UVAIRx Combine Fitness Synopsys
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Last Edited by: Jerrod Keith
Last Modification date: 1/5/16

Setup:
Two sets of tests were conducted in a fitness center in New York; Swab/Culture Tests were taken using a sterile cotton swab over a specific area of equipment, UVAIRx machines were turned on, and 48 hours later, 'after' swabs were taken in the same areas. These swabs were then cultured in an independent lab (Lyle Labs), and the numbers of surface-borne bacteria are included in this document.
Indoor Air Quality Cassettes were also used to evaluate the number of mold spores in the indoor airstream before and after UVAIRx products were implemented in the same space.

Results:
Independent results of the test have been included at the end of this report, with more specific detail. An overview of results is shown here:

Swab/Culture Tests showed each of the four swab sites exhibited dramatic reduction of bacterial activity.

Swab Tests	Before	After	Difference
Door Handle (1 sq in)	+4	0	-4
Handle Bars (10 sq in)	+9	+6	-3
Adjuster Dial (1 sq in)	+5	+1	-4
Treadmill (10 sq in)	+12 (maximum possible)	+4	-8

Indoor Air Quality Cassette results are also dramatic. Two sites exposed to UVAIRx show 100% reduction in airborne mold spores, one other showed 87% reduction, and the two control sites showed minimal (12%) mold differentiation.

Site	Description	Before	After	% Different
1	Outdoor Control	307	270	-12%
2	Outdoor Control	306	270	-12%
3	Indoor Area	493	66	-87%
4	Window Area	670	0	-100%
5	Weight Room	937	0	-100%

Analysis:
Overall, these results are very encouraging. These tests were taken after only two days of UVAIRx exposure, and no changes in their daily routine.

The **Swab/Culture Tests** shows a reduction in each of the four swab sites (some dramatic). The Door Handle had all bacteria inactivated. Since the Handle Bars of the Weight Machine are a high-touch surface, it is not unreasonable to see a reduced kill rate compared to the other sites tested. The Adjuster Dial of the Weight machine also had minimal growth after being exposed to UVAIRx technology for 48 hours. The side panel of the Treadmill also shows a dramatic reduction in bacterial load; from the maximum growth possible, to only moderate growth of two of the four media, and the other two showing complete inactivation. Also, note that the Weight Machine and Treadmill sites are larger than

the other two sites; this could explain that these sites could require slightly longer to achieve full inactivation.

Lyle Labs commented:
"Initial results show the presence of heavy colonization of surfaces with bacteria such as *Staphylococcus aureus, E. coli*, and others. After antimicrobial treatment, results indicate that the amount and type of surface microorganisms (microbial growth) is impacted by this anti-microbial treatment. Post treatment surfaces demonstrated fewer total bacteria, and a significant reduction in the pathogens *Staphylococcus aureus, E. coli.*"

In the **Air Quality Cassette** Samples 1 and 2 were outdoor controls, showing a slight variation of mold spores in the airstream.
Of the samples taken when exposed to UVAIRx, dramatic reductions of mold spores were observed. Sample 3 saw reduction from 493 spores/m3 to 66 spores/m3 during the two day period, a reduction of 87%. Samples 4 and 5 both saw complete elimination of mold spores in the samples taken (Sample 4 from 670 to 0, and Sample 5 from 937 to 0.) These results, when compared to the control Sample Sites 1 and 2 is conclusive that UVAIRx technology had a dramatic impact on the indoor air environment of Combine Fitness.

Overall, UVAIRx' capabilities were well demonstrated in this series of tests. Overall reduction of mold and bacteria in the indoor environment was substantial, and shows promise as the technology improves over time. Lyle Labs later tested UVAIRx technology's capabilities to inactivate (via cellular membrane disruption) potentially hazardous bacteria (staphylococcus aureus and MRSA, specifically.) Lyle Labs commented, "**It is particularly interesting to note that both Staphylococcus aureus and the MRSA strain were very readily killed and eliminated from surfaces.**" They also commented, "Significant kill was also noted in the other bacterial strains." This summary is also included below. UVAIRx technology shows great promise, and should be considered in indoor environments where bacteria and mold are a concern.

LYLE
LABORATORIES

646-872-0862 New York City email: manager@lylelabsnyc.com

Date of Report: May 02, 2014

LABORATORY REPORT

Report to: Mr. Billy Ward (contact)
Re: Combine Fitness

Analysis for: Billy Ward
Phone: 914-260-6868
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Job ID Number: 04182014-B
PO Number: NA
Technician: Mr. Osh Ghanimah
Testing Site (s): Combine Fitness
Greenwich, CT

SWAB/CULTURE ANALYSIS

Combine Fitness

Sample Description (Site & Date)	Before Treatment 04/26/2014		After Treatment 04/28/2014	
Swab #1 Door Handle Front Entrance, 1 sq in	TSA Agar: Mannitol Salt: Blood Agar: MacConkey Agar:	+2 +0 +2 +0	TSA Agar: Mannitol Salt: Blood Agar: MacConkey Agar:	+0 +0 +0 +0
Swab #2 Weight Machine Handle Bars, 10 sq in	TSA Agar: Mannitol Salt: Blood Agar: MacConkey Agar:	+3 +3 +3 +0	TSA Agar: Mannitol Salt: Blood Agar: MacConkey Agar:	+2 +2 +2 +0
Swab #3 Weight Machine Adjuster Dial, 1 sq in	TSA Agar: Mannitol Salt: Blood Agar: MacConkey Agar:	+1 +3 +1 +0	TSA Agar: Mannitol Salt: Blood Agar: MacConkey Agar:	+0 +1 +0 +0
Swab #4 Treadmill Left Panel, 10 sq in	TSA Agar: Mannitol Salt: Blood Agar: MacConkey Agar:	+3 +3 +3 +3	TSA Agar: Mannitol Salt: Blood Agar: MacConkey Agar:	+2 +0 +2 +0

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Note: Growth on plates was scored as follows:
Plus 3 indicates heavy growth, no reduction, similar to initial.
Plus 2 indicates moderate growth, slight reduction from initial.
Plus 1 indicates light growth, significant reduction from initial.
Zero (0) indicates no growth and/or total elimination of microorganisms.

TSA is used as a general growth medium for most bacteria (total bacteria).

Blood Agar is used as an enriched growth medium that supports the growth of pathogenic and fastidious bacteria.

Mannitol Salt is a selective and differential agar that selects for and grows only coagulase positive *Staphyloccus aureus.*

MacConkey's Agar is a selective and differential agar that selects for and grows only the faecal coliform, *E. coli.*

COMMENTS:

Initial results show the presence of heavy colonization of surfaces with bacteria such as *Staphylococcus aureus, E. coli* and others. After anti-microbial treatment, results indicate that the amount and type of surface microorganisms (microbial growth) is impacted by this anti-microbial treatment. Post treatment surfaces demonstrated fewer total bacteria and a significant reduction in the pathogens, *Staphylococcus aureus* and *E. coli.*

It is reasonable to assume that this anti-microbial treatment could have had a negative impact on the viability of the surface microorganisms in this facility. More testing is needed and recommended at this time.

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Indoor Air Quality Cassettes
Light Microscopy (individual spore counts

Treatment Site: Outdoor Control (by side entrance)

Description/Fungi Identified	Control (spores/m3) 04/26/2014	Control (spores/m3) 04/28/2014
Alternaria	40	53
Ascobasidium		
Aspergillus/Penicillium types	27	13
Bipolaris/Drechslera group		
Blakeslea trispora		
Cercospora		
Chaetomium		
Cladosporium	200	110
Coelomycetes		
Curvularia		
Epicoccum		27
Ganoderma		
Fusarium		
Hyphae	27	40
Mucor		
Nigrospora		
Oidium/Erysiphe		
Other Ascospores		
Other Basidiospores		
Penicillium		
Phomopsis		
Polythrincium		
Rusts		
Smuts / myxomycetes		
Stachybotrys		
Stemphylium		
Torula		
Trichoderma		
Ulocladium		
Unidentified Spores	13	27
Total Spores/m3	**307**	**270**
Background Debris (1-4)	Plus 1 (plant material, trace pollen, inorganic materials)	Plus 1 (plant material, trace pollen, inorganic materials)
Sample Volume	115 liters	115 liters

LYLE
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Indoor Air Quality Cassettes
Light Microscopy (individual spore counts

Treatment Site: Outdoor Control (by side entrance)

Description/Fungi Identified	Control (spores/m3) 04/30/2014	Control (spores/m3) 04/282014
Alternaria	40	53
Aureobasidium		
Aspergillus/Penicillium types	27	13
Bipolaris/Drichalera group		
Blakeslea trispora		
Cercospora		
Chaetomium		
Cladosporium	200	110
Coelomycetes		
Curvularia		
Epicoccum	13	27
Fusarium		
Ganoderma		
Hyphae	13	40
Mucor		
Nigrospora		
Oidium/Erysiphe		
Other Ascospores		
Other Basidiospores		
Penicillium		
Pithomyces		
Polythrincium		
Rusts		
Smuts / myxomycetes		
Stachybotrys		
Stemphylium		
Torula		
Trichoderma		
Ulocladium		
Unidentified Spores	13	27
Total Spores/m3	**306**	**270**
Background Debris (1-4)	Plus 1 (plant material, trace pollen, inorganic materials)	Plus 1 (plant material, trace pollen, inorganic materials)
Sample Volume	115 liters	115 liters

LYLE
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Indoor Air Quality Cassettes
Light Microscopy (individual spore counts

Treatment Site: Indoor Area

Description/Fungi Identified	Area (spores/m3) Before Treatment	Area (spores/m3) After Treatment
Alternaria	80	27
Aureobasidium		
Aspergillus/Penicillium types	80	
Bipolaris/Drechslera group		
Blakeslea trispora		
Cercospora		
Chaetomium		
Cladosporium		
Coelomycetes	200	
Curvularia		
Epicoccum		
Eurotium	27	13
Fusarium		
Ganoderma		
Hyphae		
Mucor	27	13
Nigrospora		
Oidium/Erysiphe	53	13
Other Ascospores		
Other Basidiospores		
Penicillium		
Pithomyces		
Polythrincium		
Rusts		
Smuts / myxomycetes		
Stachybotrys		
Stemphylium		
Torula		
Trichoderma	13	
Ulocladium		
Unidentified Spores		
	13	
Total Spores/m3	493	66
Background Debris (1-4)	Plus 3 (cells, dander, fibers, hair and inorganic material)	Plus 2 (trace cells, unidentified fragments, inorganic materials)
Sample Volume	115 liters	115 liters

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Indoor Air Quality Cassettes
Light Microscopy (individual spore counts

Treatment Site: Area by Window

Description/Fungi Identified	Area (spores/m3) Before Treatment	Area (spores/m3) After Treatment
Alternaria	80	
Aureobasidium		
Aspergillus/Penicillium types	110	
Bipolaris/Drechslera group		
Blakeslea trispora		
Cercospora		
Chaetomium		
Cladosporium	400	
Coelomycetes		
Curvularia		
Epicoccum	27	
Eurotium		
Fusarium		
Ganoderma		
Hyphae	27	
Mucor		
Nigrospora		
Oidium/Erysiphe		
Other Ascospores		
Other Basidiospores		
Penicillium		
Pithomyces		
Polythrincium		
Rusts		
Smuts / myxomycetes		
Stachybotrys		
Stemphylium		
Torula		
Trichoderma	13	
Ulocladium		
Unidentified Spores		
	13	
Total Spores/m3	670	None Observed
Background Debris (1-4)	Plus 2 (cells, dander, fibers, hair and inorganic material)	Plus 2 (unidentified fragments, inorganic materials)
Sample Volume	115 liters	115 liters

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Indoor Air Quality Cassettes
Light Microscopy (individual spore counts

Treatment Site: Room by Weight Machine

Description/Fungi Identified	Room (spores/m3) Before Treatment	Room (spores/m3) After Treatment
Alternaria	80	
Aureobasidium		
Aspergillus/Penicillium types	200	
Bipolaris/Drechslera group		
Blakeslea trispora		
Cercospora		
Chaetomium		
Cladosporium	400	
Coelomycetes		
Curvularia		
Epicoccum	53	
Eurotium		
Fusarium		
Ganoderma		
Hyalue	40	
Mucor		
Nigrospora	119	
Oidium/Erysiphe		
Other Ascospores		
Other Basidiospores		
Penicillium		
Pithomyces		
Polythrincium		
Rusts		
Smuts / myxomycetes		
Stachybotrys		
Stemphylium		
Torula		
Trichoderma	27	
Ulocladium		
Unidentified Spores	27	
Total Spores/m3	**937**	**None Observed**
Background Debris (1-4)	Plus 4 (cells, dander, hair, fibers, insect fragments, inorganic materials)	Plus 2 (unidentified fragments, inorganic materials)
Sample Volume	115 liters	115 liters

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COMMENTS:

According to recommendations from the Environmental Protection Agency (EPA), the American Heart and Lung Association and the American Industrial Hygiene Association, guidelines recommend that indoor air be as good as or better than outdoor air in homes, schools and public buildings. EPA goes on to say that the types and numbers of organisms (molds) found in homes and public buildings should be similar to outdoor air. Please note, however, outdoor air during sub-freezing temperatures and snow cover does not demonstrate reliable or countable spores.

Results from the initial air testing (air-o-cell cassettes) conducted at this facility indicate that the indoor air mold spore counts were slightly higher than outdoor air on the day of initial testing. The total number of indoor spores was uniformly very low (below 1,000/m3). In addition, the mold spores observed are considered to be common indoor fungi that are found in most homes and businesses.

Results from air testing conducted indoors after treatment indicate that most entities with cellular structure no longer can be seen under 400X light microscopy. Only trace fungal organisms could be seen on the post treatment cassette. It is reasonable to assume that the antimicrobial treatment could have had the ability to break or shatter cellular organisms in the air. More testing is needed and recommended at this time.

If you have any concerns or questions, feel free to contact me at (646) 872-0852 or (614) 519-6384.

Respectfully submitted,

Louise Karl (electronically signed and certified)

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Lyle Laboratories

Rodac Environmental Surface Plates were used to test the surfaces of this commercial dairy for the number of viable microorganisms (bacteria) capable of surviving in the presence of the photo-ionizing device being testing. All plates were incubated, counted, and reported according to manufactures directions. The particular surfaces tested in this phase of the survey were inoculated with specific pure cultures of test organisms.

Results indicate that the photo-ionizing device being tested had a negative impact on the specific bacteria used to contaminate the counter surfaces. **It is particularly interesting to note that both *Staphylococcus aureus* and the MRSA strain were very readily killed and eliminated from surfaces.** Significant kill was also noted in the other bacterial strains.

If you have any concerns or questions, feel free to contact me at (646) 872-0852 or (614) 519-6384.

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