



Steril-Aire

IAQ and Airborne Disinfection



STERIL-AIRE®



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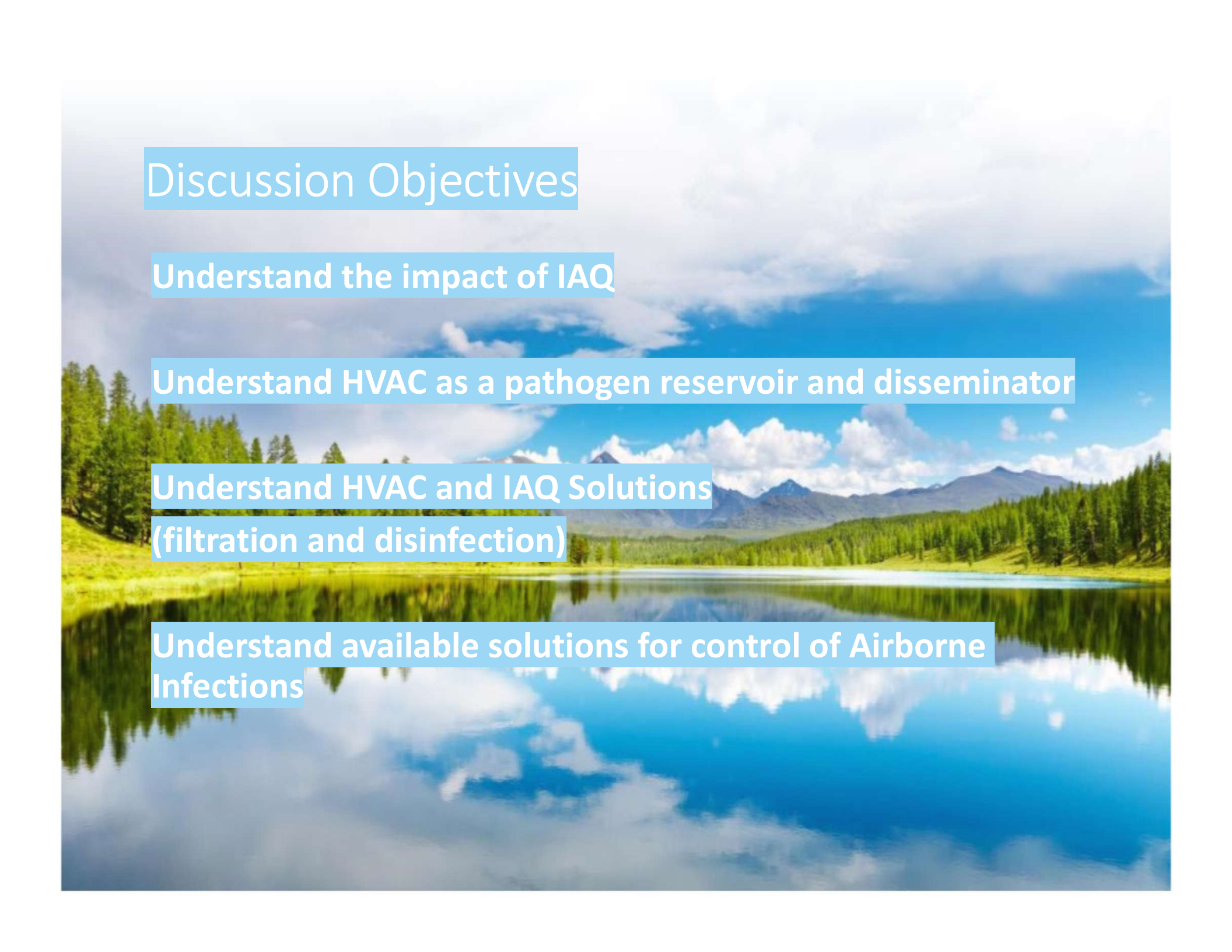
Contact us to learn more





Introductions

- Josh Oelker, *Steril-Aire*
Director of Business Development
- Steril-Aire: Manufacturer of UVC
Solutions for Disinfection in industries
such as HVAC, Healthcare, IAQ, Food,
and Cannabis



Discussion Objectives

Understand the impact of IAQ

Understand HVAC as a pathogen reservoir and disseminator

Understand HVAC and IAQ Solutions
(filtration and disinfection)

Understand available solutions for control of Airborne Infections

Effects of Poor Air Quality

- **Air pollution** is now the fourth-highest **cause of death worldwide**
- **Even** in relatively "**clean**" areas, life expectancies are **shortened by 8.6 months on average** due to pollution from human activities
- **According** to the U.S. Environmental Protection Agency, **air quality inside the home** is often **two to five times worse** than it is outdoors.

Potential Annual Health Care Savings And Productivity Gains From Improving Indoor Environments

(Fisk and Rosenfeld 1997)

They also estimated the **annual economic costs of common respiratory illnesses** (reported in estimated 2020 dollars):

- **240 million** lost workdays
- **160 million** additional days of restricted activity
- **\$54 billion** (\$210 per person) in health care costs
- **\$105 billion** (\$400 per person) total cost.

Harvard -TH Chan School of Public Health

What is the impact of good IAQ?

Consider that **90%** of building costs are the occupants.

60% of Energy costs are HVAC

With Better IAQ

- Crisis Response Improved 97%-131%
- Strategic Thinking Improved 183%-288%
- Information Usage Improved 172%-299%

• Allen, Joseph G.; MacNaughton, Piers; Satish, Usha; Santanam, Suresh; Vallarino, Jose; Spengler, John D. (2015). "Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments". Environmental Health Perspectives. 124 (6): 805–12. doi:10.1289/ehp.1510037. PMC 4892924. PMID 26502459.

EPA- Good Physical Conditions reduce Absenteeism, Improve Test Scores and Improve Teacher Retention Rates



- 80 percent of teachers responding to a survey reported that school facility conditions were an important factor in teaching quality and the most frequently cited problem was bad IAQ
- IAQ problems cause increased absences due to respiratory infections, allergic diseases from biological contaminants, or adverse reactions to chemicals used in schools.
- Respiratory health effects, such as infections and asthma, are associated with increased absenteeism

Effect of ultraviolet germicidal lights installed in office ventilation systems on workers' health and wellbeing: double-blind multiple crossover trial

McGill University

- A double blind, multiple crossover trial of 771 participants, in office buildings in Montreal, Canada, UVGI was alternately off for 12 weeks, then turned on for 4 weeks.
- Operation of UVGI resulted in 99% (95% CI 67–100) reduction of microbial and endotoxin concentrations on irradiated surfaces within the ventilation systems.
- Use of UVGI was associated with significantly fewer work-related symptoms overall (adjusted odds ratio, as well as respiratory and mucosal symptoms than was non-use.
- 26% Overall Reduction in Absenteeism

ASHRAE Position

- Many infectious diseases are transmitted through inhalation of airborne infectious particles termed droplet nuclei
- Airborne infectious particles can be disseminated through buildings including ventilation systems
- Airborne infectious disease transmission can be reduced using dilution ventilation, specific in-room flow regimes, room pressure differentials, personalized and source capture ventilation, filtration and UVGI

COVID-19 & SARS CoV2 Virus

- Respiratory virus
- Spread via respiratory droplets- droplet nuclei
- Attacks lungs and immune system
- Kills via Secondary infection much like Influenza
- Less airborne viral load and secondary infections translates into increased survival rate

The Role of HVAC Systems and Airborne Infection Transmission



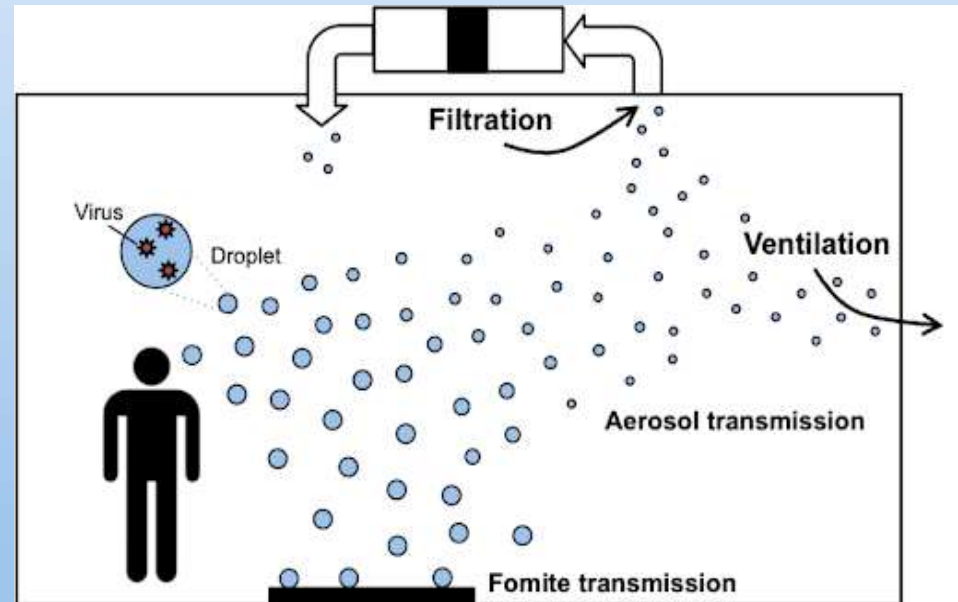
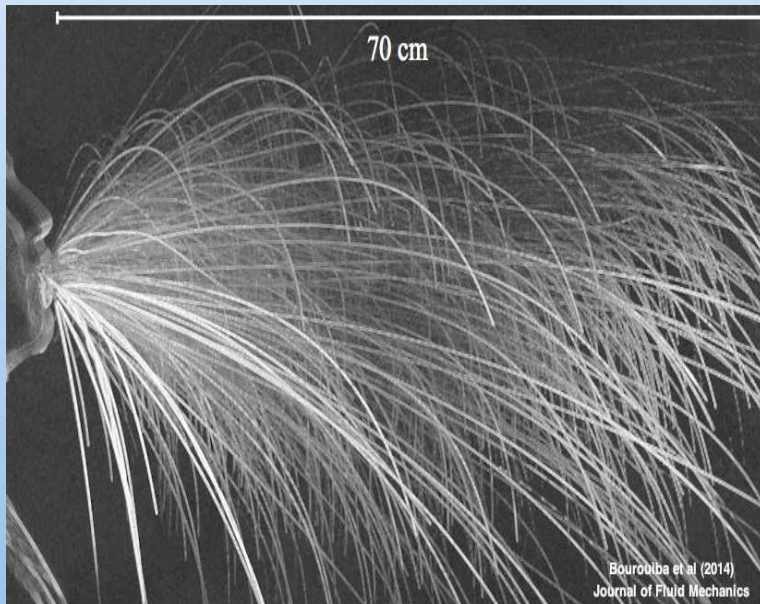
Bioaerosols and Droplet Nuclei



- Larger droplets fall to the ground
- Smaller droplets (1-5 micron diameter) evaporate and become droplet nuclei
- Remain suspended in air for hours or days, traveling long distances or recirculating within a building envelope

Droplet Nuclei Suspension

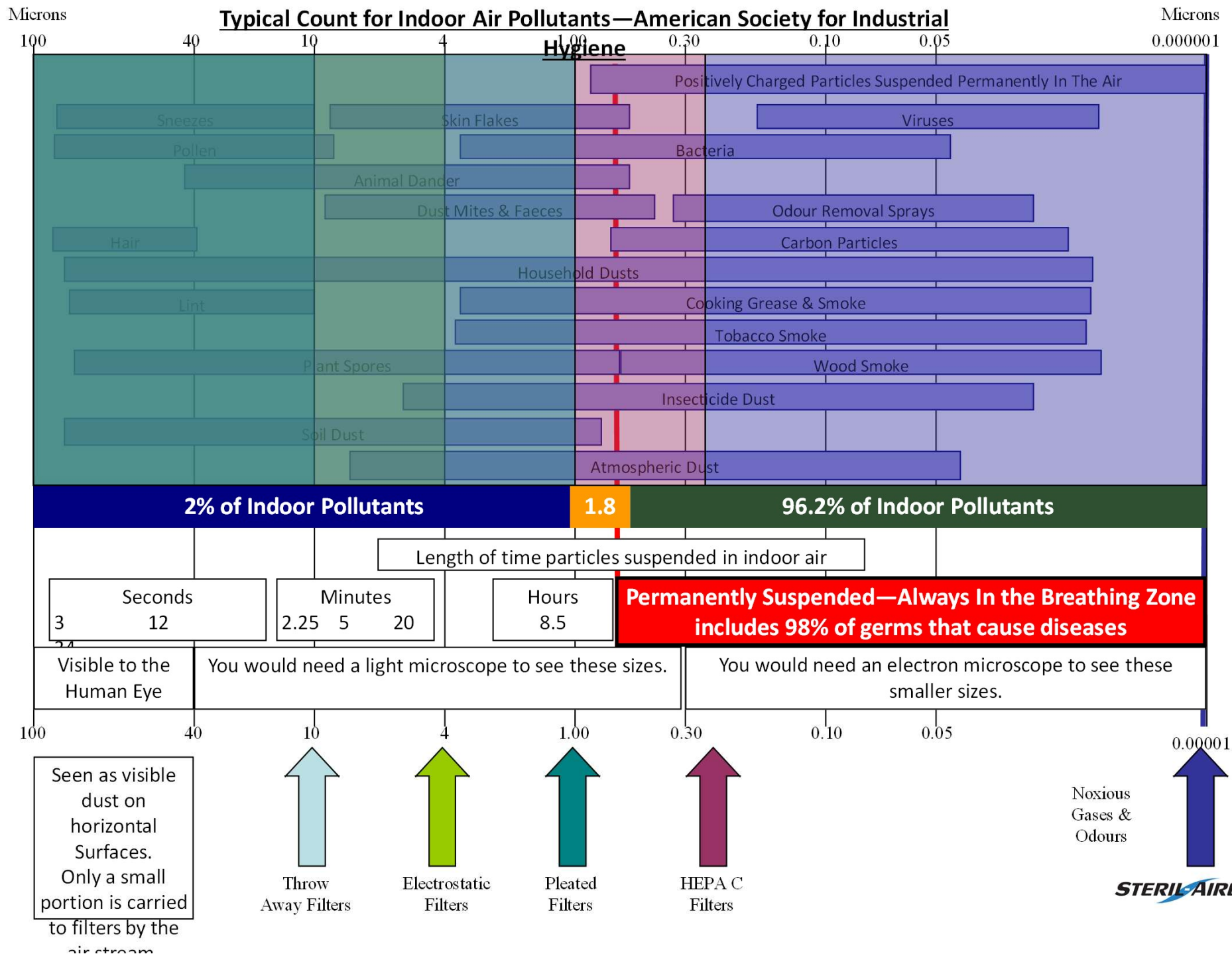
- A $2\text{ }\mu\text{m}$ droplet nuclei settling in a calm room takes approximately 4.2 hours to fall a distance of 2 m

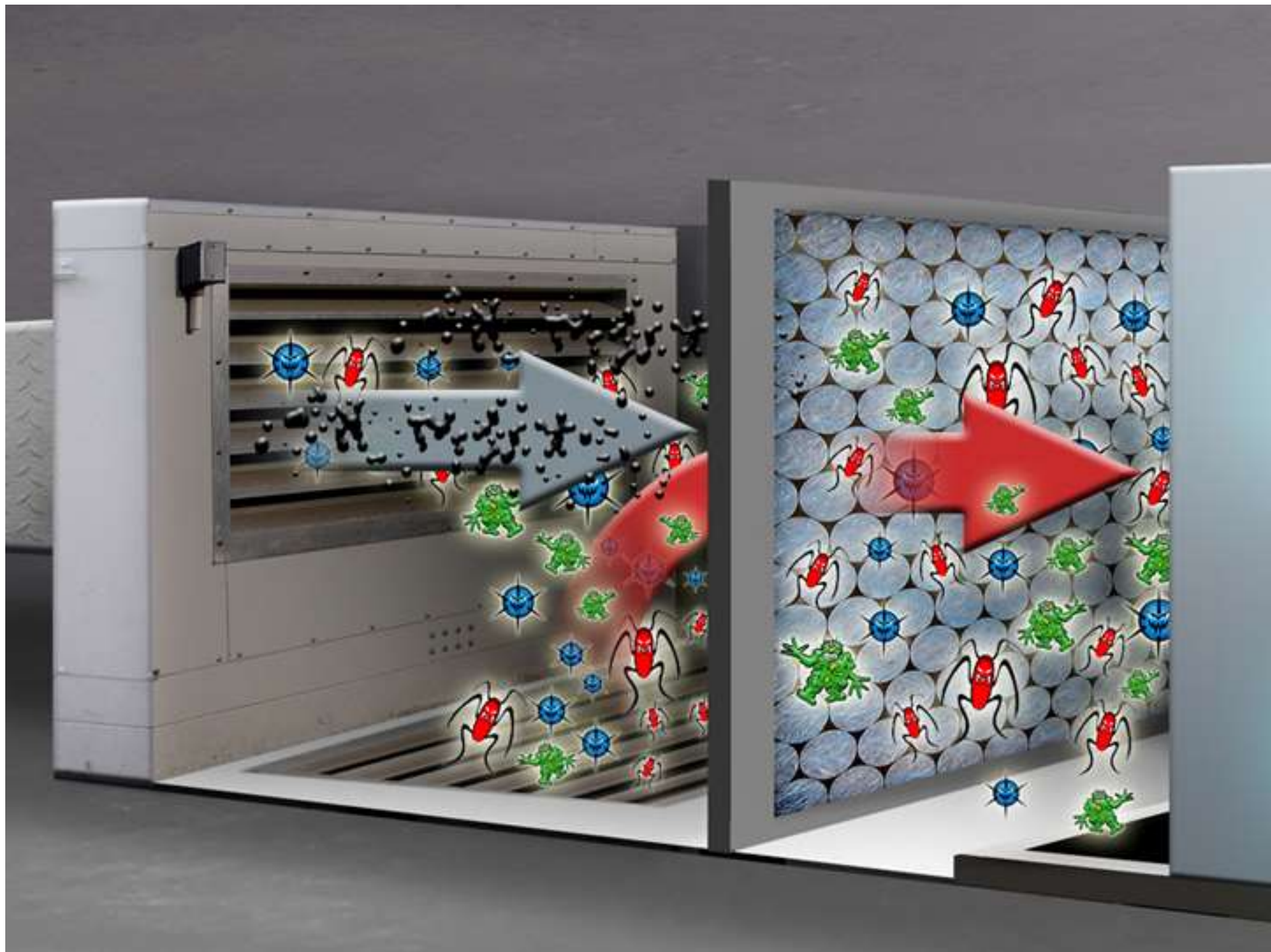


the presence of viral RNA in air droplets and aerosols indicates the possibility of viral transmission

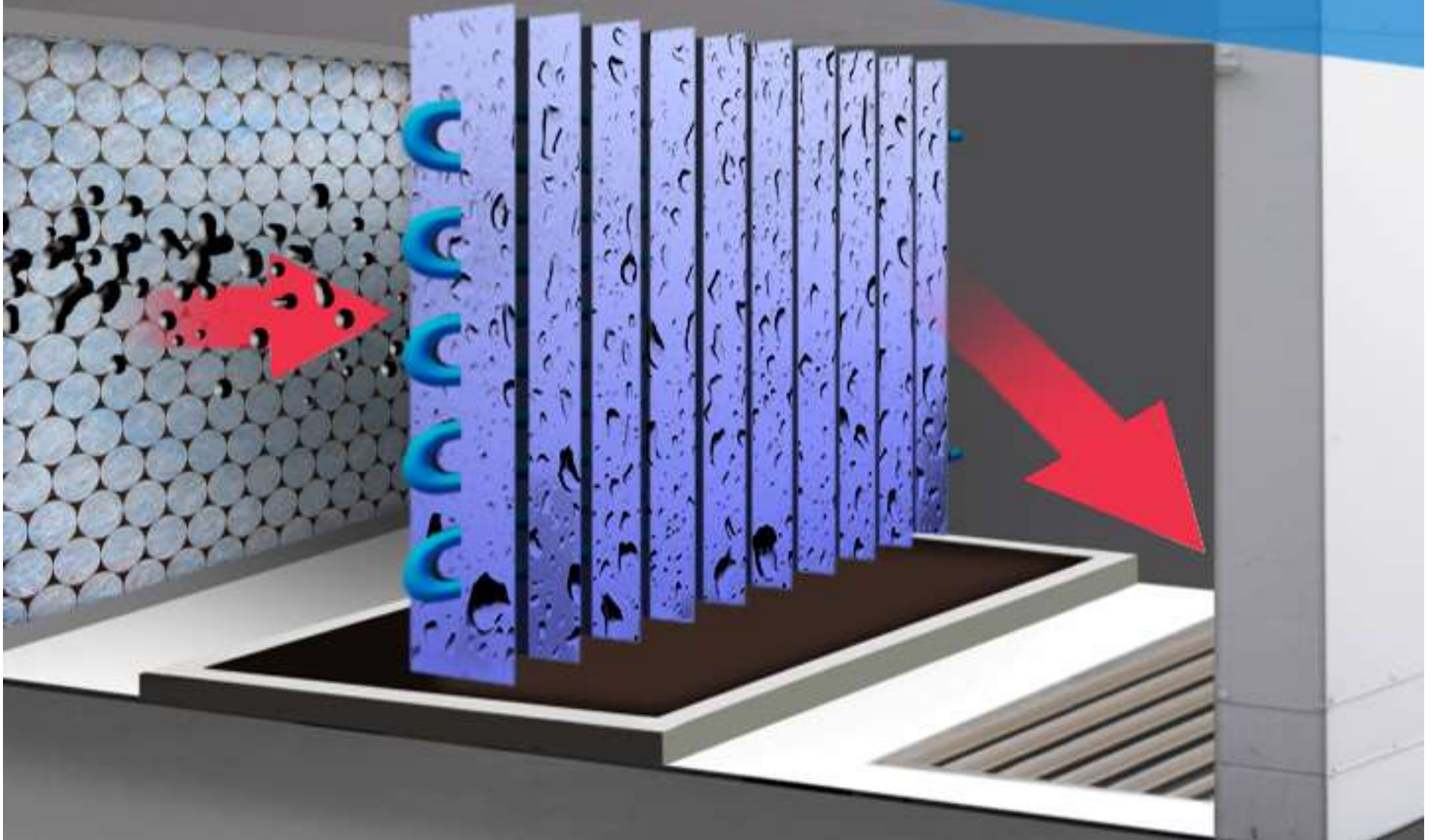
Droplet Nuclei Transfer

- One cough can generate 3000 droplet nuclei
- Talking for 5 minutes can generate 3000 droplet nuclei
- Singing can generate 3000 droplet nuclei in one minute
- Sneezing generates tens of thousands droplet nuclei, which can spread to individuals up to 10 feet away. Initial velocities can be up to 100 m/s

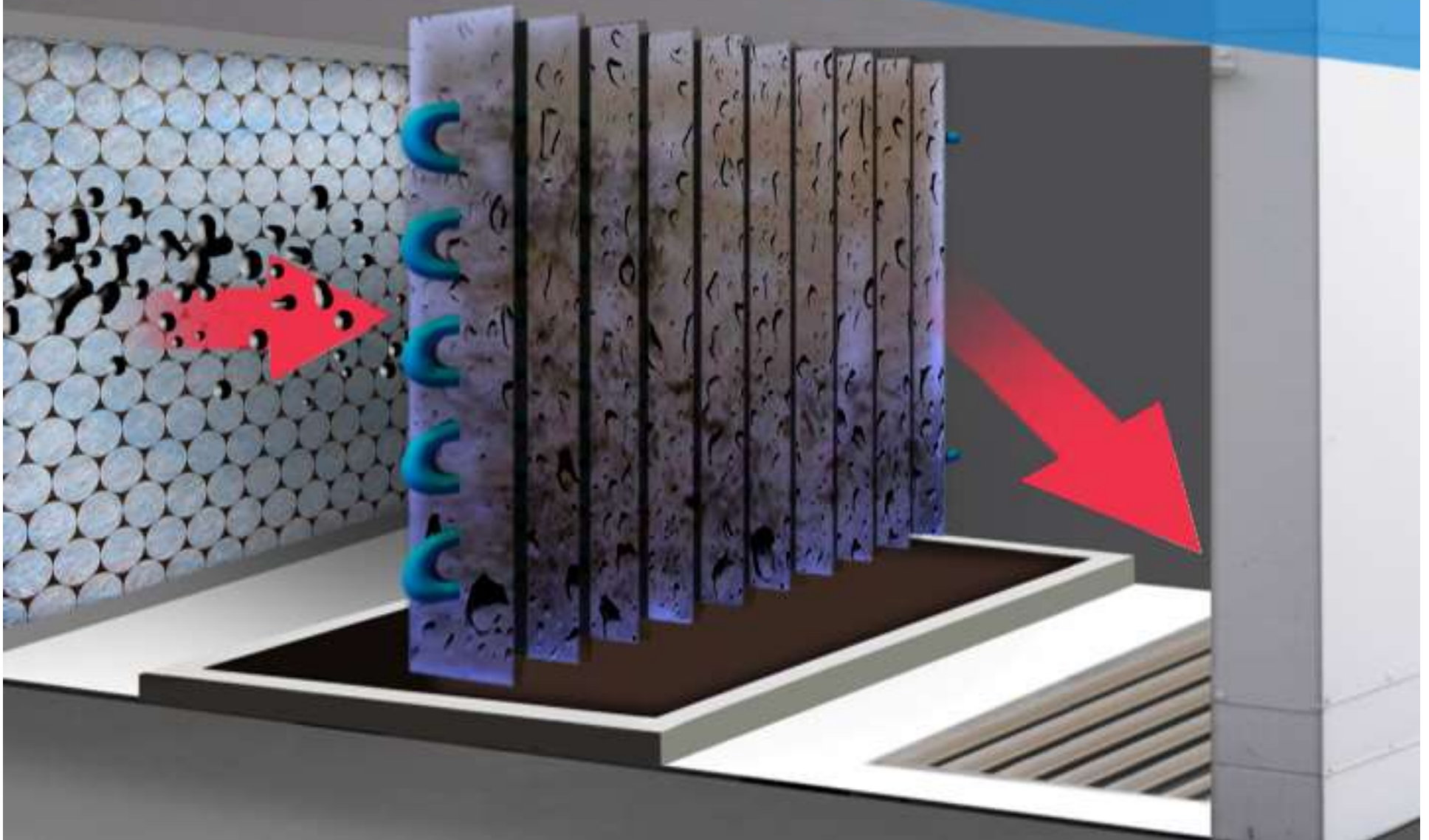




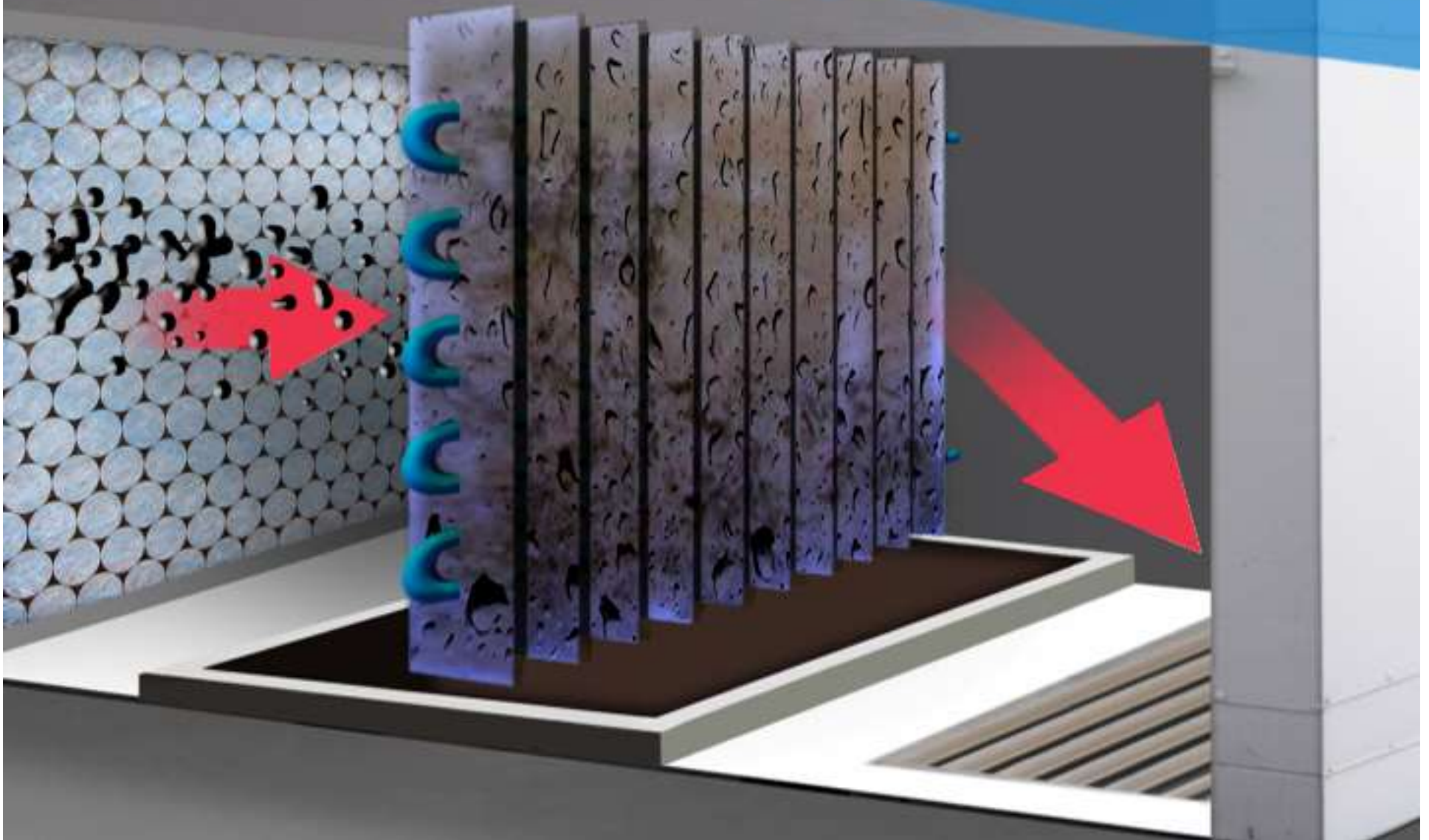
MOISTURE ON COIL



DIRT ON COIL



***DIRT COMBINING WITH
MOISTURE ON COIL***



Mold Growing in AC Coil



Biofilms

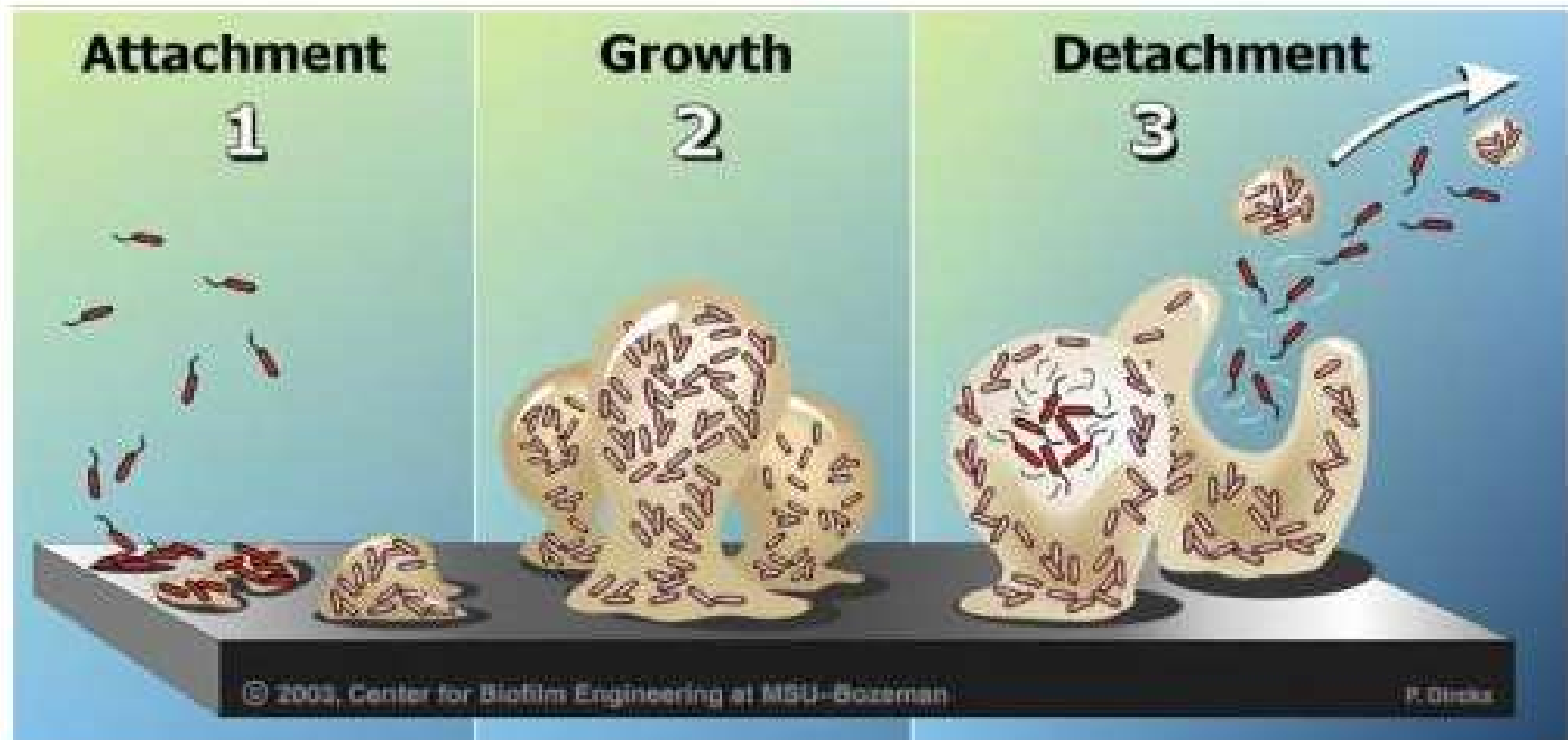
- Biofilms are composed of different microorganisms adhering to surfaces producing a matrix composed of polysaccharides, proteins and nucleic acids.
- This material allows the biofilm to stick together and develop attached communities.
- Biofilms will form anywhere water is present and are typically attached to all untreated HVAC coils and drain pans.
- Life in a biofilm imparts protection from penetration of outside forces such as antimicrobial agents and offers cross species genetic transfer to enhance survival

Biofilm Effects on HVAC Coils, Drain Pans & Filters

- Insulator
 - Reducing heat exchange efficiency
- Airflow obstruction
- Reservoir and “Amplification Device “for pathogens
- Aerosol generator
- Pathogen aerosol transmitter

Biofilm Formation

Biofilm formation in 3 steps



Typical Microbiology of HVAC Biofilm

- Over 50 hospitals and facilities
 - 17 states
- Over 500 HVAC Systems
- ICU & Operating Suites
 - Over 3,500 cultures

Selected Six Hospitals for HAI Study

- (1) New York, (1) Michigan, (2) Pennsylvania & (2) Washington DC
- Total of 13 HVAC systems surfaces cultured for presence microorganisms
- All HVAC systems served critical care patient environments
- Air supply & return diffusers cultured for presence microorganisms
- Microorganism sample were collected pre-UVGI and 90 day post-UVGI installation

HVAC Biofilm- Typical *Fungi* Cultured

Fungi	HVAC System Cooling Coils & Final Filters	Supply and Return Air Diffusers
Candida spp.[†]	•	•
Aspergillus spp	•	•
Aspergillus niger	•	
Aspergillus wentii	•	
Penicillium spp.	•	•
Fusarium spp.	•	
Cladosporium spp.	•	•
Alternaria spp.	•	•
Epicoccum spp.	•	•
Epicoccum nigrum	•	•
Cryptococcus spp.	•	
Aureobasidium spp.	•	
Aureobasidium pullulans	•	
Basidiomycetes spp.	•	
Acremonium spp.	•	
Rhodotorula spp.	•	
Chaetomium spp.	•	•
Stachybotrys spp.	•	•
Stachybotrys chartarum	•	
Ulocladium	•	
Verticillium	•	

HVAC Biofilm - Typical *Bacteria* Cultured

Microorganisms	HVAC System Cooling Coils & Final Filters	Supply and Return Air Diffusers
Gram-negative		
(1) <i>Pseudomonas</i> spp [†]	•	•
<i>Pseudomonas aeruginosa</i>	•	•
<i>Stenotrophomonas</i> spp.	•	•
<i>Acinetobacter</i> spp.	•	•
<i>Klebsiella</i> spp.	•	•
<i>Serratia</i> spp.	•	•
<i>Enterobacter</i> spp.	•	
<i>Enterobacter cloace</i>	•	
<i>Escherichia coli</i>	•	•
<i>Corynebacterium</i> spp.	•	
<i>Comamonas</i> spp.	•	
Gram-positive		
<i>Enterococcus</i> spp.	•	•
(1) <i>Staphylococcus aureus</i>	•	•
CONS*	•	•
<i>Micrococcus</i> spp.	•	•
<i>Streptococcus</i> spp.	•	•
<i>Bacillus</i> spp.	•	•

Women & Children's Hospital of Buffalo (WCHOB)

- Neonatal Intensive Care Unit
- Ventilator Associated Pneumonia
- Highest at Risk Patient
- Infants < 30 Weeks Gestational Age
- Ventilator Support > 2 weeks
- Span of study – 2.5 years
- Presented at S.H.E.A. 2007 Conference
- Presented at PAS 2007 Conference
- Published in *Journal of Perinatology*, Spring 2011

Microorganisms Cultured from NICU Environments

WCHOB

Microorganism	Remote HVAC	NICU Environment						Outdoor Air	Infants' Tracheas
		Ceiling Diffusers	Linen Hamper	Diaper Weigh	Work Stations	Sinks	NICU Air		
Pseudomonas	♦	♦	♦	♦		♦			♦
Stenotrophomonas	♦	♦	♦	♦		♦			♦
Acinetobacter	♦	♦	♦	♦	♦	♦			♦
Klebsiella	♦	♦		♦	♦	♦			♦
Serratia	♦		♦	♦	♦	♦			♦
Staph Aureus	♦	♦	♦	♦	♦		♦	♦	♦
CONS	♦			♦		♦	♦		♦
Streptococcus	♦	♦					♦		♦
Yeast	♦	♦		♦		♦	♦		♦
Enterobacter		♦		♦	♦	♦			♦
E. Coli				♦	♦				♦
Enterococcus				♦	♦				♦
Aspergillus		♦	♦	♦	♦	♦	♦	♦	♦
Bacillus	♦	♦	♦	♦	♦	♦	♦	♦	
Flavomonas	♦	♦			♦	♦	♦		
Penicillium	♦	♦	♦	♦	♦	♦	♦	♦	
Corynebact	♦	♦	♦	♦	♦	♦	♦	♦	
Comomonas	♦			♦	♦	♦			
Cladosporidium	♦	♦				♦	♦	♦	
Alternaria	♦	♦		♦	♦		♦	♦	
Citrobacter				♦	♦				

GUH

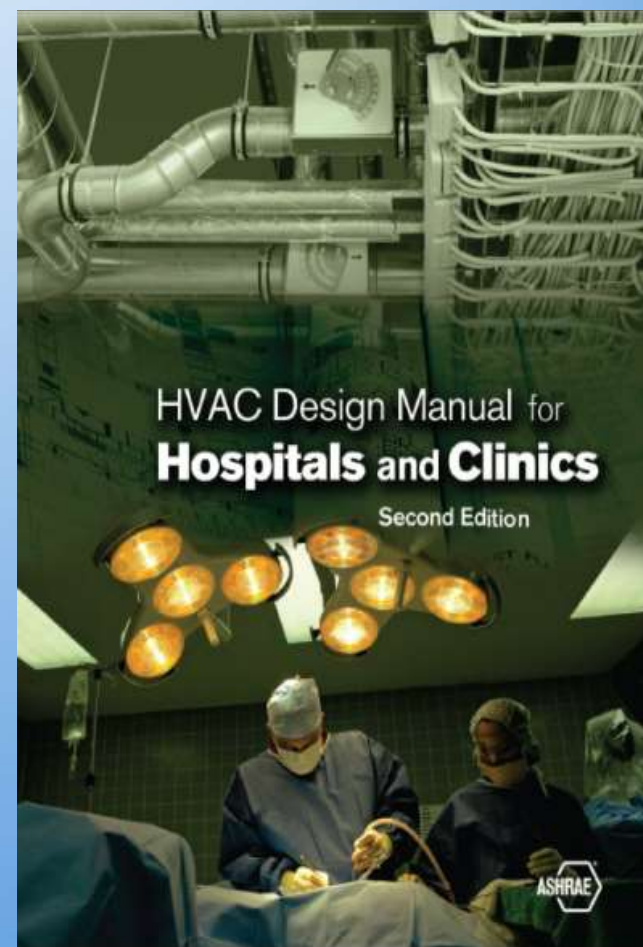
Microorganisms	HVAC	SA Grilles	RA Grilles	Sinks	Pee Scale	Infants
Pseudomonas	X		X	X		
Stenotrophomonas						
Acinetobacter	X		X	X	X	
Klebsiella			X	X	X	
Syaphylococcus	X	X				
Bacillus	X	X	X	X		
Penicillium	X	X	X	X		
Corynebacterium	X		X	X		
Alternaria	X					
Aspergillus	X					
Cladosporium	X			X		
Yeast	X			X		
Aeomonas				X		
Enterococcus			X			
Enterobacter			X	X		
Pantoea			X	X		
Paecilomyces				X		
Fusarium				X		
Chaetomium	X					
Citrobacter				X		
Raoultella				X	X	

Role of HVAC in Airborne Infection Control

ASHRAE Section 2.2

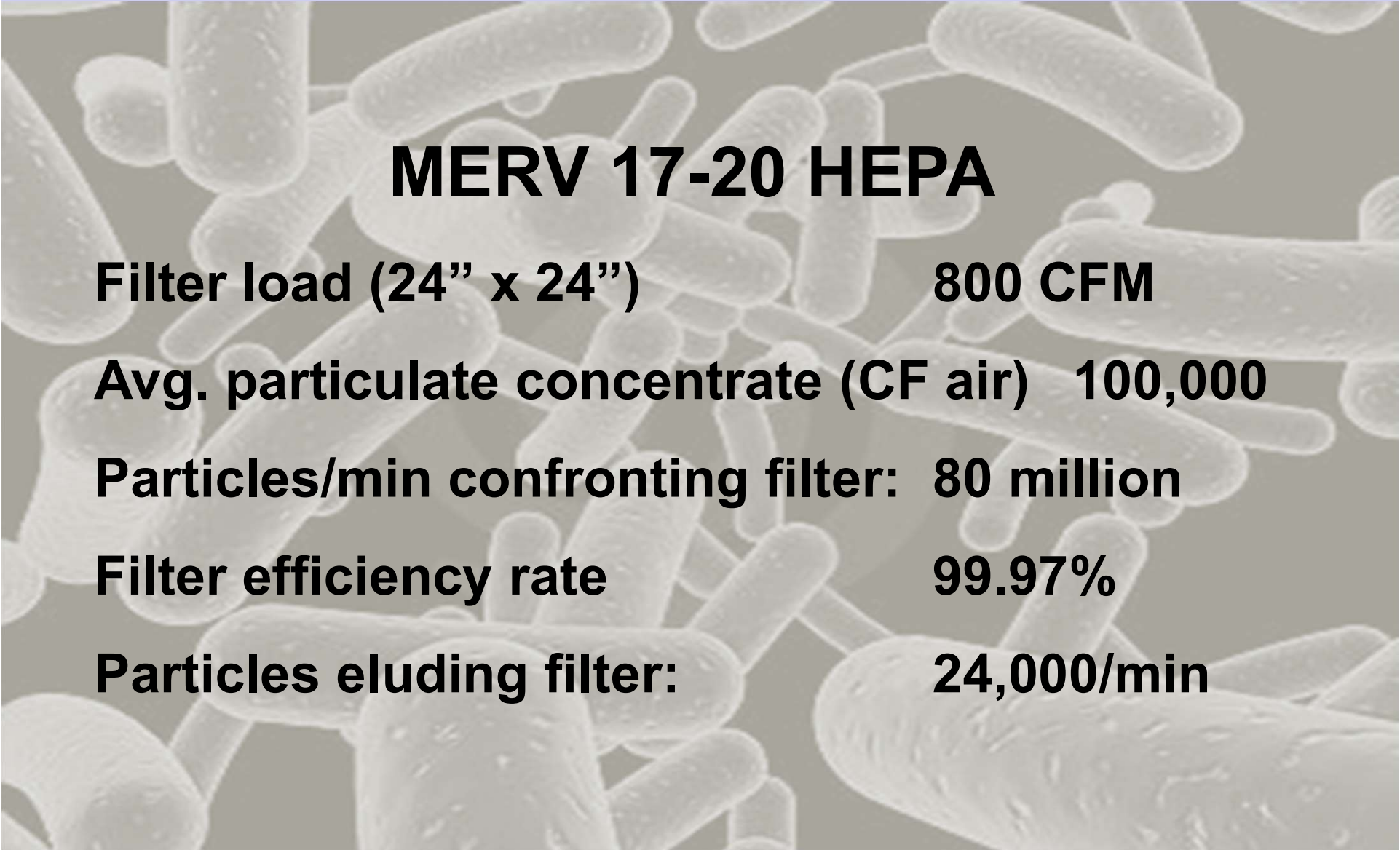
Infection Control

- Dilution (by ventilation)
- Air quality (by filtration)
- Exposure time (by air change)
- Temperature/humidity
- Organism viability
(by ultraviolet treatment- UVGI)
- Airflow patterns



How effective is a HEPA Filter

MERV 17-20 HEPA



Filter load (24" x 24")	800 CFM
Avg. particulate concentrate (CF air)	100,000
Particles/min confronting filter:	80 million
Filter efficiency rate	99.97%
Particles eluding filter:	24,000/min



**34,560,000
particles**

MICRO-ORGANISM BASICS

*How big are they?
Small enough to go through the filters!*

Mold: 1 to 5+ Microns

Bacteria: 0.5 to 4 Microns

**Viruses: 10 to 750 Millimicrons
(1000th of a Micron)**

A Micron is 1 / 25,400 of an inch!

How Quickly do Microorganisms Replicate?



Doubles every
20 minutes



Every 2-6 hours
Species specific

MICRO-ORGANISM BASICS

How fast do bacteria multiply?

Under ideal conditions, bacteria and viruses may double every 20 minutes.

Therefore in one day the formula becomes 2^n so that in 24 hrs we have 2^{72} or approximately 7×10^{13} or :

70 TRILLION ORGANISMS!



MICRO-ORGANISM BASICS

Mold multiplies a little slower (every 6 hours)

**It takes 18 days to get
70 TRILLION MOLD ORGANISMS!**

EPA Critical Assessment of Building Air Cleaner Technologies

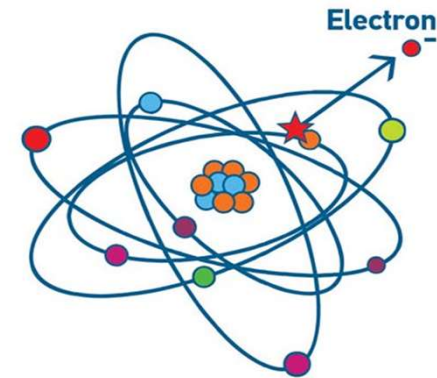
***Ionization and Oxidation** (ESP) testing conditions (either environmental or equipment operation such as field strength) **are not standardized**.

*Mainelis et al. (2002c) demonstrated that **about 70% of robust organisms and 20% of vegetative organisms can be recovered unharmed** using an ESP as a collection device.

***ESP devices form ozone**, and to a lesser extent, other oxygen and nitrogen by-products. In fact, though negative polarity corona results in more advantageous operation, much more ozone is produced than with positive corona, as much as 5 to 6 times as much.

*Accumulation of **charged dust particles** will result in **significantly increased deposition on indoor surfaces** (Grabarczyk, 2001). These effects are **more significant with whole-room ionization technologies** that use devices that do not also collect the charged particulates.

CA EPA- Indoor Air Chemistry: Cleaning Agents, Ozone and Toxic Air Contaminants



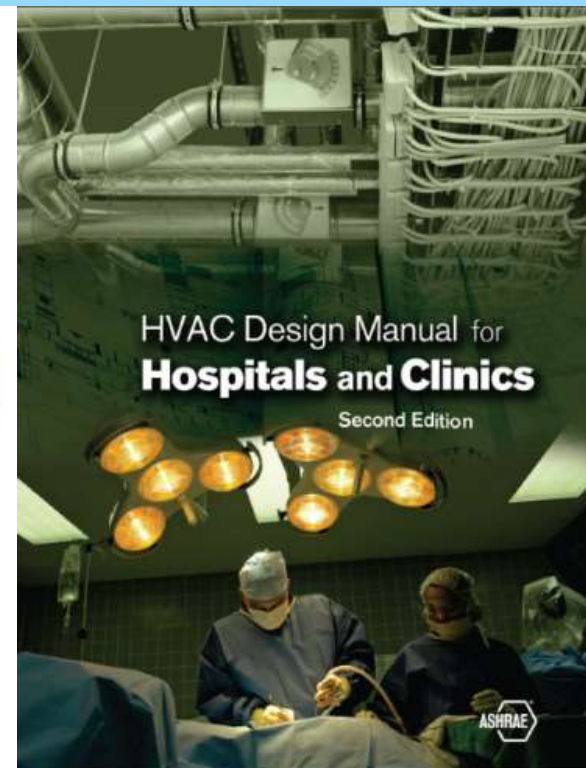
Biproductions of Ionization: Hydroxyl radicals and nitrate radicals are oxidants present indoors at sufficient concentrations to produce **significant quantities of secondary pollutants**.

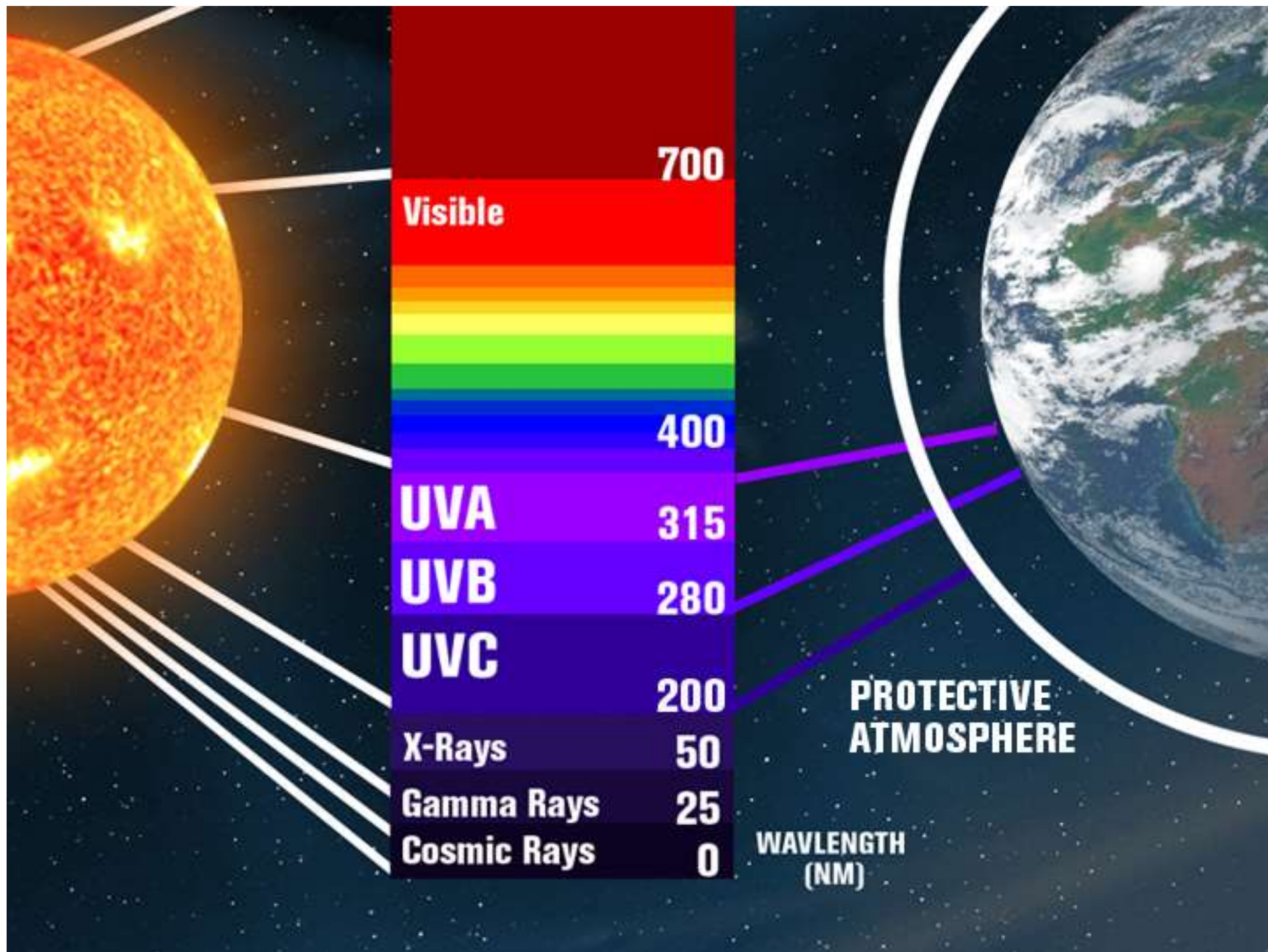
Air cleaning product constituents, especially terpenes and related compounds, can **react rapidly** not only with ozone, but also with the hydroxyl radical (OH) and with the nitrate radical (NO₃), all of which may be present in ionized indoor air. The chemistry **can generate a host of dangerous secondary pollutants**, some of which are stable and can be measured (such as formaldehyde).

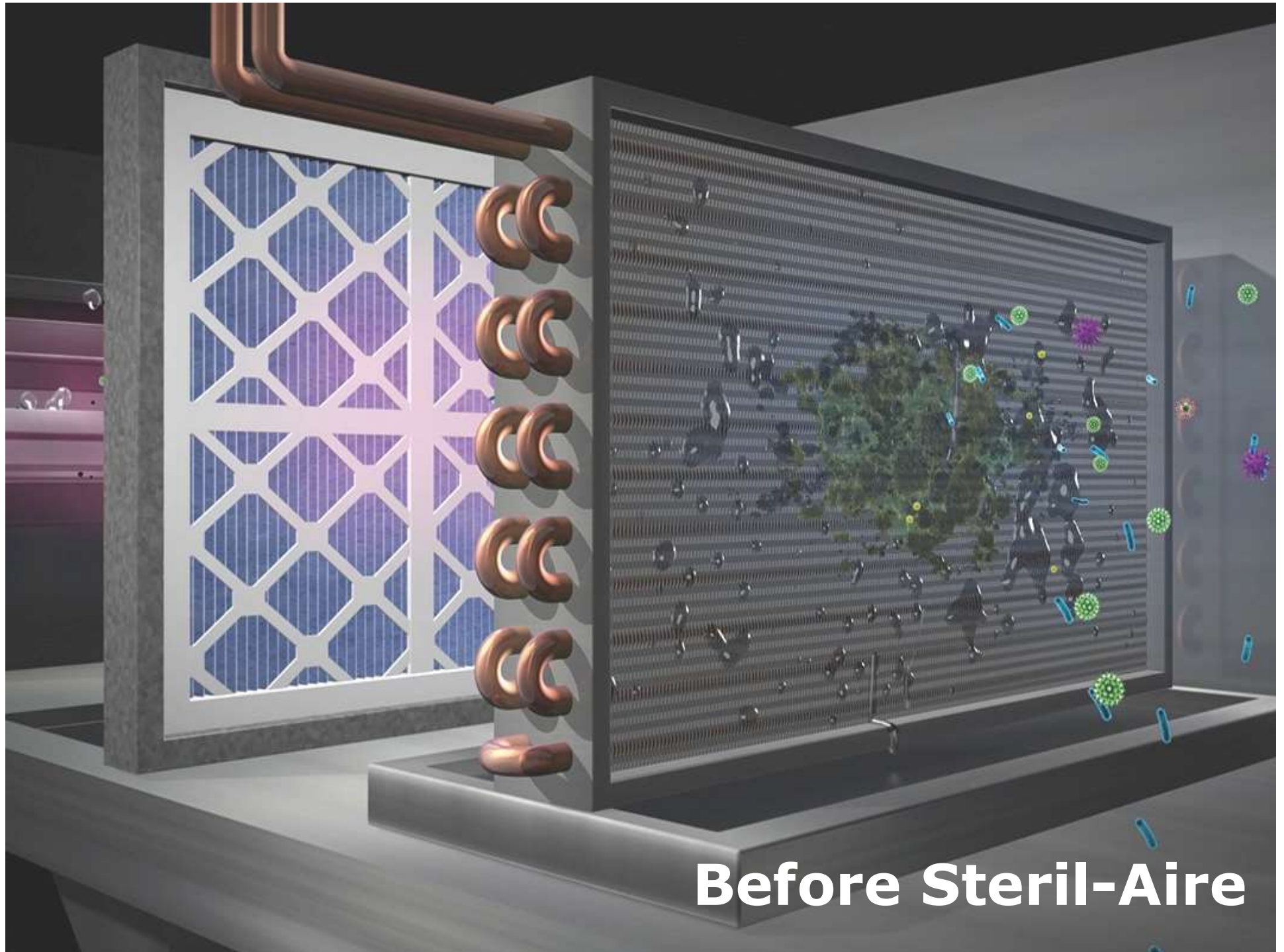
ASHRAE Design Manual

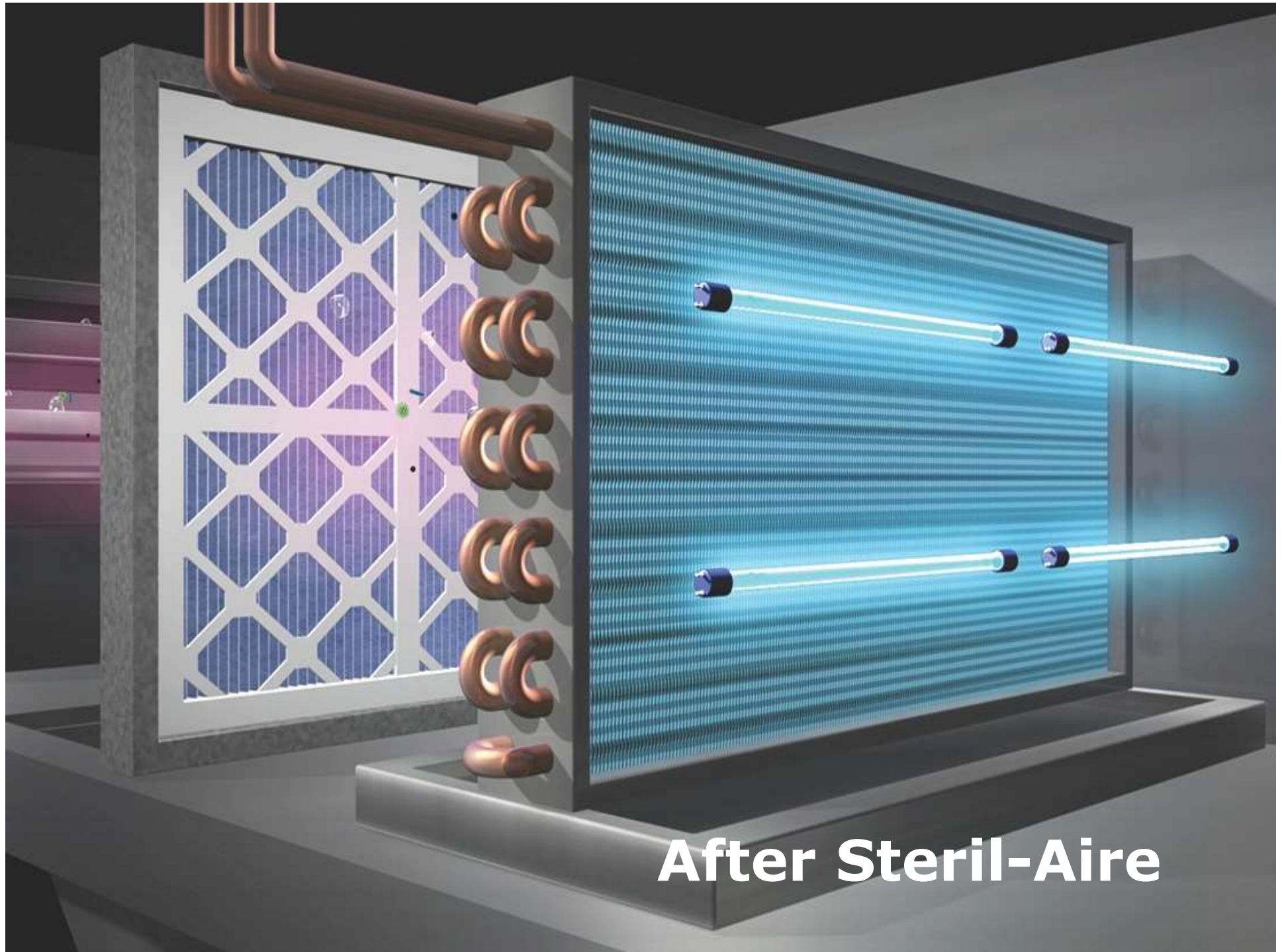
■ **Section 2.11: Ultraviolet Radiation**

- UVGI can be effective in reducing the virulence of microorganisms and therefore reducing infection rates









UVGI System Design Parameters

- Intent was to be at 99.9% at end of lamp life
- Minimum intensity across entire irradiated surface:
 - 1,225 $\mu\text{W}/\text{cm}^2$ - Initial
 - 735 $\mu\text{W}/\text{cm}^2$ after 12 months of continuous operation
- 99.9% Inactivation rate on specified microorganisms:
 - *Aspergillus niger* in less than 10 minutes
 - *Pseudomonas aeruginosa* less than 30 seconds

Inactivation Rate Examples (99.9%) End of Lamp Efficiency

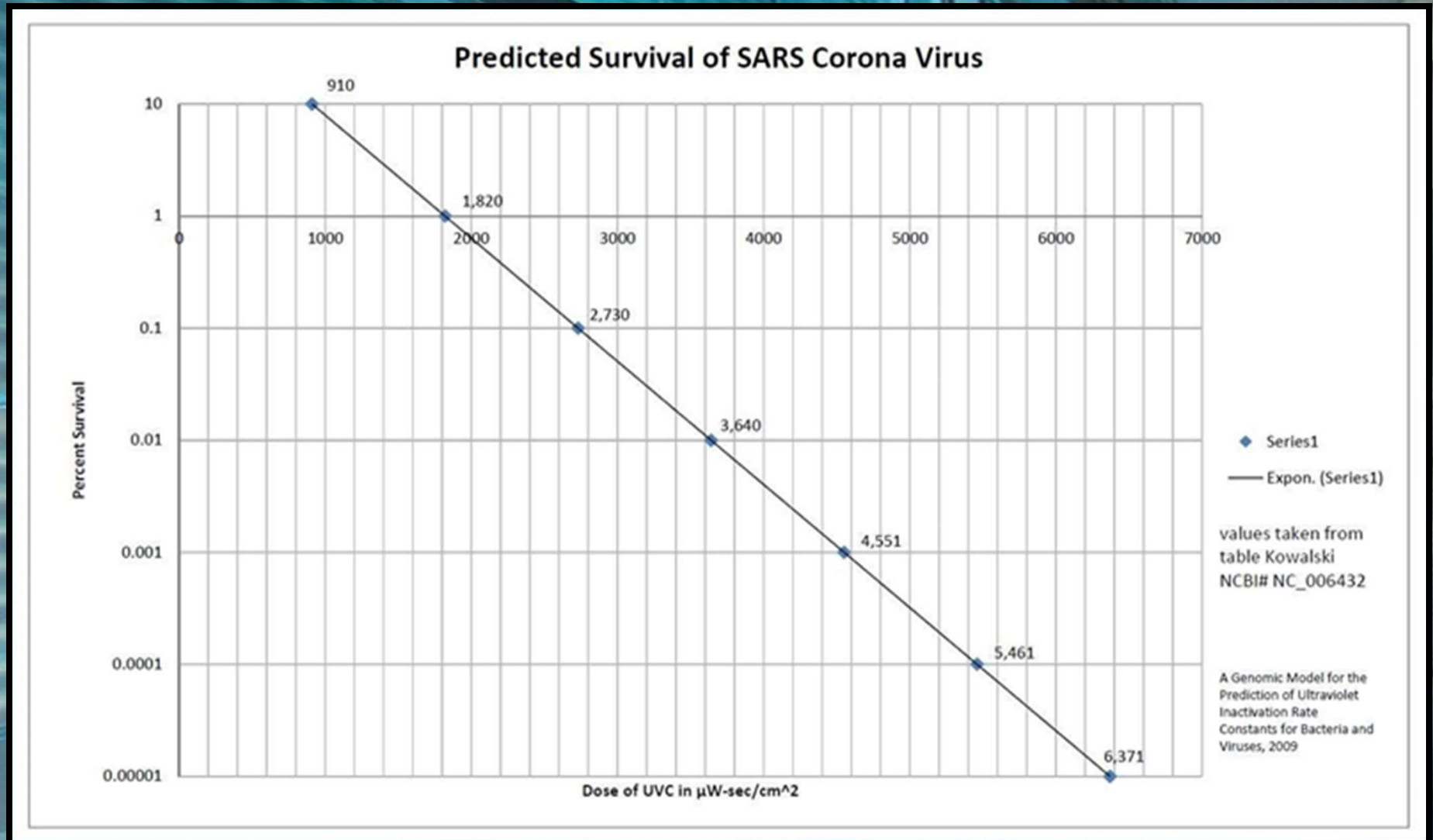
$\mu J = \text{Intensity } (\mu W/cm^2) \times \text{Time}$

Aspergillus niger - 406,338 $\mu J/cm^2$ (Required UVC dose for 99.9 inactivation) $\div 735 \mu W/cm^2 = 552$ Seconds (9.1 minutes)

Pseudomonas aeruginosa - 16,486 $\mu J/cm^2$ (Required UVC dose for 99.9 inactivation) $\div 735 \mu W/cm^2 = 22.4$ Seconds

Coronavirus (COVID19) - 6371 $\mu J/cm^2$ (Required UVC dose for 99.99999 inactivation) $\div 9,000 \mu W/cm^2$ Avg (fly-by) = 0.7 seconds

UVC Dosage to Disinfect COVID-19



DHS



EPA



RTI



U.S. HOMELAND SECURITY RESEARCH:

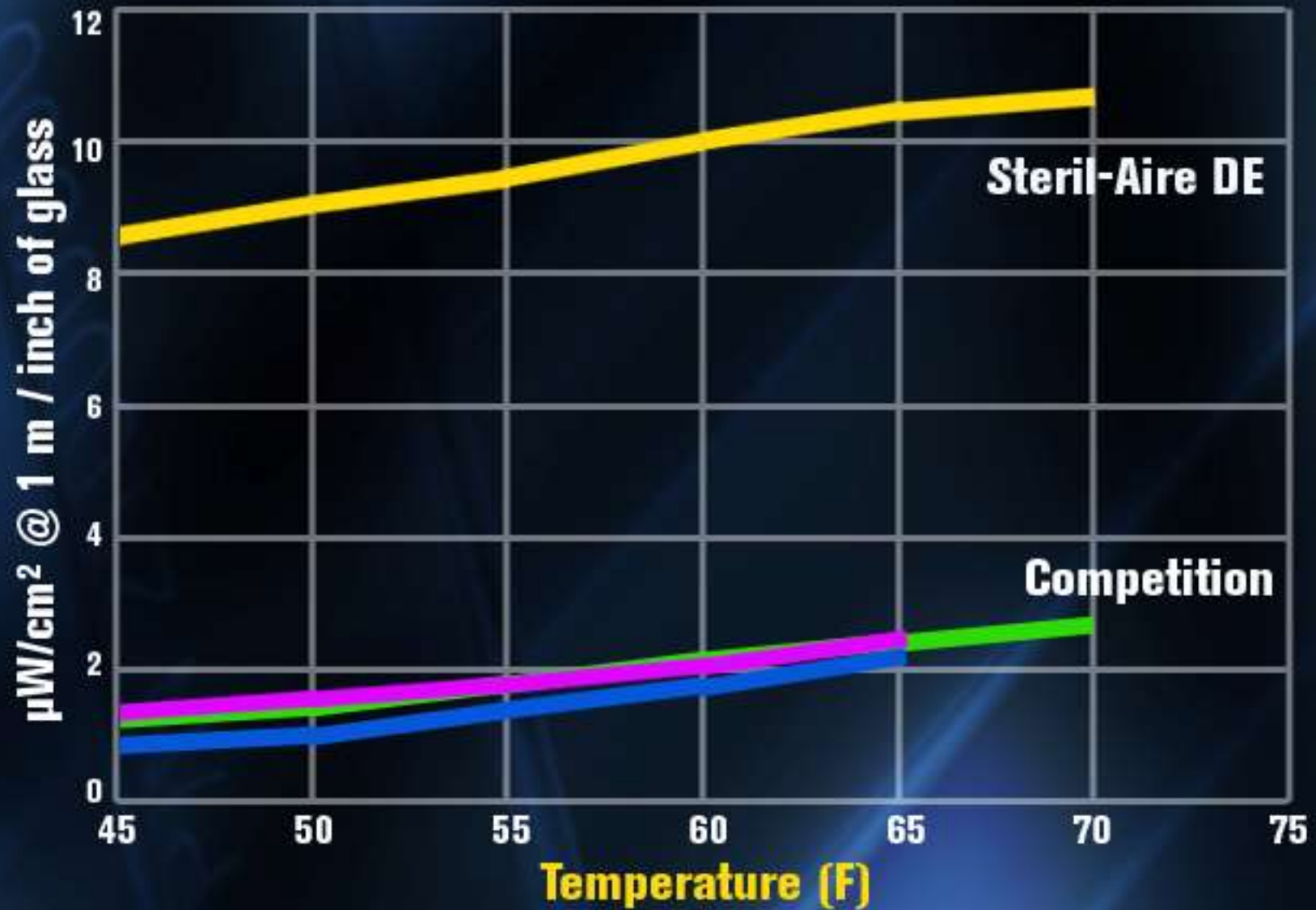
Homeland Security/EPA tests confirm that on average, Steril-Aire Emitters™ are, 6 times more effective than the tested competition lamps, on a Kill/Watt basis.

STERIL-AIRE
SANUVOX TECHNOLOGIES
ULTRAVIOLET DEVICES
NOVATRON
LUMALIER
DUST FREE
ATLANTIC UV
AMERICAN UV
ABRACAIR LLC



BIOLOGICAL INACTIVATION STUDY

Emitter/ UVC Lamp Energy Output



RAPID PRECISION TESTING LABS: DR ROBERT SAYRE TEST DATA

Results - Pre & Post UVGI Installation

Bacteria Reported HVAC and Air Diffusers

Sample Locations	Pre UVGI Installation	90 Day Post UVGI Installation
	Bacteria CFU/cm² Mean (SD)	Bacteria CFU/ cm² Mean (SD)
HVAC cooling coils, condensate drain pans & final filters	1,736,396 (1,348,668)	33.3 (115.5)
Patient care area supply and return diffusers	1,092,779 (1,313,629)	28.5 (40.3)

Hospital Environmental Microbial Samples

Pre & Post UVC Installation

Hospital Environment Location	Pre sample Bacteria CFU/sq. in. Mean (SD)	Pre sample Fungi CFU/sq. in. Mean (SD)	Post sample Bacteria CFU/sq. in. Mean (SD)	Post sample Fungi CFU/sq. in. Mean (SD)
HVAC Cooling Coils & Final Filters	1,255,877 (932,485.1)	85,657 (84,114.9)	125 (209.2)	1,919 (5,309.5)
Patient Care Units Supply Air & Return Diffusers	814,750 (1,149,402.1)	21,425 (30,158.1)	1,375 (1,944.5)	0 (0)

Peer Reviewed Published Study Women & Children's Hospital of Buffalo

\$25,000 investment

***\$800,000
savings***

50% VAP reduction

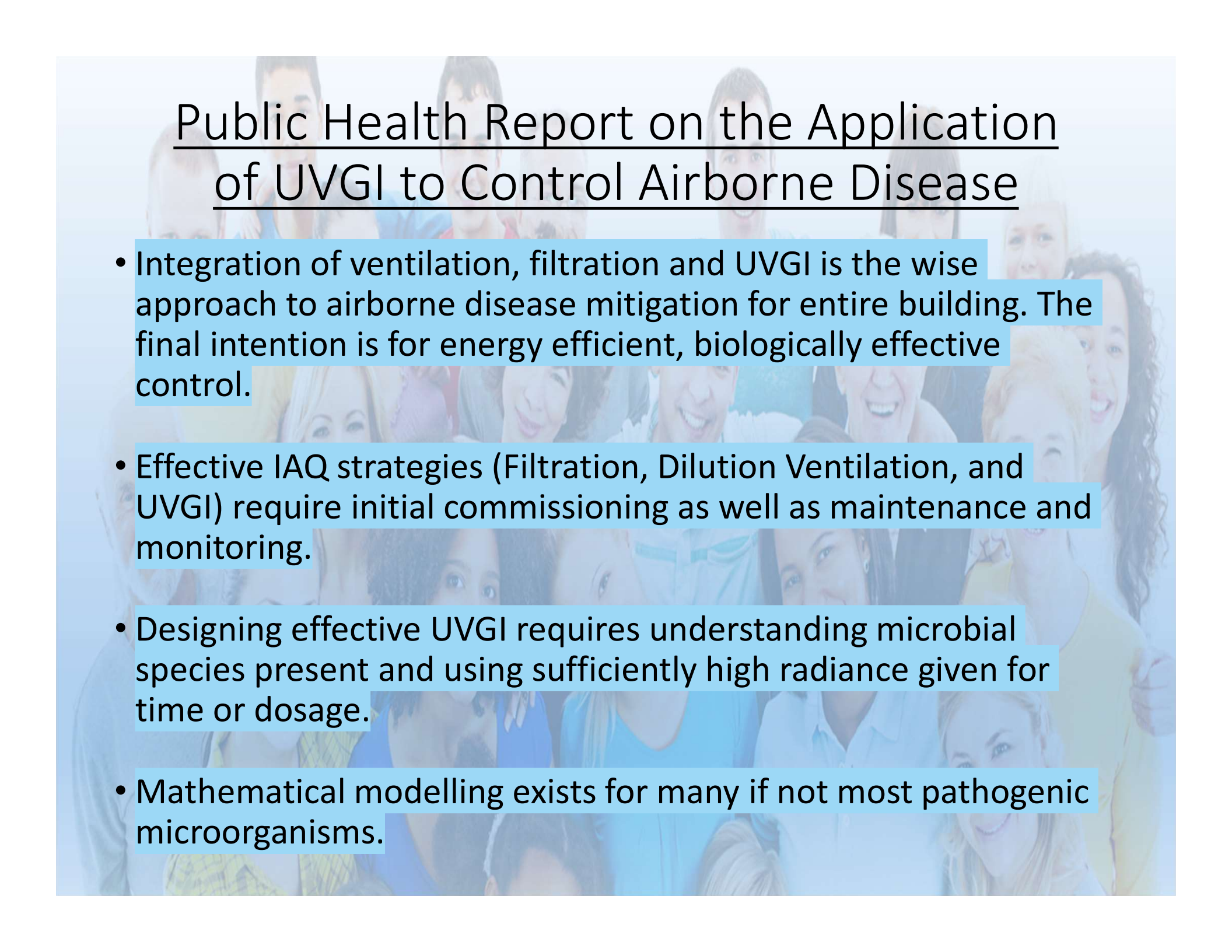
Reduced antimicrobial use

Reduced antimicrobial resistance

5 Log reduction environmental pathogen &
tracheal contamination

5 Log microbial load reduction per cm² HVAC coil in 6 days!

2 ½ year study
Published in *Journal of Perinatology* – Spring 2011

A background image showing a diverse group of people of various ages and ethnicities smiling and looking towards the camera. The image is slightly faded and serves as a backdrop for the text.

Public Health Report on the Application of UVGI to Control Airborne Disease

- Integration of ventilation, filtration and UVGI is the wise approach to airborne disease mitigation for entire building. The final intention is for energy efficient, biologically effective control.
- Effective IAQ strategies (Filtration, Dilution Ventilation, and UVGI) require initial commissioning as well as maintenance and monitoring.
- Designing effective UVGI requires understanding microbial species present and using sufficiently high radiance given for time or dosage.
- Mathematical modelling exists for many if not most pathogenic microorganisms.

HVAC Energy Facts



- HVAC uses 40- 60% of building energy
- Dirty coils use up to 30% more energy
- Environmental effect
- Increased costs

How Much Will Air-side Fin Fouling Cost ?

Fouling Thickness	Efficiency Loss
.006"	5.3%
.012"	10.8%
.024"	21.5%
.036"	32.2%

Microscopic levels of micro-organisms begin forming immediately after cleaning, rapidly multiply in volume, & have a major effect on HVAC system efficiency.

California Society for Healthcare Engineering Inc
May/June 1998 Vol. 28 No 3

Steril-Aire Energy Solutions

- Electrical energy savings up to 15%
 - Reduced fan, chiller and chiller pump use
-
- Clean coils improve
 - Heat transfer
 - Airflow
 - Compressor run time
 - Operational efficiency
 - Thermal comfort



UVC Independent Test Results

● BEFORE ▲ AFTER

COOLING COIL PRESSURE DROP (DX)



Measurements taken for 3 days 8/26-8/28 to establish the baseline.
The UVC Emitters™ were installed in the afternoon of 8/28

UVC Life Cycle Cost Savings

● BEFORE ▲ AFTER

SYSTEM AIR FLOW



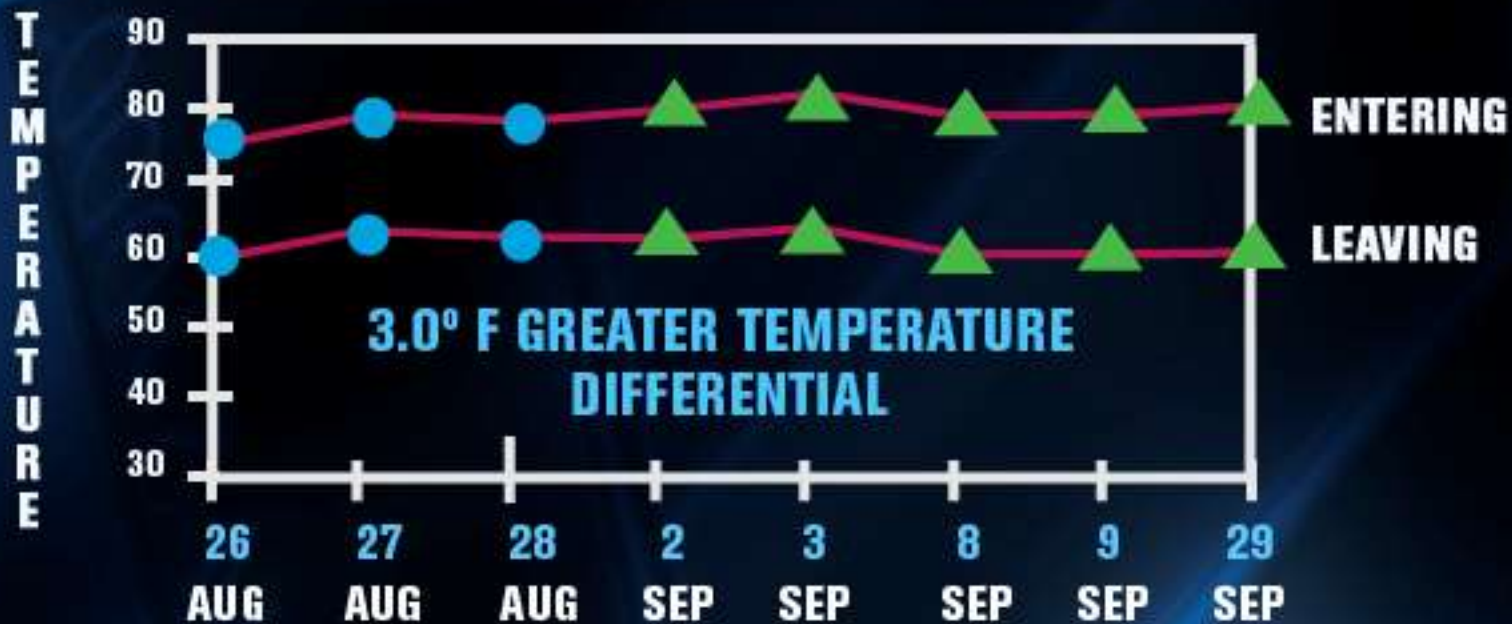
Measurements taken for 3 days 8/26-8/28 to establish the baseline.

The UVC Emitters™ were installed in the afternoon of 8/28/

UVC Life Cycle Cost Program

● BEFORE ▲ AFTER

DRY BULB TEMPERATURES

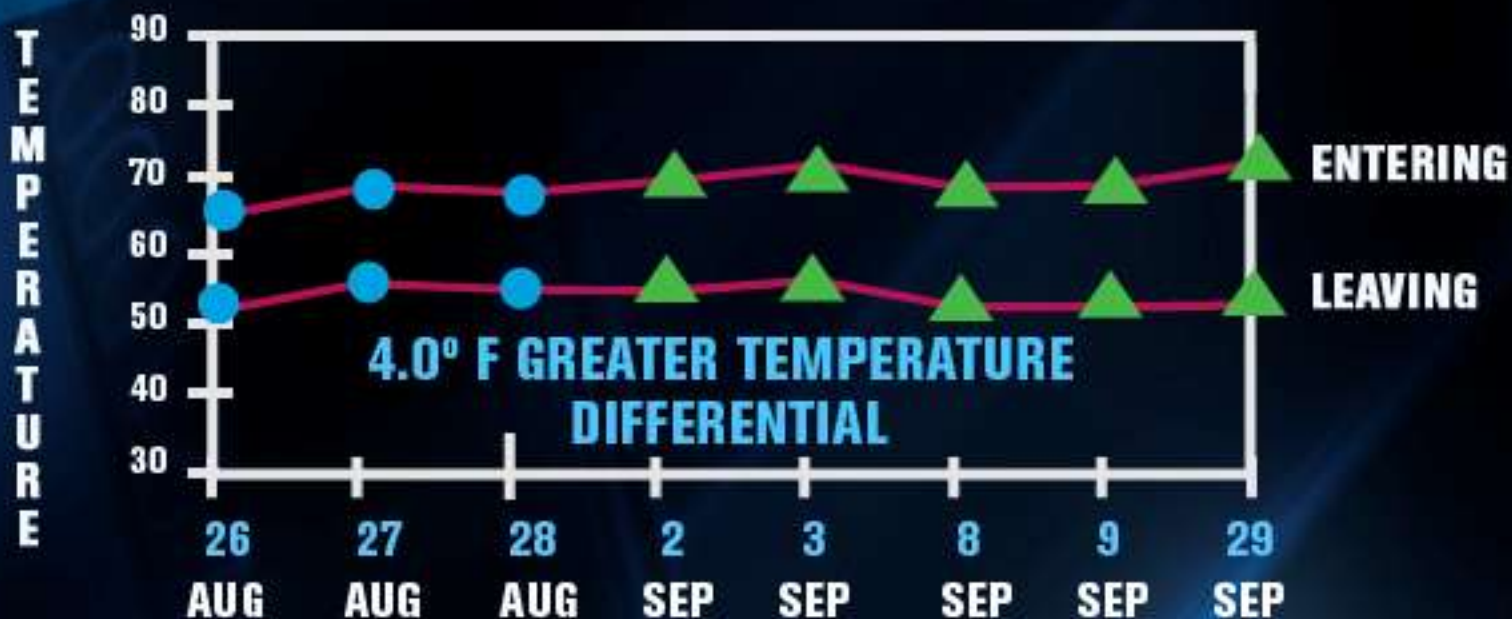


Measurements taken for 3 days 8/26-8/28 to establish the baseline.
The UVC Emitters™ were installed in the afternoon of 8/28

UVC Life Cycle Cost Program

● BEFORE ▲ AFTER

WET BULB TEMPERATURES



Measurements taken for 3 days 8/26-8/28 to establish the baseline.
The UVC Emitters™ were installed in the afternoon of 8/28

STERIL-AIRE UVC Cost Savings (Life Cycle) **Estimate Sheet**

Project Name: Example # 2

Location:

AHU Tagging:

Date: 17-Aug-04

Contact:

Engineer:

Contractor:

UVC Installation	Before	After
Date Sampled:	4-Jun-03	6-Aug-03
CFM-Measured or Selected (VAV)	25,000	28,750
Entering Air Temperature- Dry Bulb °F	80.0	79.0
Entering Air Temperature- Dry Bulb °F	67.0	66.0
Leaving Air Temperature- Dry Bulb °F	55.9	52.4
Leaving Air Temperature- Dry Bulb °F	54.6	51.9
Total Cooling capacity -Btuh	1,012,500	1,289,869
Sensible heat- btuh	650,700	825,930
Latent Heat - Btuh	361,800	463,939
Net Cooling Capacity Gain - Btuh	→	277,369

STERIL-AIRE UVC Cost Savings (Life Cycle) Estimate Sheet

Pressure Drop "Across Coil" 1.25 " WG

0.79 " WG

Pressure Drop Reduction 0.46 " WG

Pressure Drop BHP Reduction 3.468

EER: 7.0

Annual Operating Hours 2,500

Before

Energy Cost per kWh \$0.10

EER: 8.5

Annual Improvement (kWh cost) \$11,068

After

Annual Coil Cleaner & Biocide Cost \$2,000

Annual Coil Cleaning Labor Cost \$1,500

Annual Drain Pan Cleaner & biocide Cost \$500

Annual Drain Pan Labor Cost

Annual Maintenance Costs \$4,000

Total Annual Improvement \$15,068

STERIL-AIRE UVC Cost Savings (Life Cycle) Estimate Sheet

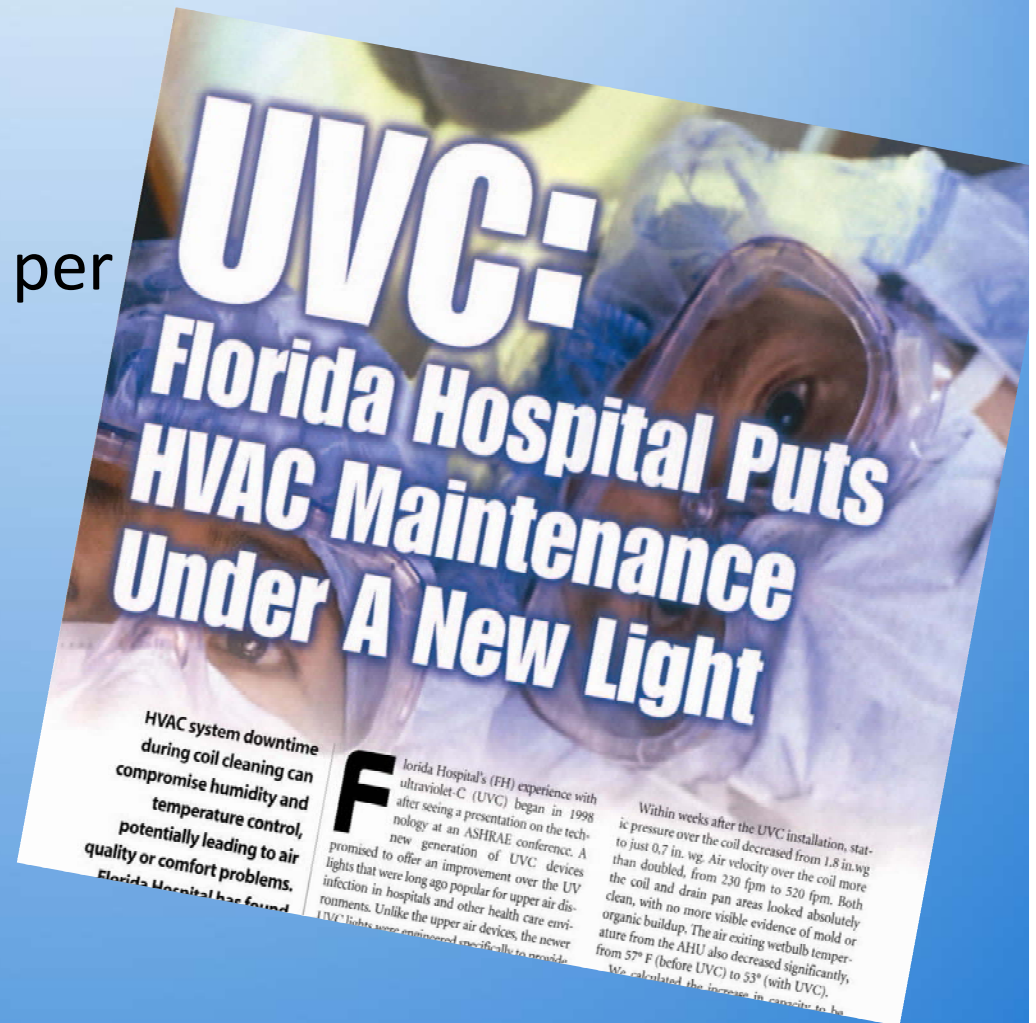
Installation Costs	1st Year	2nd Year	3rd Year	4th Year
Number of Fixtures	15			
Average Fixture Cost Each	500.00			
Installation Labor Cost	1,200.00			
Fixture(s) Annual Energy Cost (8760 hrs)	982.22	982.22	982.22	982.22
Emitter Replacement Cost (each)		85.00	85.00	85.00
Annual Emitter Replacement Cost		1,275.00	1,275.00	1,275.00
Total Installed & Operating Cost	\$9,682.22	\$2,257.22	\$2,257.22	\$2,257.22
Annual Improvement (Less Costs)	\$5,386	\$12,811	\$12,811	\$12,811
Estimated Return (years)	0.643			
Cumulative Improvement	\$5,386	\$18,197	\$31,008	\$43,819



- **Installed Steril-Aire UVC on the downstream side of Fan 67's cooling coil**
- **Performed same air handler independent tests 60 days after Steril-Aire UVC install**
- **Results:**
 - **992 CFM Gain**
 - **0.07" WG Static Pressure Reduction**
 - **Net Cooling Capacity: 208% BTU Gain**
 - **ESTIMATED 1st YEAR NET SAVINGS: \$4,639**
 - **ROI: 8 MONTHS**

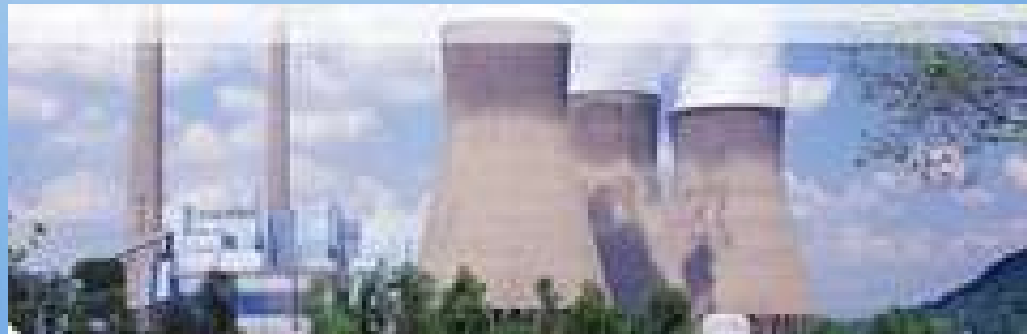
Florida Hospital Orlando, FL

\$237,500 energy savings per year



American Electric Power Dallas, TX

- 2,635,740 total kWh savings
- \$139,000 annual energy savings

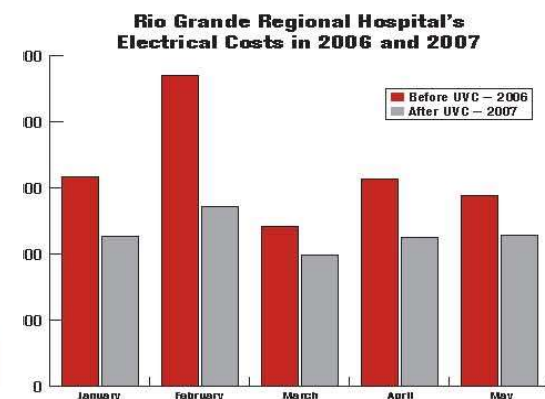


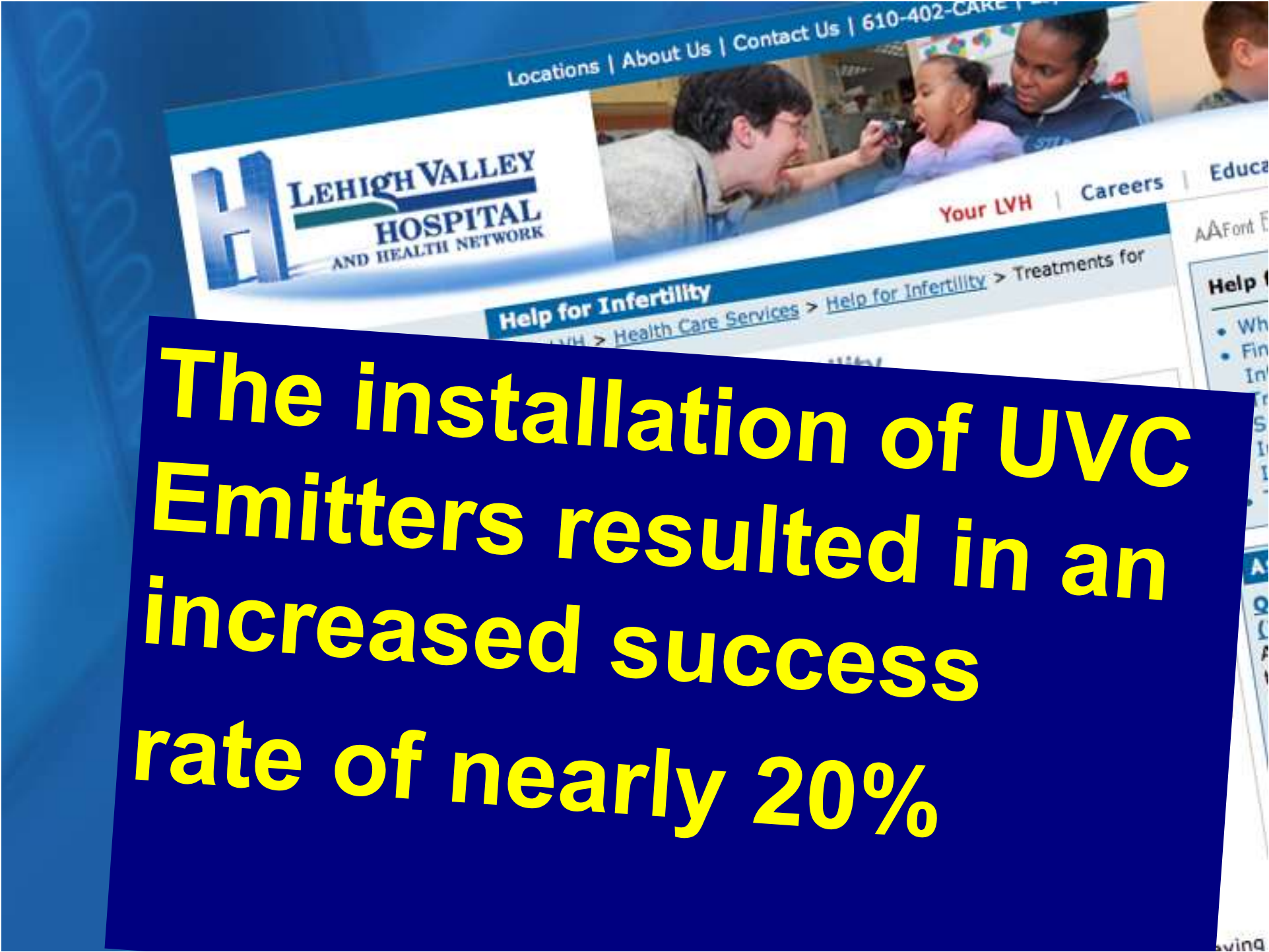
Rio Grande Regional Hospital McAllen, TX

- **\$500,000** annual energy savings
- 2 chillers taken off-line

Rio Grande Regional Hospital – McAllen, Texas Utility Savings with UVC			
Month	2006 Utility Cost <i>Before UVC</i>	2007 Utility Cost <i>After UVC</i>	Savings
January	\$158,790	\$113,294	\$45,496 (28.7%)
February	235,547	136,019	99,528 (42.3%)
March	120,616	98,866	21,750 (18.2%)
April	156,919	112,892	44,027 (28.1%)
May	144,383	114,299	30,084 (20.8%)
Total	\$816,255	\$575,370	\$240,885 (29.5%)

This chart shows the breakdown of utility cost savings achieved at Rio Grande Hospital after it installed UVC lights in the hospital's air-handling units.
(Information provided by Steril-Aire.)



A screenshot of the Lehigh Valley Hospital website. The header features the hospital's logo and navigation links: 'Locations | About Us | Contact Us | 610-402-CARE'. Below the header is a banner image showing a doctor examining a young girl. The main navigation bar includes 'Your LVH', 'Careers', and 'Education'. A breadcrumb trail reads: 'Home > Health Care Services > Help for Infertility > Treatments for Infertility'. A large blue text box is overlaid on the lower half of the page.

**The installation of UVC
Emitters resulted in an
increased success
rate of nearly 20%**

Pierce County Jail Tacoma, WA

- Reduced energy use:
 - 34,102 & 39,491 therms natural gas
- \$55,000 annual savings
- Improved IAQ
- Reduced infections



CASE STUDY



UVC Goes to School

UVC Emitters™ enhance the hygiene, and reduce illness and absenteeism at a California preschool

BY ROGER STAMPER

At the Crescent Avenue Christian Preschool in Buena Park, Calif., director Marcia Sevilla is proud of their conscientious approach to health and hygiene.

"Illness prevention is a very high priority for us," Sevilla explains. "We have a book on germs that we review with the children, we talk about it a lot, and we're always making sure they wash their hands properly."

In addition to these traditional precautionary measures, this preschool uses another, more hi-tech tool for ensuring a healthy environment: ultraviolet-C, or UVC lights. Installed in the air-handling system. Since installing the lights in the summer of 2002, Sevilla reports an estimated 20 percent drop in absenteeism among students and a 50 percent drop among teachers.

"Last winter was an especially bad flu season for Southern California schools," Sevilla recalls. "I can say very confidently that throughout this season, our students and teachers have had some colds, but not the hounding fevers and flus that the other schools in our area have

consistently experienced."

Sevilla first learned about the UVC lights from a parent who had installed the devices in her home air-conditioning system in the hope of alleviating her young daughter's severe allergy-asthma symptoms. When she found that the lights were indeed effective, she suggested that Sevilla consider using the devices at the school.

UVC benefits

Ultraviolet C energy has a germicidal effect on all types of microbes, including bacteria, mold and even the tiniest of viruses, which are far too small to be captured by regular air filters. For many years, UV light has been used for water disinfection, but the older technology did not work effectively in air-handling systems.

The mid-1990s marked the arrival of a new-generation UVC device engineered specifically for hvac systems, capable of delivering the high output needed to perform in cold and moving air. By killing or deactivating a very high percentage of the infectious disease particles that

REDUCTION
IN ABSENTEEISM:

50% TEACHER
25% PUPIL

Iolani School Honolulu, HI

- 98.8% reduction in mold growth
- Elimination of odors
- Improved IAQ
- Improved teacher & student attendance
- \$8,000/yr maintenance savings
- Reduced energy costs

10 years of success!



Source: AHR the News, August 2006

York Quay Toronto, Canada

- 17 story, 2000 residents
- 1200 fan coil units
- Improved IAQ
- Mold remediation
- Equipment “like new”



Airline Terminals



George Bush Intercontinental Airport



Riviera
HOTEL & CASINO



HOTELS & CASINOS



FOUR SEASONS HOTEL
Los Angeles at Beverly Hills

Pacific Design Center West Hollywood, CA



Sammamish City Hall



the **NEWS**

Air Conditioning | Heating | Refrigeration

THE HVACR CONTRACTOR'S WEEKLY NEWSMAGAZINE SINCE 1926

DECEMBER 17, 2007

VISIT US ONLINE AT WWW.ACHRNEWS.COM

A **bnr** PUBLICATION

Installed UVC Earns LEED Credit

By B. Checket-Hanks
Of The NEWS Staff

SAMMAMISH, Wash. — As building owners become more interested in LEED (Leadership in Energy and Environmental Design) certification and saving energy in general, opportunities will continue to flourish for HVAC contractors who can provide energy-saving solutions. When those solutions also improve comfort and IAQ, they become even more attractive. In this case, the efficiency has been sustained thanks to...





Immediate gains of:

- Reduced energy costs
- Reduced hospital stays
- Reduced water costs
- Reduced nosocomial infections (HAI's)
- Reduced legal liability
- Elimination of a significant microorganism reservoir
- Extended Shelf-life for Food
- Reduced Food contamination

**ROI LESS THAN
ONE YEAR**



Emitters Vs Tubes

T12
Fluorescent Tube



STERIL-AIRE

T5
"Double Ended"
2 Pin, Emitter



Emitter Glass

High Quality Emitter Glass:
Crystal SiO₂
Transmits UVC Light

STERIL-AIRE

RIK

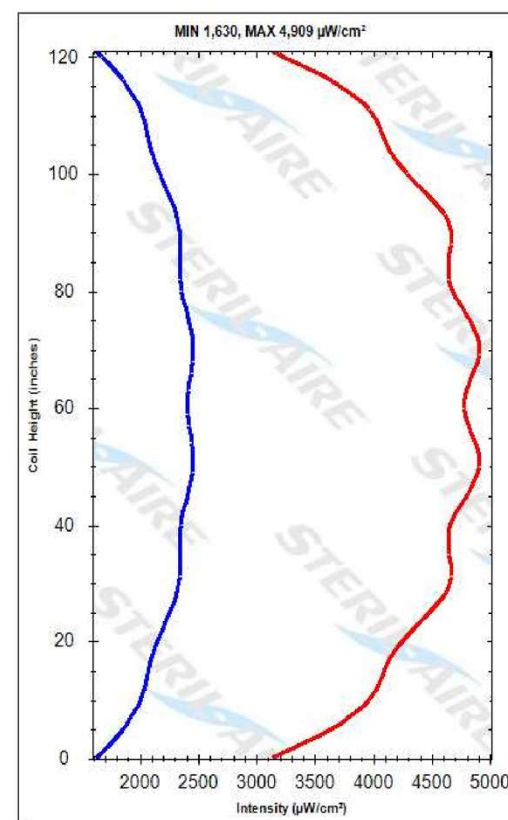
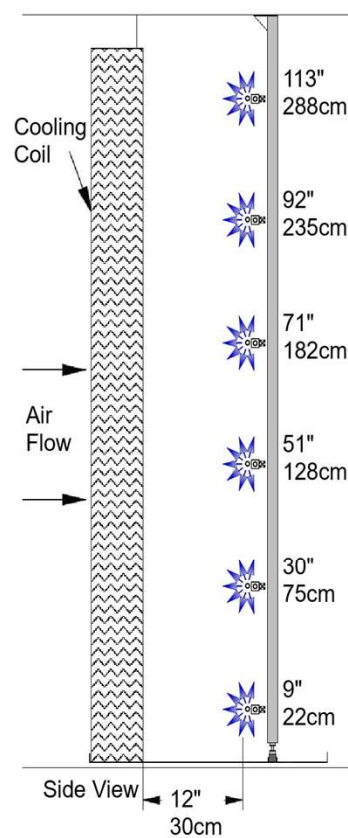
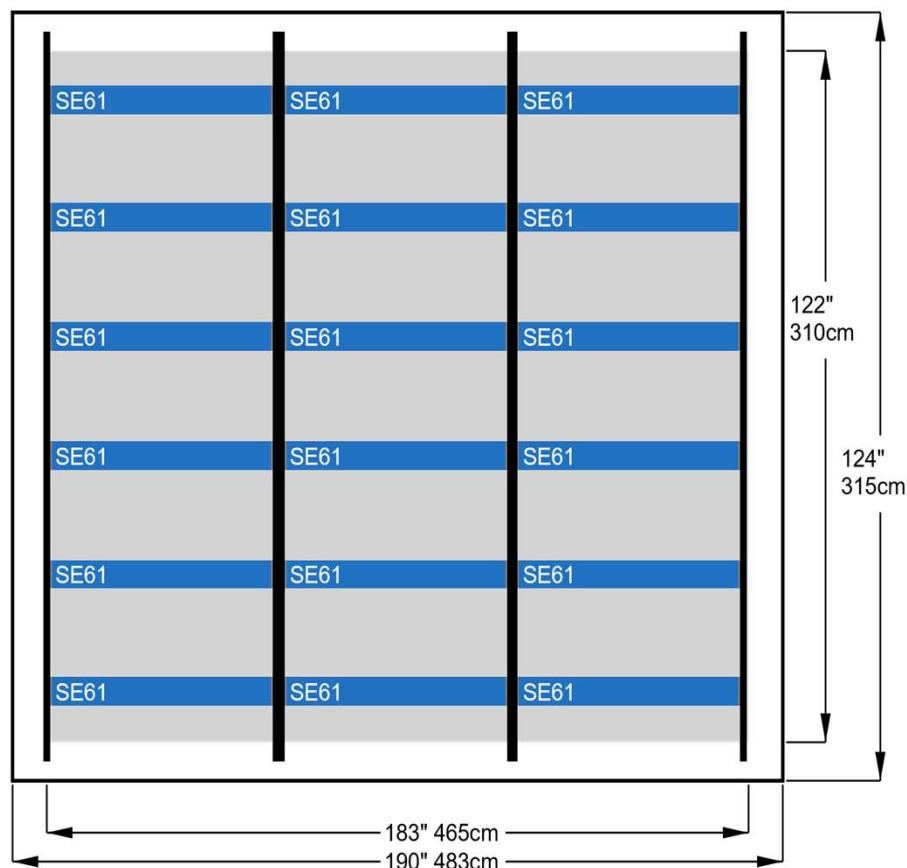
Rapid Install Kit

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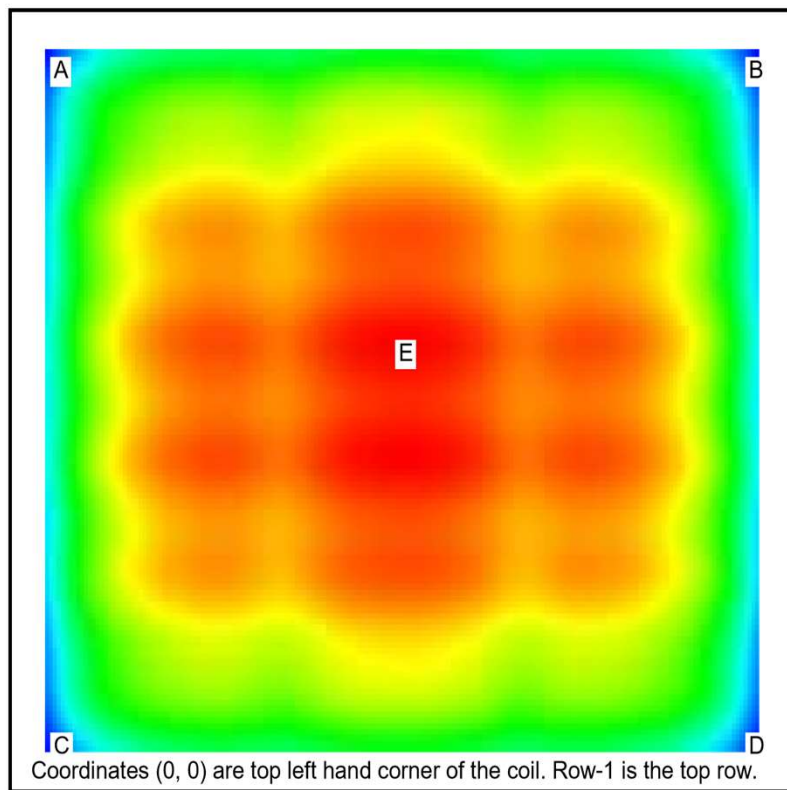
Steril-Aire Rapid Install Kit (RIK)

Available for coils with heights from 24" (60cms) to 180" (457cm) in 1 to 8 rows and Emitter tubes 24" (60cms) to 61" (155cms) wide. For coils wider than 61" (155cms) add additional RIKs.

Date: 2/16/2018	Contact:	Zip Code:
Company:	Address:	Email:
PO#:	City:	Tele:
Project Name:	State:	Rep: Josh Oelker
Project Number:	Country:	Rep Tele:
Notes:		



Date: 2/16/2018 Contact: Zip Code: Company: Address: Email: PO#: City: Tele: Project Name: State: Rep: Josh Oelker Project Number: Country: Rep Tele: Notes:



Item	Value/Location	Measured
Coil Distance	12" (30cm)	
Air Flow	400cfm	
Air Temp	55°F (13°C)	
ROW-1	113" (288cm)	
ROW-2	92" (235cm)	
ROW-3	71" (182cm)	
ROW-4	51" (128cm)	
ROW-5	30" (75cm)	
ROW-6	9" (22cm)	
A	1,893μW/cm² @ (2, 2")	
B	1,893μW/cm² @ (180, 2")	
C	1,893μW/cm² @ (2, 119")	
D	1,893μW/cm² @ (180, 119")	
E	4,909μW/cm² @ (90, 51")	

The following may cause measurements to be less than calculated:





STERIL-AIRE

THANK YOU!