140 Iowa Lane, Suite 102, Cary, NC 27511 O.919-342-4936 www.lrcresearch.com

November 24, 2024

Dare County Schools
Ian Adams
3020 S. Wrightsville Avenue
Nags Head, NC

Re: Limited Indoor Air Quality Sampling with Airborne Fungal Sampling at Kitty Hawk Elementary School
LRC Project – 24-3287

At your request, on November 15, 2024, LRC Indoor Testing & Research, Inc. (LRC) performed a limited environmental fungal Indoor Air Quality (IAQ) sampling that included airborne fungal sampling at the property listed above.

LRC performs all water-damage and fungal investigations with sampling and recommendations in accordance with guidelines published in *Bioaerosols: Assessment and Control*, by the American Conference of Governmental Industrial Hygienists (ACGIH), in *Mold Remediation in Schools and Commercial Buildings* by the United States Environmental Protection Agency (USEPA), and in the currently recognized and accepted industry standards including the ANSI/IICRC S500 *Standard and Reference Guide for Professional Water Damage Restoration*, Fourth Edition (S500) and the ANSI/IICRC S520 *Standard and Reference Guide for Professional Mold Remediation*, Third Edition (S520).

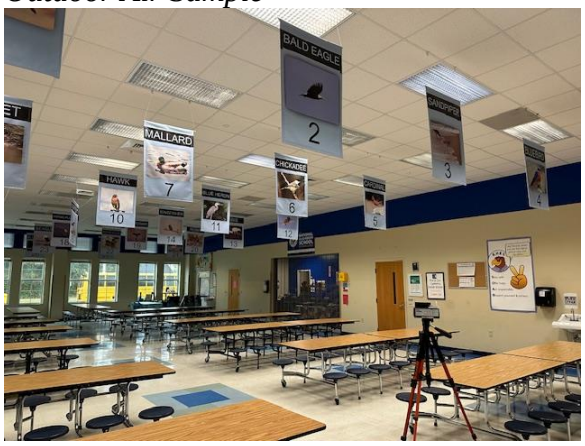
Our inspection included the following:
1. Measure temperature and relative humidity indoors and outdoors.
2. Collect representative non-viable spore trap air samples indoors and one outdoors for comparison.
3. Collect representative Particle Counts, Carbon Dioxide and Carbon Monoxide counts at locations where air samples are collected.
4. Provide a written report describing the survey results and comparing those results to accepted guidelines and directives. This report includes a summary of data and Certificates of Laboratory Analysis.

BACKGROUND

This inspection was limited to non-viable spore trap air samples, particle counts, CO and CO^2 measurements that were collected from locations selected at random throughout the building. Descriptions in this report are based on looking at the structure from the street front. Moisture measurements and visual inspections were not conducted on this day.

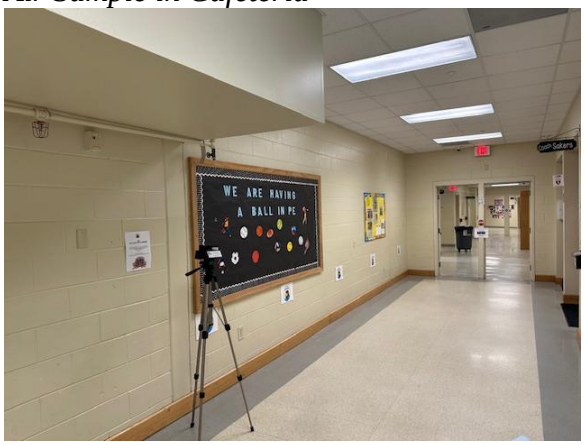
Outdoor Air Sample

Air Sample in Gym



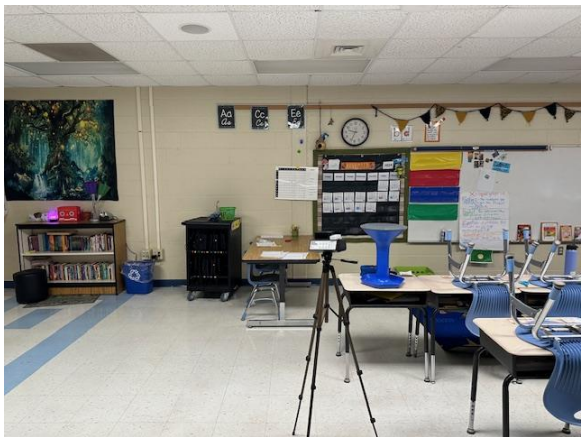
Air Sample in Cafeteria

Air Sample in Classroom



Air Sample in Hallway

Air Sample in Hallway



Air Sample in Classroom

Air Sample in Classroom

SAMPLING METHODOLOGY

Air Samples:

Currently there are no regulations regarding acceptable airborne fungal levels. Airborne fungal spores are ubiquitous in the outdoor and indoor environment. The guidelines followed in this report for the assessment and/or remediation of airborne and surface fungi are published in *Bioaerosols: Assessment and Control*, by the American Conference of Governmental Industrial Hygienists (ACGIH), in *Mold Remediation in Schools and Commercial Buildings* by the United States Environmental Protection Agency (USEPA), in *Recognition, Evaluation, and Control of Indoor Mold* by the American Industrial Hygiene Association (AIHA), and in the ANSI/IICRC S520 *Standard and Reference Guide for Professional Mold Remediation*, Third Edition (S520). Airborne fungal assessments are performed by comparing results from volumetric samples taken indoors to samples taken outdoors. Airborne fungi levels in non-problem indoor environments generally are less than or approximately the same as that outdoors and also show a similar composition and/or taxonomic predominance. Problems are usually implicated in the indoor air when one or more fungal genera or species are present in a much greater concentration indoors compared to outdoors. Sampling results are shown in the Certificates of Laboratory Analysis attached to this report. Results are discussed below.

Temperature and Relative Humidity

Temperature and relative humidity readings were recorded by the Lighthouse Handheld 3016 Particle Counter. ASHRAE Standard 55 for thermal comfort suggested that the indoor temperature should be between 73°F to 79°F in the summer and 68°F to 75°F in the winter and that the indoor relative humidity should be between 20% to 65%.

The temperature and relative humidity are summarized in Table A below. The relative humidity met the current ASHRAE Standard to maintain indoor relative humidity below 65%.

SAMPLING RESULTS

Total Non-Viable Spore Air Sample Results:

Representative samples were taken for total airborne fungal spores with a calibrated Buck spore trap. Total airborne fungal spore sample volumes were 75-liters. The outdoor total fungal spore level (Sample 19) was measured at 707 Spores/m^3 and was comprised of Ascospores (38%), Basidiospores (19%), *Cladosporium* (17%), Penicillium/Aspergillus (13), Smuts (9%), and 4% or less of various other fungal spores. The air sample results are summarized below in Table A.

Table A – Air Sampling Results

Sample #	Location	Total Airborne Spore Count (Spores/m^3)	*Non-Fungal Background Particulate Level	Temperature °F	Relative Humidity %
01	Hall at Entry	347	Low-moderate	69	63
02	Media Center	93	Low-moderate	68	61
03	Hall at 116	200	Moderate	69	61
04	Hall at 129	160	Low-moderate	70	59
05	CR D 106	147	Low	70	59
06	CR D 122	107	Low	69	59
07	Hall at Gym	227	Moderate	71	58
08	Gym	187	Low-moderate	71	57
09	Cafeteria	120	Low	71	58
10	Hall at 100F	733	Moderate	71	57
11	Hall at A 109	280	Moderate	72	56
12	Hall at A 104	67	Moderate	72	56
13	CR 103	67	Low	72	59
14	CR 108	93	Low	73	55
15	Hall at B 111	80	Low	74	55
16	Hall at B 103	67	Low	75	51
17	CR 106	53	Low	74	57
18	B 112	53	Low	74	53
19	Outdoor Air	707	Low-moderate	63	70

*The Background Particulate Level refers to non-fungal debris seen in the air sample; such as skin cells, hair, fibers, dust, dirt, etc.

The total fungal spore counts in the areas sampled indoors were lower than that found in the outdoor air. The types of fungal spores found in the indoor air samples were all common outdoor-type fungi present in low concentrations with no spikes in water loss fungi except samples 8, 10 and 11, those three samples all contained trace amounts of *Stachybotrys* spores. Therefore, the results suggested a normal indoor fungal ecology in the areas sampled except for those three samples which suggest an altered indoor fungal ecology in those areas.

The particulate in the indoor air samples was in the low to moderate range. The particulate that we see in the microscope at the magnification used is usually called 'course particulate' and consist of many things and can include the following: dirt, dust, mold, pollen, fiber, hair, skin cells, dust mites and other insects. Fine particulates (to include VOC's – volatile organic compounds) are not seen with the magnification used for these samples.

PARTICLE COUNT METHODOLOGY

A Lighthouse Handheld 3016 Particle Counter was used to measure the levels of airborne particulates. Airborne particles are solids suspended in the air. In a commercial setting, particle levels should be significantly less than outside readings due to better filtration and better dilution with outside air.

PARTICLE COUNT RESULTS

Table B below summarizes the minimum, maximum, and average particle count in the building in each size category during the sampling period. Each time one liter of air was drawn into the Particle Counter, and the Particle Counter calculated all particles that are greater than or equal to the particle size indicated in the size categories.

Table B – Indoor Particle Count Sampling Results

	0.3 micron	**0.5 micron**	**1.0 micron**	**2.5 micron**	**5.0 micron**	**10.0 micron**
Minimum	1861	336	39	9	0	0
Maximum	5053	965	224	16	1	0
Average	3293	649	108	7	.05	16

Table C below summarizes the average particle count in the outdoor air at the time of sampling. Each time one liter of air was drawn into the Particle Counter, and the Particle Counter calculated all particles that are greater than or equal to the particle size indicated in the size categories. In addition, temperature and relative humidity information were included.

Table C – Outdoor Particle Count Sampling Results

	0.3 micron	0.5 micron	1.0 micron	2.5 micron	5.0 micron	10.0 micron
Outdoor Air Average	5370	1315	551	316	167	94

CARBON MONOXIDE AND CARBON DIOXIDE METHODOLOGY

A TSI IAQ-Calc Indoor Air Quality Meter (Model 7545) was used to measure the concentrations of CO and CO_2. CO is a dangerous gas caused by incomplete combustion. The level of CO in an indoor environment should be low (none detected to 4 parts per million [ppm] depending on fuel sources used indoors) or same as outdoors. CO_2 is commonly used as an indicator of ventilation adequacy. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62.1 stated that the indoor concentration of CO_2 should be less than 700 ppm over the outdoor ambient air, which typically is around 400 ppm.

CARBON MONOXIDE AND CARBON DIOXIDE RESULTS

The average CO^2 concentration indoors was similar to the CO^2 concentration outdoors. In addition, the indoor CO^2 concentrations were measured at low ppm in all locations. Therefore, the results suggested that the indoor CO^2 concentrations were within normal ranges. Therefore, the results suggested that the ventilation in the areas sampled was adequate.

CONCLUSIONS

Results as reported by LRC apply only to the day of this inspection. LRC cannot and does not warranty that other parts of the structure were completely free or that the structure will remain free in the future from hidden sources of moisture or fungal contamination.

This inspection was limited to indoor air quality parameters. The indoor air samples did not show a fungal amplification or an altered indoor fungal ecology on this day except for three samples (8, 10, 11). Relative humidity was in the recommended range. Particle counts were generally lower than that found in the outdoor air. Carbon Dioxide and Carbon Monoxide levels were within the normal recommended range.

Please proceed to address the three impacted samples per the consultation on November 22nd.

This inspection was limited to indoor air quality.

If you have any questions or concerns, please do not hesitate to contact us.

Sincerely,

Tony Richmond, BBA, CAI, WRT
LRC Indoor Testing & Research

Mitchell Richmond, B.A, PMP, CMI
LRC Indoor Testing & Research