ALL-TECH
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February 1, 2022

Project #28925

Luc Venedam
Project Manager
St. FX University
PO Box 5000,
Antigonish, Nova Scotia
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RE: Total Airborne Mould Spore Sampling, Nicholson Tower, St. Francis Xavier University.

On January 27, 2022, ALL-TECH Environmental Services Limited (ALL-TECH) was contracted by St. FX University to conduct total airborne mould spore sampling in Nicholson Tower. The purpose of the sampling was to determine total airborne mould spore concentrations after clean-up of a flood occurred on January 16, 2022, in the Pantry, Rm 822 on the 8th floor. The sample locations were randomly selected by ALL-TECH. the flooding was caused by a ruptured domestic cold-water line (Category 1 – clean water).

Total Airborne Mould Spore Results

What is Mould?

Mould is a particular type of fungus. Fungi are a distinct and unique group of organisms that are classified into a kingdom classified as decomposers. Unlike animals, fungi have no organs for food uptake or absorption. Therefore, they must secrete chemicals called enzymes into the environment to degrade their complex food source into a soluble form.[1] Moulds are ubiquitous to the environment. Indoor and outdoor environments naturally harbour a great variety of microscopic organisms such as mould. Prolonged exposure to excessive moisture enables microbes to flourish. If conditions are such that moisture is limited, then these microbes have a stable relationship with the built environment. However, when moisture accumulates more rapidly than the natural drying process, the ecology changes and favours the amplification of mould.[2]

Health Effects Associated with Moulds in Indoor Environments:

There are a number of documented cases of health problems associated with exposure to indoor moulds. The most common symptoms from exposure to mould in indoor environments are runny nose, eye irritation, cough, congestion, and aggravation

[1] Bailey, H.S, Fungal Contamination: A Manual for Investigation, Remediation and Control, Building Environment Consultants Inc., 2005, Jupiter, FL, Page 10.
[2] Fungal Contamination in Public Buildings: A Guide to Recognition and Management, Health Canada, Federal-Provincial Committee on Environmental and Occupational Health, June 1995.

of asthma if the person is asthmatic. People with suppressed immune systems may be susceptible to serious fungal infections as a result of exposure to indoor moulds. People with suppressed immune systems, who can be adversely affected by mould and other hoist of microorganisms, are normally patients in health care facilities.

All mould species can produce mycotoxins; however, there is no correlation between inhalation exposure and the associated toxic response, except in cases where extremely high levels of dust contain mould metabolite. The amount of dust in these cases is described as a fog.[3] These conditions are not normally found in built environments. Most of the toxic response associated with mould is caused by ingesting foods heavily overgrown with moulds and not by inhaling moulds. The present alarm over human exposure to moulds in the indoor environment comes from a belief that breathing in mycotoxins cause numerous and varied, but generally non-specific, symptoms. Current scientific evidence does not support the proposition that human health has been adversely affected by inhaled mycotoxins (from toxigenic moulds) in the home, school, or office environment.[4]

For these reasons, and because the measurement of exposure is not standardized and biological markers of exposure to mould are largely unknown, it is not possible to establish 'safe' or 'unsafe' levels of exposure.[5]

Sampling Methodology

The air samples were collected using spore trap sampling cassettes connected to Quick Check sampling pumps calibrated at 15.0 litres per minute. The pumps were calibrated prior to sampling using a TSI Mass Flowmeter, model #4146 (S/N 41460846012). The spore trap cassette is an impaction-based air sampler designed to pull air across a tacky sampling medium, trapping any airborne particulates or microbials. All samples were sent to EMC Scientific Incorporated, an accredited microbiological laboratory located in Mississauga, Ontario, to be analysed for mould spores and mycelial fragments. Please refer to Table 1.0 for the results.

Table 1.0
Total Airborne Mould Spore Results
Nicholson Tower
January 27, 2022

Sample ID	Location/Observations	Air Sample Volume (L)	Sample Time	Type on Mould Spores ID	Percent	Spore Count (spores/m^3)	Total Spore Concentration (spores/m^3)
001-8152	8th Floor, Rm 822 – Pantry Temp: 21.55 °C, %RH: 21.95	150	1045 hrs 10 min	*Aspergillus/Penicillium* type	83	127	153
				Cladosporium	9	13	
				Colourless	4	7	
				Stachybotrys	4	7	
002-8156	7th Floor, Rm 722 – Meeting Rm Temp: 21.3 °C, %RH: 21.78	150	1049 hrs 10 min	*Aspergillus/Penicillium* type	50	13	27
				Cladosporium	50	13	
003-8166	7th Floor, Rm 712, Pantry Temp: 21.3 °C, %RH: 21.78	150	1050 hrs 10 min	*Aspergillus/Penicillium* type	89	107	120
				Cladosporium	6	7	
				Colourless	6	7	
004-8155	6th Floor, Rm 618, Office	150	1057 hrs 10 min	*Aspergillus/Penicillium* type	33	7	20
				Basidiospores	33	7	

[3] Pratt DS, May JJ. Feed-associated respiratory illness in farmers, Arch Environ Health. 1984;39:43-8

[4] American College of Occupational and Environmental Medicine guideline "Adverse Human Health Effects Associated with Moulds in the Indoor Environment" www.acoem.org/guidelines/pdf/mould-10-27-02.pdf

[5] Canadian Construction Association: Mould Guidelines for the Canadian Construction Industry, Document CCA 82-2004, page 10.

Sample ID	Location/Observations	Air Sample Volume (L)	Sample Time	Type on Mould Spores ID	Percent	Spore Count (spores/m^3)	Total Spore Concentration (spores/m^3)
	Temp: 20.97 ºC, %RH: 20.29			*Cladosporium*	33	7	
005-8146	5th Floor, Rm 516, Office Temp: 20.52 ºC, %RH: 23.11	150	1102 hrs 10 min	Ascospores	14	7	47
				Aspergillus/Penicillium type	29	13	
				Cladosporium	14	7	
				Colourless	29	13	
				Smuts, *Periconia,* Myxomycetes	14	7	
006-8160	4th Floor, Rm 412, Office Temp: 20.14 ºC, %RH: 21.28	150	1104 hrs 10 min	*Aspergillus/Penicillium* type	57	27	47
				Cladosporium	14	7	
				Colourless	29	13	
007-8161	3rd Floor, Rm 319, Office Temp: 20.26 ºC, %RH: 21.35	150	1110 hrs 10 min	*Aspergillus/Penicillium* type	29	13	47
				Basidiospores	14	7	
				Cladosporium	43	20	
				Colourless	14	7	
008-8165	1st Floor, Rm 100, Elevator Lobby Temp: 21.39 ºC, %RH: 22.01	150	1121 hrs 10 min	*Aspergillus/Penicillium* type	67	13	20
				Cladosporium	33	7	
009-8142	2nd Floor, Rm 222, Work Area Temp: 21.99 ºC, %RH: 20.68	150	1135 hrs 10 min	*Aspergillus/Penicillium* type	33	7	20/21
				Cladosporium	33	7	
				Colourless	33	7	
010-8144	Exterior of Building, Ground Level	150	1246 hrs 10 min	*Aspergillus/Penicillium* type	25	7	27/28
				Cladosporium	25	7	
				Colourless	25	7	
				Smuts, *Periconia,* Myxomycetes	25	7	

Conclusion

No visible mould growth was observed during the assessment. The interior temperature and % relative humidity (< 40%) measured during the assessment provides excellent drying conditions inside the building.

When interpreting airborne mould concentrations, there is no precise formula for distinguishing normal background levels. Typically, indoor, and outdoor environments naturally harbour a great variety of microscopic organisms such as moulds. In most, but not all, normal building environments, the qualitative diversity (types) of airborne mould indoors and outdoors should be similar. In most building environments, the total concentration of mould inside of the building should be generally less than in the ambient environment outside of the building. However, during the winter months, it is not uncommon for indoor mould samples to be higher than outdoor samples due to exterior sub-zero temperatures, and snow cover reducing the amount of exterior total airborne mould spores. In warmer months, exterior total airborne mould spore concentrations can easily exceed several thousand spores per cubic meter.

Total airborne mould spore concentration in the interior samples collected ranged between 20 to 153 spores/m^3 and indicates and non-problem environment. The specific genus of moulds identified in the above noted sample locations were common types found in buildings and similar with those found in the exterior of the building. The interior airborne mould concentrations were considered normal for occupied buildings at the time of sampling.

If extensive mould growth is present inside a building, total airborne mould spore concentrations can easily exceed tens of thousands+ of airborne mould spores.

Limitations

The findings contained in this report are based upon conditions as they were observed at the time of the survey. It is possible that these procedures will not identify all moisture and/or mould present in a building; however, this approach can be considered to be a reasonable estimate of the extent of moisture and/or mould present. No assurances are made regarding changes in conditions subsequent to the time of the survey. The client acknowledges that fungi and bacteria, including mould and spores, are ubiquitous within the environment, and the absence of any reported visible growth should not be considered a guarantee that materials are fungi or bacteria free. Given the right conditions, mould may grow or re-grow on building materials or furnishings following any assessment or remediation activities.

ALL-TECH's assessment reports present professional opinions and findings of a scientific and technical nature. While attempts were made to relate the data and findings to applicable environmental laws and regulations, the report shall not be construed to offer legal opinion or representations as to the requirements of, nor compliance with, environmental laws, rules, regulations, or policies of federal, provincial, or local governmental agencies. Any use of the assessment report constitutes acceptance of the limits of ALL-TECH's liability.

If you have any questions regarding the report or results, please contact me at 902-835-3727 or via email at rgardner@toalltech.com.

Thank you,

Robert Gardner

Robert Gardner, CET
Senior Technical Advisor
ALL-TECH Environmental Services Limited

Encl: EMC Scientific Inc. Laboratory Results and Photograph

Photo 1 - Location of water leak, Rm 822, Pantry

Photo 2 - Ruptured domestic cold water line causing leak, Rm 822, Pantry.

emcscientific
INCORPORATED

Laboratory Analysis Report

To:

Rob Gardner
ALL-TECH Environmental Services
162 Trider Crescent
Dartmouth, Nova Scotia
B3B 1R6

EMC LAB REPORT NUMBER: 83767
Job/Project Name:
Job/Project No: 28925 **No. of Samples:** 10
Sample Type: Allergenco-D **Date Received:** Jan 27/22
Analysis Method(s): Fungal Spore Counting
Date Analyzed: Jan 31/22 **Date Reported:** Jan 31/22
Analyst: Fajun Chen, Ph.D., *Principal Mycologist*

Client's Sample ID	**001-8152**			**002-8156**			**003-8166**			**004-8155**			**005-8146**		
EMC Lab Sample No.	357746			357747			357748			357749			357750		
Sampling Date	Jan 27/22			Jan 27/22			Jan 27/22			Jan 27/22			Jan 27/22		
Description/Location	8th Floor - pantry, rm 822 - 1045 am			7th Floor - meeting rm 722 - 1049 am			7th Floor - pantry, rm 712 - 1050 am			6th Floor - office, rm 618 - 1057 am			5th Floor - office, rm 516 - 1102 am		
Air Volume (m^3)	0.150			0.150			0.150			0.150			0.150		
Fungal Spores	raw ct.	%	spores/m^3	raw ct.	%	spores/m^3	raw ct.	%	spores/m^3	raw ct.	%	spores/m^3	raw ct.	%	spores/m^3
Alternaria															
Arthrinium															
Ascospores													1	14	7
Aspergillus/Penicillium type	19	83	127	2	50	13	16	89	107	1	33	7	2	29	13
Basidiospores										1	33	7			
Cercospora															
Chaetomium															
Cladosporium	2	9	13	2	50	13	1	6	7	1	33	7	1	14	7
Colorless	1	4	7				1	6	7				2	29	13
Curvularia															
Drechslera/Bipolaris group															
Epicoccum															
Fusarium															
Nigrospora															
Pithomyces															
Polythrincium															
Rusts															
Smuts, *Periconia* , Myxomycetes													1	14	7
Stachybotrys	1	4	7												
Ulocladium															
Unidentified spores															
Number of spores/sample	23			4			18			3			7		
Fungal fragments (0-3 +)	0+			0+			0+			0+			0+		
Non-fungal material (0-3 +)	2+			2+			2+			2+			2+		
TOTAL SPORES/M^3	**153**			**27**			**120**			**20**			**47**		

Note:
1. *Aspergillus/Penicillium* type spores may include those of *Acremonium, Paecilomyces, Trichoderma* and others.
2. A scale of 0 + to 3 + (indicating increasing amount) is used to rate abundance of fungal fragments and non-fungal material, with 3+ indicating the most abundance.
3. The presence of a large amount of dust debris may obscure some spores to be counted. Spore counts from samples with 3 + non-fungal material and/or 3 + fungal material may be treated as under-counts.
4. Unidentified spores are those lacking distinguishable characteristics for correct identification. Colorless are colorless spores lacking distinguishable characteristics.
5. These results are only related to the sample(s) analyzed.

emcscientific INCORPORATED

Laboratory Analysis Report

EMC LAB REPORT NUMBER: 83767
Client's Job/Project No.: 28925
Analyst: Fajun Chen, Ph.D., *Principal Mycologist*

Client's Sample ID	**006-8160**			**007-8161**			**008-8165**			**009-8142**			**010-8144**		
EMC Lab Sample No.	357751			357752			357753			357754			357755		
Sampling Date	Jan 27/22			Jan 27/22			Jan 27/22			Jan 27/22			Jan 27/22		
Description/Location	4th Floor - office, rm 412 - 1104 am			3rd Floor - office, rm 319-1110 am			1st Floor - elevator lobby, rm 100-1121am			2nd Floor, work area, rm 222 - 1135 am			Exterior of building - ground level - 1246 pm		
Air Volume (m^3)	0.150			0.150			0.150			0.150			0.150		
Fungal Spores	raw ct.	%	spores/m^3	raw ct.	%	spores/m^3	raw ct.	%	spores/m^3	raw ct.	%	spores/m^3	raw ct.	%	spores/m^3
Alternaria															
Arthrinium															
Ascospores															
Aspergillus/Penicillium type	4	57	27	2	29	13	2	67	13	1	33	7	1	25	7
Basidiospores				1	14	7									
Cercospora															
Chaetomium															
Cladosporium	1	14	7	3	43	20	1	33	7	1	33	7	1	25	7
Colorless	2	29	13	1	14	7				1	33	7	1	25	7
Curvularia															
Drechslera/Bipolaris group															
Epicoccum															
Fusarium															
Nigrospora															
Pithomyces															
Polythrincium															
Rusts															
Smuts, *Periconia* , Myxomycetes													1	25	7
Stachybotrys															
Ulocladium															
Unidentified spores															
Number of spores/sample	7			7			3			3			4		
Fungal fragments (0-3 +)	0+			0+			0+			0+			0+		
Non-fungal material (0-3 +)	2+			2+			2+			2+			2+		
TOTAL SPORES/M^3	**47**			**47**			**20**			**20**			**27**		

Note:
1. *Aspergillus/Penicillium* type spores may include those of *Acremonium, Paecilomyces, Trichoderma* and others.
2. A scale of 0 + to 3 + (indicating increasing amount) is used to rate abundance of fungal fragments and non-fungal material, with 3+ indicating the most abundance.
3. The presence of a large amount of dust debris may obscure some spores to be counted. Spore counts from samples with 3 + non-fungal material and/or 3 + fungal material may be treated as under-counts.
4. Unidentified spores are those lacking distinguishable characteristics for correct identification. Colorless are colorless spores lacking distinguishable characteristics.
5. These results are only related to the sample(s) analyzed.