

# Active Photocatalytic Oxidation Technology

## Partial Knowledge Base of Test Results as of 2012



UVAIRx products employ a proprietary enhancement to the established photocatalytic oxidation (PCO) technology developed more than 20 years ago. This *advanced* utilization of (PCO) technology is the foundation of UVAIRx instruments currently being used to clean air and surfaces. PCO has been proven to kill many bacteria, viruses, volatile organic compounds (VOCs), molds, fungus and odors wherever they reside. This is in contrast to some air purification systems dependent upon air flow passing through the unit or through filters. PCO technology has been proven both safe and effective in laboratory and industrial testing. PCO technology, similar to that used in UVAIRx products, has been licensed for use in medical, food, military, residential, commercial, marine, and hospital applications. PCO products have been approved or registered by UL, ETL, FCC, TUV, CE and CSA. PCO is used by NASA on the International Space Station.

The following is a summary of some of the peer reviewed testing and studies performed by third party independent labs and universities of PCO technology, which is the technology that is used in UVAIRx products.

### Bacteria

**Methicillin-resistant Staphylococcus aureus (MRSA)** - Easily transmitted in a hospital environment and resistant



MRSA

to most *staphylococcus* antibiotics including oxacillin, penicillin, amoxicillin and methicillin, MRSA has only a few expensive treatment options and there are challenging side effects. From 1999 to 2005 the estimated number of MRSA related hospitalizations more than doubled, from 127,036 to 278,203 causing a national priority for disease control. In 2010 encouraging results from the Center for Disease Control indicates a 28% decrease in invasive (life threatening) MRSA infections in a hospital setting. Estimated cost of MRSA treatment in 2005 was \$3.2 billion to \$4.2 billion nationwide. <sup>(1)</sup>

**Effectiveness of Photocatalytic Oxidation Technology:** ~ 99.9% reduction in viability of MRSA was observed within 80 minutes of photocatalytic treatment. <sup>(2)</sup>

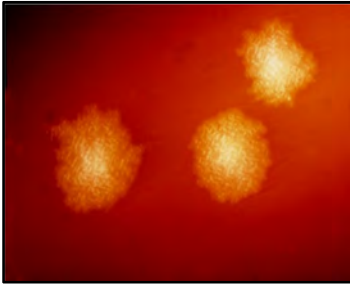
**Staphylococcus aureus** - *S. aureus* can cause a range of illnesses, from minor skin infections such as pimples, impetigo, boils (furuncles), cellulitis folliculitis, carbuncles, scalded skin syndrome and abscesses to life-threatening diseases such as pneumonia, meningitis, osteomyelitis, endocarditis, toxic shock syndrome (TSS), bacteremia and sepsis. The systems it affects range from skin, soft tissue, respiratory, bone, joint, endovascular to wound infections. It is still one of the five most common causes of nosocomial infections and is often the cause of postsurgical wound infections. Each year, some 500,000 patients in American hospitals contract a staphylococcal infection.



S. aureus

**Effectiveness of Photocatalytic Oxidation Technology:** ~ 99.9% reduction in viability of Staphylococcus aureus was observed within 80 minutes of photocatalytic treatment. <sup>(3)</sup>

## Clostridium difficile (C. diff)



C. diff

*C. diff* is a bacterium that can cause symptoms ranging from diarrhea to life-threatening inflammation of the colon. *C. diff* most commonly affects older adults in hospitals or long term care facilities. In recent years, *C. diff* infections have become more frequent, more severe and more difficult to treat. While MRSA infection rates are decreasing in response to stepped-up prevention efforts within hospitals, infections caused by *C. diff* have increased each year since 2007. [Mayo Clinic Staff, 2010]

**Effectiveness of Photocatalytic Oxidation Technology:** ~ 99.9% reduction in viability of *C. diff* within 80 minutes of photocatalytic treatment. Complete surface inactivation was demonstrated and bacterial re-growth following photocatalytic treatment was not observed.<sup>(2)</sup>

## Listeria monocytogenes

Listeriosis is a serious infection usually caused by consuming food contaminated with *Listeria monocytogenes* and causes significant public health risks responsible for approximately 1,600 cases annually. Prior to 2011, the largest outbreak occurred in 2002, when 54 illnesses, 8 deaths, and 3 fetal deaths in 9 states were associated with consumption of contaminated turkey deli meat. The 2011 outbreak, caused by tainted cantaloupe, infected a total of 139 persons with any of the four outbreak-associated strains of *Listeria monocytogenes*. The outbreak spread over 28 states and resulted in 29 deaths.<sup>(4)</sup>



Listeria monocytogenes

**Effectiveness of Photocatalytic Oxidation Technology:** Testing on stainless steel surfaces using PCO resulted in ~ 99% microbial reductions.<sup>(3)</sup>

## Escherichia coli

*E. coli* consists of a large and diverse group of bacteria. Although most strains are harmless, other strains of *E. coli* can cause illnesses such as diarrhea, urinary tract infections, respiratory illness and pneumonia. In most cases of disease causing outbreaks, shiga toxins produced by *E. coli* are responsible. Recent multistate foodborne outbreaks include: Lebanon Bologna 2011, Hazelnuts 2011, Shredded Romaine Lettuce 2010, and Beef 2010, resulting in massive product recalls.<sup>(5)</sup>



E. coli

**Effectiveness of Photocatalytic Oxidation Technology:** Antibacterial activity of Ag doped TiO<sub>2</sub> showed ~ 99% deactivation of *E. coli*. The doped TiO<sub>2</sub> showed enhanced efficacy as opposed to the non-doped.<sup>(6)</sup>

## Group A Streptococci (GAS)

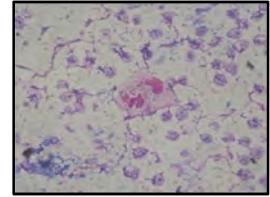


Group A streptococci

*GAS* is a bacterium often found in the throat and on the skin. People may carry *Group A Streptococci* and have no symptoms of illness. Most *GAS* infections are relatively mild illnesses such as "strep throat," or impetigo. Occasionally these bacteria can cause severe and even life-threatening diseases when bacteria get into parts of the body where they are not usually found, such as the blood, muscle, or the lungs. These infections are termed "invasive *GAS* disease". About 9,000-11,500 cases of invasive *GAS* disease occur each year in the United States, resulting in 1,000-1,800 deaths annually.<sup>(7)</sup>

**Effectiveness of Photocatalytic Oxidation Technology:** Testing on stainless steel surfaces using PCO resulted in ~ 96% microbial reductions.<sup>(3)</sup>

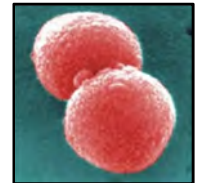
**Pseudomonas aeruginosa** - *P. aeruginosa* is an increasingly prevalent opportunistic human pathogen and the most common gram negative bacterium in nosocomial infections. *P. aeruginosa* is responsible for 16% of nosocomial pneumonia cases, 12% of nosocomial urinary tract infections, 8% of surgical wound infections, and 10% of bloodstream infections. <sup>(8)</sup>



Pseudomonas aeruginosa

**Effectiveness of Photocatalytic Oxidation Technology:** Testing on stainless steel surfaces using PCO resulted in ~ 99% microbial reductions. <sup>(3)</sup>

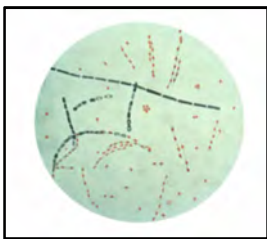
**Streptococcus pneumonia** – *S. pneumonia* typically enter the lung when airborne droplets are inhaled, but can enter through the bloodstream when there is an infection in another part of the body. There were 50,774 deaths in the US in 2009 attributed to pneumonia. It is estimated that up to 2.3% of all nursing home patients have pneumonia at any given time. <sup>(8)</sup>



Streptococcus pneumonia

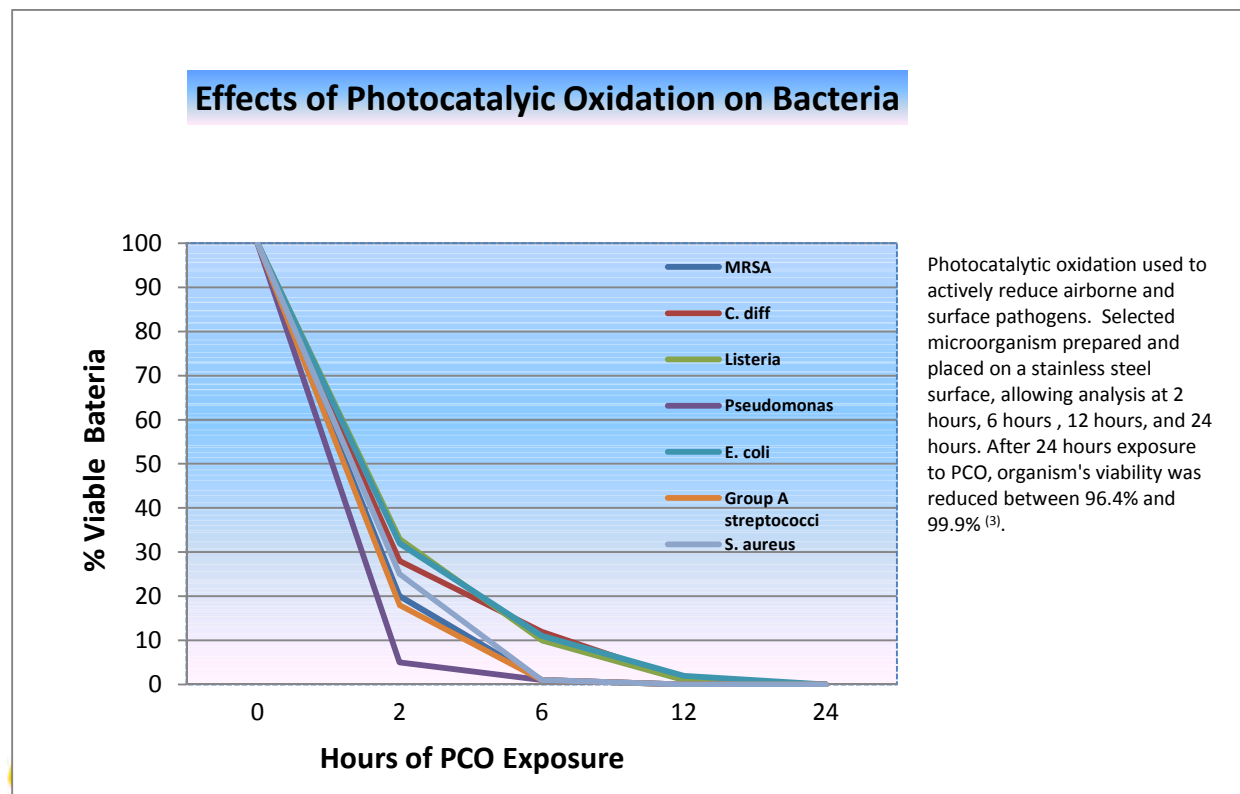
**Effectiveness of Photocatalytic Oxidation Technology:** Testing on stainless steel surfaces using PCO resulted in ~ 99% microbial reductions. <sup>(3)</sup>

**Bacillus anthracis** – *Anthrax* is an acute disease caused by *Bacillus anthracis*. Most forms of the disease are lethal and it affects both humans and other animals. *Anthrax* spores can be produced in vitro and used as a biological weapon. *Anthrax* is spread by spores of *B. anthracis*. These spores can be transported by clothing or shoes. The body of an animal that had active *Anthrax* at the time of death can be a source of *Anthrax* spores. A lethal infection is reported to result from inhalation of about 10,000 – 20,000 spores, though this dose varies among host species. Testing at the University of Cincinnati by Dr. Grinshpun used *Bacillus subtilis* as a surrogate.



Bacillus anthracis

**Effectiveness of Photocatalytic Oxidation Technology:** Deactivation of > 90% of microorganisms was achieved in less than 60 minutes, the majority of which occurred within 10 minutes. <sup>(10)</sup>



# Viruses

**Norwalk Virus** –This virus is a Norovirus. Noroviridae are a group of related single stranded RNA, highly contagious viruses and the most common cause of acute gastroenteritis in the United States. Known by other names such as stomach flu and food poisoning, it is responsible for 50% of food-borne outbreaks of gastroenteritis. Noroviruses spread from person to person by direct contact, touching contaminated surfaces, and contaminated food and water supplies. Norovirus outbreaks happen on cruise ships, resulting in quarantine. <sup>(12)</sup>



Norwalk Virus

**Effectiveness of Photocatalytic Oxidation Technology:** Deactivation of > 90% of Murine Norovirus (MNV) microorganisms was achieved after 4 hours. <sup>(13)</sup>

**H1N1 Virus (Swine Influenza)**

– The H1N1 virus is a unique strain of influenza. The Centers for Disease Control determined that the strain contained genes from four different flu viruses – North American swine influenza, North American avian influenza, human influenza and swine influenza viruses typically found in Asia and Europe. The virus spreads from person to person by droplets from coughing and sneezing and by touching a person contaminated with the virus, then touching one’s eyes, nose or mouth. <sup>(14)</sup>

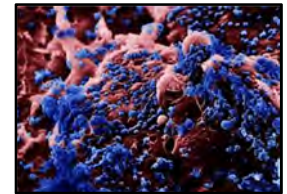


H1N1 Swine Flu Virus

**Effectiveness of Photocatalytic Oxidation Technology:** Testing on stainless steel surfaces using PCO resulted in ~ 99% microbial reductions. <sup>(3)</sup>

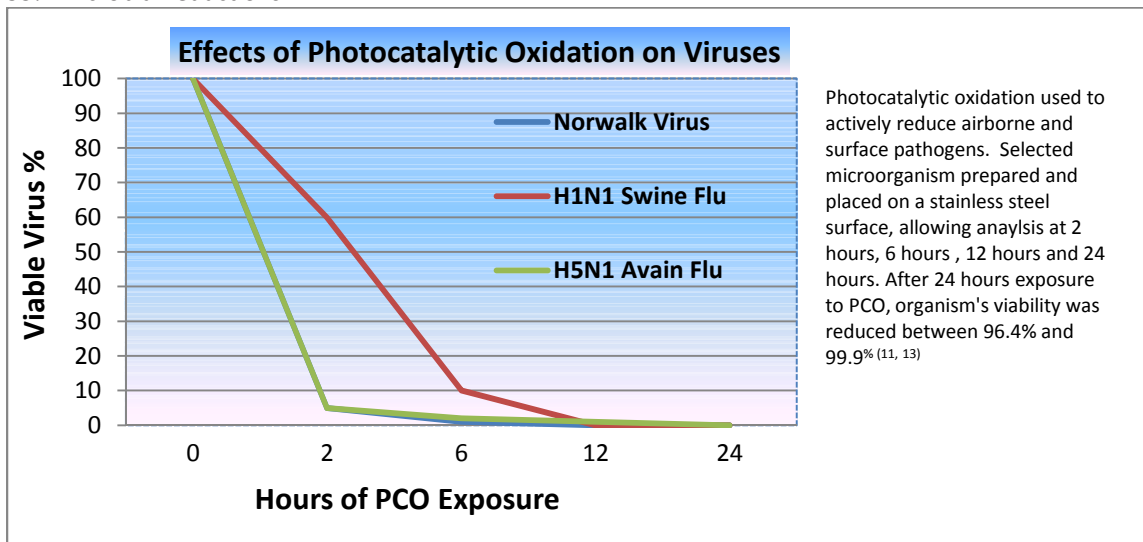
**H5N1 Virus Avian Influenza (Bird Flu)**

– H5N1 has evolved into a flu virus strain that infects more species than any previously known strain, is deadlier than any previously known strain, and continues to evolve, becoming both more widespread and more deadly. Epidemiologists are afraid the next time such a virus mutates, it could pass from human to human. Direct transmission of avian viruses to humans is possible. Testing of photocatalysis on H5N1 was completed at Kansas State University using H5N8 as a surrogate. <sup>(15)</sup>



H5N1 Bird Flu Virus

**Effectiveness of Photocatalytic Oxidation Technology:** Testing on stainless steel surfaces using PCO resulted in ~ 99% microbial reductions. <sup>(11, 13)</sup>



# Fungus, Molds and Spores

**Stachybotrys chartarum** – *S. chartarum* is a black mold that produces its conidia in slime heads and is found in soil and grain as well as cellulose rich building materials and damp or water-damaged buildings. It requires high moisture content in order to grow and is associated with wet gypsum material and wallpaper. Health problems related to this mold have been documented in humans and animals since the 1930s and more recently has been linked with “sick building syndrome.”<sup>(16)</sup>



*S. chartarum*

**Effectiveness of Photocatalytic Oxidation Technology:** Testing on stainless steel surfaces using PCO resulted in ~ 99% microbial reductions within 24 hours.<sup>(3)</sup>

**Candida albicans** – *C. albicans* is a diploid fungus that grows as both yeast and filamentous cells and a causal agent of opportunistic oral and genital infections in humans. Systemic fungal infections (fungemias) including those by *C. albicans* have emerged as important causes of morbidity and mortality in immune-compromised patients (e.g., AIDS, cancer chemotherapy, organ or bone marrow transplantation). *C. albicans* biofilms may form on the surface of implantable medical devices. In addition, nosocomial infections by *C. albicans* have become a cause of major health concerns.<sup>(17)</sup>

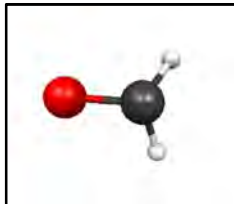


*Candida albicans*

**Effectiveness of Photocatalytic Oxidation Technology:** Testing on stainless steel surfaces using PCO resulted in ~ 99% microbial reductions within 24 hours.<sup>(3)</sup>

## Other Studies

**Volatile Organic Compounds (VOCs)** – There have been studies showing the effectiveness of PCO on over 60 VOCs.



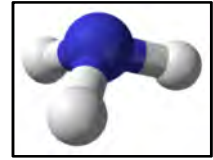
Formaldehyde

A partial list includes *formaldehyde* and *chloroform* (found outgassing from common household materials), *Acetone*, *isopropyl alcohol*, *ethanol*, *methyl ethyl ketone*, *propene*, *toluene*, *methylene chloride* (frequently found in common chemical cleaners) *vinyl acetate* and *xylene* (found outgassing from common plastic products). Airborne tobacco smoke has also been shown to be a major cause of irritations and has caused other major health issues as well. Contact **UVAIRx** for a complete listing.

**Effectiveness of Photocatalytic Oxidation Technology:** Testing has shown reductions of > 90% in most cases. The VOCs are transformed leaving only carbon dioxide and water vapor.<sup>(18, 19)</sup>

**Odors** – Photocatalytic oxidation of odor compounds including *acetaldehyde*, *isobutyric acid*, *toluene*, *hydrogen sulfide* and *trimethylamine* at about 500 ppm were reduced by over 90%. The data suggest that photocatalysis should be considered for reduction of certain odor compounds.<sup>(20)</sup>

**Inorganic Compounds** – A few inorganic gas-phase compounds include *ammonia* (NH<sub>3</sub>), *hydrogen sulfide* (H<sub>2</sub>S), *nitrogen oxides* (NO<sub>x</sub>), N<sub>2</sub>O), *ozone* (O<sub>3</sub>) and *sulfur oxides* (SO<sub>x</sub>). Those compounds containing hydrogen, carbon and oxygen when exposed to conditions of complete oxidation form water and carbon dioxide.



Ammonia

**Effectiveness of Photocatalytic Oxidation Technology:** Testing has shown reductions of > 90% in the compounds tested.<sup>(21)</sup>

**Allergens** – Allergens are numerous and varied things such as dust mites excretions, pollen and pet dander. Basidiospores are considered a major source of airborne fungal allergens, which may include mushrooms, rusts, smuts, and brackets. A study in New Zealand has shown that 22% of patients with respiratory allergic disorders tested positive for basidiospores allergies. Heavy rainfall increases fungal spore releases which are listed as a major source of airborne allergens.<sup>(22)</sup>



Dust Mite

**Effectiveness of Photocatalytic Oxidation Technology:** Testing has shown reductions > 95% in most cases of airborne allergens including mold spores, basidiospores, dust mite excretions, tobacco smoke and protein molecules (animal allergens).<sup>(23, 24)</sup>

### Sneeze test – PCO

Many microbials are transmitted in the air from one animal or human to another. It has been reported that tests run at a simulated sneeze test lab using a sneeze simulation machine showed a 78% reduction of microbials within 3 feet.



## Safety

Photocatalysis, a natural chemical process, is the acceleration of a photoreaction in the presence of a catalyst. The output of the PCO process (multi-clustered ions) can then break down organic molecules, like air pollutants and smog precursors, into environmentally friendly compounds. These pollutants are converted into non-toxic compounds, such as carbon dioxide and water vapor. Using PCO has become more attractive than filtration or UV treatment because it is a non-invasive, non-toxic, and cost effective method to address a wide variety of indoor environmental issues.<sup>(25)</sup> Engineered PCO devices produce controlled outputs of specific ions on demand. The formation of undesirable byproducts, such as ozone, is minimized. Furthermore, in multi-floor buildings, no new VOCs were detected as products of incomplete ionization.<sup>(27)</sup>

Among photocatalysts used in PCO, titanium dioxide (TiO<sub>2</sub>) is the most widely implemented because it is inexpensive, nonhazardous, chemically inert and stable, and has been shown to have the most efficient photoactivity.<sup>(26)</sup> More significantly, it has been used as a white pigment from ancient times, and thus, its safety to humans and the environment is guaranteed by history. Prof. Akira Fujishima. Today, titanium dioxide is used in common household products such as toothpaste, cosmetics, and sunscreen.

Titanium Dioxide Photocatalysis used by *UVAIRx* is a safe technology for humans and animals from several aspects:

1. Electronic ionization
2. Chemical decomposition
3. Symbiotic Flora
4. Substrate effectivity
5. UV protection
6. Metastate reactor

## Electronic Ionization

The main aspect of bacterial inactivation through PCO technology is an abundance of Multi-Cluster Ionization (MCIs) (Daniels, 2002). MCIs are both positively and negatively charged ions created near the surface of the TiO<sub>2</sub> substrate, and are released into the airstream and environment. (Nisihawa, 2006). This abundance of both positively and negatively charged particles prohibits the formation of charged particulates as seen in negative ionizers of the past that lead to “Grey Wall Syndrome” (or “Black Wall Syndrome”) and the health risks associated therewith. Human and animal cells are much larger than bacteria and virus cells, with cell membranes that are thick enough to not be damaged by the effects of PCO ionization. More so, the deactivation of bacteria through PCO technology “breaks down cell membrane proteins on bacterial surfaces” and “This (test) result shows that ion irradiation didn’t change the internal cytoplasmic proteins” meaning ionization of bacteria poses no risk for mutation or damage of viruses and bacteria. (Nisihawa, 2006)

## Chemical Decomposition

Also associated with PCO technology is the decomposition of certain VOCs and other complex compounds through the PCO process. (Fujishima & Noguchi, 1998) Upon contact with a MCI, VOCs exhibit a specific, simultaneous, and complete oxidative degradation in which carbon bound in the molecule is converted to carbon dioxide. “Molecular oxygen (O<sub>2</sub>) is typically the oxidizing agent as has been demonstrated unmistakably in a few gas/solid reactions.” (Tompkins, Lawnicki, Zeltner, & Anderson, 2005)

## Symbiotic Flora

Certain bacteria live within and on human and animal bodies. Bacteria that live within the body are shielded from any effects Multi-Cluster Ionization would have on them simply due to the body tissue that surrounds them. Some of the bacteria that live on human and animal skin could be affected by MCIs, but most bacteria that have a symbiotic relationship with humans or animals populate within the top layer of the skin, not simply on the surface. This flora is shielded by the abundance of large skin cell above the bacteria.

### Substrate effectivity

It is well known that release of any metal nanoparticles into the environment is a major health concern for any living organism in the environment, including animals and humans. Through proper reactor design and coating process, TiO<sub>2</sub> is bound within the unit and kept from escaping into the airstream. (Fujishima, Irie, & Hashimoto, 2005)

### UV Protection

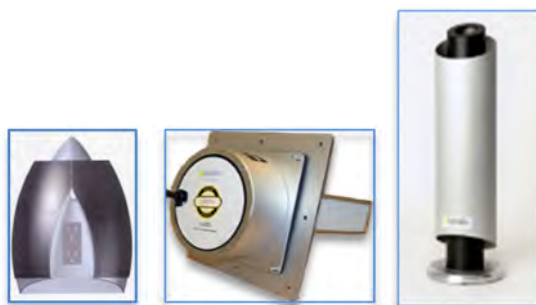
Exposure to Ultraviolet radiation is a concern for any technology utilizing UV light; *UVAIRx* has taken great care to keep UV light entrapped within the reaction chamber itself. Any light escaping through the top or bottom has been reflected and diffused to a point that is not a hazard to humans.

### Metastate Reactor Design

*UVAIRx* designs their reactors to inhibit any possibility of contact with the metastate.

### Green Technology – Energy Star Compliant

*UVAIRx* is committed to the environment by using low voltage technology to power our devices (using approximately the power of a 25W light bulb), designing our products with durability, refurbishment and reuse in mind, and packaging with recycled materials. Preference is shown to suppliers that share these values.



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## Field Testing Proof and Testimonials

Clinical Tests conducted by EnviroScreeningLab.com and other Independent Laboratories, Universities & Facilities have validated the effectiveness of PCO in killing bacteria, viruses, molds, allergens and VOCs from treated air and surrounding surfaces. The chart below shows how the PCO cell used in UVAIRx dramatically reduced the presence of common pathogens within 24 hours or less. Most pathogens were reduced by 99% or greater.

 <b>PATHOGEN CHART</b> 				
<small>Made in USA</small> Testing of Advanced Photocatalytic Oxidation (PCO) Technology on UVAIRx cell by Independent Laboratories, Universities & Facilities				
Pathogen	Descriptive Examples	Results	Time Tested	Test Method
Norovirus	Norwalk virus	99.6% reduction	24 hours *	Stainless, carpet & cloth
	Lab Name: <b>In vitro</b> - Radil, LLC; FDA & EPA approved - Dr. Leila Riley, DVM.* In vivo shelter test: Aurora Animal Hospital, Dr. Nicole Bartley, DVM; State of Colorado Expert Witness for Veterinary Medicine; 3 month, double blind study.			
Methicillin-resistant Staphylococcus aureus	MRSA	99.9% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
Staphylococcus aureus	S. aureus	99.8% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
Clostridium difficile	C. diff	99.8% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
Listeria monocytogenes	Listeria	97.3% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
Group A streptococci	GAS	97.4% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
Pseudomonas aeruginosa	P. aeruginosa	99.9% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
Streptococcus pneumonia	S. pneumonia	99.9% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
Bacillus anthracis	Anthrax	97.6% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
H1N1	Swine flu	99.9% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
H5N1	Bird flu	99.9% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
Stachybotrys chartarum	Fungus and Spores	99.4% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
Candida albicans	Molds and Spores	99.5% reduction		On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
Volatile Organic Compounds	Over 60 VOCs	Average of 91% reduction	24 hours	VOC in enclosure
	Lab Name: <b>In vitro</b> - Avomeen Analytical Services, Ann Arbor, MI, FDA, cGMP, DEA, ACIL. Lab Name: <b>In vitro</b> - NREL, FDA & EPA approved, Dr. D. Tompkins, et al., summary of testing on PCO technology.			
Volatile Inorganic Compounds	Ammonia/ Nox/ H <sub>2</sub> S/ Sox/ O <sub>3</sub>	Average of 89% reduction	24 hours	VIC in enclosure
	Lab Name: <b>In vitro</b> - NREL, FDA & EPA approved, Dr. D. Tompkins, et al., summary of testing on PCO technology.			
Odors	Alkanes, Acetone, Alcohols, Ketone	Average of 87% reduction	12 hours *	Gas in enclosure
	Lab Name: <b>In vitro</b> - North Carolina State University, EPA & FDA approved, Dr. J. Peral, et al., testing on PCO technology.* In vivo testing: C&W Engineering, Ocala, FL - Showed pet odors reduced by 72%. Used 10 person test panel with two 500 ft <sup>3</sup> test chambers.			
Basidiospores	Allergens, Fungus, Ringworm	99.4% reduction	24 hours	On stainless coupons
Lab Name: <b>In vitro</b> - Kansas State University, FDA & EPA approved, Drs. Ortega and Marsden, et al.				
In vivo shelter test: Aurora Animal Hospital, Dr. Nicole Bartley, DVM; State of Colorado Expert Witness for Veterinary Medicine; 3 month, double blind study.				
Allergens	Pet dander, dust mite antigens	Average of 91% reduction	70 minutes	In solution
	Lab Name: <b>In vitro</b> - University of Florida, EPA & FDA approved, Dr. D. Goswami; Mie University, Japan, N. Nishikawa, et al.; testing on PCO technology.			
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Inactivation of pathogens used the advanced photocatalytic oxidation (PCO) cells which are used in UVAIRx products, and labeled either PHI® or RCI. All tests were done using standard and accepted test methods employed by the fully accredited test laboratories. Doctors (PhD) Marsden, Ortega, Goswami, Riley, Peral and Tompkins are all internationally recognized for their work with photocatalysis. Dr. Marsden is an internationally acclaimed expert in food safety and Dr. Riley, DVM, as an expert in veterinary medicine. Additional extensive testing has been done by Disney Cruise Lines, and the USDA in conjunction with Swift Foods and Costco.				
<b>* ALL UVAIRx UNITS ARE ETL, UL, FCC &amp; CE APPROVED * UNITS USING THE UVAIRx CELL ARE FDA APPROVED * UNITS ARE 12 VDC &amp; ENERGY STAR COMPLIANT *</b>				



As can be seen in this report from an independent testing lab, the before and after effects of the UVAIRx technology and products are substantial. Two separate locations were swabbed in a private residence. Columns 1 and 3 show the before measurements, and columns 2 and 4 show the after measurements. The corresponding Petri Dish samples are on the right.



Chain of Custody ID Number	001	002	003	004
Client ID Number	1	2	3	4
Location of Sample	Kitchen	Kitchen	Bedroom	Bedroom
Type of Sample	Swab	Swab	Swab	Swab

	Results	Results	Results	Results
	☉ CFU ○ Direct Read ○ Cubic M	☉ CFU ○ Direct Read ○ Cubic M	☉ CFU ○ Direct Read ○ Cubic M	☉ CFU ○ Direct Read ○ Cubic M
Alternaria	2			
Ascospores				
Asper/Pen Like Group				
Basidiospores				
Bipolaris/Drechslera				
Chaetomium				
Cladosporium sp.				
Curvularia	5		9	
Epicoccum				
Fusarium				
Pithomyces/Uloclas				
Rusts/Smuts				
Stachybotrys				
Aspergillus				3
Penicillium	27	4	11	
Yeast				
Hyphal Fragments				
Bacteria (non-specific)				
No Detectable Growth				0
Insect Parts				
Skin Cells (animal/human)				
Fibers (non-specific)				
Unidentified				
	001	002	003	004
TOTAL Results	34	4	23	N/A
Culture Type	☉ PRE ○ POST	○ PRE ☉ POST	☉ PRE ○ POST	○ PRE ☉ POST
	Limited Contamination	Minor Contamination	Minor Contamination	Minor Contamination

