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Project #13045

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RE: Mould Testing Results, Saint Andrew's Elementary School, Rooms 220, 228, 224, 210, 216, 207, 118, 121 and 123.

1.0 Introduction

On March 17, 2011, ALL-TECH Environmental Services Limited (ALL-TECH) conducted airborne mould air sampling in the following locations within Saint Andrew's Elementary School, located at 77 Chatham Avenue in Miramichi, NB:

- Room 220
- Room 228
- Room 224
- Room 210
- Room 216
- Room 207
- Room 118
- Room 121
- Room 123
- Outside

2.0 Mould

Moulds are ubiquitous to the environment. Indoor and outdoor environments naturally harbor 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 favors the rapid amplification of mould¹. The Institute of Inspection, Cleaning and Restoration Certification (IICRC) *S520 Standard and Reference Guide for Professional Mould Remediation* has defined mould in buildings into three categories:

¹ *Fungal Contamination in Public Buildings: A Guide to Recognition and Management*, Health Canada, Federal-Provincial Committee on Environmental and Occupational Health, June 1995.

- Condition 1 (normal fungal ecology)- Indoor environment that may have settled spores, fungal fragments, or traces of actual growth whose identity, location and quantity are reflective for normal fungal ecology for similar indoor environment.
- Condition 2 (settled mould spores) – Indoor environment which is primarily contaminated with settled spores that were dispersed directly or indirectly from a condition 3 area. No actual mould growth.
- Condition 3 (actual growth) – Indoor environment contaminated with the presence of actual mould growth and associated spores. Actual growth includes mould growth that is active or dormant, visible or hidden.

Mould contamination is defined as the presence of mould growth and/or mould spores, whose identity, location, and quantity are not reflective of a normal fungal ecology for similar indoor environments, and which may produce adverse health effects, cause damage to materials and/or adversely affect the operation of function of building systems.

3.0 Sampling Methodology

3.1 Air Sampling for Mould

Total airborne mould spore air samples were collected using Zefon Air-O-Cell[®] sampling cassette connected to a vacuum sampling pump. The flow rate on the sampling pump was set at 15.0 litres per minute. The Zefon Air-O-Cell[®] cassette is an impaction-based air sampler designed to pull air across a tacky sampling medium, trapping any airborne particulates. The samples were sent to EMC Scientific Inc., Mississauga, Ontario for direct microscopic analysis for total airborne mould spores concentrations.

4.0 Health Effects Caused by Mould

There are a number of documented cases of health problems related to exposure to indoor moulds. The most common symptoms from exposure to mould in indoor environments are runny nose, eye irritation, cough, congestion, and aggravation 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. The people with suppressed immune systems are normally patients in health care facilities and can be adversely affected by not only mould but by a host of other microorganisms found in buildings.

All mould species can produce mycotoxins; however, there is no correlation between inhalation exposure and the associated toxic response except in case where extremely high levels of dust containing mould metabolite. The amount of dust in these cases is described as a fog². These conditions are not normally found in built environments. Most of the toxic response associated with mould is by ingestion of foods heavily overgrown with moulds and not by inhalation of moulds. The present alarm over human exposure to moulds in the indoor environment derives from a belief that inhalation exposures to 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 in the home, school, or office environment³.

People who are exposed to mould growth will not necessarily exhibit adverse health effects. However, the mould must still be removed or controlled. People are at risk from indoor mould when spores or fragments are released into the air and inhaled or physically contacted (dermal exposure). Not everyone experiences allergic reaction; the susceptibility to exposure varies with the individual's genetic predisposition, age, state of health, and concurrent exposures. 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. However, there are numerous guidelines that have been written to minimize mould exposure and control mould indoors⁴.

5.0 Exposure Criteria

Currently, Federal/Provincial regulations for airborne mould concentrations in indoor environments do not exist, however, there are numerous guidelines published regarding acceptable airborne mould concentrations. When air samples are collected as part of an air quality assessment, most situations dictate that comparisons are made between indoor and

² Pratt DS, May JJ. Feed-associated respiratory illness in farmers, *Arch Environ Health*. 1984;39:43-8

³ 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

⁴ Canadian Construction Association: Mould Guidelines for the Canadian Construction Industry, Document CCA 82-2004, page 10, 2004.

outdoor mould levels. Indoor and outdoor samples must be collected within the same time period. It is important that, to the extent possible, the outdoor samples taken represent the air entering the building.

Indoor/outdoor relationships are assessed both by comparing concentrations and species composition of comparable collected samples. In non-problem environments, the concentration of fungi (mould) in indoor air typically is similar to or lower than the concentration seen outdoors, except when outdoor air concentrations are near zero (i.e. during periods of snow cover). If fungal concentrations indoors are consistently higher than those outdoors, then indoor sources are indicated.⁵

6.0 Airborne Mould Sampling Results

Table 1.0 - Total Airborne Mould Concentration Results

Sample #	Location	Sample Volume M ³	Fungal Name	Spores/M ³	Percent of Total Spores	Total Spore Conc. Spores/M ³
158033	Room 220	0.15	<i>Aspergillus/Penicillium</i> type	80	67	120
			<i>Cladosporium</i>	27	22	
			Colorless	13	11	
158034	Room 228	0.15	<i>Aspergillus/Penicillium</i> type	53	57	93
			<i>Cladosporium</i>	13	14	
			Colorless	20	21	
			<i>Epicoccum</i>	7	7	
158035	Room 224	0.15	<i>Aspergillus/Penicillium</i> type	47	58	80
			<i>Cladosporium</i>	20	25	
			Colorless	13	17	
158036	Room 210	0.15	<i>Aspergillus/Penicillium</i> type	40	60	67
			<i>Cladosporium</i>	7	10	
			Colorless	20	30	
158037	Room 216	0.15	<i>Aspergillus/Penicillium</i> type	107	84	127
			<i>Cladosporium</i>	13	11	
			Colorless	7	5	
158038	Room 207	0.15	<i>Aspergillus/Penicillium</i> type	7	25	27
			<i>Cladosporium</i>	13	50	
			Colorless	7	25	
158039	Room 118	0.15	<i>Aspergillus/Penicillium</i> type	27	57	47
			<i>Cladosporium</i>	7	14	
			Colorless	13	29	
158040	Room 121	0.15	<i>Aspergillus/Penicillium</i> type	47	78	60
			<i>Cladosporium</i>	7	11	
			Colorless	7	11	
158041	Room 123	0.15	<i>Aspergillus/Penicillium</i> type	40	75	53
			<i>Cladosporium</i>	7	13	
			Colorless	7	13	
158042	Outside	0.15	<i>Aspergillus/Penicillium</i> type	53	53	100
			<i>Cladosporium</i>	33	33	
			Colorless	13	13	

7.0 Conclusions

There is no precise formula for distinguishing normal background mould from contamination. Indoor and outdoor environments naturally harbour a great variety of microscopic organisms such as moulds. In most, but not all healthy

⁵Burge, Harriet A., and Otten, James A., *In Bioaerosols: Assessment and Control*, pp 19-12, J. Macher, H.A. Ammann, H.A. Burge et. al., eds. American Conference of Governmental Industrial Hygienists, Cincinnati OH, 1999.

building environments, the qualitative diversity (types) of airborne mould indoors and outdoors should be similar. Conversely, the dominating presence of one or two kinds of mould indoors and the absence of the same kind outdoors may indicate a moisture problem and degraded air quality. In most healthy building environments, the total concentration of mould inside of the building should be generally less than in the ambient environment outside of the building.⁶ The following factors were considered when interpreting air sampling data:

- There is no precise formula to distinguish normal background levels from elevated airborne mould spore levels.
- There is a high natural variability of airborne mould spores in the environment.
- There are no widely accepted evidence-based criteria that attribute a commonest of adverse health effects to exposure to airborne mould.

When compared to the exterior sample, all samples were found to be lower than the exterior sample with the exception of Rooms 216 and 220. Although snow cover outdoors may have contributed to the lower exterior sample results. With the exception of *Epicoocum* found in Room 228 spores in the exterior samples were similar in all nine samples.

8.0 Recommendations

A good general house cleaning of these rooms (Rooms 216 and 220) is recommended to help improve air quality within these rooms. As with all buildings it is always recommended that building occupants report excess moisture levels within a structure. When identified excessive moisture problems should be corrected to improve Indoor Air Quality within a building.

9.0 Limitation

It should be noted that 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 mould free. Given the right conditions, mould may grow or re-grow on building materials or furnishings following any assessment or remediation activities. 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 airborne and surface mould present. No assurances are made regarding changes in conditions subsequent to the time of the survey.

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 506-658-1058 or via email at bafraser@toalltech.com

Thank you,



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