

Scientific Air Solution



airPHX Companies
1311-A Dolley Madison Blvd.
McLean, VA 22101

October 18 2019

Pre and In-Treatment Air and Surface Report – University [REDACTED] – Hockey

A. Summary – Air Samples

Pre and in-treatment air samples results given below.

Sample Date	Treatment	Number of samples	Location	Average (cfu/m ³)	Range	Standard Deviation	% Reduction
08/07/19	Pre	14	Various	436	267/667	110.9	-
10/01/19	In			39	0/133	35.6	91.1
08/07/19	Pre	4	Coach's lounge Nutrition (2) Rink entrance	317	267/367	37.3	-
10/01/19	In			125	67/167	36.3	60.6
08/07/19	Pre	3	Exterior	2,067	1,800/2,300	205.5	-
10/01/19	In			2,111	1,800/2,433	258.7	+ 2.1

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 airborne organisms found in the above locations for this **pre-treatment** sampling, excluding the outside samples.

Species	Raw Count	Species	Raw Count
<i>Penicillium, aspergillus types</i>	1,525	<i>Ulocladium chartarum</i>	715
<i>Aspergillus fumigatus</i>	1,205	<i>Penicillium brevicompactum</i>	580
<i>Cladosporium sphaerospermum</i>	1,010	<i>Absidia spp</i>	355
<i>Penicillium purpurogenum</i>	815	<i>Firmicutes spp</i>	295

Noted below are the airborne organisms found in the above locations for this **in-treatment** sampling, excluding the outside samples.

Species	Raw Count	Species	Raw Count
<i>Penicillium, aspergillus types</i>	270	<i>Ulocladium chartarum</i>	< 5
<i>Aspergillus fumigatus</i>	185	<i>Penicillium brevicompactum</i>	< 5
<i>Cladosporium sphaerospermum</i>	165	<i>Absidia spp</i>	< 5
<i>Penicillium purpurogenum</i>	47	<i>Firmicutes spp</i>	< 5

08/07/19 - Pre-treatment bioburden in the above locations are considerably > 300 cfu/m³ which is not acceptable and needs corrective action.

10/01/19 - **In-treatment** area results show a **91.1% decrease** in bioburden and is now < 100 cfu/m³ which is considered **clean and acceptable**, per the Target Air Quality guide.

- The coaches lounge, food and the rink areas which are out of the direct airPHX treatment area have seen the “halo effect” from the treatment area showing a **60.6% reduction**.

Observations

The exterior air samples ranged from **1,800 to 2,433 cfu/m³** and reveals that most of the bioburden is attributed to the outside air. locations. The airPHX units are having a noticeable impact on reducing the bioburden.



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.

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 given below.

Sample Date	Treatment	Number of samples	Location	Average (cfu/cm ²)	Range	Standard Deviation	% Reduction
08/07/19	Pre	10	Various	54.7	21/125	31.6	-
10/01/19	In			2.2	0.8/4.9	1.3	96.0
08/07/19	Pre	1	Neg. Control	0	0/0	-	-
10/01/19	In			0	0/0	-	-

08/07/19 - Pre-treatment contact swab results from the various locations are noticeably $> 5 \text{ cfu/cm}^2$ which is considered not acceptable and needs corrective action.

10/01/19 - In-treatment results show a **96% reduction** and now is $< 5 \text{ cfu/cm}^2$ which is considered **clean and acceptable**, per the Target Contact Surface Quality guide.

Target Contact Surface Quality

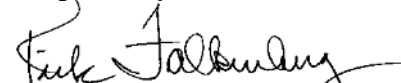
Contact surface quality scale for workplaces, public buildings, schools, and homes are as follows:

- $< 5 \text{ cfu/cm}^2$ 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 swabs $< 5 \text{ cfu/cm}^2$ 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,


Rick Falkenberg, Ph.D. CFS
Senior Principal Scientist

Scientific Air Solution



Table #1
University ██████ – Hockey
10/01/19 In-treatment Air Sample Results - CFU/m³

10-01-19 - In-treatment University ██████ Hockey						
Plate Lot No.	Air Sample Location	Air Sample Location	Liters of Air	Raw Count	Corrected Count	CFU/m ³
929	Ctrl	Unopened	0	0	0	0
925	1	Locker	30	1	1	33
921	2	Locker	30	1	1	33
917	3	Locker	30	0	0	0
913	4	Locker	30	2	2	67
909	5	Lounge	30	0	0	0
905	6	Lounge	30	0	0	0
901	7	Bath hall	30	1	1	33
897	8	Weight	30	1	1	33
893	9	Weight	30	4	4	133
810	10	Weight	30	1	1	33
778	18	Training	30	1	1	33
774	19	Training	30	2	2	67
806	11	Food	30	4	4	133
802	12	Food	30	2	2	67
798	13	Rink	30	5	5	167
794	14	Coach's lounge	30	4	4	133
790	15	Exterior	30	62	73	2,433
786	16	Exterior	30	55	63	2,100
782	17	Exterior	30	48	54	1,800

Avg	39	High	133
Low	0	SD	35.6

Avg	125	High	167
Low	67	SD	36.3

Avg	2,111	High	2,433
Low	1,800	SD	258.7

Total Adjusted Raw Count 219
 Total CFU/m³ 667

Table #1, continued
University ██████ – Hockey
08/07/19 Pre-treatment Air Sample Results - CFU/m³

08-07-19 - Pre-treatment University ██████ Hockey						
Plate Lot No.	Air Sample Location	Air Sample Location	Liters of Air	Raw Count	Corrected Count	CFU/m ³
929	Ctrl	Unopened	0	0	0	0
925	1	Locker	30	9	9	300
921	2	Locker	30	10	10	333
917	3	Locker	30	8	8	267
913	4	Locker	30	12	12	400
909	5	Lounge	30	15	16	533
905	6	Lounge	30	12	12	400
901	7	Bath hall	30	11	11	367
897	8	Weight	30	13	13	433
893	9	Weight	30	19	20	667
810	10	Weight	30	15	16	533
778	18	Training	30	14	14	467
774	19	Training	30	15	16	533
806	11	Food	30	10	10	333
802	12	Food	30	8	8	267
798	13	Rink	30	9	9	300
794	14	Coach's lounge	30	11	11	367
790	15	Exterior	30	59	69	2,300
786	16	Exterior	30	55	63	2,100
782	17	Exterior	30	48	54	1,800

Avg	436	High	667
Low	267	SD	110.9

Avg	317	High	367
Low	267	SD	37.3

Avg	2,067	High	2,300
Low	1,800	SD	205.5

Total Adjusted Raw Count 381
 Total CFU/m³ 5,833



Table #2

University [REDACTED] – Hockey
10/01/19 In-treatment Surface Sample Results – CFU/cm²

10-01-19 - In-treatment University [REDACTED] Hockey					
Room	Swab Number	Surface Swab Sample Location	10x10x10 cm	Raw Count	CFU/cm ²
N/A	CTRL	Control swab	0	0	0
Surface	1	[REDACTED] glove	10x10x10	150	1.5
Surface	2	[REDACTED] pad/shoulder	10x10x10	175	1.8
Surface	3	[REDACTED] seat	10x10x10	75	0.8
Surface	4	[REDACTED] locker	10x10x10	135	1.4
Surface	5	Middle cushion sofa	10x10x10	278	2.8
Surface	6	Bath floor center stall	10x10x10	310	3.1
Surface	7	Counter hydro pool	10x10x10	485	4.9
Surface	8	Taping table	10x10x10	395	4.0
Surface	9	Middle bench press seat	10x10x10	110	1.1
Surface	10	Stairmaster Bike handle	10x10x10	80	0.8

Avg 2.2 Max 4.9
Min 0.8 SD 1.34

Total Adjusted Raw Count 2,193
Total CFU/cm² 22

Table #2, continued

University [REDACTED] – Hockey
08/07/19 Pre-treatment Surface Sample Results – CFU/cm²

08-07-19 - Pre-treatment University [REDACTED] Hockey					
Room	Swab Number	Surface Swab Sample Location	10x10x10 cm	Raw Count	CFU/cm ²
N/A	CTRL	Control swab	0	0	0
Surface	1	[REDACTED] glove	10x10x10	3,600	36.0
Surface	2	[REDACTED] pad/shoulder	10x10x10	4,100	41.0
Surface	3	[REDACTED] seat	10x10x10	2,500	25.0
Surface	4	[REDACTED] locker	10x10x10	3,500	35.0
Surface	5	Middle cushion sofa	10x10x10	5,500	55.0
Surface	6	Bath floor center stall	10x10x10	7,200	72.0
Surface	7	Counter hydro pool	10x10x10	12,500	125.0
Surface	8	Taping table	10x10x10	9,500	95.0
Surface	9	Middle bench press seat	10x10x10	4,200	42.0
Surface	10	Stairmaster Bike handle	10x10x10	2,100	21.0

Avg 54.7 Max 125.0
Min 21.0 SD 31.58

Total Adjusted Raw Count 54,700
Total CFU/cm² 547



Table #3
University [REDACTED] – Hockey
10/01/2019 In-treatment Air Sample Pictures

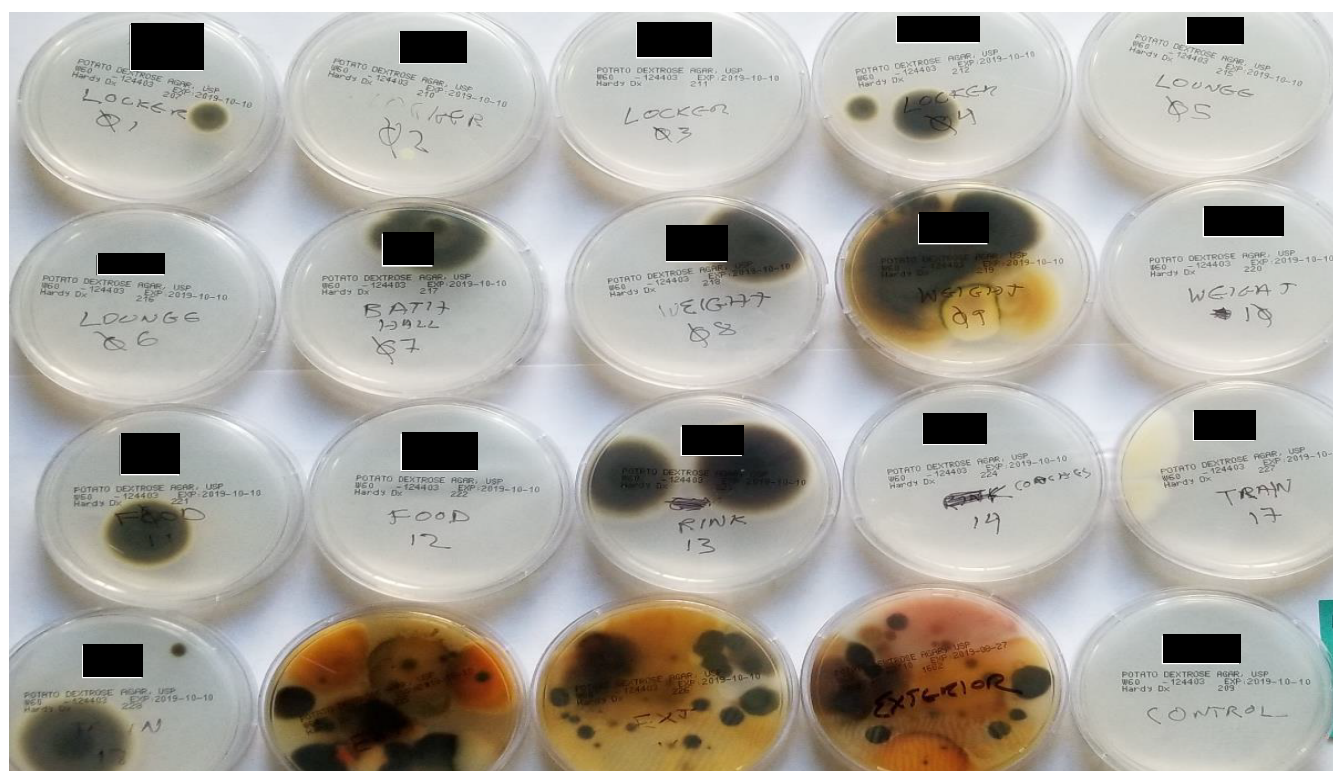
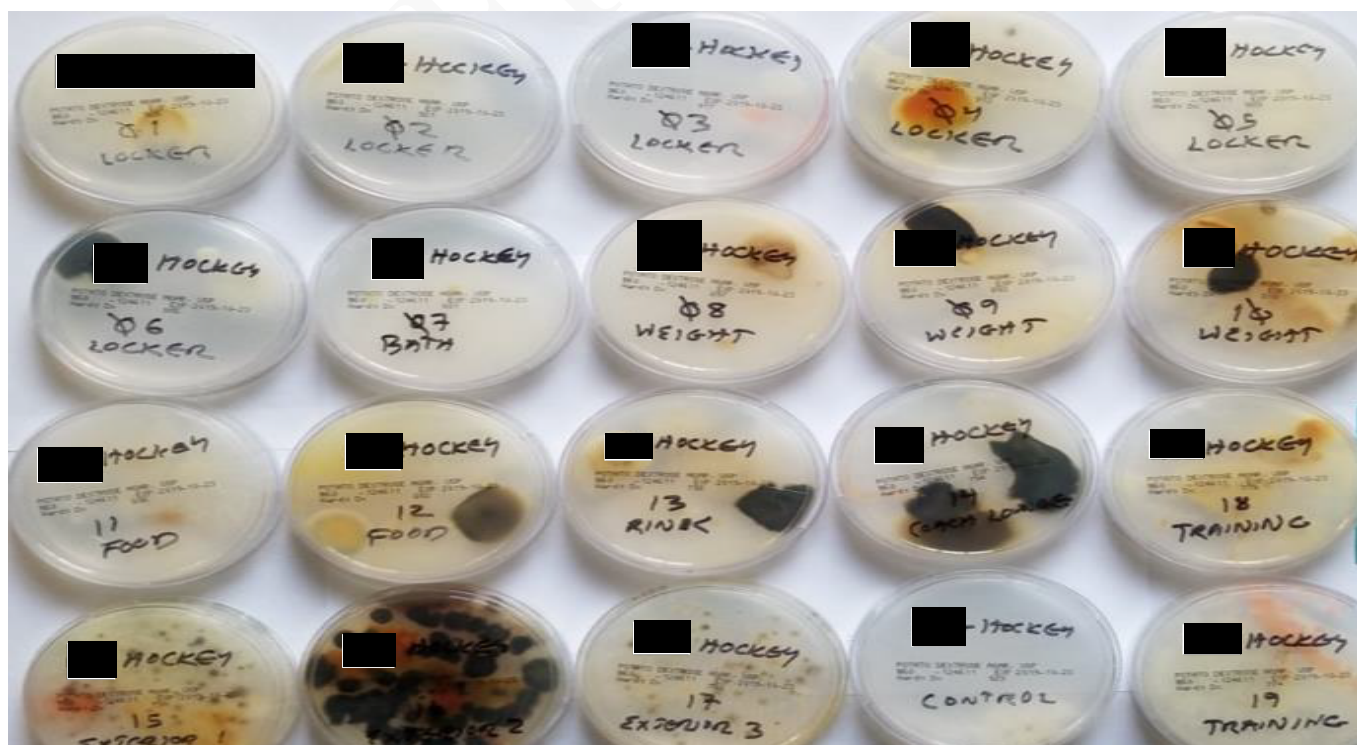


Table #3, continued
University [REDACTED] – Hockey
08/07/2019 Pre-treatment Air Sample Pictures



Scientific Air Solution



Table #4

University [REDACTED] – Hockey

10/01/19 and 08/07/19 Pre and In-treatment Air and Surface Swab Locations

