activTek
ENVIRONMENTAL

I.A.Q.

Environment Conditioning Technology

Five Supporting Technologies

- Filtration
- Ionization
- Ozone
- Germicidal UV
- UV w/Target Plates

PASSIVE *versus* ACTIVE

- **Filtration**—bring the pollution to the solution
  - Low-Resistant Airflow Technologies
  - HEPA Grade MERV Rated Technologies
- **Purification**—take the solution to the pollution
  - Heart of systems—UV W/Target Technology
  - Multi-strategic approach with Multiple Technologies

Multi-Strategic Approach

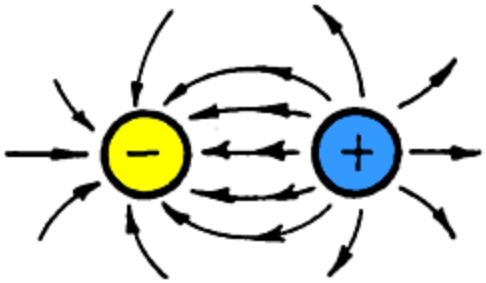
1) Ionization—to precipitate particles

2) Advanced Oxidation—utilizing low levels of ozone, UV, and UV w/target technologies to break down VOCs and deactivate pathogens

3) Filtration—to capture particles

1) Ionization

Ions are charged particles which travel out into the environment, charging particulate in the air-- oppositely charged particles attract one another, allowing them to gain sufficient mass to be filtered or fall to the ground. activTek technology may incorporates one or both of two forms of ionization:



- Needlepoint - 2M ions/cu cm
- "RF Ionizer Effect" produced by an electromagnetic pulse to excite particles inducing a charge and reducing particles.

2) Advanced Oxidation

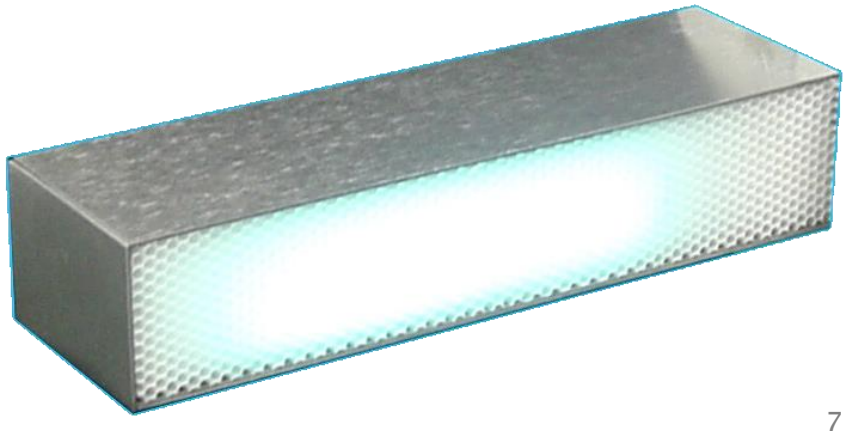
Advanced Oxidation—utilizing low levels of ozone, UV, and UV w/target plate technologies to break down VOCs and deactivate pathogens.

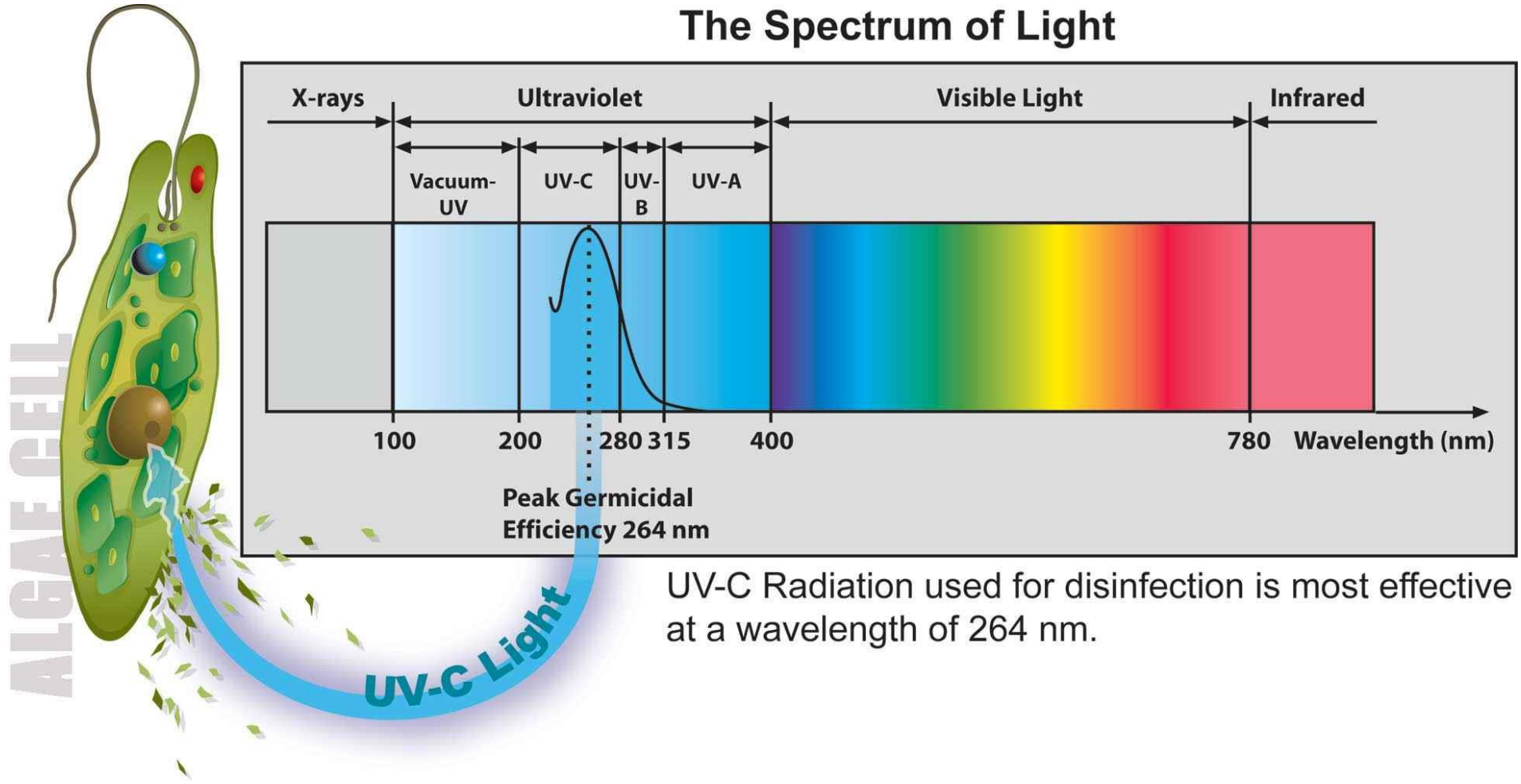
Introducing a unique technology…

ActivePure™

A “Certified Space Technology”

Go to: www.spacefoundation.org

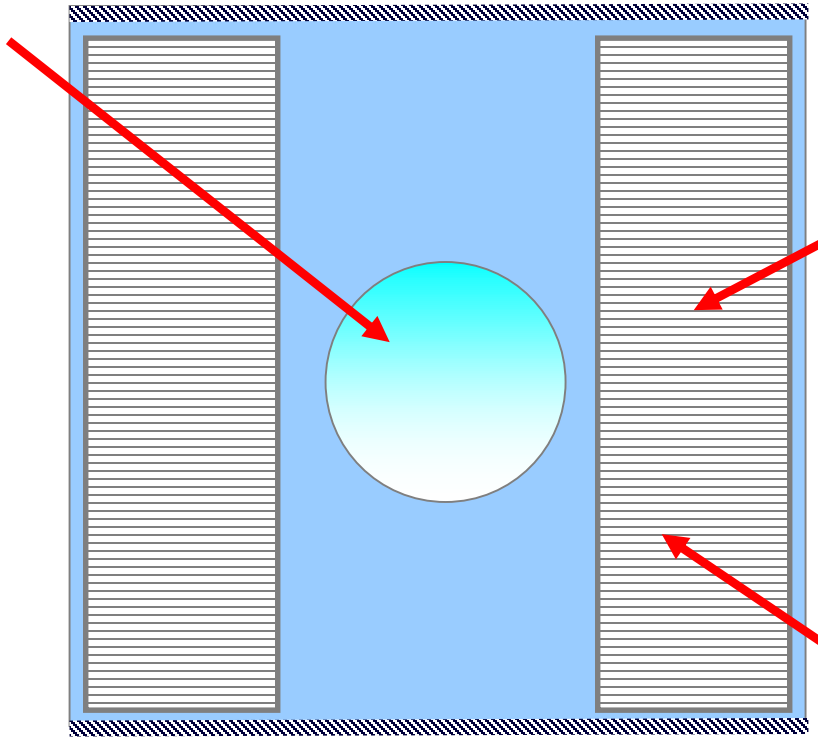




UV-C Radiation used for disinfection is most effective at a wavelength of 264 nm.

Radiant Catalytic Ionization (RCI)
A unique and proprietary System

Broad spectrum UV lamp

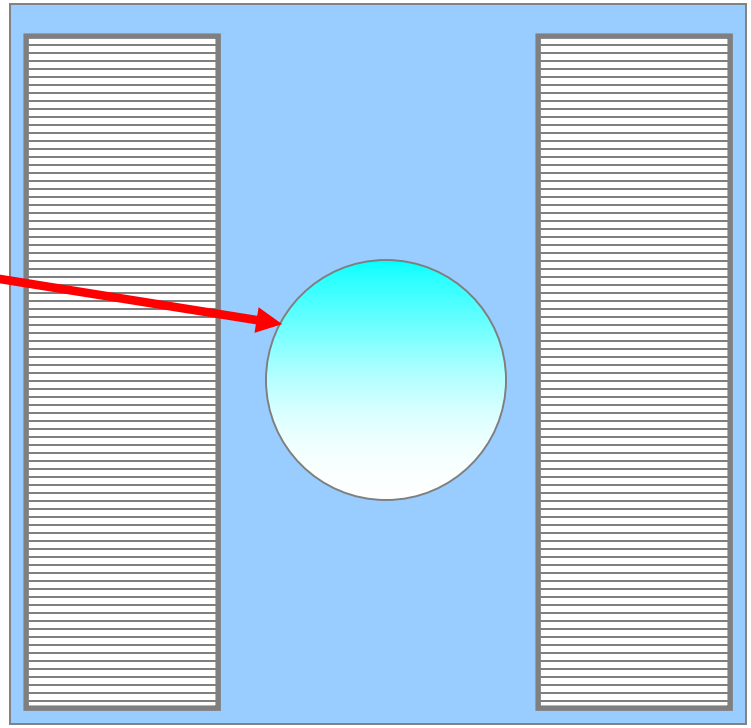


Honeycomb Matrix for maximum surface area

Quad-metallic Hydrophilic coating

Germicidal UV (254 nm)

253.7 nano meter



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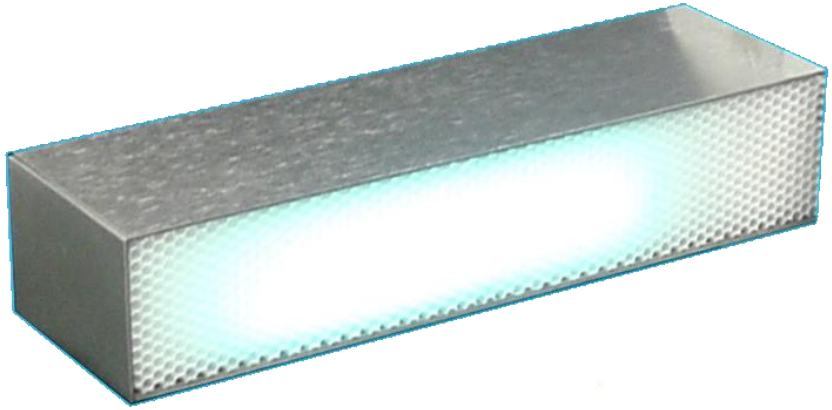
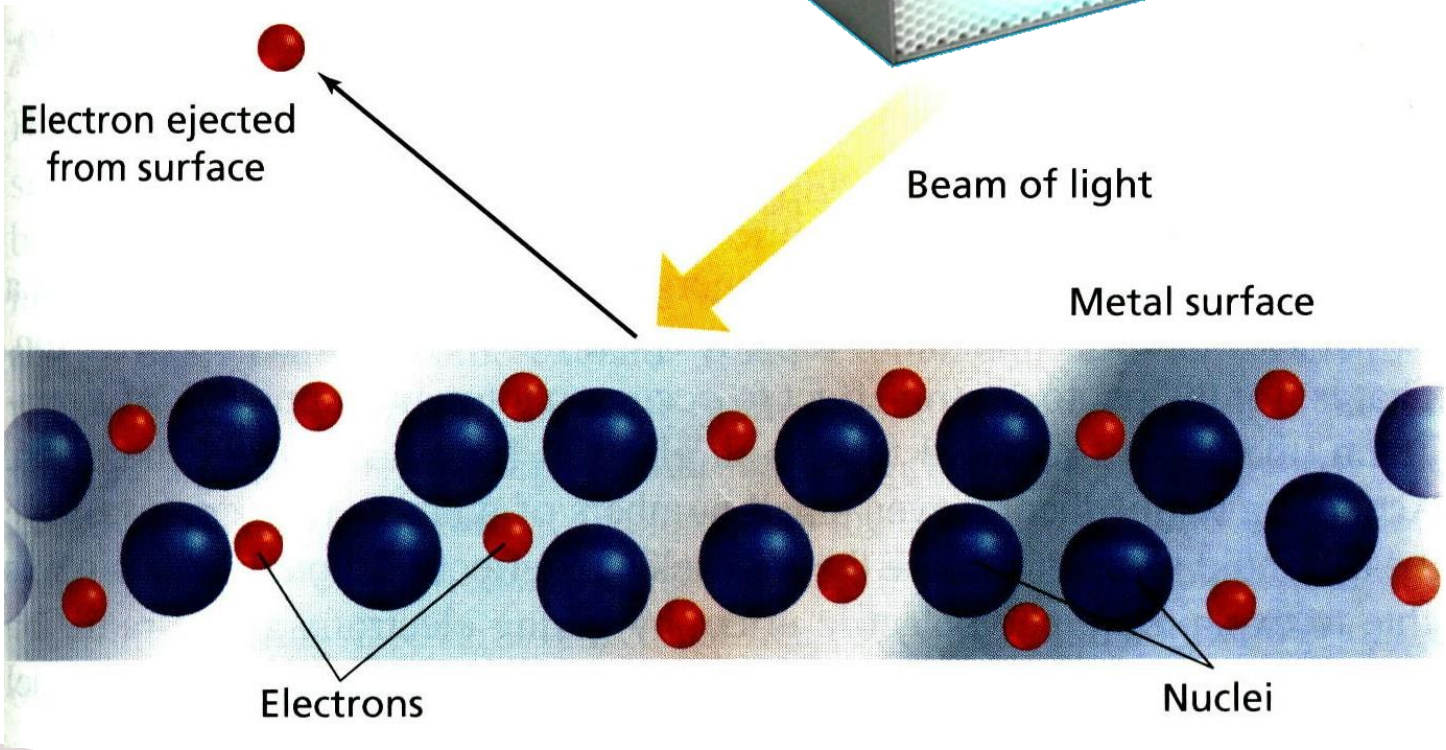
254nm UV Activates the Catalyst



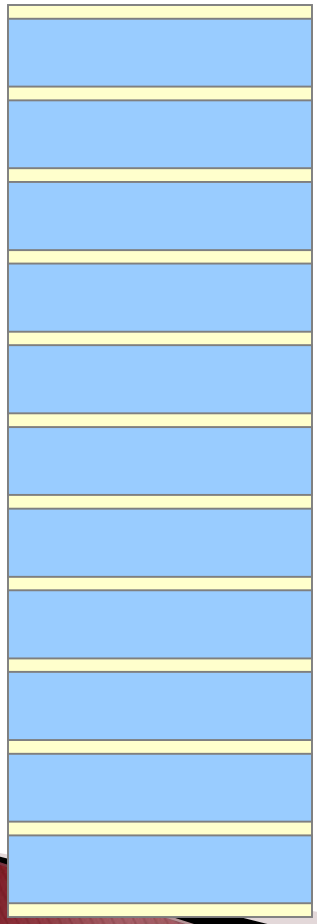
Photoelectric Effect:

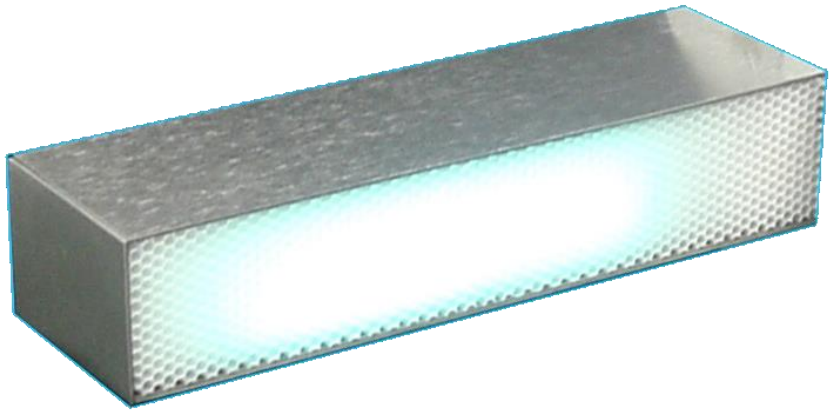
The conversion of light to electricity



The Catalyst

Hydrophilic Coating





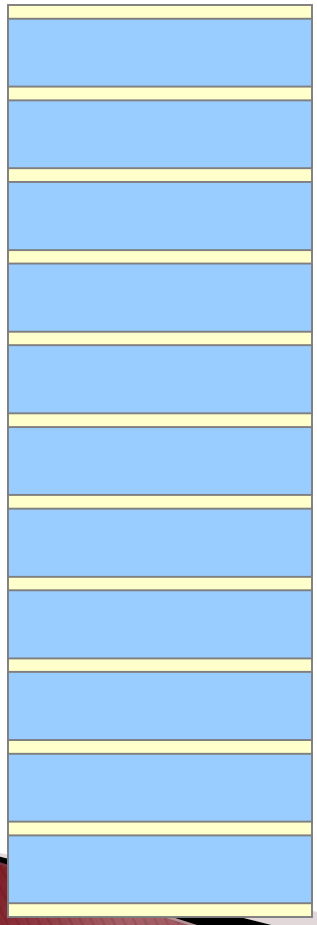
“Hydrophilic” – means the coating absorbs water vapor (H2O) from the air, creating an abundance of Hydrogen and Oxygen for creation of friendly oxidizers

Optimum Humidity is 40-60%

The Catalyst

Quad-metallic Hydrophilic Catalytic Coating

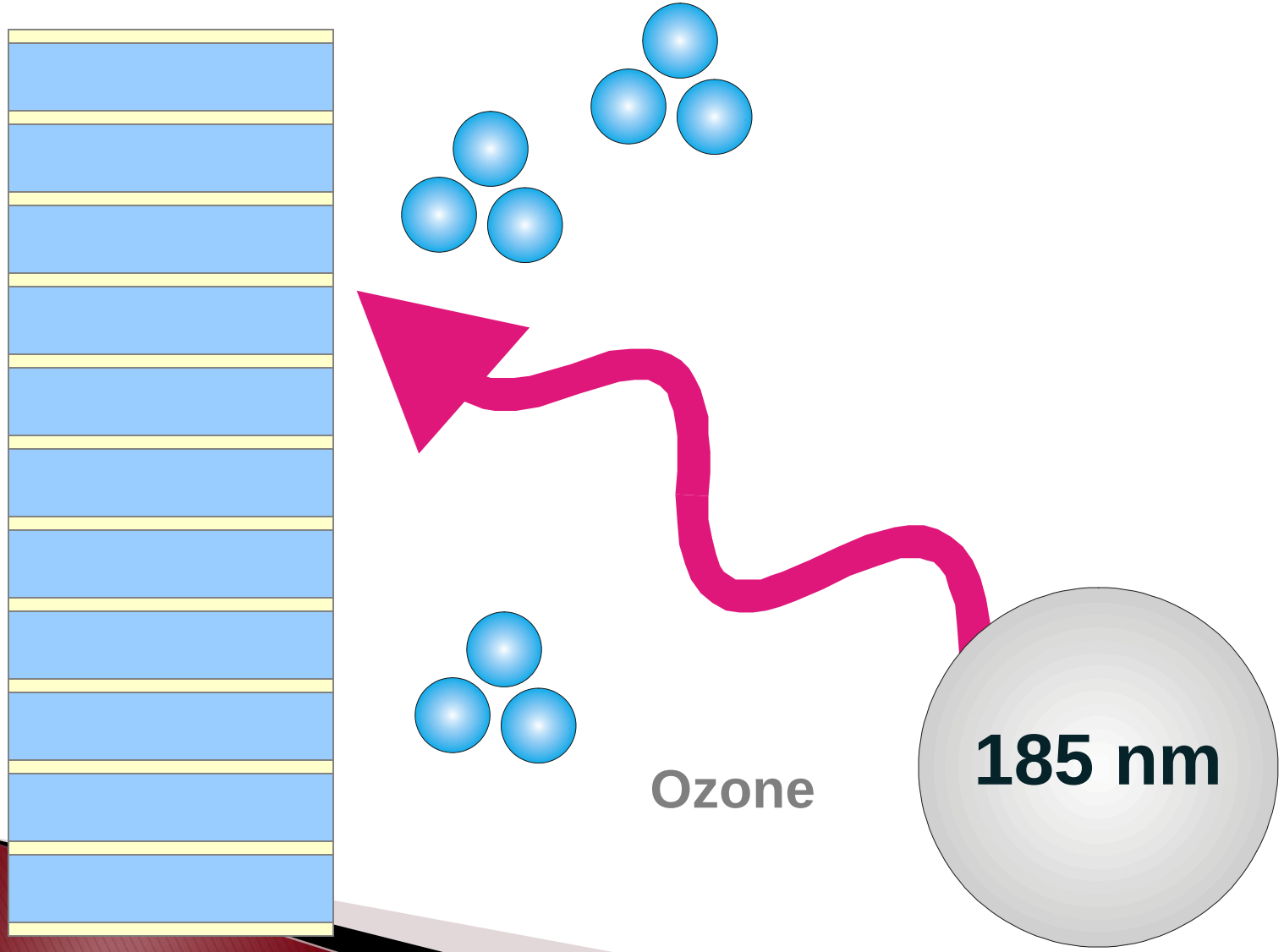
Titanium Dioxide, X, Y, Z



Each metal contributes to process:

- ***Titanium Dioxide** forms two highly reactive substances - Hydroxyl Radicals (OH) & Superoxide Ions (O2-1) - both very strong oxidizers*
- ***X** converts Nitric Oxide to Nitrogen and Oxygen*
- ***Y** speeds up the Titanium reactions by up to 3X. Proven to kill bacteria.*
- ***Z** has unique abilities to work with Hydrogen and can improve the functions of Titanium. Also, helps eliminates algae.*

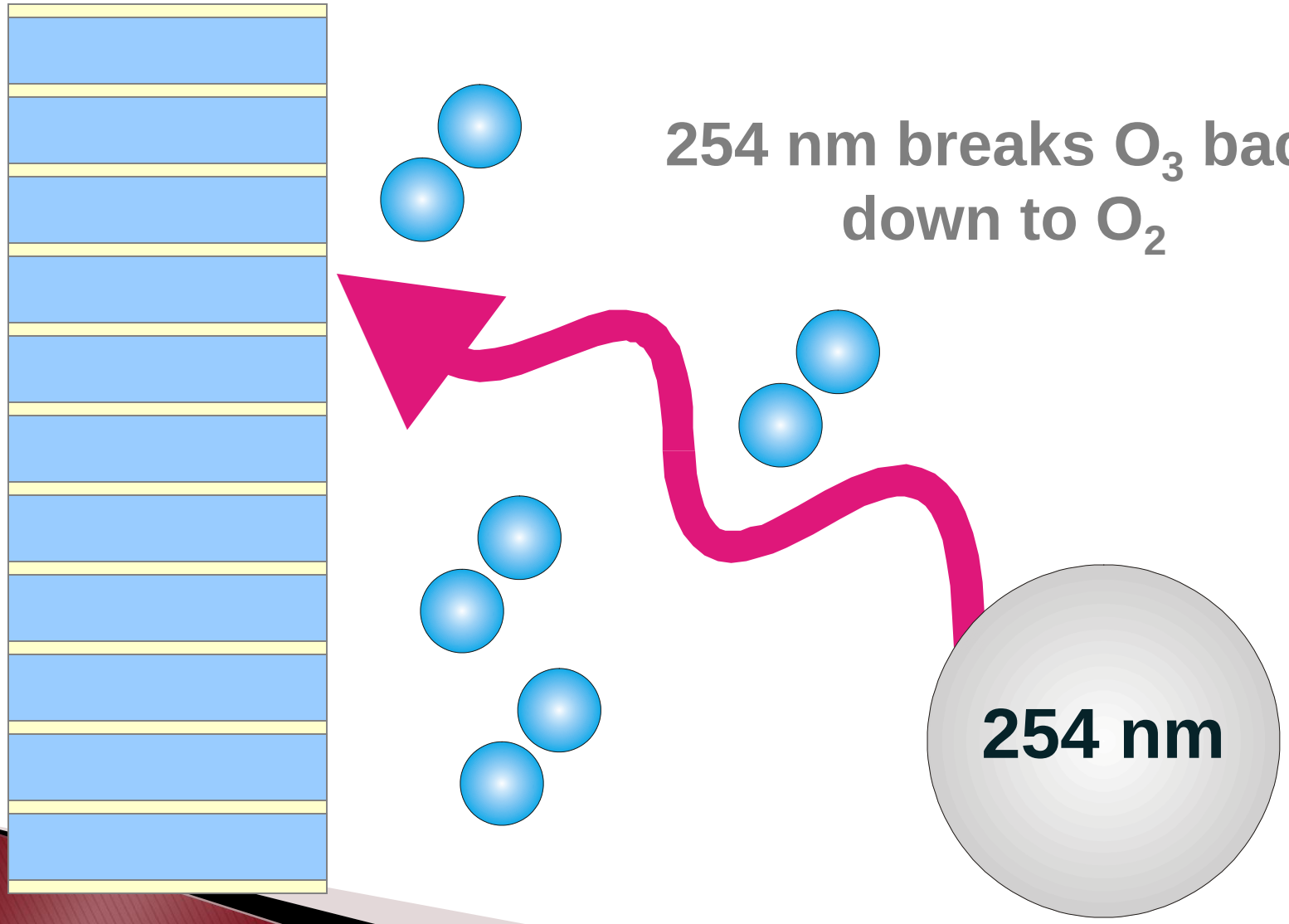
185 nm UV produces ozone



Oxidation Technology includes Low-Level Ozone

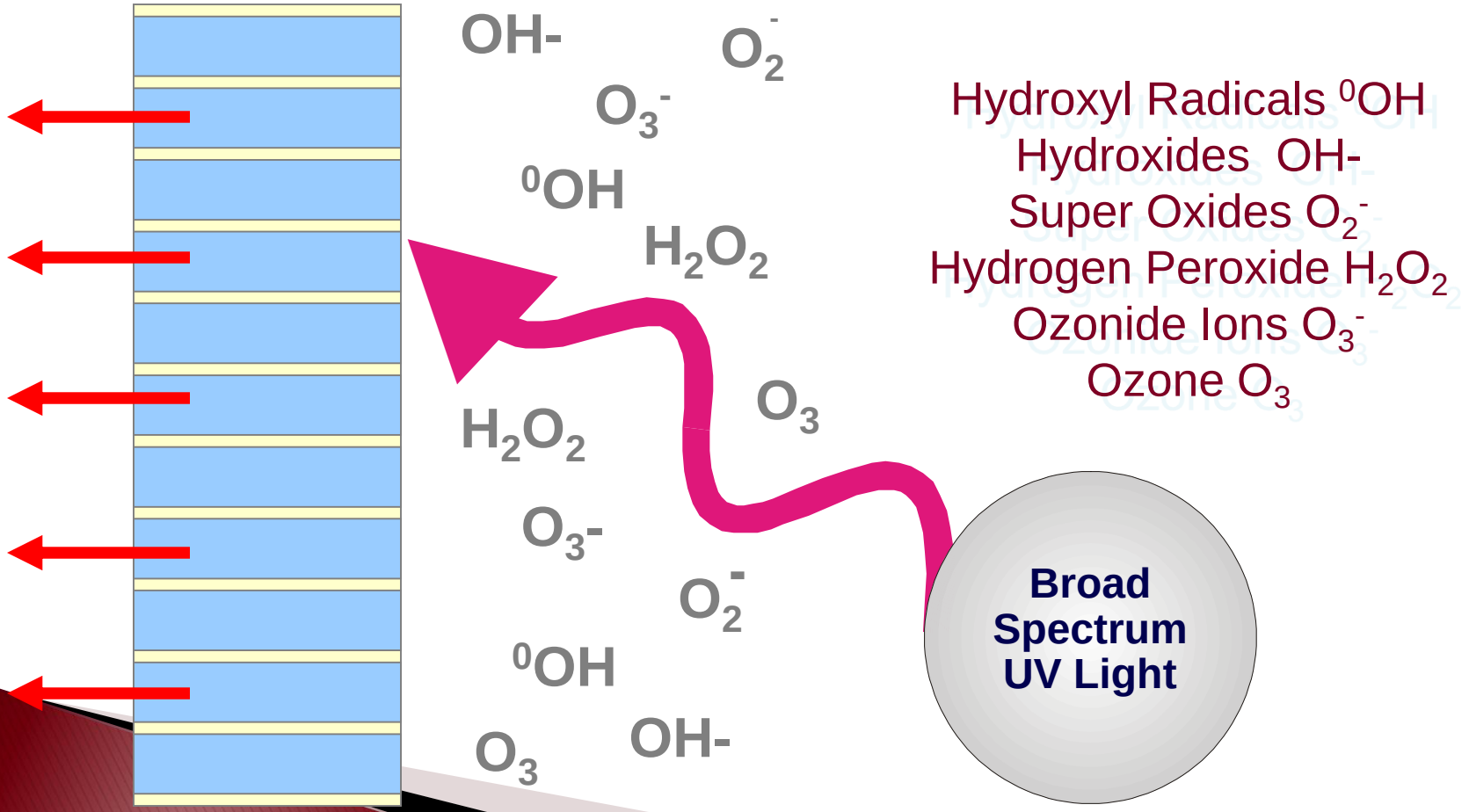
- Ozone reduces odors and VOC's including mold, bacteria & virus.
- Just like Oxygen & other naturally occurring elements Ozone is Dangerous at High Levels
- The last 40 years has shown that too low a level of ozone is also proving to be dangerous
- Ozone is proven to be effective even at low levels

254 nm decomposition of ozone



AOP formation of “Friendly Oxidizers”

These oxidizers are then picked up in the air stream and dispersed throughout the building …ACTIVELY purifying contaminants!

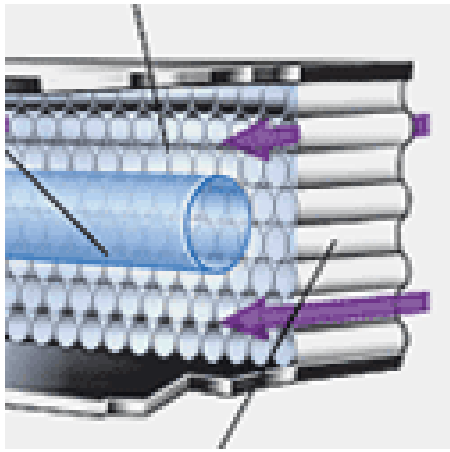


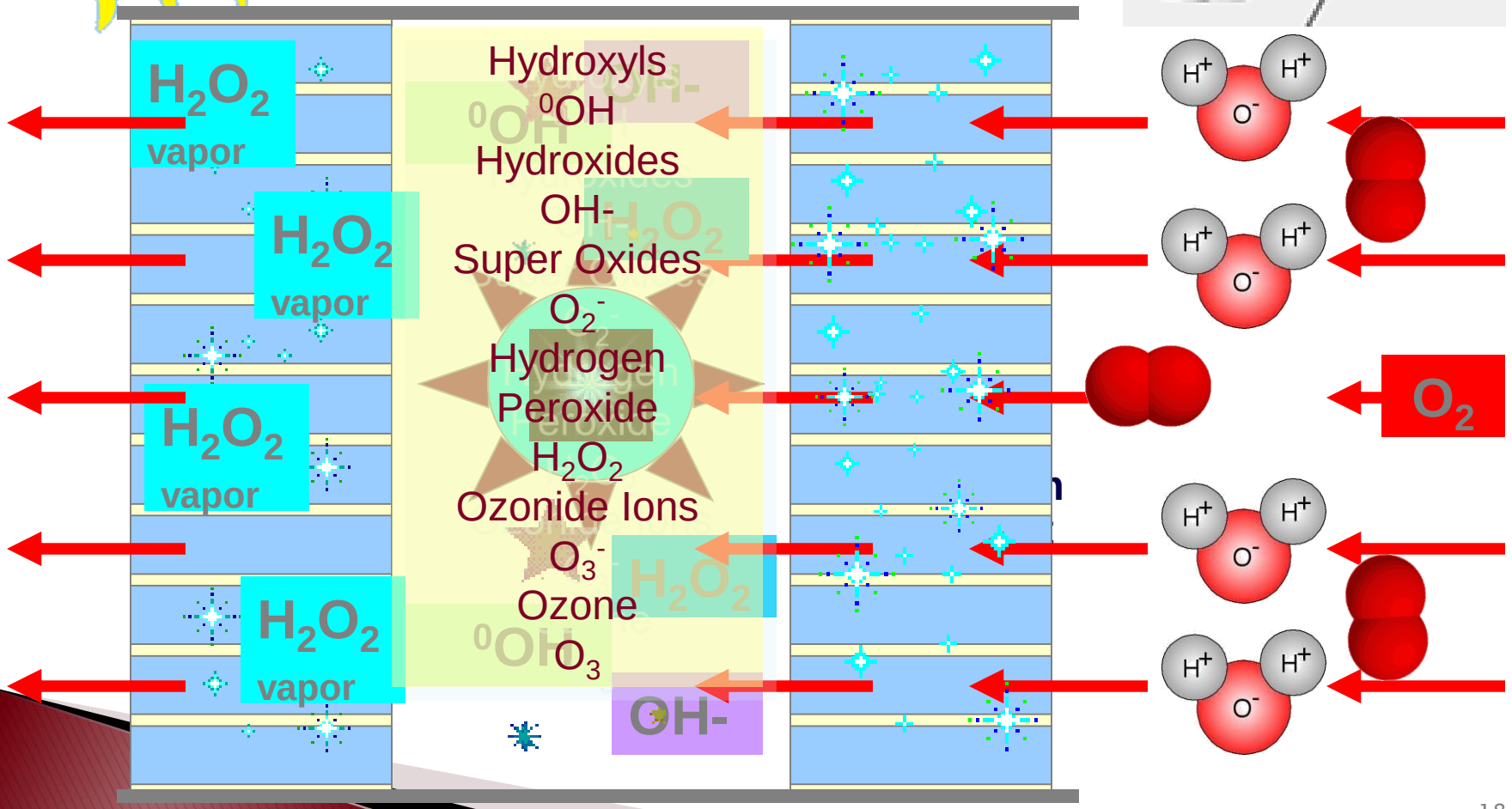
Hydroxyl Radicals ^0OH
Hydroxides OH-
Super Oxides O_2^-
Hydrogen Peroxide H_2O_2
Ozonide Ions O_3^-
Ozone O_3

ECOQUEST INTERNATIONAL

RCI™ TECHNOLOGY

The Photocatalytic Process





3) Filtration

- Filtration can be extremely effective in collecting particulates,
- Recommend MERV 7 (Minimum Efficiency Reporting Value) unless recommended by the manufacturer of the equipment,
- Harsh Environment pads protect the equipment from excessive accumulation of particulate,
- A combination of ACTIVE and PASSIVE technologies IS the synergistic answer!

How about some proof!

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ActivePure Technology

University Testing on RCI Technology

Kansas State University:

Dr. James Marsden, Regents Distinguished Professor

Microbial reduction on Surfaces (Mold, Bacteria & Virus)

University of Cincinnati:

Dr. Sergey Grinshpun, Department Head, Center for Health-Related Aerosol Studies, Department of Environmental Health

Reduction of the Aerosol Particle Concentration

Airborne Microbial reduction (Virus)

University of Cincinnati Testing

Environ. Sci. Technol. **2007**, *41*, 606–612

Control of Aerosol Contaminants in Indoor Air: Combining the Particle Concentration Reduction with Microbial Inactivation

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Center for Health-Related Aerosol Studies, Department of Environmental Health, University of Cincinnati, 3223 Eden Avenue, PO Box 670056, Cincinnati, Ohio 45267-0056

An indoor air purification technique, which combines unipolar ion emission and photocatalytic oxidation (promoted by a specially designed RCI cell), was investigated in two test chambers, 2.75 m^3 and 24.3 m^3, using nonbiological and biological challenge aerosols. The reduction in particle concentration was measured size selectively in real-time, and the Air Cleaning Factor and the Clean Air Delivery Rate (CADR) were determined. While testing with virions and bacteria, bioaerosol samples were collected and analyzed, and the microorganism survival rate was determined as a function of exposure time. We observed that the aerosol concentration decreased ~10

Another challenge is to decrease the indoor concentration of specific airborne contaminants, e.g., viable biological particles. While some indoor air purification techniques aim solely at the aerosol concentration reduction, others are designed to inactivate viable bioaerosols (e.g., viruses, bacteria, and fungi).

Some commercial air cleaners generate excessive ozone (either as a primary biocidal agent or as a bi-product); these devices have raised public health concerns (*1*). Among various guidelines for ozone exposures, the following thresholds have been specified for occupational environments: 0.2 ppm for 2 h (*2*), 0.05–0.10 for 8 h (*2*), 0.1 ppm for 8 h (*3*), and 0.05 ppm for instantaneous (no time limit specified) exposure (*4*). For comparison, the outdoor air standard is 0.08 ppm for 8 h (*5*). Ozone generators can inactivate viable microorganisms; however, the inactivation occurs at concentrations significantly exceeding health standards (*6*, *7*).

Photooxidation involving UV radiation and TiO_2 as a photocatalyst has been applied for gas-phase detoxification of organic contaminants (*8*, *9*) and for inactivating microorganisms in water (*10*–*12*). Some effort has been made to explore its application for air cleaning inside a closed-loop system (*13*, *14*). The investigators reported significant photocatalytic inactivation of stress-resistant *Serratia marcesens* that occurred when aerosolized bacteria circulated in a closed-loop duct equipped with a TiO_2 filter for a relatively long period of time. Pal et al. (*15*) found similar effect for *Escherichia coli*, *Microbacterium* sp., and *Bacillus subtilis*; Keller et al. (*16*) reported considerable inactivation of airborne *E. coli* passing through a photoreactor coated with TiO_2 film. The biocidal effect of the photocatalytic oxidation can be attributed to photogenerated valence-band holes, hydroxyl

University of Cincinnati Testing Findings Overview

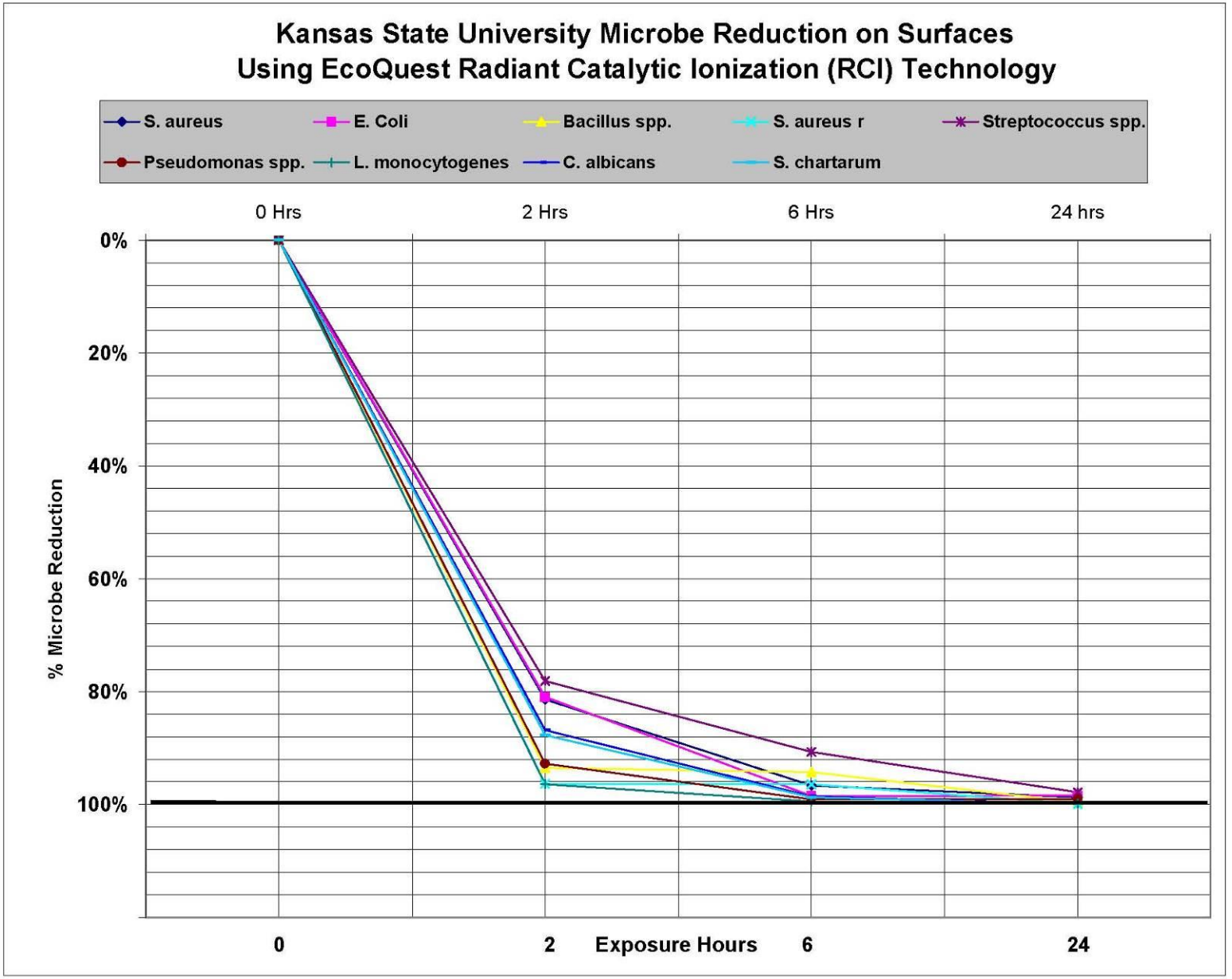
Testing included two technologies; Negative Ionization and Photo catalysis (an innovative proprietary Photo catalytic Reactor called Radiant Catalytic Ionization - RCI). Each technology was evaluated independently:

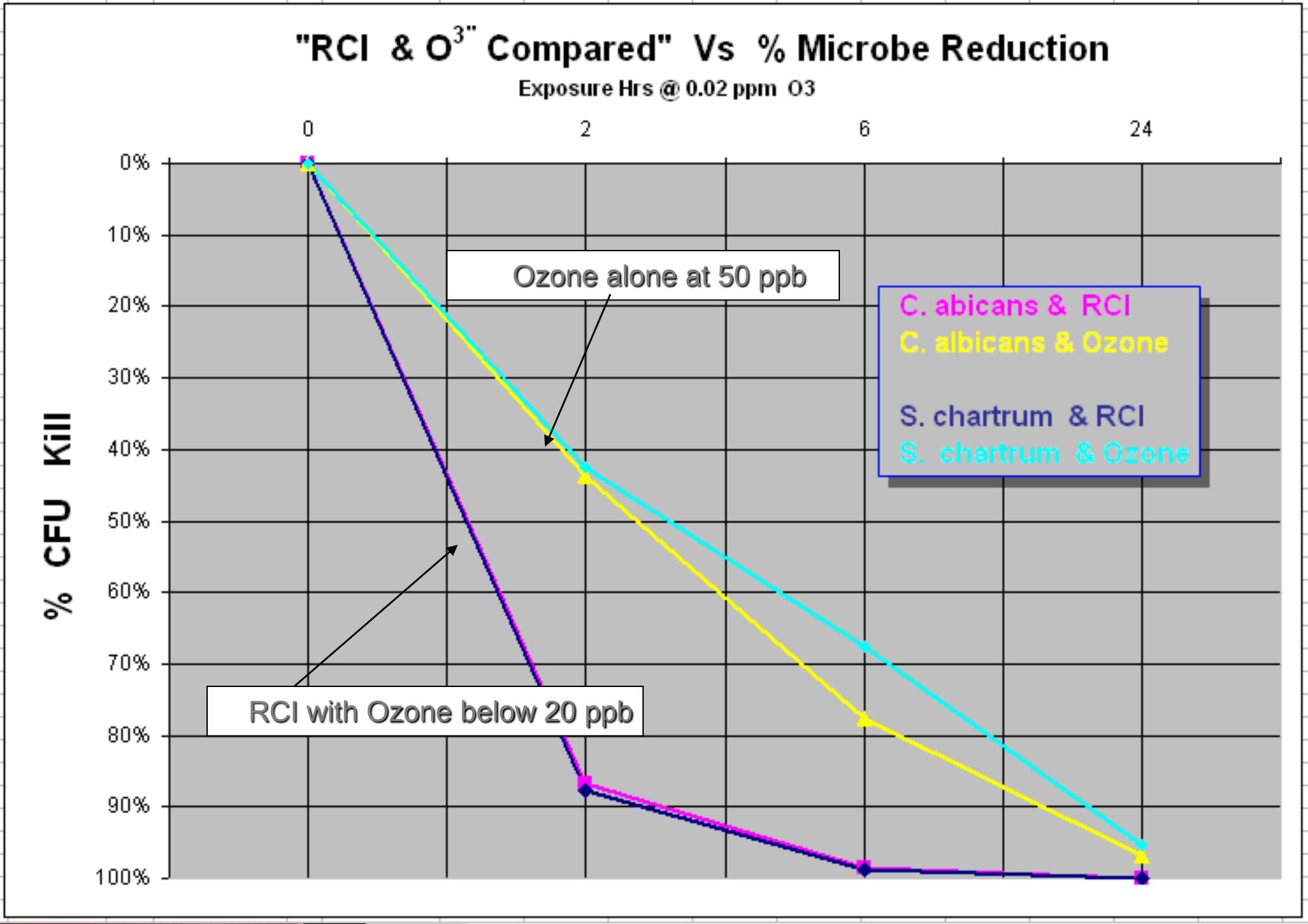
- Unipolar Ionization was able to reduce airborne particles from indoor air by up to 250 times over natural decay
- RCI was able to inactivate approximately 90% of airborne microorganisms in less than 60 minutes. The microorganisms tested were MS2 Virus and B. Subtilis (used as a surrogate for Anthrax)
- Dr. Grinshpun concluded the combination of the two technologies provided a more significant reduction of airborne bio contaminants than either of the two technologies working independently. This conclusion validates the synergistic effect of a multiple technology strategy.

Kansas State University Testing:

ability of Unique Photocatalytic Device to Reduce Microbial Populations on Surfaces in 24 hours

- Staph *(Staphylococcus aureus)* : 98.5% reduction
- MRSA *(Methicillin Resistant Staphylococcus aureus)*: 99.8% reduction
- E-Coli *(Escherichia coli)* : 98.1% reduction
- Anthrax family (*Bacillus* spp.) : 99.38% reduction
- Strep *(Streptococcus* spp.) : 96.4% reduction
- *Pseudomonas aureuginosa* : 99.0% reduction
- *Listeria monocytogenes* : 99.75% reduction
- *Candida albicans* : 99.92% reduction
- Black Mold *(Stachybotrys chartarum)* : 99.93% reduction

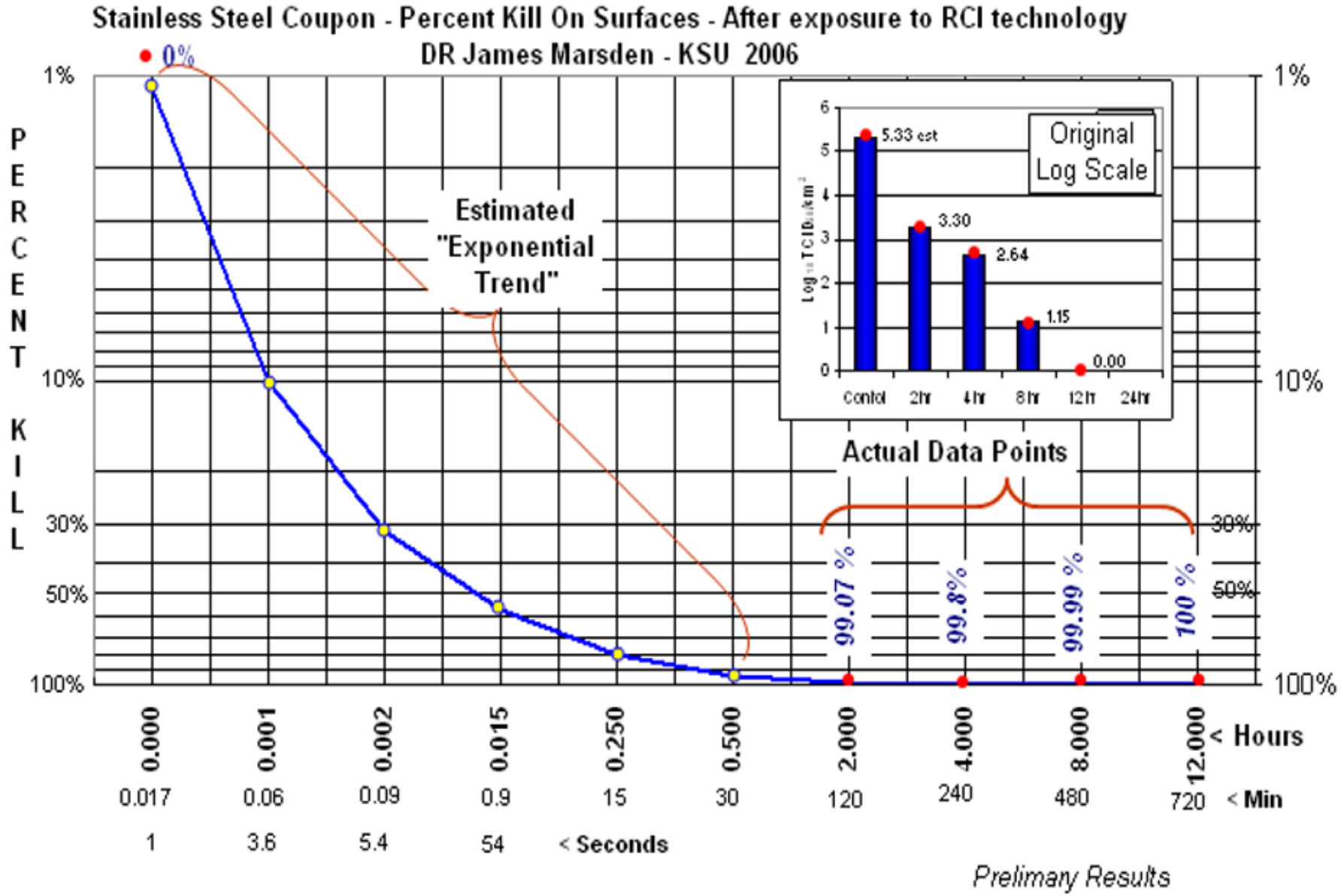

Kansas State University Microbe Reduction on Surfaces
Using EcoQuest Radiant Catalytic Ionization (RCI) Technology
S. aureus
E. Coli
Bacillus spp.
S. aureus r
Streptococcus spp.
Pseudomonas spp.
L. monocytogenes
C. albicans
S. chartarum
0 Hrs
2 Hrs
6 Hrs
24 hrs
0%
20%
40%
60%
80%
100%
% Microbe Reduction
0
2
Exposure Hours
6
24


"RCI & O3" Compared" Vs % Microbe Reduction
Exposure Hrs @ 0.02 ppm O3
0
2
6
24
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% CFU Kill
Ozone alone at 50 ppb
RCI with Ozone below 20 ppb
C. abicans & RCI
C. albicans & Ozone
S. chartrum & RCI
S. chartrum & Ozone

Avian Flu testing
Dr. Jill Bieker
Sandia National Laboratory

– Spring 2006

KSU - Avian Influenza - H5N8 Summary



Field testing results

Hospital Sírio Libanês
INSTITUTO DE ENSINO E PESQUISA

Ao Sr. Henrique Cury
Atmosfera Pura Ltda / Ecoquest do Brasil

Prezado Sr. Henrique,

após a compra e utilização dos equipamentos purificadores de ar modelos EAGLE 5000 e FRESH AIR nos Biotérios de Suínos e Ratos respectivamente, Laboratório de Micro-cirurgia, Laboratório de Neurociências e Centro Cirúrgico de animais, gostaria de informar nossas avaliações.

- Quanto à eficiência no tratamento de odores e infecções.

1. A utilização de dois equipamentos EAGLE 5000, no Biotério de suínos (pocilgas) com capacidade para 40 animais, foi suficiente para melhorar os odores em 90%.
Isto se refletiu em melhores condições de trabalho para os técnicos; diminuição de custos no tratamento, uma vez que não foi mais necessário a utilização de máscaras; melhores condições de vida para os animais.

2. A utilização de 1 equipamento FRESH AIR no Biotério dos ratos foi suficiente para que reduzíssemos as trocas de maravalha de 2 para 1 vez por semana, isto é 50%. Acreditamos que estas trocas possam vir a ser mais espaçadas. Também observamos que não houve infecções em nenhum animal até o momento (ainda não temos número estatisticamente significante).
Os níveis de amônia dentro do Biotério, que não tem um sistema de ar adequado, foram reduzidos em 70%.

3. A utilização de 1 equipamento FRESH AIR no laboratório de micro-cirurgia durante e após o Curso de Microanatomia do Osso temporal, onde utilizamos brocas para perfurar ossos, o odor foi reduzido em 90%.

Rua Cel. Nicolau dos Santos, 69 • 01308-060 • Bela Vista • São Paulo • SP
Tel.: 55 11 3155 0900 • www.hospitalsiriolibanes.org.br

This Brazilian Hospital Laboratory was conducting tests with lab rats. The rats were operated on to insert probes in their brains. Prior to installation of Stand-alone RCI Air Purification System the laboratory was loosing 10% of the rats after each surgery. Since installation of the purifier, no rats have been lost.

Test Data from a home in Central Florida in USA before and after 212mm (9”) in-duct system installation

Micro-5(™) Cassette Analysis of Fungal Spores & Other Airborne Particulates by Optical Microscopy (EMSL Method M001)

Lab Sample Number	340601072-0001								
Client Sample ID	386233								
Volume	25								
Sample Location	master bedroom								
Spore Types	Raw Count	Spores/m³	% of Total	Raw Count	Spores/m³	% of Total	Raw Count	Spores/m³	% of Total
Agrocybe/Coprinus	-	-	-						
Alternaria	-	-	-						
Arthrinium	-	-	-						
Arthrospores	>300	>12000	36.3						
Ascospores	1	40	0.1						
Aspergillus/Penicillium	333	13300	40.3						
Basidiospores	12	480	1.5						
Bipolaris	-	-	-						
Chaetomium	-	-	-						
Cladosporium	34	1360	4.1						
Curvularia	-	-	-						
Epicoccum	-	-	-						
Fusarium	-	-	-						
Ganoderma	-	-	-						
Memnoniella	4	160	0.5						
Myxomycete	4	160	0.5						
Paecilomyces	117	4680	14.2						
Pithomyces/Ulocladium	-	-	-						
Rust	-	-	-						
Scopulariopsis	17	680	2.1						
Stachybotrys	-	-	-						
Torula	-	-	-						
Unidentifiable Spores	5	200	0.6						
Zygomycetes	-	-	-						
Total Fungi	>827	>33100	100						
Fibrous Particulate	20	800							
Hyphal Fragment	78	3120							
Insect Fragment	10	400							
Pollen	2	80							
Analytical Sensitivity		40							
Skin Fragments (1-4)		2							
Background (1-5)		2							

- Before treatment test data evaluated March 28, 2006
- Master Bedroom

Micro-5(™) Cassette Analysis of Fungal Spores & Other Airborne Particulates by Optical Microscopy (EMSL Method M001)

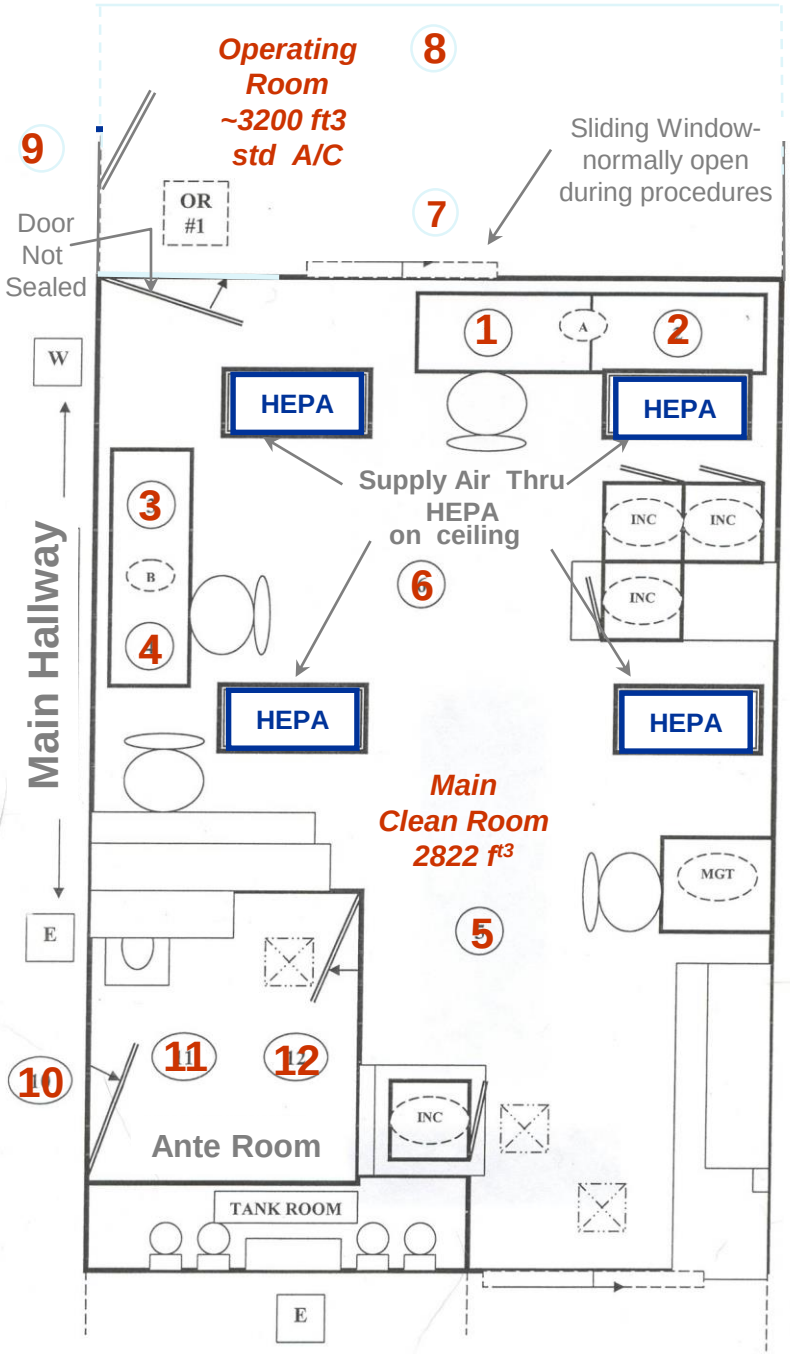
Lab Sample Number	340602014-0001								
Client Sample ID	386105								
Volume	25								
Sample Location	master bedroom								
Spore Types	Raw Count	Spores/m³	% of Total	Raw Count	Spores/m³	% of Total	Raw Count	Spores/m³	% of Total
Agrocybe/Coprinus	-	-	-						
Alternaria	-	-	-						
Arthrinium	-	-	-						
Arthrospores	-	-	-						
Ascospores	2	80	25						
Aspergillus/Penicillium	2	80	25						
Basidiospores	-	-	-						
Bipolaris	1	40	12.5						
Chaetomium	-	-	-						
Cladosporium	1	40	12.5						
Curvularia	-	-	-						
Epicoccum	-	-	-						
Fusarium	-	-	-						
Ganoderma	-	-	-						
Myxomycete	-	-	-						
Nigrospora	2	80	25						
Paecilomyces	-	-	-						
Pithomyces/Ulocladium	-	-	-						
Rust	-	-	-						
Scopulariopsis	-	-	-						
Stachybotrys	-	-	-						
Torula	-	-	-						
Unidentifiable Spores	-	-	-						
Zygomycetes	-	-	-						
Total Fungi	8	320	101						
Fibrous Particulate	4	160							
Hyphal Fragment	2	80							
Insect Fragment	2	80							
Pollen	1	40							
Analytical Sensitivity		40							
Skin Fragments (1-4)		2							
Background (1-5)		1							

- After treatment test data evaluated June 2, 2006
- Master Bedroom

Summary of Results

	Spores/cu meter	
	Before	After
Aspergillus/Penicillium	13,300	80
Cladosporium	1,360	80
Arthrospores	>12,000	0
Total Fungi	>33,100	320
Fibrous Particulate	800	160
Hyphal Fragment	3,120	80
Insect Fragment	400	80
Pollen	80	40
Total Particulate	4,420	360

Test Data from Invitro Fertilization Lab in a Large Midwestern Hospital in USA



Hospital –*Clean Room*

- *Particulate count/m3 measured @ 0.5 um*
- *Typical office 2 -3 million/m3 @ 0.5 um*
- *Before and After 2- 9" PCO Units in A/C ducts*

Loc	Class	Before/m3	After/m3	Imp %
01	5	1391.4	77.7	94%
02	5	692.2	21.2	97%
03	5	621.5	7.1	99%
04	5	374.3	7.1	98%
05	6	11,569.1	2,366.1	80%
06	6	22,236.5	332.0	99%
07	7	337,161.9	165,484.6	51%
08	7	249,121.4	153,887.2	38%
09	8	1,614,245.0	334,401.6	79%
10	8	1,304,842.0	373,078.3	71%
11	7	247,614.7	53,614.7	78%
12	7	203,518.4	50,302.2	75%

All particle counts were taken in accordance with ISO 14644-1 standards

Microbial Colonies - Before & After RCI

Location		Before	After
1- 2	*Horizontal Flow Clean Bench*	*0*	*0*
3- 4	*Horizontal Flow Clean Bench*	*0*	*0*
5- 6	*Main Clean Room*	*14*	*0*
7- 8	*Operating Room*	*9*	*0*
9- 10	*Hallway*	*27*	*8*
11-12	*Ante Room*	*23*	*15*

Three points to remember about activTek *Environment Conditioning Technology*…….

1. Nature based technologies: We clean air indoors like nature cleans the air outdoors using:
   - Two types of Ionization to reduce particles
   - UV and a Catalyst to create Oxygen & Hydrogen based friendly oxidizers to reduce microbial contaminants (Photo Catalytic Oxidation)
   - Low-level ozone to reduce odors
2. The only residential Air Purification Technology recognized by the Space Foundation and awarded Certified Space Technology status
3. The only Air and Surface Purification with validation testing from multiple universities proving the ability to reduce up to 99.99% of Mold, Fungi, Bacteria and Viruses, including MRSA and Avian Bird Flu on surfaces.