANGE™reporting system, providing more reliable estimates of the range and average concentrations of the different airborne fungal spore types for each region. Additional information on the EMLab Regional Climate code system can be found on the last page of this report.

†The Typical Outdoor Data represents the typical outdoor spore levels across the region's group of states for the time period and EMLab Regional Climate code indicated. The last column represents the frequency of occurrence. The very low, low, med, high, and very high values represent the 10, 20, 50, 80, and 90 percentile values of the spore type when it is detected. For example, if the frequency of occurrence is 63% and the low value is 53, it would mean that the given spore type is detected 63% of the time and, when detected, 20% of the time it is present in levels above the detection limit and below 53 spores/m3. These values are updated periodically and if not enough data is available to make a statistically meaningful assessment, it is indicated with a dash.

‡ n is the sample size used to calculate the MoldRANGE™ Local Climate data summarized in the table.

* The spores in this category are generally capable of growing on wet building materials in addition to growing outdoors. Building related growth is dependent upon the fungal type, moisture level, type of material, and other factors. *Cladosporium* is one of the predominant spore types worldwide and is frequently present in high numbers. *Penicillium/Aspergillus* species colonize both outdoor and indoor wet surfaces rapidly and are very easily dispersed. Other genera are usually present in lesser numbers.

** These fungi are generally not found growing on wet building materials. For example, the rusts and smuts are obligate plant pathogens. However, in each group there are notable exceptions. For example, agents of wood decay are members of the basidiomycetes and high counts of a single morphological type of basidiospore on an inside sample should be considered significant.

§ Total Spores/m3 has been rounded to two significant figures to reflect analytical precision.

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Understanding EMLab Regional Climate Codes

Outdoor airborne spore concentrations are strongly influenced by climate and weather patterns, often resulting in pronounced seasonal and diurnal cycles (Burge 1995). The seasonal climatic changes directly affect the growth cycle of plants, thereby influencing fungal growth, spore maturation, and release cycles. By evaluating outdoor spore concentrations across similar climatic zones rather than for the state as a whole, it is possible to provide a more representative estimate of typical outdoor spore levels and frequency of occurrence for different airborne fungal spore types in a given area.

The EMLab Regional Climate code system is a novel classification system that uses data from the NOAA - National Oceanic and Atmospheric Administration database to define unique climate zones. The following climate variables, for each regional zip code, are obtained from NOAA and assigned a letter code of A (above the regional average for that variable) or B (below the regional average for that variable):

1. Annual High Temperature
2. Elevation
3. Rainfall/Precipitation
4. Monthly Temperature Range

The result is a 4-character code assigned to each statewide zip code, referred to as the Regional Climate Code. Below are some examples of decoded Regional Climate Codes:

AAAA = Above avg. Annual High Temperature, Above avg. Elevation, Above avg. Rainfall/Precipitation, Above avg. Monthly Temperature Range
AABB = Above avg. Annual High Temperature, Above avg. Elevation, Below avg. Rainfall/Precipitation, Below avg. Monthly Temperature Range
BBAA = Below avg. Annual High Temperature, Below avg. Elevation, Above avg. Rainfall/Precipitation, Above avg. Monthly Temperature Range

The actual outdoor air sample data from matching regional climate codes in each group of states are then compiled in a manner relating typical spore concentrations and frequency of occurrence.

The data presented in this report is from the Northwest Region which includes the states of: ID, OR, and WA

The NOAA regional climate variables were selected by mapping data points from a subset of approximately 145,000 weather and geographic database entries to over 80,000 outdoor spore trap samples with known zip codes and assessing them using orthogonal array experimental design techniques. The results were then compared to the typical ranges of spore types found when grouping zip codes using the Koppen-Geiger climatic classification system; a commonly used climatic system that provides an objective numerical definition in terms of climatic elements such as temperature, rainfall, and other seasonal characteristics . The EMLab Regional Climate codes showed improved granularity and refinement of the zip code groupings, implying a better representation of the expected range of spore types to be found within an individual zip code.

The values on this report were calculated by obtaining the four variables listed above from the over 585 million data points of weather and geographic information available in the NOAA database, and determining the frequencies and percentile values of spore types by utilizing over 180,000 Eurofins EMLab P&K outdoor spore trap samples with known zip codes.

This report groups regional zip codes in relation to these EMLab Regional Climate codes and summarizes MoldRANGE™ data by month and year within each EMLab Regional Climate code.

References:

Burge, Harriet, A. Bioaerosols: Boca Raton: Lewis Publishers, pp. 163-171, 1995.

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MoldRANGE™, Local Climate; Extended Outdoor Comparison

PROJECT ANALYST AND SIGNATORY REPORT

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Analyst: Braidin Herman

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MoldSTAT™: Supplementary Statistical Spore Trap Report

Outdoor Summary: 3920 8564: Outside Air @ JFK Back Loading Dock

Species detected	Outdoor sample spores/m3 (<100 / 1K / 10K / >100K)		Typical outdoor ranges (North America)	Freq. %
Alternaria	53		7 - 27 - 380	40
Ascospores	430		13 - 210 - 5,300	73
Basidiospores	160		13 - 370 - 22,000	88
Cladosporium	480		27 - 440 - 7,800	87
Penicillium/Aspergillus types	110		20 - 200 - 2,600	59
Smuts, Periconia, Myxomycetes	53		7 - 53 - 730	62
Total	1,300			

The "Typical outdoor ranges" and "Freq. %" columns show the typical low, medium, and high spore counts per cubic meter and the frequency of occurrence for the given spore type. The low, medium, and high values represent the 2.5, 50, and 97.5 percentile values when the spore type is detected. For example, if the low value is 53 and the frequency of occurence is 63%, it would mean that we typically detect the given spore type on 63 percent of all outdoor samples and, when detected, 2.5% of the time it is present in levels below 53 spores/m3.

Indoor Samples

Location: 3920 8561: JFK Inside Room U20

% of outdoor total spores/m3	Friedman chi-square* (indoor variation)	Agreement ratio** (indoor/outdoor)	Spearman rank correlation*** (indoor/outdoor)	MoldSCORE**** (indoor/outdoor)
Result: 25%	dF: N/A Result: N/A Critical value: N/A Inside Similar: N/A	Result: 0.6667	dF: 6 Result: 0.1571 Critical value: 0.7714 Outside Similar: No	Score: 123 Result: Low

Species Detected	Spores/m3 (<100 / 1K / 10K / >100K)	
Cladosporium	110	
Penicillium/Aspergillus types	160	
Smuts, Periconia, Myxomycetes	53	
Total	320	

* The Friedman chi-square statistic is a non-parametric test that examines variation in a set of data (in this case, all indoor spore counts). The null hypothesis (H0) being tested is that there is no meaningful difference in the data for all indoor locations. The alternative hypothesis (used if the test disproves the null hypothesis) is that there is a difference between the indoor locations. The null hypothesis is rejected when the result of the test is greater than the critical value. The critical value that is displayed is based on the degrees of freedom (dF) of the test and a significance level of 0.05.

** An agreement ratio is a simple method for assessing the similarity of two samples (in this case the indoor sample and the outdoor summary) based on the spore types present. A score of one indicates that the types detected in one location are the same as that in the other. A score of zero indicates that none of the types detected indoors are present outdoors. Typically, an agreement of 0.8 or higher is considered high.

*** The Spearman rank correlation is a non-parametric test that examines correlation between two sets of data (in this case the indoor location and the outdoor summary). The null hypothesis (H0) being tested is that the indoor and outdoor samples are unrelated. The alternative hypothesis (used if the test disproves the null hypothesis) is that the samples are similar. The null hypothesis is rejected when the result of the test is greater than the critical value. The critical value that is displayed is based on the degrees of freedom (dF) of the test and a significance level of 0.05.

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MoldSTAT™: Supplementary Statistical Spore Trap Report

**** MoldSCORE™ is a specialized method for examining air sampling data. It is a score between 100 and 300, with 100 indicating a greater likelihood that the airborne indoor spores originated from the outside, and 300 indicating a greater likelihood that they originated from an inside source. The Result displayed is based on the numeric score given and will be either Low, Medium, or High, indicating a low, medium, or high likelihood that the spores detected originated from an indoor source. Eurofins EMLab P&Kreserves the right to, and may at anytime, modify or change the MoldScore algorithm without notice.

Interpretation of the data contained in this report is left to the client or the persons who conducted the field work. This report is provided for informational and comparative purposes only and should not be relied upon for any other purpose. "Typical outdoor ranges" are based on the results of the analysis of samples delivered to and analyzed by Eurofins EMLab P&K and assumptions regarding the origins of those samples. Sampling techniques, contaminants infecting samples, unrepresentative samples and other similar or dissimilar factors may affect these results. With the statistical analysis provided, as with all statistical comparisons and analyses, false-positive and false-negative results can and do occur. Eurofins EMLab P&K hereby disclaims any liability for any and all direct, indirect, punitive, incidental, special or consequential damages arising out of the data contained in, or any actions taken or omitted in reliance upon, this report.

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Client: Eastern Washington University
C/O: Mr. Chad Johnson
Re: JFK Library; Air Quality Sampling of 2 Sites in and aroudn JFK Libray

Date of Sampling: 11-20-2024
Date of Receipt: 11-22-2024
Date of Report: 11-26-2024

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PROJECT ANALYST AND SIGNATORY REPORT

Project Analyst

Analyst: Braidin Herman

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".