

Scientific Air Solution



BSW Group LLC
7823 Village Drive
Knoxville, TN 37919

November 25, 2019

Pre and In-Treatment Air and Surface Report – [REDACTED] College - Football Locker Room

A. Summary – Air Samples

Pre and in-treatment air samples results are given below.

Sample Date	Number of samples	Location	Average (cfu/m ³)	Range	Standard Deviation	Percent Reduction
08/20/19	8	Various	742	333/1,100	202.6	-
11/19/19			21	0/100	33.1	97.2
08/20/19	2	External Air	2,483	2,300/2,667	183.3	-
11/19/19			2,433	2,300/2,567	133.3	2.0

Background

All air samples were taken via the MB-1 air sampler, 30 liters per sample throughout the various locations given above with results normalized to colony forming units per cubic meter of air (CFU/m³).

Given below are the types of airborne organisms found in the above locations, excluding the exterior samples, during this **pre-treatment** sampling.

Species	Raw Count	Species	Raw Count
<i>Penicillium, aspergillus types</i>	1,650	<i>Penicillium purpurogenum</i>	521
<i>Penicillium purpurogenum</i>	1,050	<i>Mortierella, spp</i>	482
<i>Cladosporium sphaerospermum</i>	855	<i>Basidiospores spp</i>	328
<i>Aspergillus fumigatus</i>	795	<i>Absidia, spp</i>	252

Shown below are the types of airborne organisms found in the above locations, excluding the exterior samples, during this **in-treatment** sampling.

Species	Raw Count	Species	Raw Count
<i>Penicillium, aspergillus types</i>	78	<i>Penicillium purpurogenum</i>	< 5
<i>Penicillium purpurogenum</i>	65	<i>Mortierella, spp</i>	< 5
<i>Cladosporium sphaerospermum</i>	24	<i>Basidiospores spp</i>	< 5
<i>Aspergillus fumigatus</i>	< 5	<i>Absidia, spp</i>	< 5

08/20/19 - **Pre-treatment** bioburden in the sampled locations are considerably above > 300 cfu/m³ which is not acceptable and needs corrective action.

11/19/19 - **In-treatment** results show an **97.2% decrease** from the 08/20/19 pre-treatment samples and now are < 100 cfu/m³ which is considered **clean and acceptable**.

Observations

Exterior air samples ranged from **2,300 to 2,667 cfu/m³** indicating that a significant amount of the inside bioburden is coming from the outside air.

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Target Air Quality

Air quality scale for workplaces, public buildings, schools, and homes are as follows:

- $< 100 \text{ cfu/m}^3$ is considered **clean and acceptable**.
- 100 to 300 cfu/m^3 is **marginal**.
- $> 300 \text{ cfu/m}^3$ is **not acceptable** and needs corrective action.

In most cases, air quality $< 100 \text{ cfu/m}^3$ has shown a decrease in the overall bioburden and odors.

Predominant Microorganisms

Although the predominant organisms noted in this report are fungi, previous testing results show bacteria, viruses and protozoa are eliminated as effectively as fungi. The reactive oxygen species (ROS) generated is effective on gram +, gram – bacteria, protozoa, spores and viruses.

B. Summary – Surface Contact Swabs

Pre and in-treatment surface (swab) samples results are given below.

Sample Date	Number of samples	Location	Average (cfu/cm ²)	Range	Standard Deviation	Percent Reduction
08/20/19	10	Various	57.6	28.5/125.0	29.8	-
11/19/19			3.1	1.9/5.5	1.2	94.6
08/20/19	1	Negative control	0	0/0	-	-
11/19/19			0	0/0	-	-

08/20/19 - **Pre-treatment** contact swab results in the various locations are significantly $> 10 \text{ cfu/cm}^2$ which is not acceptable and needs corrective action.

11/19/19 - **In-treatment** contact swab results reveal a **94.6% reduction** from the pre-treatment samples from the same locations which are now $< 5 \text{ cfu/cm}^2$ and is considered **clean and acceptable**.

Target Contact Surface Quality

Contact surface quality scale for workplaces, public buildings, schools, and homes are as follows:

- $< 5 \text{ cfu/cm}^2$ is considered **clean and acceptable**.
- 5 to 10 cfu/cm^2 is considered **marginal**.
- $> 10 \text{ cfu/cm}^2$ is considered **not acceptable** and needs corrective action.

In most cases, surface quality $< 5 \text{ cfu/cm}^2$ has shown a decrease in the overall bioburden and odors.

Please contact me if there are questions or if further information is needed.

Respectfully submitted,

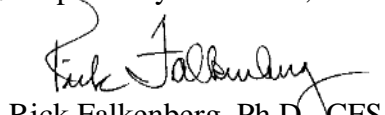

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Senior Principal Scientist



Table #1
College Football Locker Room
 11/19/19 Pre-treatment Air Sample Results - CFU/m³

In-treatment 11/19/2019 College Football Locker Room						
Plate Lot No.	Air Sample Location	Air Sample Location	Liters of Air	Raw Count	Corrected Count	CFU/m ³
2181	Ctrl	Unopened	0	0	0	0
2178	1	Back right corner	30	0	0	0
2180	2	Back left corner	30	0	0	0
2179	3	Back middle	30	1	1	33
2182	4	Door leading to hallway	30	0	0	0
2184	5	Locker rm exit door leading outside	30	3	3	100
2183	6	Bathroom center	30	0	0	0
2181	7	Main hallway	30	1	1	33
2289	8	HS football locker room	30	0	0	0
2187	9	EXT	30	65	77	2,567
2186	10	EXT	30	59	69	2,300

Avg	21	High	100
Low	0	SD	33.1

Avg	2,433	High	2,567
Low	2,300	SD	133.3

Total Adjusted Raw Count	5
Total CFU/m ³	167

Table #1, continued
College Football Locker Room
 08/20/19 Pre-treatment Air Sample Results - CFU/m³

Pre-treatment 08/20/2019 College Football Locker Room						
Plate Lot No.	Air Sample Location	Air Sample Location	Liters of Air	Raw Count	Corrected Count	CFU/m ³
2137	Ctrl	Unopened	0	0	0	0
2144	1	Back right corner	30	20	21	700
2143	2	Back left corner	30	19	20	667
2142	3	Back middle	30	10	10	333
2141	4	Door leading to hallway	30	21	22	733
2140	5	Locker rm exit door leading outside	30	25	27	900
2139	6	Bathroom center	30	21	22	733
2138	7	Main hallway	30	31	33	1,100
2188	8	HS football locker room	30	22	23	767
2187	9	EXT	30	65	80	2,667
2186	10	EXT	30	59	69	2,300

Avg	742	High	1,100
Low	333	SD	202.6

Avg	2,483	High	2,667
Low	2,300	SD	183.3

Total Adjusted Raw Count	178
Total CFU/m ³	5,933



Table #2
College Football Locker Room
 11/19/19 Pre-treatment Surface Sample Results – CFU/cm²

In-treatment 11/19/2019 College Football Locker Room					
Room	Swab Number	Surface Swab Sample Location	10x10x10 cm	Raw Count	CFU/cm2
N/A	CTRL	Swab not removed from container	0	0	0
Surface	1	Locker 72	10x10x10	210	2.1
Surface	2	Locker 69	10x10x10	355	3.6
Surface	3	Locker 57	10x10x10	385	3.9
Surface	4	Locker 40	10x10x10	400	4.0
Surface	5	Door facing/handle to hallway	10x10x10	225	2.3
Surface	6	Light switch leading to hallway	10x10x10	230	2.3
Surface	7	Water fountain	10x10x10	185	1.9
Surface	8	Bathroom-back soap dispenser	10x10x10	190	1.9
Surface	9	Locker 28	10x10x10	410	4.1
Surface	10	Equipment counter	10x10x10	545	5.5
<div> <div>Avg</div> <div>3.1</div> <div>Max</div> <div>5.5</div> </div> <div> <div>Min</div> <div>1.9</div> <div>SD</div> <div>1.16</div> </div>					
Total Adjusted Raw Count				3,135	
				Total CFU/cm2	31

Table #2, continued
College Football Locker Room
 08/20/19 Pre-treatment Surface Sample Results – CFU/cm²

Pre-treatment 08/20/2019 College Football Locker Room					
Room	Swab Number	Surface Swab Sample Location	10x10x10 cm	Raw Count	CFU/cm2
N/A	CTRL	Swab not removed from container	0	0	0
Surface	1	Locker 72	10x10x10	3,500	35.0
Surface	2	Locker 69	10x10x10	5,850	58.5
Surface	3	Locker 57	10x10x10	6,900	69.0
Surface	4	Locker 40	10x10x10	7,500	75.0
Surface	5	Door facing/handle to hallway	10x10x10	3,650	36.5
Surface	6	Light switch leading to hallway	10x10x10	3,410	34.1
Surface	7	Water fountain	10x10x10	2,850	28.5
Surface	8	Bathroom-back soap dispenser	10x10x10	2,950	29.5
Surface	9	Locker 28	10x10x10	8,520	85.2
Surface	10	Equipment counter	10x10x10	12,500	125.0
<div> <div>Avg</div> <div>57.6</div> <div>Max</div> <div>125.0</div> </div> <div> <div>Min</div> <div>28.5</div> <div>SD</div> <div>29.80</div> </div>					
Total Adjusted Raw Count				57,630	
				Total CFU/cm2	576



Table #3

██████████ College Football Locker Room
11/19/19 Pre-treatment Air Sample Pictures

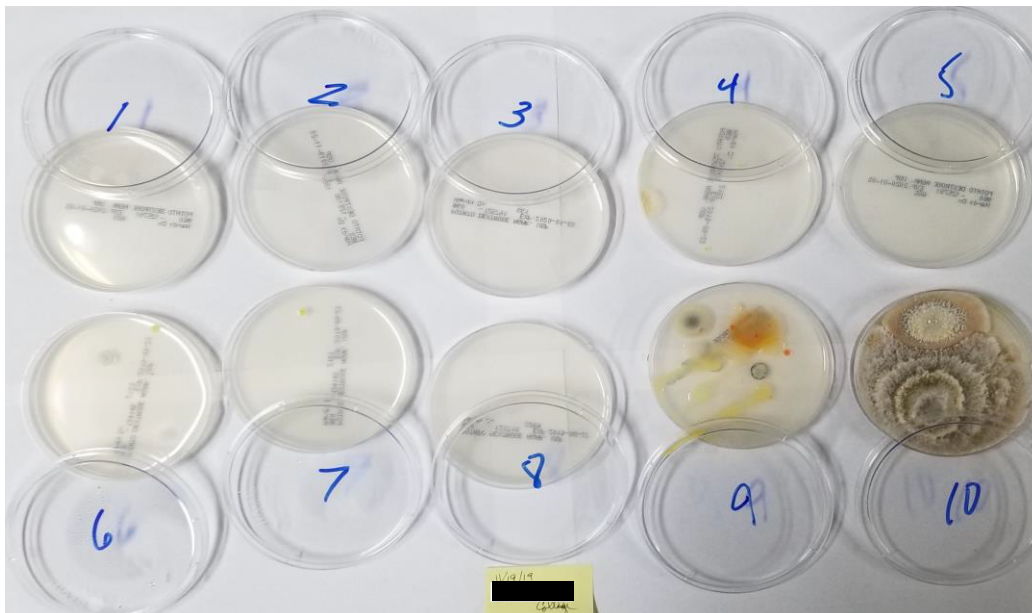
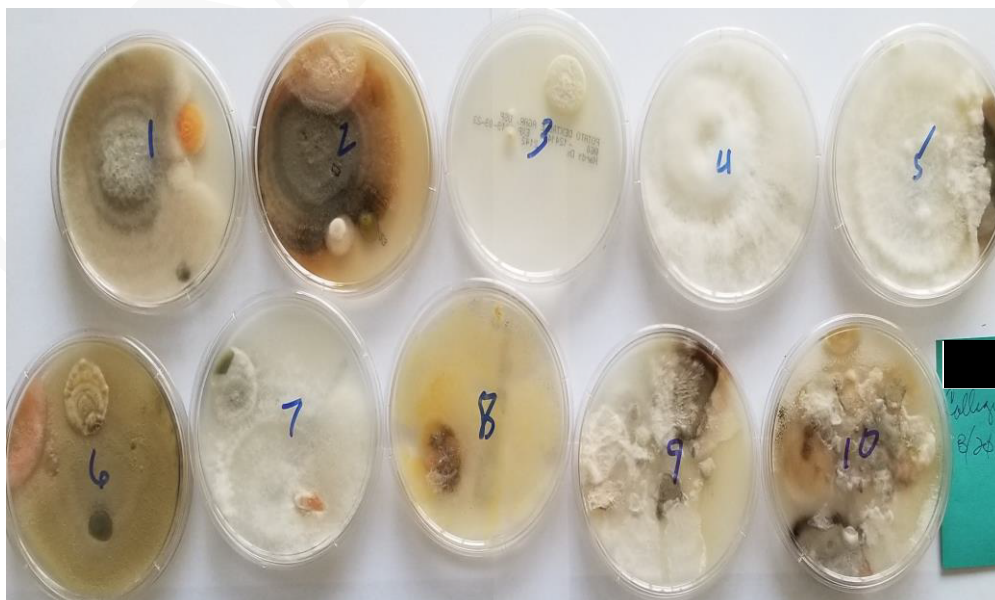


Table #3, continued

██████████ College Football Locker Room
08/20/19 Pre-treatment Air Sample Pictures



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Table #4

College Football Locker Room Air and Swab Sample Locations

airPHX®

Air & Surface Testing Template

Date: 8/20/2019

Facility: College Football Locker Room

Pre/In-Test: Pre-Test

Air Sample	Location
1	Back right corner
2	Back left corner
3	Back middle
4	Door area leading to hallway
5	Locker room exit door leading outside
6	Bathroom center
7	Main hallway
8	HS football locker room
✓ 9	Outside air
✓ 10	Outside air

Swab Sample	Location
✓ 1	Locker 72
✓ 2	Locker 69
✓ 3	Locker 57
✓ 4	Locker 40
✓ 5	door facing/handle to hallway
✓ 6	light switch leading to hallway
✓ 7	water fountain
✓ 8	bathroom-back soap dispenser
✓ 9	Locker 28
✓ 10	Equipment counter

Air & Surface Testing Template

Date: 11/20/2019

Facility: College Football Locker Room

Pre/In-Test: In-Test

Air Sample	Location
✓ 1	Back right corner
✓ 2	Back left corner
✓ 3	Back middle
✓ 4	Door area leading to hallway
✓ 5	Locker room exit door leading outside
✓ 6	Bathroom center
✓ 7	Main hallway
✓ 8	HS football locker room
✓ 9	Outside air
✓ 10	Outside air

Swab Sample	Location
✓ 1	Locker 72
✓ 2	Locker 69
✓ 3	Locker 57
✓ 4	Locker 40
✓ 5	door facing/handle to hallway
✓ 6	light switch leading to hallway
✓ 7	water fountain
✓ 8	bathroom-back soap dispenser
✓ 9	Locker 28
✓ 10	Equipment counter