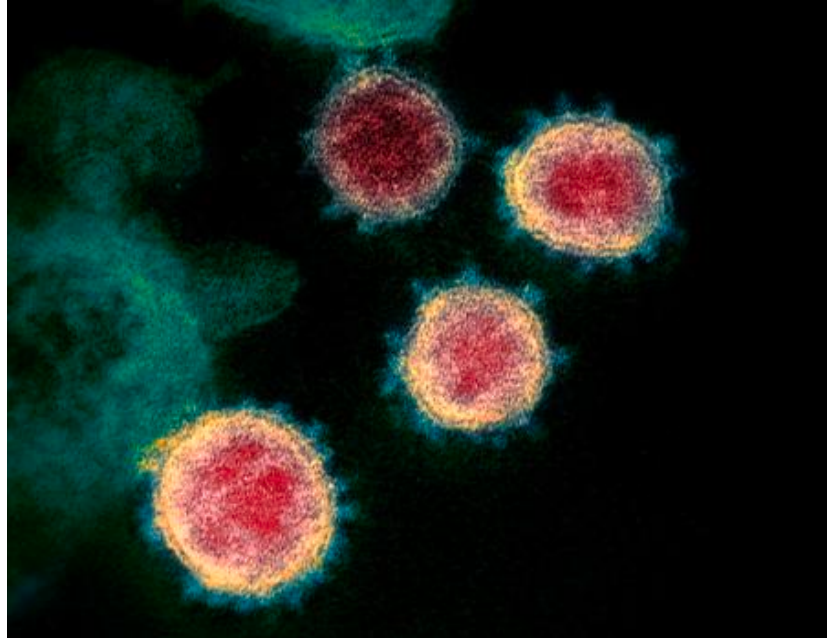


## Help Reduce Airborne Coronavirus Transmission With BioOx® Air Cleaning

March 23rd, 2020



At this time, the COVID-19 pandemic is raging throughout the world, and governments and the medical establishment are taking strong measures to prevent the spread of the virus.

Recent studies have shown coronavirus particles can remain airborne for 3 hours or longer, and on surfaces for 3 days. The World Health Organization (WHO) is alerting health workers to take additional airborne precautions.

The purpose of this document is to inform the medical establishment of the benefits BioOx air cleaning can bring. BioOx can capture and destroy viruses, and thus decrease transmission of coronavirus to health care workers.

# Introduction

BioOx® Air Cleaning Systems perform environmental decontamination, air quality improvement and odor control. BioOx® Air Cleaning Systems treat indoor hospital air contamination from viruses, bacteria, hospital gases, formaldehyde, and other emissions via bio-oxidation using a patented immobilized cell technology that captures particles from the air and biodegrades contaminants.

In hospital studies, BioOx® Air Cleaning Systems achieved up to a 98% reduction in airborne bacteria, without requiring any special ducting.

Air contaminants are basically in two physical forms -- those that move with air flow and those that linger. The latter tend to be tiny particles that are electrically charged. These tiny particles are not readily moved by HVAC systems or fans.

Viruses, including coronavirus, are such tiny, electrically charged particles. Coronavirus particles are about 0.1 microns in size. HEPA air filters, considered by most to be the gold standard of air filtering, can only remove particles 0.3 microns or larger, and are thus likely ineffective against the coronavirus.

BioOx air cleaning routinely removes particles from the air as small as 0.001 microns (or smaller), and thus should be effective at capturing the coronavirus out of the air. BioOx® Air Cleaning Systems may be the only devices that are able to respond quickly to real viral and bacterial epidemiological outbreaks spread via air.

In a December 2003 article published in the Journal of Environmental Health, Uthup, et al changed the principles of air flow forever.\* The authors show that more than 98% of particulates in room air are small, less than 2 microns in size, and essentially do not settle out of the air by gravity.

Air currents in a room entrain and move large particulates, carrying them into the ducts and thence into the filters. Most small particulates are not entrained and moved by air currents because their cross-sectional area is so small.

Small particulate motion is primarily determined by the typical electrical fields that exist in all rooms.

*\* December 2003, Journal of Environmental Health, "Minimizing pathogenic bacteria, including spores, in indoor air," Linda J. Uthup, PhD, Kenneth Werner, Allan H. Frey, PhD.*

BioOx® Air Cleaning Systems combine the fundamental sciences of:

- convection
- molecular charge attraction
- bio-oxidation

to capture and destroy airborne pollutants without limitations to type or size. This is how the Clean Air Zone is created.

## Creating a clean air zone

Convection is the process by which a fan is used to move large particulates, which account for approximately 10% of industrial airborne pollutants. Molecular charge attraction occurs when grounded, neutral air is used as an attractor for the 90% of airborne pollutants that are not affected by convection. These airborne pollutants consist of ultrafine particulates, volatile organic compounds (VOCs), hazardous air pollutants (HAPs), and others. This grounded air zone is not ionic and is not electrostatic, and therefore, produces no harmful byproducts. All charged particles are captured in this neutral zone and become entrenched in the bioreactor.

Bio-oxidation happens when the airborne pollutants that enter the system are broken down and destroyed. Our patented BioOx® Air Cleaning Systems, along with our proprietary BioOx® Media, control the combination of water, oxygen and enzymes to achieve a superior oxidative process that can be as much as 12 times greater than natural oxidation. The process is all natural and results in cleaner air, without any harmful by-products.

# Bio-oxidation is superior to other technologies

BioOx® Air Cleaning Systems technology is the most advanced, powerful, efficient, and sustainable portable bioreactor we know of. BioOx® Air Cleaning Systems far surpass other technologies because we do not have the limitations that are currently plaguing conventional air purifiers, as illustrated below.

	BioOx®	HEPA	IONIC	CARBON	UV
Particle size removed	.001 microns or smaller	Down to .3 microns	Down to .1 microns	N/A	N/A
Removes allergens	YES	YES	YES	N/A	N/A
Removes bacteria	NEARLY ALL	SOME	SOME	N/A	YES
Removes viruses & germs	NEARLY ALL	SOME	SOME	SOME	SOME
Removes cigarette smoke	YES	YES	YES	YES	N/A
Removes chemical fumes	YES	NO	NO	SOME	NO

## In Vitro pathogen destruction

Assured Bio Labs, LLC compared the change in concentration of several public health pathogens - including H1N1, Legionella, Influenza B, MRSA and others\* – when placed in BioOx® compared with tap water:

- **H1N1** was significantly reduced when placed in BioOx solution compared with tap water.
- **Legionella** organisms were significantly reduced when introduced into BioOx® solution. Legionella concentration actually increased in the tap water.
- **Influenza B** was significantly reduced after 24 hours in BioOx® solution but remained unchanged in tap water after 120 hours.

*Continued...*

· **MRSA** was significantly reduced within 36 hours in BioOx® solution and tap water. MRSA DNA remained reduced in BioOx® solution for the duration of the study but increased in tap water after 72 hours.

\*Also tested and significantly reduced: *Clostridium difficile*, *Candida albicans*, *Mycobacterium tuberculosis*.

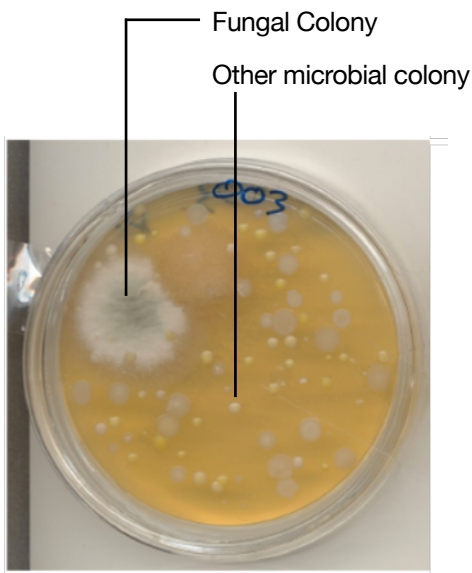
## In-hospital pathogen destruction

BioOx® solution significantly reduced viral and bacterial pathogen concentrations. It reduced the airborne microbial population and particulate matter (PM) in hospital visiting rooms and attached waiting areas.

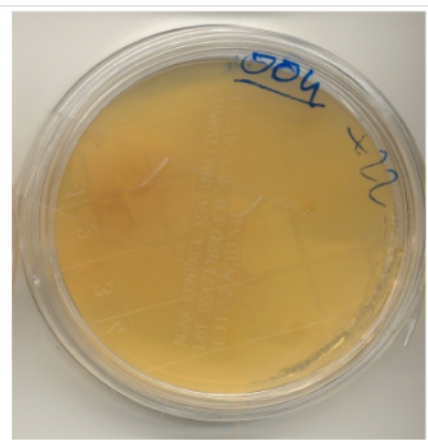
**Saronno, Italy-August 2011.** An area of 1000 sqm hosting 4 visiting rooms and a waiting area for 100 people, with a daily turnover of 1300 patients seeking for medical advice was used for testing BioOx® efficiency in realistic scenario.

Four BioOx® units were placed (one in each visiting room) and a BioOx® unit was also placed in the waiting area.

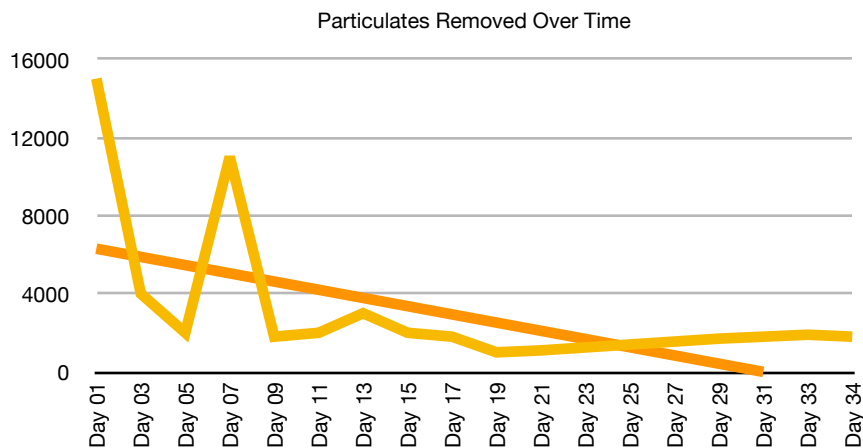
The area was subject to a lot of movement throughout the facility with doors and windows open most of the time. The 3rd party test results showed microbiological abatement up to 98%, and particulate matter abatement up to 94%, in the 0,5-1-3-5 microns already from the first week of operation.



**BEFORE**



**AFTER**



# Kennel cough, odor control and air pollution uses

BioOx is also in use at many indoor swimming pools, horse barns and kennels. At swimming pools its primary function is to reduce chlorine gas (chloramines), and at horse barns and kennels, to reduce ammonia gas from animal excretions. Both gases have particle sizes 0.001 microns or smaller, so BioOx's effectiveness is continued demonstration of its ability to capture and destroy small particles.

In kennels they commonly have outbreaks of a viral infection referred to as "kennel cough." Since introduction of BioOx at some of these kennels, kennel cough has been reduced to near zero, thus providing more evidence that BioOx aids in the prevention of virus transmission.

Additionally, BioOx® Air Cleaning Systems have been used at Rutgers University Hospital, in Newark, New Jersey, to control odors and air pollution in:

- Gross anatomy laboratory, where strong chemical odors used in the laboratory are controlled;
- Mouse lab and cell biology lab, where animal odors are controlled;
- Patient transport, where truck and helicopter fuel fumes are controlled; and
- Numerous offices and laboratories to control odors.

## Nitrous oxide levels reduced

In the dental operating room, where oral surgery is performed at Rutgers University Hospital, nitrous oxide (laughing gas) levels were significantly higher than the 25 ppm maximum exposure levels recommended by the National Institute of Occupational Safety & Health. After installing a BioOx unit in the operating theater, the levels were reduced to acceptable levels. Subsequently, the BioOx® clinical unit has been operating continuously in the Rutgers Dental Clinic since 2004.

# Enhance hospital biosecurity

BioOx air cleaning units can add a powerful technology to further reduce the transmission of viruses and other pathogens within medical facilities. This additional air treatment, which could be placed in any room or area of a hospital, could help protect healthcare workers and patients at a time when they are most vulnerable.

## BioOx® units

- are free-standing
- can be easily installed anywhere there is an electrical outlet
- are affordable and come in multiple sizes
- can be purchased or used on a rental basis



Our most economical model, the 650, is smaller than a vending machine, and can effectively cover about 2000 square feet. It simply needs to be plugged in, have some water added to it, along with a bit of BioOx enzyme solution. It will immediately start cleaning the air and creating its Clean Air Zone.

Air & Water Solutions wants to work with medical facilities to make BioOx units economical, be it through a rental or purchase plan. Initially, the company will provide the units on a free trial. We will customize the configuration of our units to provide effective air cleaning and increased biosecurity, while keeping the cost as low as possible. We would welcome field testing of our units and will gladly assist in any study design process.

For more information visit:

**[www.bioox.us](http://www.bioox.us)**

or contact us directly at:

[info@bioox.us](mailto:info@bioox.us) | 301-246-0151

# Dr. Sam Sofer, PhD, creator of BioOx® Air Cleaning Systems

Dr. Sam Sofer, PhD, PE, (ssofer@bioox.us) is President of Air & Water Solutions (NJ) and ReGen Technology LLC (NM), specializing in biological processes and bioreactor design, with applications in medicine, energy, and the environment. He has developed, patented, manufactured, and globally marketed the original biological residential and commercial water cleaners. He has developed BioOx®, a proprietary natural blend of microorganisms used to clean air, water, and soil, and to boost agricultural productivity. Dr. Sofer has also developed and patented biomedical instruments and test protocols related to boosting the immune system to fight diseases in humans, plants, and animals.

Sam has industrial experience as a US chemical plant engineer, and holds the following patents: *Method and Spiral Bioreactor for Processing Feedstocks*, U.S. Patent 6,916,630 B2, Jul. 12, 2005; *Immune and Oxygen System Measuring and Drug Screening Method and Apparatus* U.S. and International patents pending, 2012.

He served as Professor and Director, Chemical Engineering and Materials Science, University of Oklahoma; Research Chair Professor of Biotechnology, New Jersey Institute of Technology; supervised 60 Graduate Research projects; and several publications and books.

**Education: PhD**, University of Texas at Austin; **Post Doctoral** at Clayton Foundation Biochemical Institute; **Master of Engineering**, Texas A & M University; **Honors BS in Chemical Engineering**, Phi Beta Kappa, University of Utah, including 3.5 years of biochemistry research, College of Medicine.