CASE STUDY: CYPRESS FITNESS
MCLEAN, VIRGINIA

March 6, 2017

AirPHX Sports
1100 North Glebe Road, Suite 600
Arlington, VA 22201

Objectives

The treatment space is an approximate 41,500 cubic foot exercise and equipment room Cypress Fitness, a boutique gym in McLean, Virginia. The space includes a mix of cardio and weight equipment, free weights, TRX stations and artificial grass space. The objectives of the installation were to reduce the microbial "bio-burden" in the treatment space and provide a cleaner, healthier workout space for members and staff.

Equipment

One portable PA2400-P unit was provided to Cypress Fitness in February 2017. The unit was run on "HI" mode nightly, activated after the gym closed each evening and shut down immediately prior to opening. The unit was run nightly for approximately two weeks. To increase the effectiveness of the unit, it can be run at longer intervals including 24/7 to achieve maximum effect.

Pre-treatment Testing (05/11/2016)

airPHX technicians took 40 air samples and 16 surface swabs at various locations in the treatment space. The petri dishes for the air samples and the swabs were subsequently "cultured" and analyzed by independent labs "Practical Air Testing Solutions" in Turlock, California. Results of this testing were provided in a report dated May 31, 2016 (following). The average level of air contamination in the treatment area was 848 CFUs/m3 ("colony forming units per cubic meter") and the average surface contamination was 274 CFUs/cm2 ("colony forming units per square centimeter") – both representing high levels of contamination.

In-treatment Testing (02/20/2017)

airPHX technicians conducted in-treatment testing to evaluate effectiveness of the technology. In a report dated March 4, 2017, Practical Air Testing Solutions concluded:

- Surface swabs. Swabs were taken at approximately the same locations as the pre-treatment testing. The average CFU/cm2 in the surface swabs for the treated space was 8 CFU/cm2 compared to pre-treatment contamination in the treated space of 274 CFU/cm2,

an average reduction of 97.1 percent in the swabbed areas.

Overall: 97.1% reduction in surface contamination

- Air Samples. 40 air samples were taken inside the locker room/bathroom space. The average CFU/m3 ("colony forming units per cubic meter") in the air samples for the treated space was 47 CFU/m3 compared to pre-treatment contamination in the treated space of 848 CFU/m3.

  Overall: 94.5% reduction in air contamination

Future Results

Continued use of airPHX Sports technology will have a cumulative sanitizing effect on the treatment space – surfaces will continue to get cleaner, the bioburden throughout the space will continue to decline, and odors and health benefits to members and staff will continue to increase.

Over time, the sanitizing effect of the equipment should have a positive impact on the entire McLean facility including locker room and bathroom spaces as treated air is circulated throughout the facility by HVAC ductwork.

Testing Reports
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AIRPHX
1100 North Glebe Road, Suite 600
Arlington VA 22201

March 4, 2017

In-Treatment Report – **Cypress Gym - Final**

Summary
Pre-treatment air and contact swab samples were taken 05/11/16 and In-treatment samples taken 02/20/17 with average results given below results by location for air samples are given in Table #1 and results for contact swab samples are given in Table #2.

Sample Date	Sample	Number of samples	Location	Average cfu/m^3	Average cfu/cm^2	Range	Standard Deviation	Percent Difference
05/11/16	Air	40	Various Gym Locations	848		440/1,320	232.9	-
02/20/17				**47**		**33/167**	**42.7**	**94.5**
05/11/16		4	Exterior	0*		0/0	0	-
02/20/17				**2,592**		**2,300/3,067**	**290.0**	-
05/11/16	Contact	16	Various Gym Locations		274	14.4/2,427	792.1	-
02/20/17					**8**	**3/8**	**4.6**	**97.1**

* Samples not taken

Background
Air samples were taken via the MB-2 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/m^3).

Contact (Swab) Samples were taken via 3M environmental sponge. Samples were taken in a 10 x 10 cm square (approximately 4 inch) and serial diluted onto standard methods media with results normalized to colony forming units per square centimeter of contact surface (CFU/cm^2).

Results – Air Samples

Noted below is an overview of the types of airborne organisms found in locations on Table #1 during the **Pre-treatment** air sampling.

Species	Raw Count	Species	Raw Count
Penicillium, aspergillus types	378	*Stachybotrys chartarum (atra)*	220
Aspergillus fumigatus	361	*Absidia, spp*	178
Pseudomonas spp	284	*Botrytis spp*	165
Penicillium purpurogenum	256	*Basidiospores spp*	150
Cladosporium sphaerospermum	230	*Mortierella, spp*	88
Penicillium brevicompactum	226	*Alternaria spp*	62

Noted below is an overview of the types of airborne organisms found in locations on Table #1 during the **In-treatment** sampling.

Species	Raw Count	Species	Raw Count
Penicillium, aspergillus types	219	*Stachybotrys chartarum (atra)*	42
Aspergillus fumigatus	196	*Absidia, spp*	21
Pseudomonas spp	126	*Botrytis spp*	0
Penicillium purpurogenum	98	*Basidiospores spp*	0
Cladosporium sphaerospermum	82	*Mortierella, spp*	0
Penicillium brevicompactum	75	*Alternaria spp*	0

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Pre-treatment bioburden from the air samples are **848 cfu/m³** which is > 300 cfu/m³ and is **not acceptable** and needs corrective action, per the Target Air Quality recommendation below.

In-treatment air samples show a **94.5%** reduction to **47 cfu/m³** and now is < 100 cfu/m³ which is considered **clean and acceptable**.

Target Air Quality
Air quality scale for workplaces, public buildings, schools, and homes is as follows, air with:

- < 100 cfu/m³ is considered **clean and acceptable**.
- 100 to 300 cfu/m³ is **marginal**.
- **>** 300 cfu/m³ is **not acceptable** and needs corrective action.

In most cases, air quality < 100 cfu/m³ has shown a decrease in the overall bioburden of bacteria/fungi and odors.

Observations - Air
As can be seen outside air samples are adding a significant amount of the bioburden to the (inside) the Gym. Even with this heavy bioburden the air treatment system continues to reduce the air samples to acceptable levels.

Results – Contact (Swab) Samples

Pre-treatment bioburden from the air samples were 274 **cfu/cm²** which is > 10 cfu/cm² and considered **not acceptable,** needs corrective action per the Target Contact Surface Quality recommendation given below.

In-treatment swabs results show a **97.1%** reduction to **8 cfu/cm²** and now is in the 5 to 10 cfu/cm² which is considered **marginal**, it is anticipated that continued treatment would further reduce to clean and acceptable.

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

- < 45 cfu total or < 1.67-log, or < 5 cfu/cm² is considered **clean and acceptable**.
- 140 to 260 cfu total or 2.15 to 2.41-log, or 5 to 10 cfu/cm² is considered **marginal**.
- **>** 260 cfu total or > 2.41-log, or > 10 cfu/cm² is considered **not acceptable** and needs corrective action.

In most cases, air quality < 45 cfu total or < 5 cfu/cm² has shown a decrease in the overall bioburden of bacteria/fungi 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

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Table #1
Cypress Gym
In-treatment **Air** Sample Results - CFU/m^3

Cypress Gym - In-treatment Air Samples								
Room	Plate Lot No.	Air Sample Location	Air Sample Location	Raw Count	Corrected Count	CFU/m3		
Control 1	1133	Control Plate	Unopened	0	0	0		
H17009	1137	1	Gym area	1	1	33		
H17009	1141	2		1	1	33		
H17009	1145	3		0	0	0		
H17009	1149	4		3	3	100		
H17009	1153	5		0	0	0		
H17009	1157	6		0	0	0		
H17009	1161	7		2	2	67		
H17009	1165	8		3	3	100		
H17009	1169	9		1	1	33		
H17009	973	10		3	3	100		
H17009	977	11		2	2	67		
H17009	981	12		1	1	33		
H17009	985	13		1	1	33		
H17009	989	14		2	2	67		
H17009	993	15		0	0	0		
H17009	997	16		1	1	33		
H17009	1001	17		1	1	33		
H17009	1005	18		1	1	33		
H17009	1009	19		1	1	33		
H17009	1149	20		1	1	33		
H17009	1148	21		1	1	33		
H17009	1147	22		5	5	167		
H17009	1146	23		1	1	33		
H17009	1145	24		1	1	33		
H17009	1144	25		2	2	67		
H17009	1143	26		1	1	33		
H17009	1141	27		2	2	67		
H17009	1140	28		0	0	0		
H17009	1142	29		1	1	33		
H17009	1131	30		0	0	0		
H17009	1135	31		0	0	0		
H17009	1139	32		0	0	0		
H17009	1143	33		0	0	0		
H17009	1147	34		1	1	33		
H17009	1151	35		0	0	0		
H17009	1155	36		3	3	100		
H17009	1159	37		5	5	167	Avg	47
H17009	1163	38		3	3	100	Low	33
H17009	1167	39		2	2	67	High	167
H17009	692	40		3	3	100	SD	42.7
H17009	696	1	Exterior 1	65	77	2,567	Avg	2,592
H17009	700	2	Exterior 2	62	73	2,433	Low	2,300
H17009	704	3	Exterior 3	59	69	2,300	High	3,067
H17009	708	4	Exterior 4	75	92	3,067	SD	290.0
				Total Adjusted Raw Count	367			
					Total CFU/cm2	12,233		

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Table #2
Cypress Gym
In-treatment **Surface** Sample Results – CFU/cm^2

Cypress Gym - In-treatment Contact Swabs						
Room	Swab Lot No.	Swab Number	Surface Swab Sample Location	10x10x10 cm	Raw Count	CFU/cm2
Control 1	2017-04	17	Control Unopened	0	0	0
Cyp-01	2017-04	1	On grass @ location 5	10x10x10	950	10
Cyp-01	2017-04	2	On grass @ location 12	10x10x10	1,006	10
Cyp-01	2017-04	3	On grass @ location 29	10x10x10	1,115	11
Cyp-01	2017-04	4	On grass @ location 24	10x10x10	740	7
Cyp-01	2017-04	5	On grass @ location 17	10x10x10	500	5
Cyp-01	2017-04	6	On grass - Sled	10x10x10	323	3
Cyp-01	2017-04	7	Medicine ball green 12#'s near 28	10x10x10	963	10
Cyp-01	2017-04	8	Dumbells small freewts near 22	10x10x10	829	8
Cyp-01	2017-04	9	Barbells on rack @4	10x10x10	1,006	10
Cyp-01	2017-04	10	Elliptical #3 @ location 1-2	10x10x10	672	7
Cyp-01	2017-04	11	TRX handles @28	10x10x10	1,010	10
Cyp-01	2017-04	12	Bench - furthest DR bench @25	10x10x10	251	3
Cyp-01	2017-04	13	Dual cable x handles & levers @9	10x10x10	521	5
Cyp-01	2017-04	14	Bosu, both sides @29	10x10x10	300	3
Cyp-01	2017-04	15	Front Desk - counter area	10x10x10	2,210	22
Cyp-01	2017-04	16	Kettlebell 20# w/peeling paint @25	10x10x10	485	5
				Total Adjusted Raw Count	12,881	
				Total CFU/cm2		129

Avg	8
Low	3
High	22
SD	4.6

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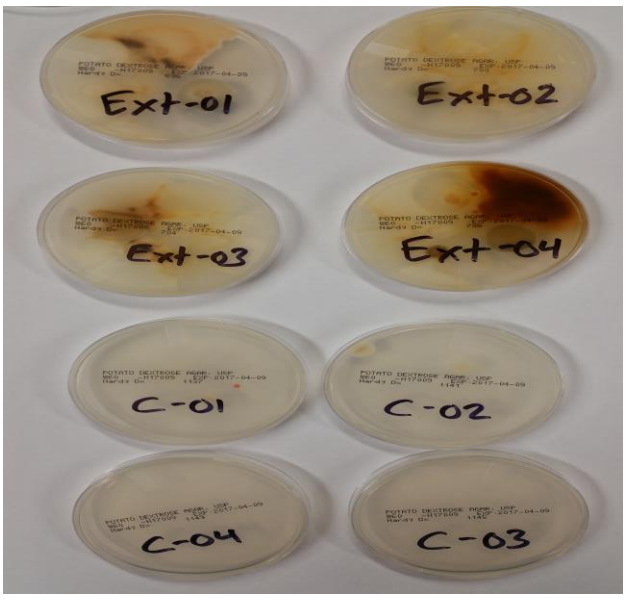
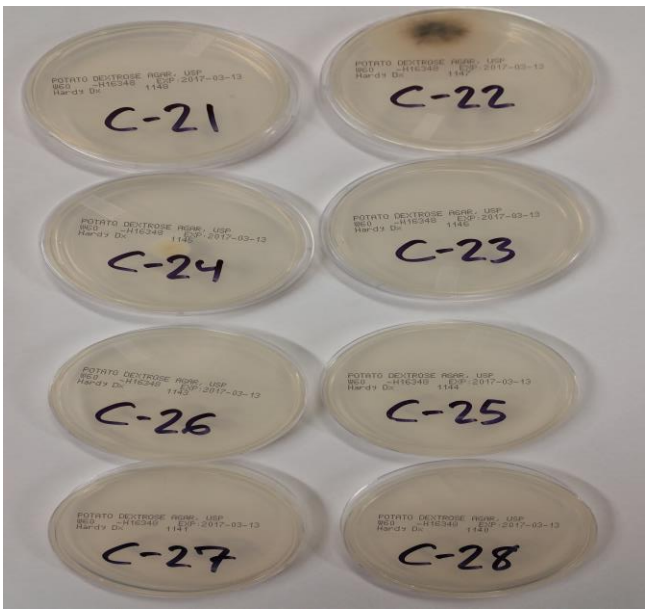
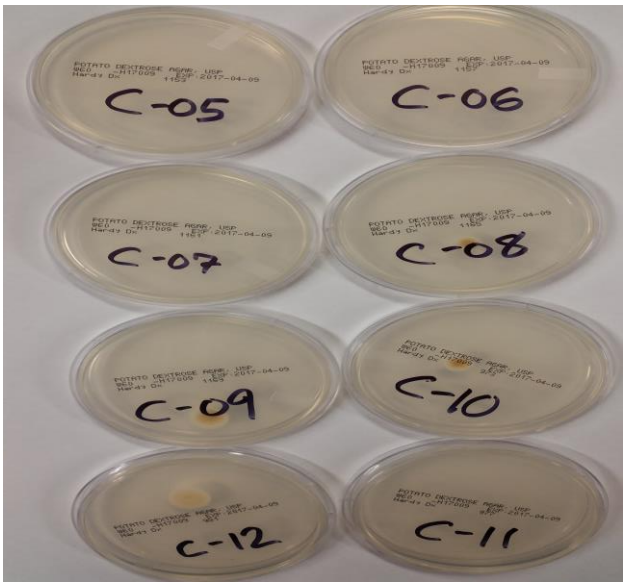
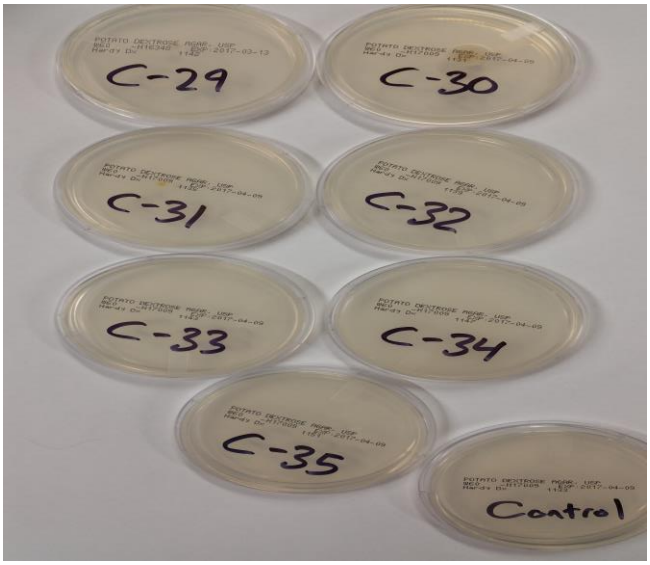
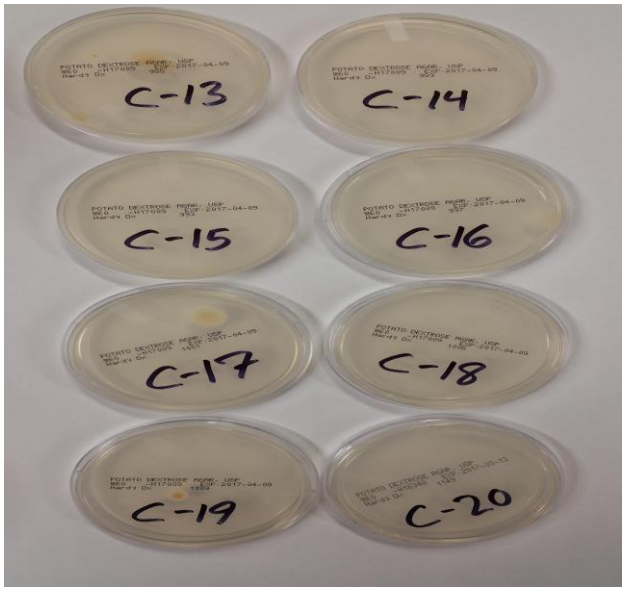
Cypress Gym
In-Treatment Air Samples

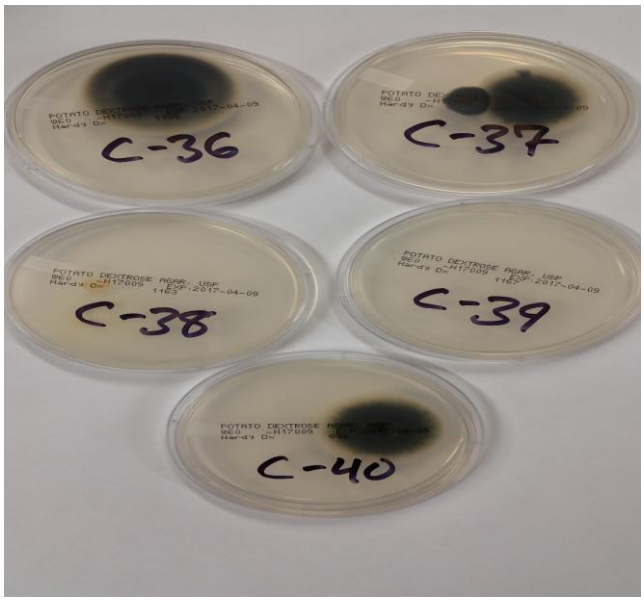






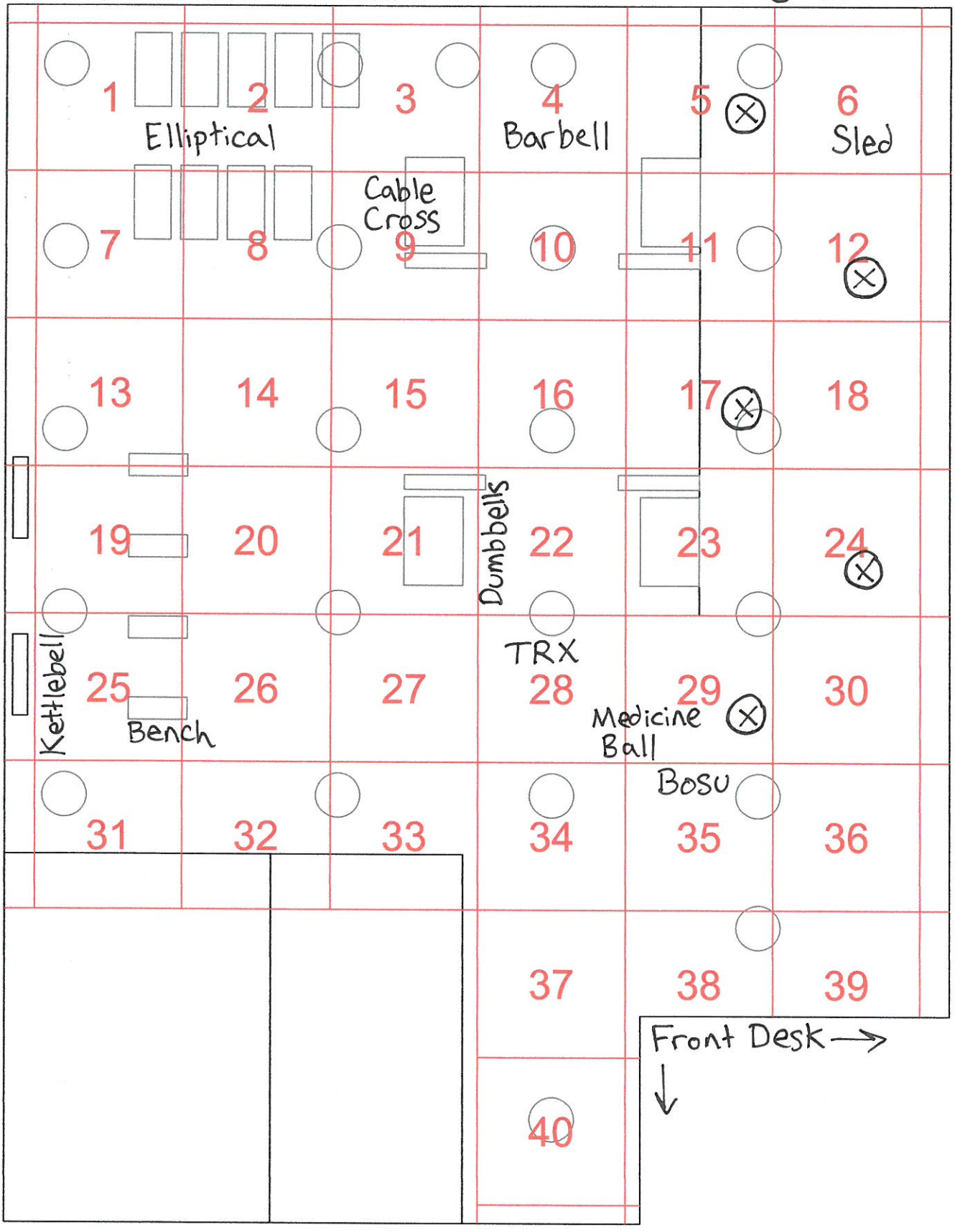






Cypress Gym

Room 01 - Gym
Air Samples - Grid
Surface Samples - ⊗ on Grass



Practical Air Testing Solutions

May 31, 2016

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Pre-Treatment Report – **Cypress Gym**

Summary

Pre-treatment air and contact swab samples were taken 05/11/16 with average results given below and results by location for air samples in Table #1 and results for contact swab samples in Table #2. Also attached is the air and physical sample location map.

Sample Date	Sample	Number of samples	Location	Average cfu/m^3	Average cfu/cm^2	Range	Standard Deviation
05/11/16	Air	40	Various Gym Locations	848		440/1,320	232.9
	Contact	16			274	14.4/2,427	577.5

Background

Air samples were taken via the MB-2 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/m^3).

Contact samples were taken via 3M environmental sponge. Samples were taken in a 10 x 10 cm square (approximately 4 inch) and serial diluted onto standard methods media with results normalized to colony forming units per square centimeter of contact surface (CFU/cm^2).

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Pre-treatment bioburden from the air samples are > 300 cfu/m^3 which is **not acceptable** and needs corrective action.

Contact swab results appear to be high as well and should be compared to post treatment samples taken from the same location.

Observations

Outside air samples are needed to understand if a significant amount of the bioburden inside the Gym is coming from the outside air or if the internal bioburden inside the Gym is higher than the outside air indicating that there is internal issues.

Target Air Quality

Air quality scale for workplaces, public buildings, schools, and homes is as follows, air with:

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

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

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Senior Principal Scientist

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Table #1
Cypress Gym
Pre-treatment **Air** Sample Results - CFU/m^3

Plate #	Location	Raw	cfu/m^3	Plate #	Location	Raw	cfu/m^3
977	Control	0	0	1811	21	20	840
976	1	12	480	986	22	26	1,120
975	2	15	640	1809	23	21	880
974	3	17	720	1808	24	23	960
973	4	15	640	985	25	26	1,120
972	5	11	440	1806	26	24	1,000
971	6	12	480	1805	27	21	880
970	7	15	640	1804	28	20	840
969	8	18	760	2304	29	23	960
2098	9	17	720	2303	30	21	880
2097	10	16	680	2302	31	20	840
2096	11	13	520	2301	32	19	800
2095	12	18	760	2300	33	18	760
2094	13	29	1,240	2299	34	13	520
2093	14	20	840	2298	35	12	480
2092	15	22	920	2297	36	22	920
2091	16	19	800	2296	37	21	880
2090	17	31	**1,320**	2295	38	25	1,080
2089	18	26	1,120	988	39	29	1,240
1813	19	23	960	987	40	31	**1,320**
1812	20	22	920				

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Table #2
Cypress Gym
Pre-treatment **Surface** Sample Results – CFU/cm^2

Plate #	Location	Raw cfu/ml	Final cfu/cm^2
W01	5 on grass	5,120	49.6
W02	12 on grass	14,210	137.7
W03	29 on grass	8,450	81.9
W04	24 on grass	11,370	110.1
W05	17 on grass	19,250	186.5
W06	Sled on grass	13,510	130.9
W07	Med. Ball green – 12lbs near 28	25,210	244.2
W08	Dumbbell small FW near 22	12,750	123.5
W09	Barbell on rack @ 4	1,490	14.4
W10	Elliptical #3 @ location 1-2	16,370	158.6
W11	TRX handles @ 28	19,400	187.9
W12	Furthest DR Bench @ 25	14,510	140.6
W13	Dual Cable X, handles and levers @ 9	13,150	127.4
W14	Bosu, both sides @ 29	24,450	43.1
W15	Front Desk, all around counter	250,500	**2,426.6**
W16	Kettlebell, old 20lb solid cast iron w/ peeling paint @ 25	22,200	215.1

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Cypress Gym - Air and Contact Swab Locations