Submitted to:
RFP SP-19-PW-23
PORTABLE AIR PURIFIERS AND MONITORS
CITY OF FONTANA
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Fontana, CA 92335
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Submitted by:
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ALLIANCE
BUILDING SOLUTIONS, INC

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A: INTRODUCTION

1.

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2.

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3.

Growing from an initial staff of five in 1964 focusing on warranty work and HVAC service calls, Alliance Companies, Inc. (ABS) has gone from a small mechanical contractor to a leader in energy infrastructure solutions within the public sector in California. Alliance contracts with public agencies throughout the state, within the municipal and educational sectors. Through offering a design-build / turnkey approach, ABS strives to create successful and effective energy projects, becoming a long-term energy partner with all our customers.

In this relationship-driven industry, success also relies on customer satisfaction and long-term relationships with clients and industry professionals. For nearly half a century, our experienced team of executives, project managers, mechanical engineers, estimators, technicians, and installers have been delivering quality energy solutions to satisfied clients throughout California.

Throughout this pandemic ABS has continued to deliver COVID-19 disinfection solutions to public agencies throughout the state. Through our partnership with WellAir and Uhoo, our firm has been granted distribution rights and is the authorized dealer for the WellAir Protect 900/Protect 200 and Uhoo Aura Technology for California and the West Coast. Thus, any company or agency looking to acquire this innovative technology on the West Coast will have to purchase it through our firm. This groundbreaking technology allows the City to provide continuous disinfection while occupants are in the room, while delivering the highest level of sanitation available on the market today.

Alliance has worked with a wide range of agencies throughout the state on implementing effective disinfection strategies with effective multi layered solutions, ranging from viral disinfection to real time indoor air quality monitoring. To date, Alliance has executed roughly $51M+ in projects, entailing some type of disinfection or indoor air quality related measures. In addition to these projects, we believe that we are best positioned to be selected for this project with the City of Fontana already being an existing customer.

Our firm has already completed 3 phases of work with the City totaling over $10M in successful projects. Through this experience in working with various City facility/maintenance, billing, finance, and legal staff, we are well versed in all the various items below:

- *Points of contacts for all various departments included in a project implementation*
- *Aware of all finance and billing dynamics associated with the invoicing process*
- *Familiar with all facility and maintenance staff that will be working hand in hand with our team to provide site access and assist with the installation dynamics*
- *Have already worked with the City's legal team in executing multiple contracts*
- *Aware of all City codes, compliances, requirements, and other agency specific aspects relating to completing a successful project*

Our strategic partner WellAir has solidified themselves as an industry leader in the sanitation space, specializing in disinfection research and technologies with over 71+ third party studies. Over the last twelve (12) years WellAir has brought to market several different disinfection products, leveraging various patented technologies and prestigious accreditations and accolades from industry specific organizations. WellAir has been offering medical-grade remedies for an international issue—unhealthy indoor air—for more than ten years. Numerous viral ailments, bacterial infections, asthma, allergies, and a variety of chronic health conditions are all caused by indoor air. "By reducing the viruses and chemicals that cause illness, we make indoor places safer. People can live, work, and play without anxiety thanks to our cutting-edge disinfection solutions for indoor air and surfaces, offering peace of mind."

We adopted a fundamentally new approach to air disinfection under the leadership of a committed and highly skilled team of scientists, which resulted in the transformational discovery of NanoStrikeTM, the distinctive, patented technology at the heart of all current WellAir portable air disinfection devices. All airborne germs are instantly rendered inactive by this nanotechnology. Our continued efforts to guarantee the health and safety of people in the built environment are based on our family of solutions, which includes air purification and surface disinfection products. Products that have received FDA clearance are part of WellAir's expanding portfolio of medical-grade solutions, which help safeguard indoor environments in more than 60 nations.

Although healthcare is the core of our business, we also have a strong presence in the commercial, educational, hotel, entertainment, and residential sectors. At WellAir, we firmly believe that it is our responsibility to create cleaner indoor settings so that the people we affect can continue living their best lives free from concern for what might be in the air.

WellAir's experience and qualifications are solidified within their Medical Advisory Board, whose mission is to develop, educate, and support innovation in a multi-disciplinary approach to improve the healthiness of indoor environments. The board is comprised of a diverse group of top public health, environmental, and medical experts. The WellAir MAB will research and advise on indoor air and surface quality advancements, with a focus on improving respiratory, immunological, oncological, and general public health outcomes.

WellAir Medical Advisory Board

Board Chair

Regina Benjamin, MD, MBA

18th US Surgeon General From 2009 until 2013, Dr. Benjamin, a former vice admiral in the U.S. Public Health Service Commissioned Corps, served as the country's 18th surgeon general. She also held the position of chair of the National Prevention Council, which was composed of 17 cabinet-level federal departments and formulated the U.S. health policy. She is the founder and CEO of the Gulf States Health Policy Center as well as Bayou Clinic, Inc., a nonprofit primary care medical facility in Bayou La Batre, Alabama. She is not just an operating partner at Revival Healthcare Capital but also performs clinical duties.

Board Member

David J. Weber, MD, MPH

Medical Directory, Department of Infection Prevention, UNC Medical Center

Associate Chief Medical Officer, UNC Medical Center.

World known expert in the treatment of infectious diseases, Dr. David J. Weber. He holds academic positions at the University of North Carolina (UNC) School of Medicine as the Charles Addison and Elizabeth Ann Sanders Distinguished Professor of Medicine and Pediatrics and Professor of Epidemiology in the UNC Gillings School of Global Public Health. He also serves as

Associate Chief Medical Officer for the UNC Medical Center and as Medical Director of the Department of Infection Prevention at the UNC Medical Center.

PubMed lists Dr. Weber as an author in over 440 scientific publications.

Board Member

Daniel E Dawes, JD

Executive Director, Satcher Health Leadership Institute

Morehouse School of Medicine

Daniel E. Dawes, JD, is the Executive Director of the Satcher Health Leadership Institute and is a professor in the Department of Community Health and Preventive Medicine at Morehouse School of Medicine. His passion for addressing disparate health outcomes is exemplified in his unyielding commitment to building collaboratives, including the United States Department of Health and Human Services grant-funded National COVID-19 Resiliency Network, the Health Equity Leadership & Exchange Network, and the Health Equity Tracker, which all exist to leverage evidence-based research, data, and solutions to advance health equity. A globally respected leader in the advancement of health equity, Professor Dawes is the recipient of several national awards. These include the American Public Health Association's Award for Significant Contributions to Public Health, the Centers for Disease Control and Prevention's Health Equity Champion Award, and the National Medical Association's Louis Stokes Health Policy Award.

Board Member

Thomas Caranosos, MD

Director, Adult Cardiac Surgery, UNC School of Medicine

Medical Director, Transcatheter Aortic Valve Replacement Program, UNC School of Medicine

Dr. Thomas Caranasos is an adult cardiac and thoracic surgeon at the University of North Carolina (UNC) School of Medicine. His expertise includes heart and lung transplantation, ventricular assist device implantation, and minimally invasive approaches to cardiac surgery. In addition to his role of Director of Adult Cardiac Surgery and Assistant Professor of Surgery, Dr. Caranasos leads the structural heart program focusing on transcatheter aortic valve replacement.

uHoo Qualifications

uHoo was founded by a team of innovators who share a passion for technology, health, and the enviornment. Frustrated by the poor indoor air quality conditions in office and educational buildings , Dustin Onghaseng and Brian Lin who both studied at Hong Kong University of Science and Technology decided to build the uHoo. The worlds most comrehensive indoor air quality sensor on the market with the only patented Virus Index technology . They knew that the only way to make calculated progress towards healthier and cleaner air was to be able to quantify and measure the air. The uhoo allows you to see the air you breathe. uHoo's mission is to help you take control and invoke proactive actions by helping you monitor and manage your air quality to reduce deaths and improve lives, health, well-being globally.

uHoo has been introduced in over 40 countries and is being used by ten of thousands of people in commercial, residential and governemnt agencies worldwide. With numerous amout of case studies that prove the uHoo helps you manage and take actionable steps towards your air, but in addition also reduce cost by identifying and addressing air quality issues immediately to reduce staff or employee complaints, increase productivity, and prevent wear and tear on your equipment. The uHoo Aura can connect with your buildings HVAC systems to automatically control and manage your heating, cooling, ventilation, and fresh air system to "enhance comfort and safety while optimizing energy efficiency; thereby creating a smarter and healthier building and office envionrment."

Our Takeaway

Here at Alliance, we believe it is time for a shared responsibility to make every indoor space cleaner and safer. Air quality experts and scientists have long known that indoor air is rarely free from pollutants, harmful chemicals, gases, pathogens, and other contaminants. It's time to recognize that poor air quality has been ignored or accepted for too long. We believe that it is the responsibility of owners, architects, engineers, builders, and municipalities to make indoor air safe for everyone. Our mission is to deliver solutions that can provide for the highest level of indoor air quality. Our team is dedicated to continued innovations on science-based technologies proven to remove harmful contaminants from indoor spaces - even when poor ventilation - or no ventilation exists in that space.

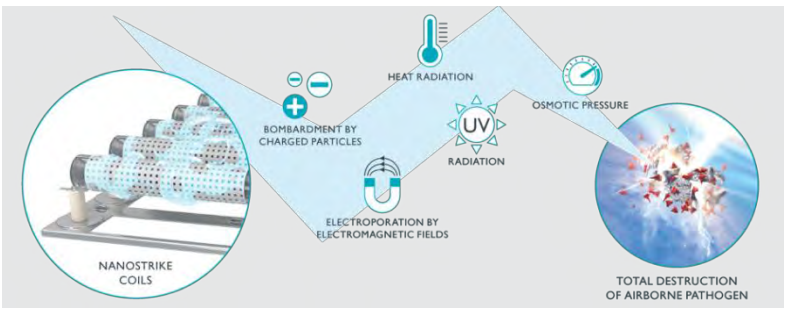
Our organizational goal is to protect each market segment across the world, using multiple technologies, to remove harmful contaminants from the air. Facilities and buildings can now be monitored (and managed) using special sensors that can detect the presence of harmful contaminants, allowing for a proactive approach to address your agencies COVID-19 disinfection strategy. While other methods of disinfection are important, it is our mission to provide a primary layer of protection in any space, using the WellAir and uHoo solutions. These primary solutions can be trusted to watch over room occupants, cleaning, purifying, and monitoring room air, regardless of other solutions that may be in place.

It is our further mission to educate and inform public, private, and regulatory constituents about the importance of air quality and their responsibility to protect the public in all indoor spaces. We believe that every person has the right to better air quality. That no one should be exposed to contaminants that can impair cognitive function, transmit infections, or cause chronic or permanent diseases - such as obesity, cancer, heart disease, neurological degeneration, and many others. The time has come when we can no longer ignore or accept poor indoor air quality and the effect it has on all of us - on our health, safety, and well-being.

Product Overviews

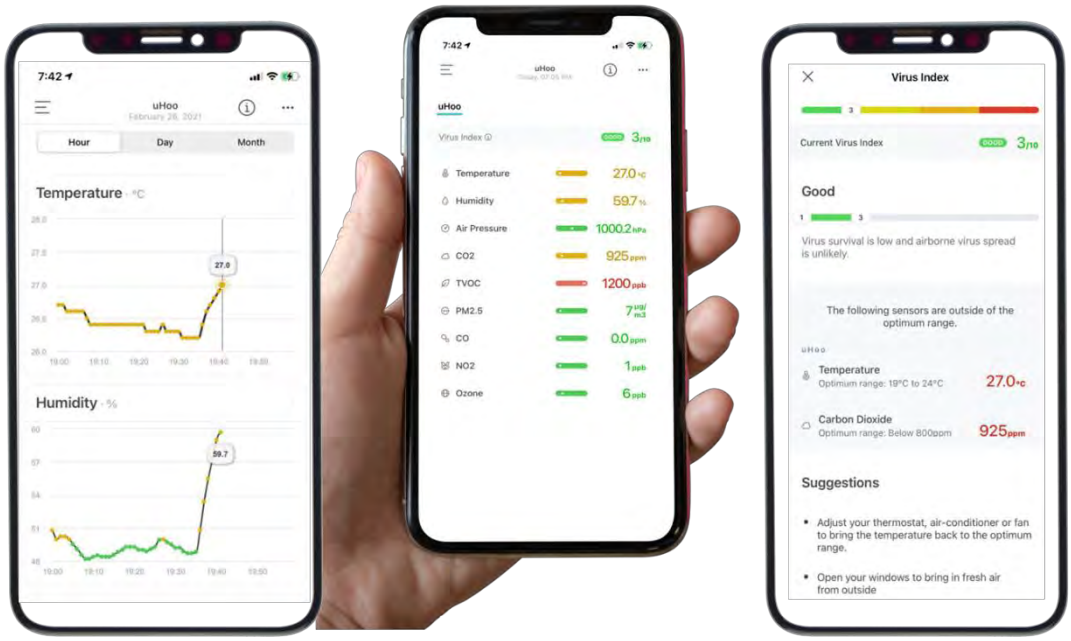
WellAir has been at the forefront of one of the biggest and most important global issues; unhealthy indoor air. For over a decade WellAir has been led by an admirable and highly esteemed team of scientists who took a fundamentally different approach to air disinfection, which led to the inception of the patented NanoStrike technology. This nanotechnology was created to inactivate all airborne microorganisms on contact providing the first line of protection against all viruses, bacteria, VOC, mold spores, and pollen. The NanoStrike technology captures a range of physical concurrent pathogen inactivation processes to safely disinfect the air. NanoStrike coils provide a powerful strike that works to burst airborne pathogen cells rapidly inactivating them, helping to ensure they are no longer a threat of infection.

The WellAir Protect 900 contains a dual speed fan with two NanoStrike coils on each side. The contaminated air is brought in through the top and bottom of the device and contaminants in the air are rapidly and safely inactivated in sub seconds at the DNA level by the two NanoStrike coils. The technology has been proven to be effective with molecules as small as 1nm. Clean purified air is recycled back into the room. Providing continuous disinfection this unit is extremely quiet compared to other purification technologies. In addition to being the leader in lowest cost of ownership due to its ultra-low energy consumption, the Protect 90 has no installation cost just simply plug into a standard outlet and turn on, while customers enjoy the benefit of no ongoing maintenance or replacement parts. The Protect 900 having no functional degradation, has tested, and proved consistent out-of-box performance throughout its entire operating life.



This patented technology can be used around people of all ages including the most vulnerable due to its powerful yet gentle process. The team behind WellAir Protect 900 can stand firmly behind their technology as it has been tested and proven effective in over 71 independent studies. The Protect 900 has passed controlled and variable environments confirming the inactivation of all pathogens guaranteeing no future antimicrobial resistance. To learn more about the independent studies please visit WellAir Technology Independent Studies. Protecting indoor environments in over 60 countries, WellAir has established itself in a vast number of industries but having its foundation in the medical field safeguarding the most vulnerable environments while also addressing the commercial, educational, residential, hospitality, entertainment, and public sector.

The uHoo Aura is the best-in-class commercial environment monitor. The Aura is the most comprehensive environment monitor measuring 13 – 15 different environmental factors (Temperature, humidity, carbon dioxide, carbon monoxide, chemicals (vocs), PM 10, PM 4, PM 2.5, PM 1, Formaldehyde, air pressure, light, and sound). Being recently recognized as one of the Cities of the Future – Urban Innovation Champions of 2022 we have realized how important it is to have the capability of monitoring your indoor air to prevent and reduce the risk of disease outbreaks such as COVID -19. With the uHoo Aura's real time data and building integration occupants can be empowered to make better decisions in creating a safer and healthier workplace. Uhoo has the only patented real time assessment of coronavirus risk using its Virus Index. The uHoo Virus Index utilizes AI-powered insights based on scientific research to provide real time risk assessments of the coronavirus surviving and becoming transmittable in the air. With this information you would know which specific actions to take to reduce your coronavirus risk.



Based on a comprehensive analysis of multiple air quality factors – temperature, relative humidity, particulate matter of varying sizes, nitrogen dioxide, and carbon dioxide. The Uhoo Virus Index calculates safety thresholds based on scientific research conducted by organizations including the World Health Organization (WHO), the Occupations Safety and Health Administration and other scientific publications conducted by various scientist and universities.

User friendly application

Access real time and historical data, analysis, alerts, tips and integrations anywhere, anytime.

Advanced analytics and proprietary uHoo IndicesTM provide valuable insights on trends and patterns, allowing owners to easily identify events that may have caused air quality issues in the past, allowing them to be avoided in the future; owners can make informed decisions to ensure health, safety, and well-being. The capability to share data is also beneficial for organizations seeking sustainability and green building certifications, as well as giving customers, employees, and building occupants with confidence and peace of mind.

B: Work Plan

1. Project Team Bios

Brad Chapman – President

As the President of Alliance Building Solutions, Inc., Mr. Chapman has complete responsibility for both Sales and Operations for the entire Energy Services and Indoor Air Quality Business. With nearly 20 years of experience in the Energy Services industry, Mr. Chapman leads California and provides the strategic direction for the Division including alliances and teaming agreements with strategic partners. Mr. Chapman is intimately involved with legislative developments in Sacramento assuring best interest of public agencies are served at the state and regulatory level.

For the last 5 years, Mr. Chapman has served as executive in charge of more than $120M in comprehensive energy conservation projects in California as well for being responsible for more Prop 39 CEC approved projects than any other in this space. Mr. Chapman is an expert in working side-by-side with the staff to create a plan custom to each agency's needs.

Starting as a Sales Executive with Bosch in 1992, he was promoted through the organization to Western Region General Manager for Bosch's Factory Automation Group. Mr. Chapman was hired by Climatec Building Technologies Group in 2008 to start the Energy Services Division. Mr. Chapman helped grow that group to a $65mm division in his 6 years when Climatec sold to Bosch. Mr. Chapman is now the Co-Founder of Alliance Building Solutions, Inc., a leading provider of energy services performance contracting in California.

Robert Bloss – Sr. Project Manager

As the Senior Project Manager for Alliance, Robby is responsible for the overall direction, coordination, implementation, execution, control, and completion of the project, ensuring consistency with company strategy, commitments, and goals.

In addition, Mr. Bloss is the lead in planning and implementation of the project. He defines the project tasks and develops full scale project plans. He schedules project timelines with all sub-contractors and provides quality assurance to the customer. Mr. Bloss continuously monitors and reports on progress of the project to all parties. Mr. Bloss will continuously be onsite during project implementation, working hand-in-hand with facility staff and team members.

Graduating from Universal Technical Institute in 1989, Mr. Bloss has over 25 years of experience in the electrical and HVAC field.

Staring his career at Sears Roebuck in 1989 as a service tech and promoted to senior A/C tech in 6months he continued to be a senior tech until 1993.

Mr. Bloss then furthered his career with Burlington North and Santa Fe Railway (BNSF) as a pipeline operator and field tech in 1993-1997.

He was offered a job with OTIS Elevator Company that lead to Mr. Bloss eventually becoming a become a Supervisor for OTIS Elevator in the LA area where he over saw 11 techs for 8yrs before transferring over to the Anaheim Office to become the Operation Manager for the remaining of the 6yrs. Robby oversaw the labor and material for 24 techs and over 3,100 elevators and escalators. Mr. Bloss worked with OTIS for a total of 25yrs.

Mr. Bloss primary role for the project is to work closely with all team members and facility staff to ensure a smooth project implementation and a successful project completion.

Jerry Gallegos – Field Project Manager

As Project Manager of Alliance Electrical Systems Inc., Jerry Gallego is responsible for the overall management of the public electrical projects. Jerry collaborates closely with the general contractor and the customer project team to ensure the project is performed safely, on time, and on budget. He is experienced managing multiple projects with budgets more than $20 million.

Jerry is a project manager with over 10 years' experience as well as a journeyman electrician. His career's primary focus is on the energy service industry. A strong leader who builds his team with training and efficient implementation processes. Jerry worked with some of the largest energy service companies throughout California. Along with project management he is closely involved in the predevelopment process including site audits, planning, budgeting, and procurement of the most innovative energy savings technology available.

With a diverse hands-on experience in sports lighting, transformers, solar, electrical vehicle charging stations, indoor air purification systems, and LED lighting retrofits, Jerry is skilled at finding solutions to help our customer solve their electrical challenges.

Cody Renwick – Superintendent

As Superintendent of Alliance Electrical Systems Inc., Cody Renwick is responsible for the direct oversight and coordination of electrical crews as they perform the installation and implementation of energy saving measures ranging from lighting upgrades to transformers, controls and solar. He also collaborates closely with client project management teams to coordinate day to day operations in the field. With over 10 years' experience in the Energy Service industry and being a state licensed Journeyman Electrician, he has also obtained certifications in HVAC, EPA, BPI, OSHA, EVITP, and various Equipment Operator Certifications.

After completing his electrical training at Ashworth College, Cody was employed by CRE in 2008, and applied his knowledge and training to become an integrated diagnostics electrician for industrial equipment serving the refinishing and aerospace industries. Following his promotion to department manager, Cody managed contracts and service agreements with industry leaders such as Raytheon, SpaceX, Northrup Grumman, and government agencies including the Border Patrol and City of San Diego. After growing CRE into San Diego's most renown service and repair contractor in Southern California, Cody transitioned into Energy Services in 2011 as a technician with Synergy Companies. Once promoted to Quality Production Manager, Cody was responsible for quality control, as well as training technicians on how to employ the latest lighting, electrical, and HVAC measures available to the industry. Today, Mr. Renwick operates as Superintendent for Alliance Electrical Systems, partnering with the leading energy services performance contractor in California as he continues to pursue the implementation of the most innovative energy savings technology available.

David Wilson – Sr. VP of Sales [WellAir]

David Wilson is the Senior Vice President and General Manager of WellAir. He brings 20 years of technology, medical device, and executive leadership experience. Throughout his career, David has focused on building products and solutions that solve every day healthcare problems.

At WellAir, David is responsible for leading the company's education and municipality verticals focused on supporting partnerships for our industry-leading line of portable air disinfection devices. Prior to joining WellAir, David held multiple executive leadership positions at Sun-Med Holdings (formerly Salter Labs), a global medical device company focused on airway management devices. He joined the company in 2003 and was promoted to CEO in 2009. While at Sun-Med, David played an integral role in developing the industry's leading airway management and respiratory equipment product lines, bringing physician-developed technologies to the US and European markets.

Excell Chua – Director of Development [uHoo]

Excell Chua is the Global Sales Director of uHoo. One of her main duties is to develop and maintain strong business relationships with partners in global markets for uHoo's entire range of indoor air quality solutions. Excell brings with her more than 20 years of solid sales & marketing track record gained from real estate, media, IT and Telco sectors in Southeast Asia.

Excell is directly in charge of overseeing the software and hardware development within all of uHoos production including overseeing dynamics within the installation and commissioning. For this project Execel has prepared a team of her experts that will be designated for the City to ensure a streamline and effective implementation.

Excell believes that companies should pay more attention to the health and well-being of their building occupants because people are productive when they are healthy and it all starts from seeing and understanding the air that they breathe.

2.

The installation of this project will be subcontracted out to Alliance Electrical Solutions (AES), who is under the Alliance Companies umbrella. AES is the electrical division within Alliance that will provide turnkey implementation services for this entire project. With over combined 40 years of expertise and experience self-performing all lighting and electrical work translates to additional savings for the Customer. AES holds its C-10 license.

The installation of the WellAir is very straightforward and with the expertise of AES it will have a very quick and streamlined process. The same representatives mentioned above in the previous section will be the main representatives managing the installation process including Jerry Gallego as the Field Manager and Robby Bloss as the Senior Project Manager and Cody Renwick as the Superintendent (for credentials please see above section B1). AES will run the install operations for both the WellAir and uHoo devices. The Protect 900 is wall mountable and only requires two anchors to be fixed on the wall, the device is then mounted onto the anchors. The uHoo Aura installation is dependent on the Cities I.T. infrastructure. AES will work closely with staff to provide the city all the proper support for a streamlines and seamless implementation of the devices.

C: SCHEDULE

The City of Fontana will be introduced to the project management team early in the project development process. The involvement, communication, and coordination between the project management team and City staff plays a vital role in a successful project implementation. The lead project manager will be involved in the entire project development and engineering process, including all preliminary meetings and site walks. This early involvement enables the project manager to have a thorough understanding of the City's needs, scope specifications, timeline deadlines, staff preferences, and overall project implementation goals to ensure a very smooth and effective transition into project installation.

Once a scope is finalized and contracts have been executed, a project kick-off meeting will be held to begin the installation process. This will entail the following:

- *Exchange of contact information kick-off meeting between city officials and ABS project management team*
- *Obtain site access information*
    - *Keys*
    - *Access Cars*
    - *Operational Hours*
- *Gather additional site information*
    - *Blueprints/Facility Layouts*
    - *Fire-alarm Layouts*
- *Schedule final analysis site walks*

Following kick-off meeting, ABS will schedule a final site walk with all subcontractors to confirm equipment/unit count specifications, equipment locations, and equipment details such as voltage, size, etc.

Project Implementation

The ABS implementation is approached in the outline below to guarantee a quality on time delivery with negligible disruptions to staff:

Program Plan

o Our team of experts will organize a master program that is coauthored with City staff that will put forth the best program at the most competitive costs with quick, quality, on time delivery.

Program Direction

o ABS will meet with City staff and outline essential roles, safety prerequisites, Code of Conduct principles, scope requirements, site access procedures, communication process' and final schedules.

Program Implementation

o The ABS will work thoroughly with the implementation team to guarantee a smooth delivery. The execution is extremely important to ABS so we are dedicating Robby Bloss (principal) as the lead Project Manager who will be on site weekly and function as the Cities single point of contact.

Pre-Commissioning

- This will begin during the implementation as the measures are being installed. Start-up documentation is used as well as manual visual inspection to ensure proper operation. All manufacture guidelines are followed for calibration and tuning and will be verified.

Final Commissioning

- All unit performances will be verified monitored and recorded.

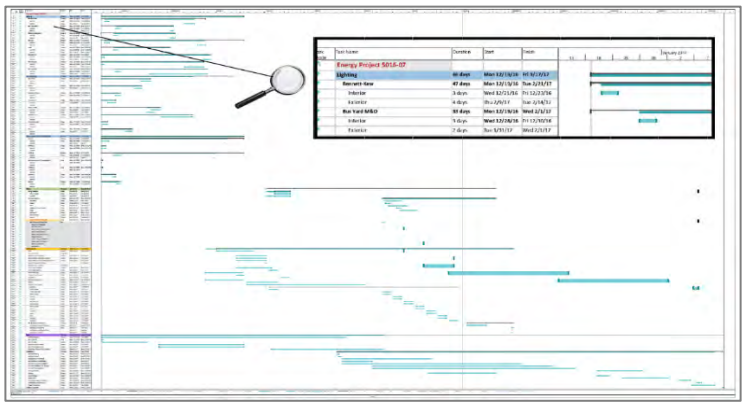
Project Scheduling

The City of Fontana will be provided with an installation schedule, also referred to as a Gantt Chart. This is the equipment installation breakout that will outline when each measure will be installed and at what sites. Here all installation deadlines and timelines will be provided. Any requested milestones or target completion dates from City staff will be incorporated in our implementation schedule. ABS will heavily coordinate with staff to fully understand and facility staffing schedules, facility hours of operation, holidays and other calendar items, along with any other simultaneous projects in order to create the most effective and efficient installation timeline.

Sample Schedule of Values

ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E)	%	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
	bond	$107,888.00	$107,888.00	$0.00	$0.00	$107,888.00	100%	$0.00	$ 5,394.40
	Engineering	$134,461.00	$121,014.90	$6,723.05	$0.00	$127,737.95	95%	$6,723.05	$ 6,386.90
	Mobilization	$134,461.00	$100,845.75	$26,892.20	$0.00	$127,737.95	95%	$6,723.05	$ 6,386.90
	Animal Services								
	Lighting	$45,045.00	$45,045.00	$0.00	$0.00	$45,045.00	100%	$0.00	$ 2,252.25
	HVAC_Controls	$28,478.00	$1,421.40	$0.00	$0.00	$1,421.40	5%	$27,056.60	$ 71.07
	Carnegie Culture Center								
	Lighting	$19,435.00	$19,435.00	$0.00	$0.00	$19,435.00	100%	$0.00	$ 971.75
	HVAC_Controls	$14,022.00	$3,303.30	$11,018.70	$0.00	$14,022.00	100%	$0.00	$ 701.10
	HVAC	$88,292.00	$52,975.20	$35,316.80	$0.00	$88,292.00	100%	$0.00	$ 4,414.60
	City Hall								
	Lighting	$35,769.00	$35,769.00	$0.00	$0.00	$35,769.00	100%	$0.00	$ 1,788.45
	HVAC_Controls	$100,816.00	$20,163.20	$0.00	$0.00	$20,163.20	20%	$80,652.80	$ 1,008.16
	HVAC	$219,962.00	$219,962.00	$0.00	$0.00	$219,962.00	100%	$0.00	$ 10,998.10
	City Yard (Public Works)								
	Lighting	$45,916.00	$45,916.00	$0.00	$0.00	$45,916.00	100%	$0.00	$ 2,295.80
	HVAC_Controls	$14,022.00	$14,022.00	$0.00	$0.00	$14,022.00	100%	$0.00	$ 701.10
	HVAC	$120,056.00	$120,056.00	$0.00	$0.00	$120,056.00	100%	$0.00	$ 6,002.80
	Gibson Senior Center								
	Lighting	$30,811.00	$30,811.00	$0.00	$0.00	$30,811.00	100%	$0.00	$ 1,540.55
	HVAC_Controls	$24,333.00	$24,333.00	$0.00	$0.00	$24,333.00	100%	$0.00	$ 1,216.65
	HVAC	$228,641.00	$228,641.00	$0.00	$0.00	$228,641.00	100%	$0.00	$ 11,431.55
	Historic Fire Station								
	Lighting	$11,825.00	$11,825.00	$0.00	$0.00	$11,825.00	100%	$0.00	$ 591.25
	HVAC_Controls	$17,458.00	$872.90	$0.00	$0.00	$872.90	5%	$16,585.10	$ 43.65
	Landecena Family Community Center								
	Lighting	$15,654.00	$15,654.00	$0.00	$0.00	$15,654.00	100%	$0.00	$ 782.70
	HVAC_Controls	$19,179.00	$958.95	$0.00	$0.00	$958.95	5%	$18,220.05	$ 47.95
	Police Department								
	Lighting	$75,735.00	$75,735.00	$0.00	$0.00	$75,735.00	100%	$0.00	$ 3,786.75
	HVAC_Controls	$251,124.00	$37,668.60	$100,449.60	$0.00	$138,118.20	55%	$113,005.80	$ 6,905.91
	HVAC	$361,829.00	$253,340.30	$54,244.35	$0.00	$307,584.65	85%	$54,244.35	$ 15,369.23
	Public Library								
	Lighting	$94,428.00	$94,428.00	$0.00	$0.00	$94,428.00	100%	$0.00	$ 4,671.40
	HVAC_Controls	$231,977.00	$26,395.60	$0.00	$0.00	$26,395.60	20%	$205,581.60	$ 2,319.77
	Recreation & Community Services								
	Lighting	$78,790.00	$17,274.00	$0.00	$0.00	$17,274.00	68%	$61,516.00	$ 864.70
	HVAC_Controls	$18,695.00	$924.75	$17,760.25	$0.00	$18,695.00	100%	$0.00	$ 934.25
	HVAC	$97,894.00	$6,285.40	$4,803.45	$0.00	$11,678.85	11%	$83,180.15	$ 733.94
	City Wide								
	LM_SYS	$281,403.00	$0.00	$0.00	$0.00	$0.00	0%	$281,403.00	$ -
		SUB-TOTAL	$ 1,797,094.00	$ 1,734,054.55	$ 258,197.90	$ -	$ 1,992,252.45	71%	$ 804,841.55	$ 99,612.62

Sample Implementation Schedule



Following the commencement of project installation, the project management team will hold update meetings. These update meetings can be held in time increments in accordance with the City's discretion. These update meetings will involve short and long-term deadline progress reports, addressing any issues that arise since the previous meeting, clarification on any equipment installation specifications, and to give general project feedback. The project manager will be continuously on site throughout project installation with extensive oversight throughout all operations sitewide. In addition to a Gannt Chart, a schedule of values will be provided. The schedule of values will provide the City with a full breakdown of all project billings and invoices that will be submitted throughout the progression of project completion, correlating with the installation schedule. The schedule will entail the billing dollar amounts, projected dates that billings will be received, along with detailed descriptions of how many items are included in each submission.

Our internal account management, engineering, and project management teams are constantly reviewing and coordinating through every process from start to finish, assuring smooth transitions between stated project milestones.

D: REFERENCE

City of Fresno

- Name of Organization
  - City of Fresno
- Mailing Address
  - 2600 Fresno St, Fresno CA 93721
- Name of Contact
  - Ann Kloose
- Telephone
  - 559.621.2489
- Email
  - Ann.kloose@fesno.gov

Stockton Unified School District

- Name of Organization
  - Stockton Unified School District
- Mailing Address
  - 56 South Lincoln Street, Stockton CA 92503
- Name of Contact
  - Anthony Silva
- Telephone
  - 209.933.7000

City of El Monte

- Name of Organization
  - City of El Monte
- Mailing Address
  - 11333 Valley Boulevard, El Monte CA 91731
- Name of Contact
  - Jessica Ancona
- Telephone
  - 626.453.3612
- Email
  - jancona@elmonteca.gov

E: Pricing Amount

Item	Brand	Model	Quantity	Cost
1.	WellAir	Protect 900	325	$659,750
2.	WellAir	Protect 200	325	$316,875
3.	WellAir	Desk Stand	200	$59,600
4.	uHoo	Aura	650	$776,750
5.	Installation WellAir	Protect 900	125	$18,750
6.	Installation Aura	Aura	650	Price dependent on customers IT equipment/ requirements

**Sales tax already included in pricing*

**Pricing is valid for 60 days*

APPENDICES – PRODUCT SPECIFICATION SHEETS AND TECHNOLOGY INFORMATION

The following pages entail product specifications on all related projects called for in this solicitation

Protect 900

The WellAir Protect 900 is a medical-grade, airborne infection control device that inactivates aerosolized viruses, bacteria, mold spores and pollen within the breathing zone. Easy to use, flexible in positioning, and quiet in operation, the portable device provides the safest and most cost-effective airborne pathogen protection in a continuous manner to people in small-to-medium sized rooms or within the occupied spaces of larger rooms. The device uses two NanoStrike™ coils with a dual-speed fan. It can be deployed using one of our specially designed stands.

Protect 900 with Stand

Protected by NanoStrike™ technology

MODEL
WellAir Protect 900
Wall mountable, countertop or stand-alone unit supplied with 6.6 ft power cord

ELECTRICAL RATING
Single Phase, 100 - 120 VAC, 60 Hz
Fuse Rated at 120 VAC, 3 Amps, Listed

POWER CONSUMPTION
Maximum 14W

CONSTRUCTION + COLOR
Precision-cut fabricated metal casing in a silver anti-bacterial powder coat finish

DIMENSIONS + WEIGHT
14.4" (h) × 14.4" (w) × 4.5" (d)
(36.6 × 36.6 × 11.4 cm)
Approx. 10.4 lbs (4.7 kg)

ELECTRICAL CONNECTION
Switched and fused with a grounded, molded power cord

FAN AIR FLOW VOLUME
Speed I = 129 CFM
Speed II = 153 CFM

NOISE LEVEL
Speed I = 40 dB
Speed II = 45 dB

OPERATING CONDITIONS
50 – 95 °F (10 – 35 °C)
10-75% Relative Humidity

SHIPPING / STORAGE CONDITIONS
41 – 122 °F (5 – 50 °C)
Maximum 95% Relative Humidity

QUALITY & SAFETY
Manufactured under ISO 9001, ISO 14001 & OHSAS 18001

UL867 - Safety for Electrostatic Air Cleaners
cUL
IEC 60601-1
IEC 60601-1-2

UL CERTIFIED E356410

WA-POR-US-SP-002-Protect-900

The Wellair 900 Difference

ALLIANCE-USA.COM

Leveraging Patented NanoStrike Technology proven to inactivate pathogens at the DNA level

Over 70+ 3rd party studies showing efficacy in destroying pathogens in sub seconds

No filter change outs, internal components replacements, or ongoing maintenance needed. Zero cost of ownership

10year useful Life / 3 year warranty

No functional degradation over time

Technology backed by manufacturer medical advisory board

14w low energy consumption

Wall mount / table stand / portable stand

Under 40dB of sound output

CARB certified

ALLIANCE COMPANIES

Protect 900

PRIMARY SOURCE OF DISINFECTION

Specifications

14 watts / 3 AMPS

10lbs in weight

Under 40 dB of sound projection

10 year useful life
No filters or internal replacement parts
No functional degradation

Efficacy validated through 70+
independent 3rd party studies

Power Source: Wall Plug In

Lowest cost of ownership vs others

Leveraging patented NanoStrike Technology

Stand Options

Desk Stand / Portable Stand / Wall Mount

How it Works

01.

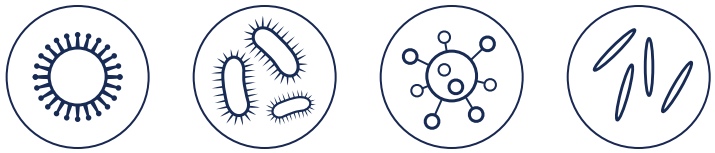
Contaminated indoor air is pulled into the unit by an internal dual-speed fan.

02.

Two NanoStrike™ coils provide a powerful strike, made up of multiple concurrent inactivation processes, that work to rapidly inactivate airborne pathogens.

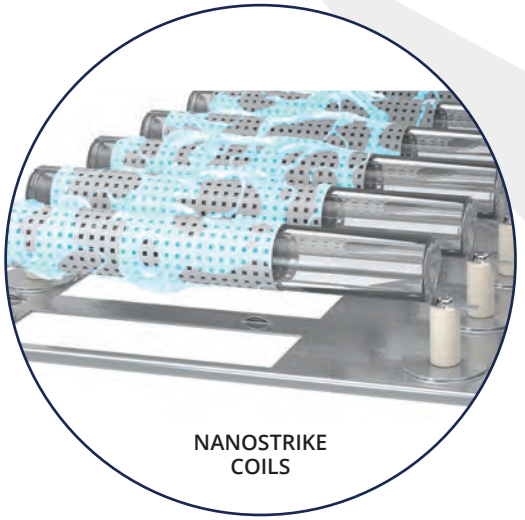
03.

Clean purified air is recycled back into the room.



Virus Bacteria Mold Dander

Patented NanoStrike Technology



NANOSTRIKE COILS

BOMBARDMENT BY CHARGED PARTICLES

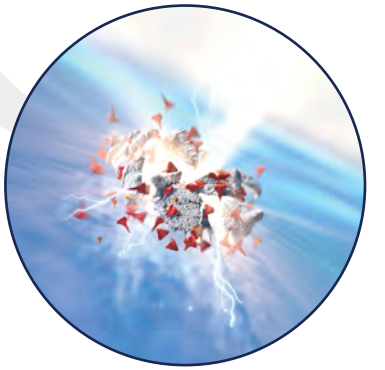
HEAT RADIATION

OSMOTIC PRESSURE

UV

RADIATION

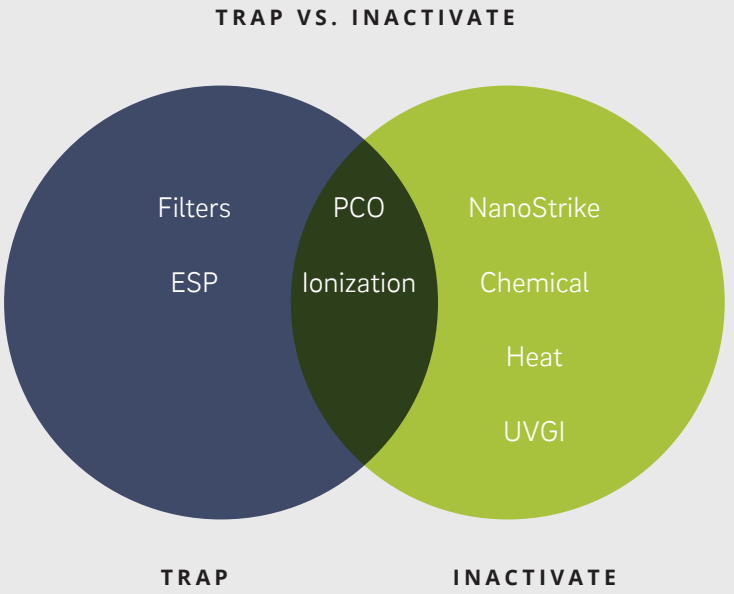
ELECTROPORATION BY ELECTROMAGNETIC FIELDS



THE PATHOGEN IS InactivatED AND IS NO LONGER INFECTIOUS

Coils release a plasma based electric discharge hundreds of times a second, inactivating pathogens from a DNA level

NanoStrike Technology Vs. Others

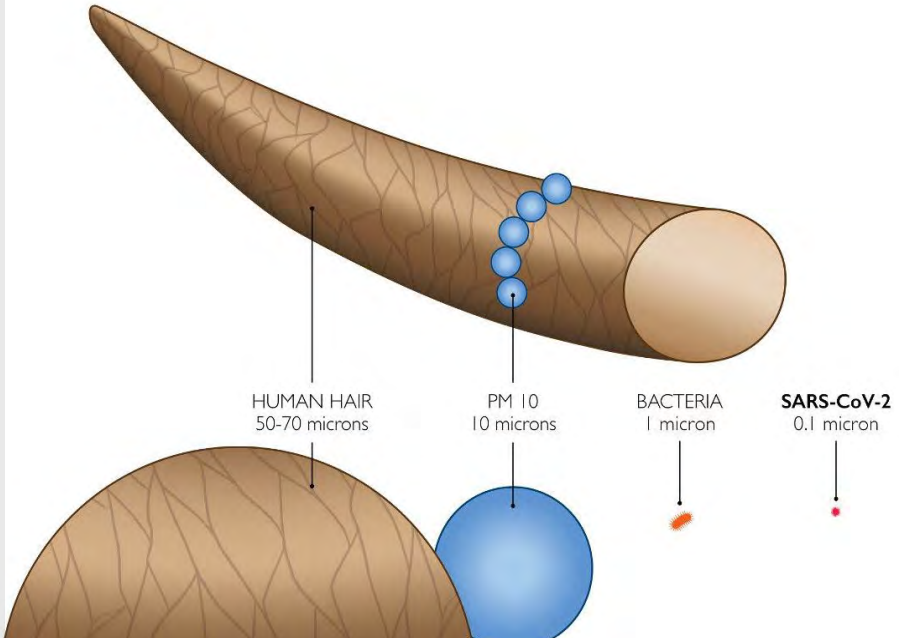


Dynamic Overview

NanoStrike proven technology is effective at inactivating molecules <.0001 micron in diameter

100 million

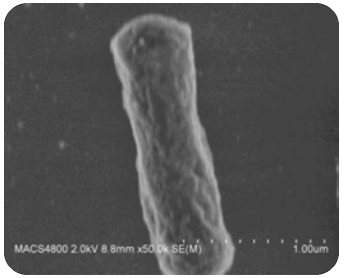
CORONAVIRUS PARTICLES CAN FIT ON THE HEAD OF A PIN



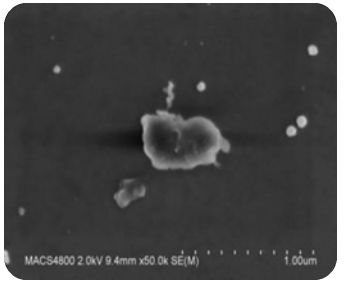
NanoStrike Disinfection Testing

"The WellAir technology rapidly inactivates the DNA in pathogens. Concrete evidence of the effect on airborne bacteria; strong chemical and structural changes are observed."

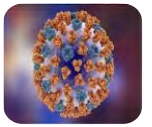
Dr. Ram Prasad Gandhiraman,
Research Scientist, NASA

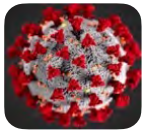


'Healthy' E.coli Bacteria prior to exposure



WellAir after 0.002 Seconds

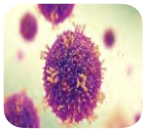

Influenza A
99.9%


SARS-COV-2
99.99%

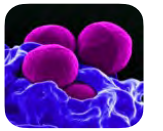

Staphylococcus epidermidis
99.87%


Mycobacterium Smegmatis
99.7%


Aspergillus Niger (Mold)
98.85%


Human parainfluenza virus
99.87%


Clostridium difficile
99.9%


MRSA (Methicillin-Resistant Staphylococcus Aureus)
99.99%

Clinical Studies & Testing / Certifications

Medical Device / Equipment Standards	IEC 60601 · EU-MDR · IEC 60601-1-2:2014 4TH EDITION
Air Purification Device Standards	UL · CALIFORNIA AIR RESOURCES BOARD · EN/IEC 61010 · CE
Regional Requirements	KC · NOM · RoHS · China
Quality and Manufacturing Standards	ISO 9001 · ISO 14001 · OHSAS 18001

Lab Studies

31

Clinical Trials

11

Clinical Case Studies

27

Case Studies

Reduction in Bacteria counts by

82%

Reduction in airborne bacteria CFUs in occupied spaces from (4) separate studies

Reduction in surface bacterial counts by

68%

Single study conducted on surface level bacteria counts

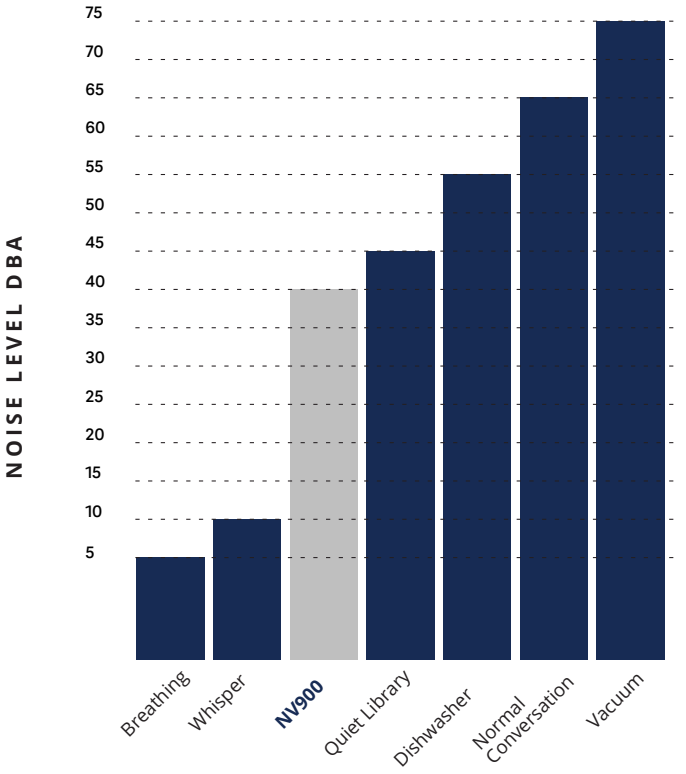
Reduction in Spore counts by

94%

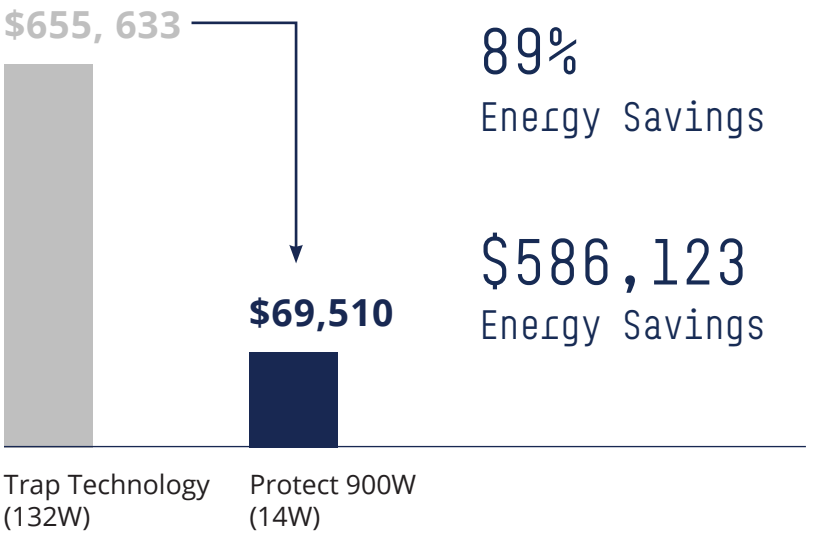
Air tests in (4) occupied admin school rooms showed similar results

Sound Output / Energy Savings

PROTECT 900 SOUND OUTPUT



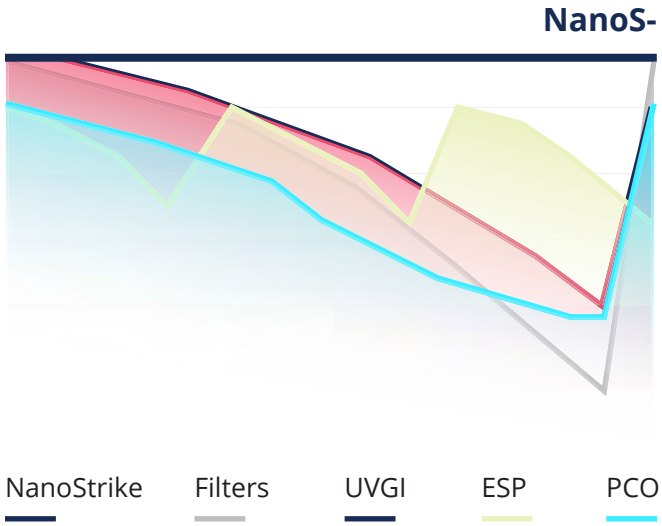
ENERGY SAVINGS COMPARISON



*Energy Savings @ National Average of $0.0809/kWh
*Comparison of Protect 900 vs 132

Degradation Factor / Cost of Ownership

PERFORMANCE OVER 12 MONTH



Other technologies like Filters, ESP, PCO and UVGI have performance degradation over time requiring parts to be replaced or cleaned to achieve "as new" performance levels again.

HIGHEST LEVEL OF DISINFECTION WITH THE LOWEST COST OF OWNERSHIP

No installation or set-up cost

No costs of ongoing filter, bulb or catalyst replacement

No servicing or replacement of internal parts

Trusted by a Wide Range of Industries

"The WellAir Protect 900 portable air infection prevention device provides vital peace of mind. The medical grade NanoStrike technology it uses helps to safely clean the air by reducing contaminants and viruses 24 hours a day. The decision was obvious once we reviewed the NanoStrike testing and scientific data, specifically its effectiveness on the SARS CoV 2 virus."

Ken Mueller
Director of Operations
School District (40,000 students)

5 million Sq. Ft.

HEALTHCARE

MAYO CLINIC

Karolinska Institutet

MONUMENT HEALTH

MERCYHEALTH

Cleveland Clinic

COMMERCIAL

Microsoft

DELTA

PGA TOUR

DANONE

ROSEWOOD HOTELS & RESORTS

MARRIOTT

Hilton

Google

wework

Sheraton HOTELS & RESORTS

NBA

EDUCATION

VANDERBILT UNIVERSITY

THE UNIVERSITY OF TENNESSEE KNOXVILLE

Kalamazoo Public Schools
Every child. Every opportunity. Every time.

RUSD RIVERSIDE UNIFIED SCHOOL DISTRICT

MISSISSIPPI COLLEGE

RIT Rochester Institute of Technology

GRPS my choice

Medical & Scientific Expertise Behind Wellair

TODD M. POPE

CEO

TIME Magazine's 50 Most Influential People in Healthcare

NICK MEDENDORP

PhD

Deep expertise in electronic materials and LED technology with 115 patents

STEVEN BRYDON

VP, Operations

Global Operations & Supply Chain Expert

FELIPE SOBERON

PhD, CTO

Research Fellow, Dublin City University

KIERAN HANNON

Chief Marketing Officer

Forbes Top 50 Most Influential Global CMOs

STEVE GRENON

CTO/NuvaWave

63 patents and commercialized more than 20 successful medical devices

BRAD NIEMAN

EVP, Healthcare

Healthcare Executive with over 20+ years expertise

MARK SCHMIDT

EVP Sales, Commercial & Consumer

Broad IoT expertise w/ industry pioneers

Investors

polarispartners

F/PRIME CAPITAL PARTNERS

Oyster Technology Investments

ATLANTIC BRIDGE

Regina Benjamin
M.D., MBA
18th U.S. Surgeon General
2009-2013

Village at Manor Park Senior Care Implements Air Disinfection Technology

CASE STUDY
Village at Manor Park
West Allis, WI

OVERVIEW

Village at Manor Park, a 130-bed continuing care retirement community, implemented Novaerus portable NV900 units in all patient rooms, hallways, and dining rooms beginning April/May 2015. The community consists of three wings on the first floor: Park View wing, Sunny View wing, and Terrace View wing. This study compares the total number of nosocomial respiratory infections before and after implementation of the Novaerus units.

A 23-month review was conducted to evaluate the results.

METHODOLOGY

A Nurse Risk Manager Consultant with RB Health Partners, Inc. visited the facility for two days to abstract information and review the data. The periods selected for aggregate pre- and post-review were July 2014 through March 2015 and July 2015 through March 2016. Comparison of like periods reduces the risk of skewed data related to seasonal variances.

CASE STUDY Village at Manor Park

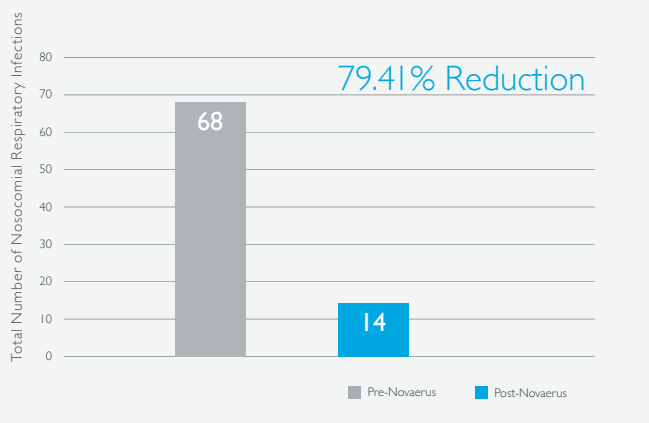
RESULTS

In the period after implementation of the NV900 units, the total number of nosocomial respiratory infections at Village at Manor Park decreased from 68 to 14, a 79.41% reduction.

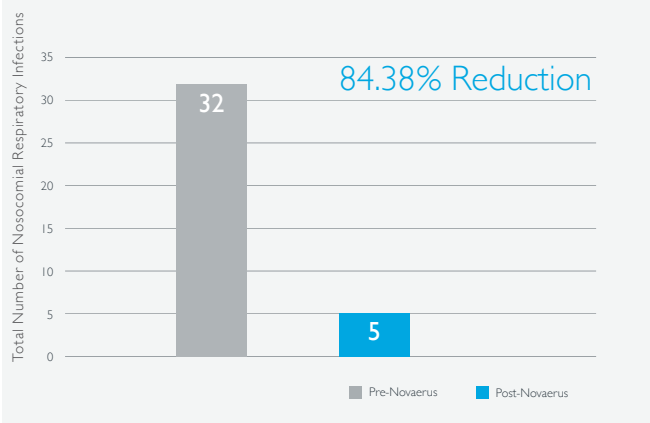
The total number of nosocomial respiratory infections in the Park View wing decreased from 16 to 5, a 68.75% reduction.

The total number of nosocomial respiratory infections in the Sunny View wing decreased from 32 to 5, an 84.38% reduction.

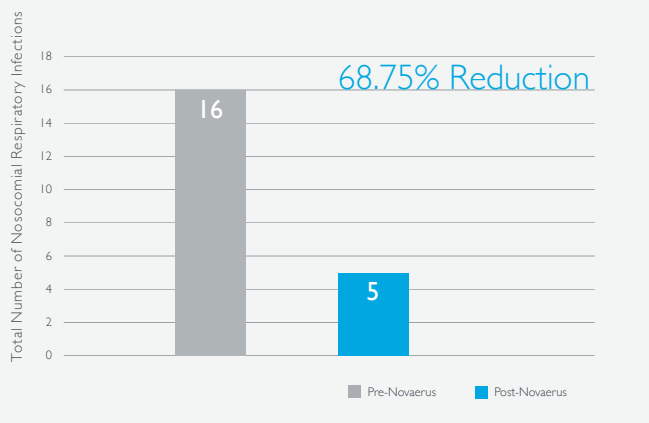
The total number of nosocomial respiratory infections in the Terrace View wing decreased from 20 to 4, an 80.00% reduction.



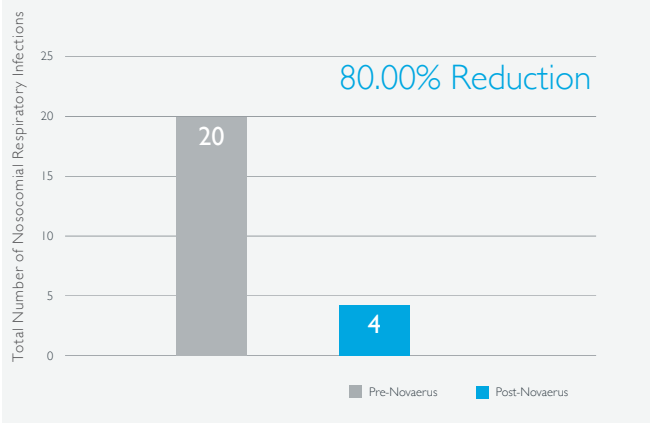
Total nosocomial respiratory infections.



Nosocomial respiratory infections in the Sunny View wing.



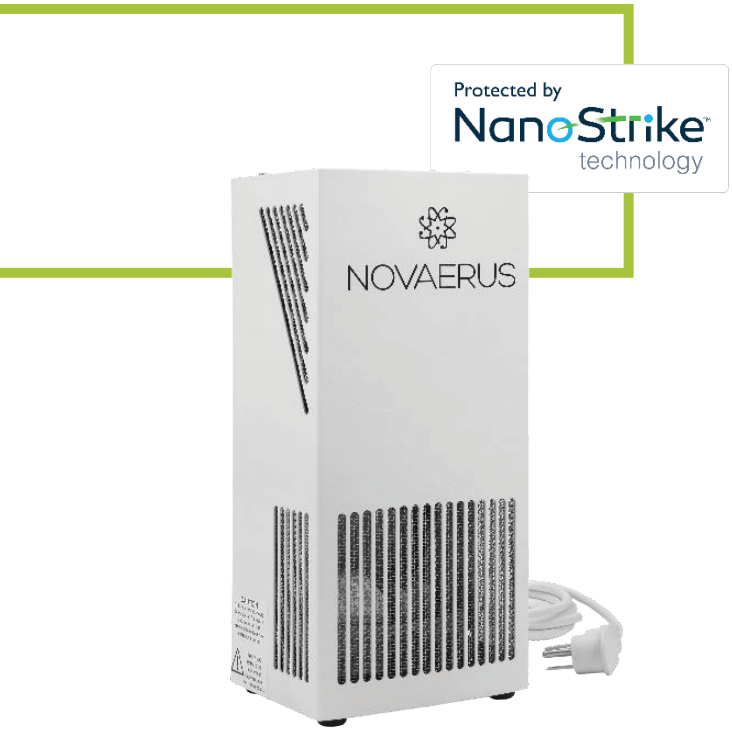
Nosocomial respiratory infections in the Park View wing.



Nosocomial respiratory infections in the Terrace View wing.

wellairsolutions.com
info@wellairsolutions.com
1.866.508.1118

ALLIANCE COMPANIES WELLAIR



Protect 200

(NV200) Specifications

MODEL
Protect 200 (NV200)
Wall mountable or countertop unit,
1-NanoStrike coil, supplied with 1.6m power cord (minimum length).

CONSTRUCTION+ COLOUR
Precision-cut fabricated metal casing in a white anti-bacterial powder coat finish

DIMENSIONS
283 mm (h) x 132 mm (w) x 108 mm (d)
11.1" (h) x 5.2" (w) x 4.3" (d)

WEIGHT
3.4kg I 7.5lbs

OPERATING CONDITIONS
10-35°C I 50-95°F, 10-75% Relative Humidity

SHIPPING/STORAGE CONDITIONS
5-50°C I 41-122°F, Maximum 95% Relative Humidity

ELECTRICAL RATING
Single Phase, 100-130 VAC 1220-240 VAC, 50-60 Hz
Fuse Rated at 250 VAC, 3 Amps, Listed

POWER CONSUMPTION RANGE'
100-130 V AC model:
12.9W - 21.8W

ELECTRICAL CONNECTION
Switched and fused with a grounded, moulded power cord

FAN AIR FLOW VOLUME
80 m3/hr 147 CFM

NOISE LEVEL
35dB

QUALITY STANDARDS
Manufactured under ISO 9001, ISO 14001 & OHSAS 45001

GLOBAL CERTIFICATIONS
IEC 60601-1
IEC60601-1-2
IEC 60335-1
IEC 60335-2-65
Conforms to Low Voltage Directive (LVD) 2014/35/EU
CE
UL867
FCC
CSA C22.2 NO. 187:20 CARB
FCC
China Disinfection WS/T 648 KCC
JQAS-Mark

CE
UL CERTIFIED SAFETY US-CA E356410

ALLIANCE-USA.COM

USM - Unité de Sécurité Microbiologique
1 rue du Professeur Calmette
BP 245 - 59019 LILLE Cedex
E-mail : usm@pasteur-lille.fr
Tél : 03 20 87 72 63
Fax : 03 59 31 74 76
Site web : http://usm.pasteur-lille.fr

Test report

Lille, 13th November, 2017

Mrs Camille Sandevoir
Azelies

Test report N. 170187
Copy 1

DEVICE: Novaerus Airborne Infection Control Unit Model NV200
Serial number: PA1W2301203502/1700056
Device received on 26th October, 2017
Tests conducted from 9th November, 2017 to 13th November, 2017

TEST: Validation of the efficiency of an air purifier for removal of Influenza virus H1N1

These results concern only the tested device.

This report has 5 pages

Anthony Pinon
Assistant manager

USM - Unité de Sécurité Microbiologique
1 rue du Professeur Calmette
BP 245 - 59019 LILLE Cedex
E-mail : usm@pasteur-lille.fr
Tél : 03 20 87 72 63
Fax : 03 59 31 74 76
Site web : http://usm.pasteur-lille.fr

Test report

I- Context

NOVAERUS developed an air purifier inactivating particles from air thanks to a plasma field. Biological air contaminants include viruses such as Influenza virus H1N1. This virus is responsible for flu in infected persons. It is transmitted via inhalation of contaminated droplets emitted by sick people through sneezing or coughing.
The aim of the test is to evaluate the ability of the air purifier to remove H1N1 virus from the air. In an air tight environment, contaminated droplets containing the virus will be aerosolized. The air purifier will then be started to 'cleanse' the air. After a determined operation time, air will be sampled and analysed for quantitation of the remaining virus population.
Efficiency of the purifier will be evaluated based on the log reduction of the viral count in air.

II- Materials and methods

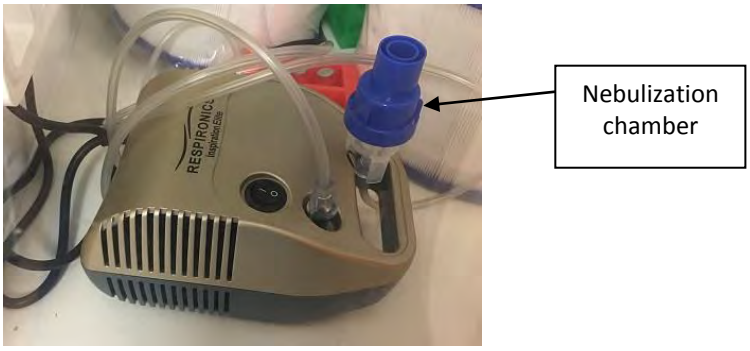
1. Strains and media

The study was conducted on Influenza virus H1N1 A/PR/8/34 (ATCC 1469). The virus was produced and titrated on cell line MDCK (ATCC CCL-34). Cells were grown in Minimal Essential Medium (MEM) supplemented with 10% Fetal Calf Serum.
Viral titres were determined using the Spearman-Kärber method, as recommended by European Standard NF EN 14476+A1 (October 2015), and expressed in 50% Tissue culture Infective Dose ($TCID_{50}$).

Liquid medium used for nebulization was Phosphate Buffer Saline (PBS). Air samples were collected in PBS + 0.005% Tween 20.

2. Material

A medical nebuliser (Respironics, Philips) was used to generate aerosols. This device is used for administration of inhalable medicine, thus ensuring that the generated droplets are in the inhalable fraction representative of particles at risk. A nebulization chamber is connected to the system.



Test report

Air sampling was performed using the Coriolis µ (Bertin Technologies), which collects samples by impinging in a cyclone formed by the collecting fluid in a conic flask. Sampling is performed at 300 litres/minute.

The air purifier operates at an air flow of 50 m^3/hour.

Experiments were performed inside a biological safety cabinet, safety level 3. The inner volume was 537 litres (or 0.537 m^3). Air renewal was switched off during the tests, to prevent aerosols from getting trapped in the cabinet filters.

3. Experimental design

Only two conditions were tested: purifier switched off during the test, or purifier switched on. Each was conducted 3 times, amounting to 3 x 2 = 6 tests.

Running time has been defined according to the air flow voloume of the purifier and the inner volume of the cabinet. The air flow is 50,000 L/hr, corresponding to 13.9 L/sec. Given the volume of 537 L of the safety cabinet, **a running time of 39 seconds corresponds to a single passage** of the air inside the cabinet through the purifier. 5 seconds were added to account for the activation time of the plasma. The final operation time of the purifier was then **44 seconds**.

4. Experimental setup

A highly concentrated suspension of H1N1 virus was prepared for each experimental series. 1 mL of the virus suspension was mixed with 7 mL PBS and placed inside the nebulization chamber. 100 µL were removed for viral enumeration before the start of the experiment.

Collection flasks were filled with 15 mL of PBS + Tween 20.

For each experiment, the nebulizer was switched on for 5 minutes. Then, simultaneously, the nebulizer was switched off and the purifier was either switched on or left off. After a defined time, the purifier was switched off (or left off) and, simultaneously, the air sampler was switched on for 5 minutes. At the end of the sampling time, the collection flask was removed and closed.

Three successive tests were conducted in the same conditions (either purifier on or purifier off), using the same nebulizing solution, but with a different collection flask each time. At the end of these 3 tests, the nebulization chamber was removed; the remaining volume was measured and the viral population was enumerated again. Collection flasks were analysed after a concentration step, allowing to lowering the detection limit of the collected viral load.

At the end of an experimental day, the safety cabinet was decontaminated by nebulizing a disinfectant (peracetic acid + hydrogen peroxide). The cabinet was aerated before new tests were performed.

5. Data analysis

The following values are measured during the test:

-	Viral concentration in nebulizing solution	Cn	(in $TCID_{50}$/mL)
-	Initial volume of nebulizing solution	Vni	(in mL)
-	Final volume of nebulizing solution	Vnf	(in mL)
-	Viral concentration in concentrated collection solution	Cc	(in $TCID_{50}$/mL)
-	Volume of concentrated collection solution	Vc	(in mL)

The former values are used to calculate the following values:

-	Nebulized volume	Vn = Vni – Vnf	(in mL)
-	Nebulized quantity of virus	Qn = Cn x Vn	(in $TCID_{50}$)
-	Collected quantity of virus	Qc = Cc x Vc	(in $TCID_{50}$)
-	Viral reduction during the experiment	R = Log(Qn) – Log (Qc)	(in Log($TCID_{50}$))

Finally, the impact of the purifier is evaluated by comparing values of R with the purifier on (R_{on}) to values obtained with the purifier off (R_{off}), for identical running times. The log reduction observed in experiments with the purifier switched on is supposed to be caused by several sources:

- Impact of the purifier,
- Impact of the experimental conditions (nebulization stress, impact on surfaces, sedimentation…).

It is assumed that the second source of viral loss is identical whether the purifier is switched on or off. Therefore, it is estimated by experiments where the purifier is switched off (R_{off}).
The value of interest, defined as the removal ability of the purifier alone R_P, is eventually evaluated as

$$R_P = R_{on} - R_{off}$$

Test report

III- Results

Results are presented below.

Purifier	Nebulized quantity Qn ($TCID_{50}$)	Collected quantity Qc ($TCID_{50}$)	Viral reduction R	Average R	Log reduction caused by purifier R_P	% removal caused by purifier
Off	7.3×10^7	4.2×10^4	3.2	3.9		
		5.6×10^3	4.1			
		4.2×10^3	4.2			
On	7.0×10^7	7.5×10^3	4.0	4.2	0.3	51.8%
		3.2×10^3	4.3			
		4.2×10^3	4.2			

Log reductions caused by the purifier (R_P values in Table) are estimated by subtracting the log reduction of virus observed in the experiments conducted with the purifier switched off from the log reduction of virus observed in the experiments conducted with the purifier switched on, for the same running time.

IV- Conclusion

The Novaerus Airborne Infection Control Unit Model NV200 was able to remove **51.8% of Influenza H1N1 virus from air after 1 passage** through the purifier.

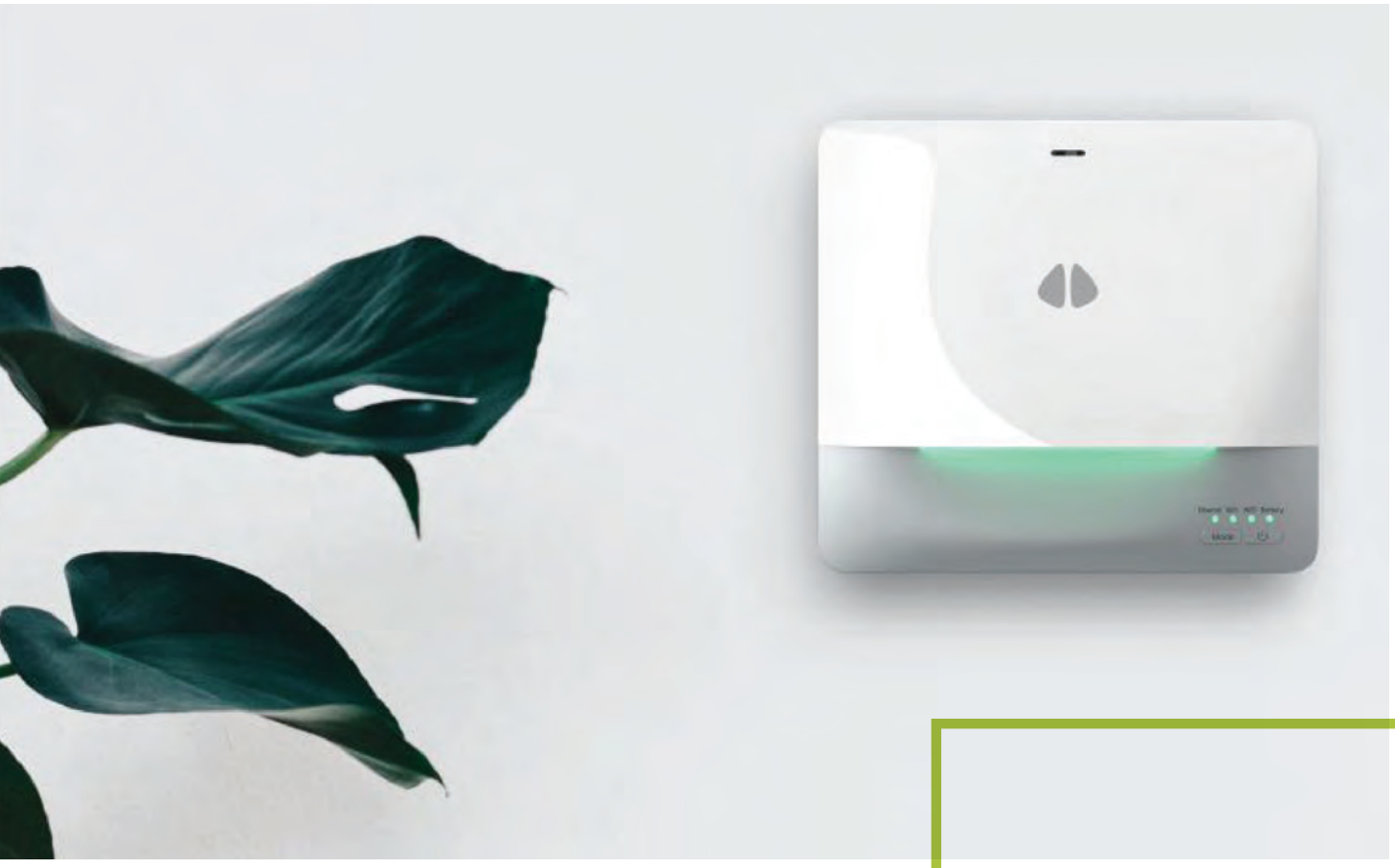
End of test report

ALLIANCE COMPANIES

uHoo

Technical Specifications

Wall-mounted or Table Top Environmental Air Quality Monitor



uHoo Aura

The Most Comprehensive Environmental Quality Monitor

Temperature, Relative Humidity, TVOC, Particulate Matter (PM_1, PM_{2-5},PM_4,PM_{10},), Carbon Dioxide (CO_2), Formaldehyde, Carbon Monoxide (CO), Air Pressure, Light, Sound

ALLIANCE COMPANIES

uHoo

GENERAL

Installation:	Wall-mounted
Operating Temperature:	10°C to 50°C 14°F to 122°F
Operating Humidity:	5% to 95%, Non-condensing
Built-in Fan:	Yes
OTA Firmware Update:	Yes
Accessories:	5V/2A USB Adapter (region-specific), 1.5m USB Cable, Mounting Tape, Tapping Screws, Wall Plugs, Air Health and Virus Index Sticker

DESIGN

Dimensions (W x L x D):	200mm x 180mm x 57mm or 7.8in x 7.1in x 2.2in
Weight:	765g or 1.7lbs
Material:	ABS Plastic
Mechanical Protection:	IP43 Ratings with Dust-filtering Mesh
Light Indicators:	Air Quality, SIM, Ethernet, Wi-Fi, Battery (Software-controllable)
Screen Display:	No

DATA

Log Interval:	Once per Minute
Backup:	Every 15-minute Interval up to 48 hours on Local Flash Memory Permanant on Cloud
Format:	Minute, Hourly Average, Daily Min/Max/Average + Analytics
APIs:	Yes

POWER

Main Power Source:	5V/2A USB Adapter
Backup Power Source:	3250mAh @ 3.6V Lithium-ion Battery
Power Consumption:	900 mW (Normal Operation) and 1.1 W (Data Transmission)

USER INTERFACE

uHoo Account:	Contact business@getuhoo.com for Account Registration
Web Dashboard:	Support All Major Browsers
Mobile App:	uHoo Business
Minimum OS Requirement:	iOS 11 (64-bit Devices) or Android 4.3 and Versions Above

CERTIFICATIONS

Radio:	FCC, IC, CE, TELEC, NTC
Safety:	FCC, IC, CE, PSE
Battery:	UN38.3, UL 62368, CB (IEC 62133-2017), PSE
Environmental:	RoHS, REACH, WEEE, Free of SCCP and HBCDD Contents

CONNECTIVITY

Choose your connectivity protocol from the following options*

1. Nb-IoT

Description:	LTE Cat M1 / NB1 and EGPRS Module
LTE Bands:	Multi-regional. 1/2/3/4/5/8/12/23/18/19/20/25/26
SIM Card:	Micro-SIM Supporting M1/NB1 Network Access. Contact your Local Telecommunication Service Provider for More Details.

2. Wi-Fi (Setup using mobile app)

Standard:	802.11 a/b/g/n @ 2.4GHz and 5GHz (20MHz Channels Only)
Security:	Open, WEP, WPA/WPA2-Personal

***There is only one connectivity protocol used by each device. Be sure to select your preferred option when ordering to ensure it is compatible with your setup.**

SENSOR SPECIFICATIONS

SENSORS	RANGE	RESOLUTION	ACCURACY
Temperature	-40 to 85ºC	0.1ºC	± 0.5°C
Relative Humidity	0 to 100%	0.1%	± 3%
Air Pressure	300 to 1,100 mBAR	0.1 mBar	± 1 mBar
Light	0 to 40,000 lux	1 lux	± 20 lux or ± 5% of actual value
Sound	30 to 120 dB	+/- 1db	Sensitivity: -26 dBFS SNR: 64 dB : 122.5 dB SPL
PM_1	0 - 1000 µg/m³	1 µg/m³	± 10 µg/m3 (0 to 100 µg/m3) ± 10% (100 to 1000 µg/m3)
PMO-ỏ	0 - 1000 µg/m³	1 µg/m³	± 10 µg/m3 (0 to 100 µg/m3) ± 10% (100 to 1000 µg/m3)
PMỎ	0 - 1000 µg/m³	1 µg/m³	± 25 µg/m3 (0 to 100 µg/m3) ± 25% (100 to 1000 µg/m3)
PMoyOy	0 - 1000 µg/m³	1 µg/m³	± 25 µg/m3 (0 to 100 µg/m3) ± 25% (100 to 1000 µg/m3)
TVOC	0 to 60,000 ppb	1 ppb	± 15 %
Carbon Dioxide	400 to 10,000 ppm	1 ppm	± 30 ppm plus 3% of actual value
Carbon Monoxide	0 to 1,000 ppm	0.1 ppm	± 2 ppm
Formaldehyde	0 to 2,000 ppb	1 ppb	± 30 ppb (0 to 300 ppb) ± 10% (300 to 2000 ppb)

CONNECTIVITY

uHoo Aura Base Device Measures the Following:
Temperature, Relative Humidity, Air Pressure, Light, Sound, PM_1, PM_{2-5},PM_4,PM_{10}, TVOC, Carbon Monoxide (CO), Carbon Dioxide (COO), Formaldehyde (HCHO) and Virus Index™

Module A: In addition to the 13 sensors of the uHoo Aura Base device, you can customize it to measure more parameters by choosing one of the options below:

a. Nitrogen Dioxide (NO_2), and Ozone (O_3)
b. Nitrogen Oxide (NO)
c. Sulfur Dioxide (SO_2)
d. Hydrogen Suilfide (H_2S)
e. Ammonia (NH_3)
f. Oxygen (O_2)

Module B: Temperature, Relative Humidity, Carbon Dioxide (CO_2), TVOC, Air Pressure

Module C: PM_1, PM_{2-5}, PM_4, PM_{10}

ALLIANCE COMPANIES

uHoo

Take control. Ensure safety. Improve productivity.

Poor indoor air lowers employee health and productivity.

Studies have shown that poor indoor air quality reduces employee productivity, increases absences and increases health care costs. Moreover, poor indoor air quality increases the risk of coronavirus surviving and getting transmitted in the air.

uHoo helps you take control of these situations and stay on top of safety. By having the proper tools to address air quality, you can make better decisions to enhance the health and well-being of your employees.

ALLIANCE COMPANIES

uHoo

Take control with uHoo Business

uHoo Business, together with uHoo Aura, monitors and manages the air you breathe.

1. Provide hope

By detecting the risk of the coronavirus so that appropriate action can be taken to reduce risk, improve the environment, and create peace of mind.

2. Reduce risk

By providing a real-time assessment of coronavirus and air quality risk so you can immediately take action to reduce any risk.

3. Enhance wellness

By monitoring air quality to help create a healthy, safe, and comfortable environment.

4. Reduce anxiety

By being transparent to your employees through the sharing of relevant air quality and coronavirus risk data.

5. Simplify management

By providing a consolidated view of all your offices on one dashboard so that you can easily identify and address any air quality issues.

6. Integrate

By connecting uHoo Business with your building's HVAC systems to automatically control and manage your heating, cooling, ventilation, and fresh air.

7. Reduce cost

By identifying and addressing air quality issues immediately to reduce employee complaints, increase productivity, and prevent wear and tear of your equipment.

8. Be informed

By having real-time access to all your air quality data, tips on how to improve your building spaces, and case studies on how other customers have benefited.

ALLIANCE COMPANIES

uHoo

Make your workspace safe with uHoo Business

Know what you're breathing through the 13 parameters* that uHoo Aura measures.

- Temperature
- Relative Humidity
- Carbon Dioxide (CO_2)
- Chemicals (VOCs)
- Carbon Monoxide (CO)
- Dust Particles (PM_{10})
- Dust Particles (PM_4)
- Dust Particles ($PM_{2.5}$)
- Dust Particles (PM_1)
- Formaldehyde
- Air Pressure
- Light (Lux)
- Sound

*Option to upgrade to measure up to 15 parameters that include nitrogen dioxide, ozone, sulfur dioxide, oxygen, hydrogen sulfide and ammonia

ALLIANCE COMPANIES

uHoo

Safeguard your environment against the coronavirus with the uHoo Virus Index™

The uHoo Virus Index™ utilizes AI-powered insights based on scientific research to provide a real-time risk assessment of the coronavirus surviving and becoming transmittable in the air. With this information, you would know which specific actions to take to reduce your coronavirus risk.

The uHoo Virus Index™ is based on a comprehensive analysis of multiple air quality factors. The safety thresholds are based on scientific research conducted by organizations such as the World Health Organization (WHO), the Occupational Safety and Health Administration (OSHA) and other scientific publications conducted by various scientists and universities.

The uHoo Virus Index™ ranges from 1-10, and sub-categorized into four levels:

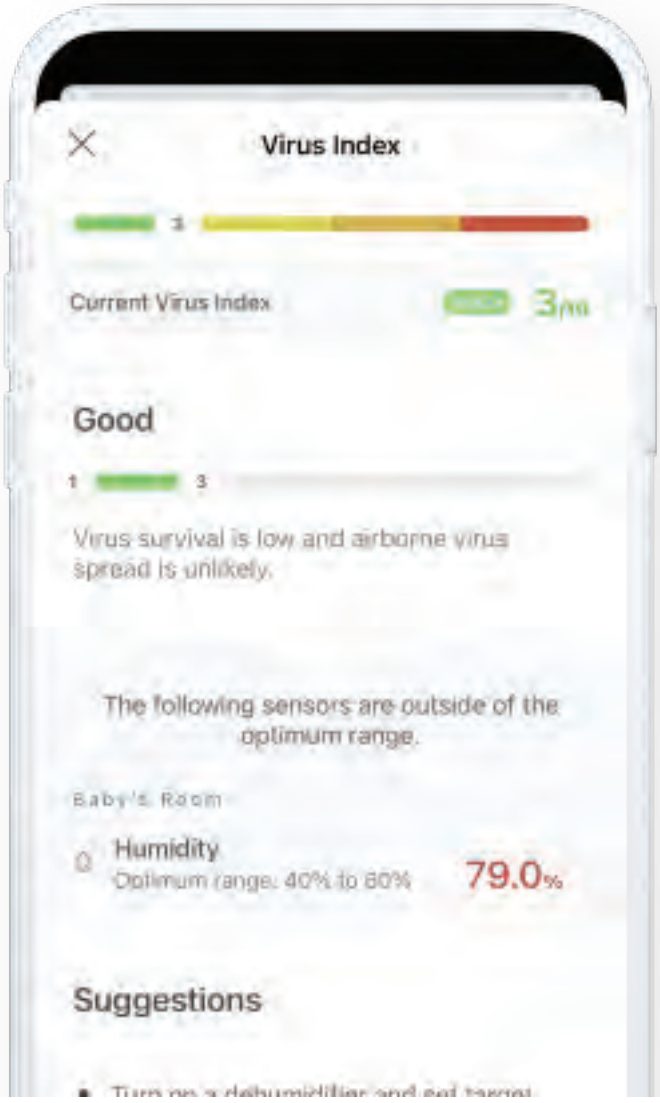
1 to 3 (Good)
Virus survival is low and transmission through the air is unlikely.

4 to 6 (Mild)
Virus survival is moderate and transmission through the air is possible but air quality poses little to almost no direct health risk for people who are not sensitive to air pollution.

7 to 8 (Bad)
Virus survival is prolonged and transmission through the air is likely. Air quality poses some health risk.

9 to 10 (Severe)
Virus survival is high and transmission through the air is likely. Air quality would affect most people.

Reducing the risk is top priority to reduce susceptibility to the coronavirus. uHoo helps you make better decisions in creating a safer and healthier workplace.

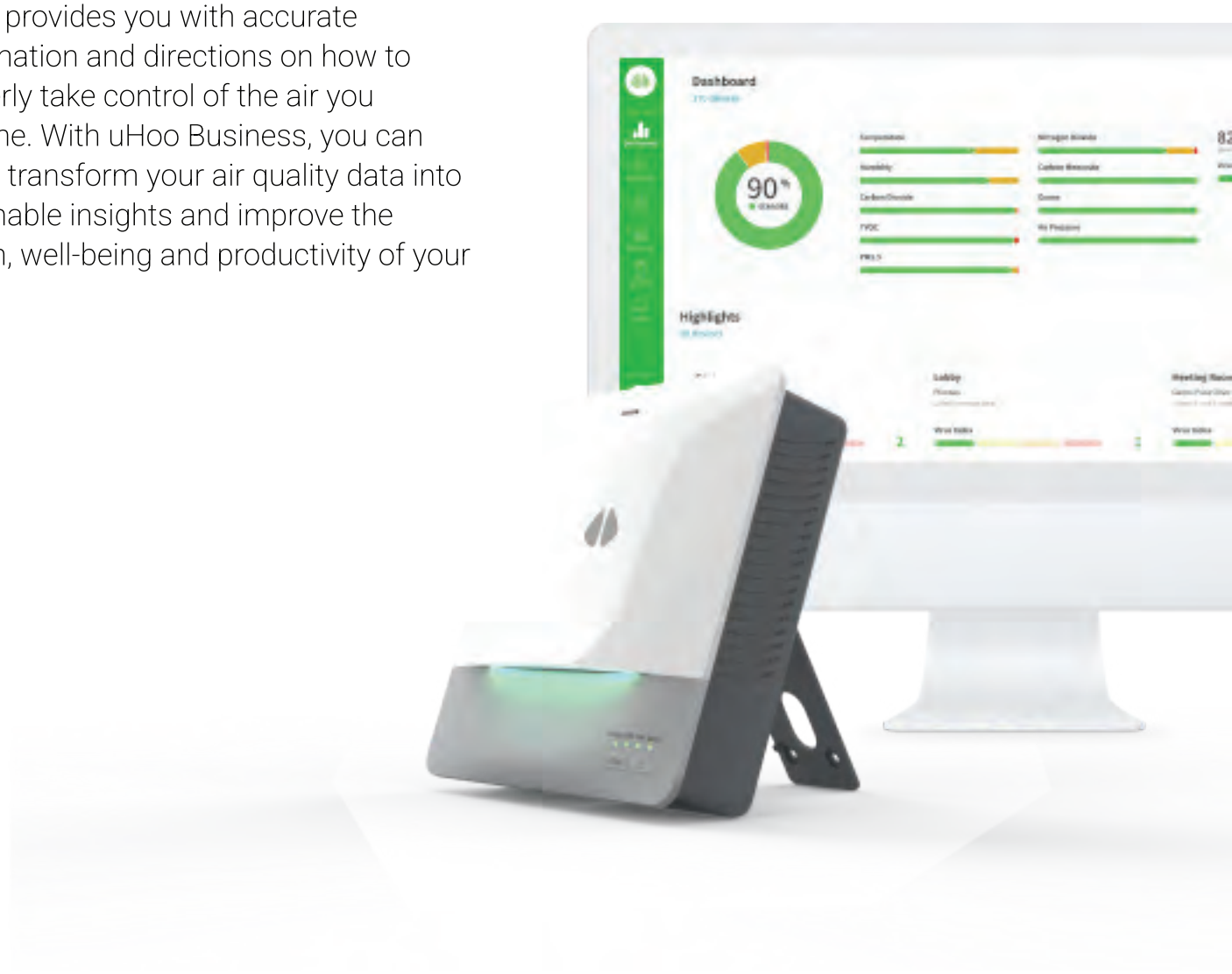


ALLIANCE COMPANIES

uHoo

Create a healthy workplace and stay ahead of your game

uHoo provides you with accurate information and directions on how to properly take control of the air you breathe. With uHoo Business, you can easily transform your air quality data into actionable insights and improve the health, well-being and productivity of your team.



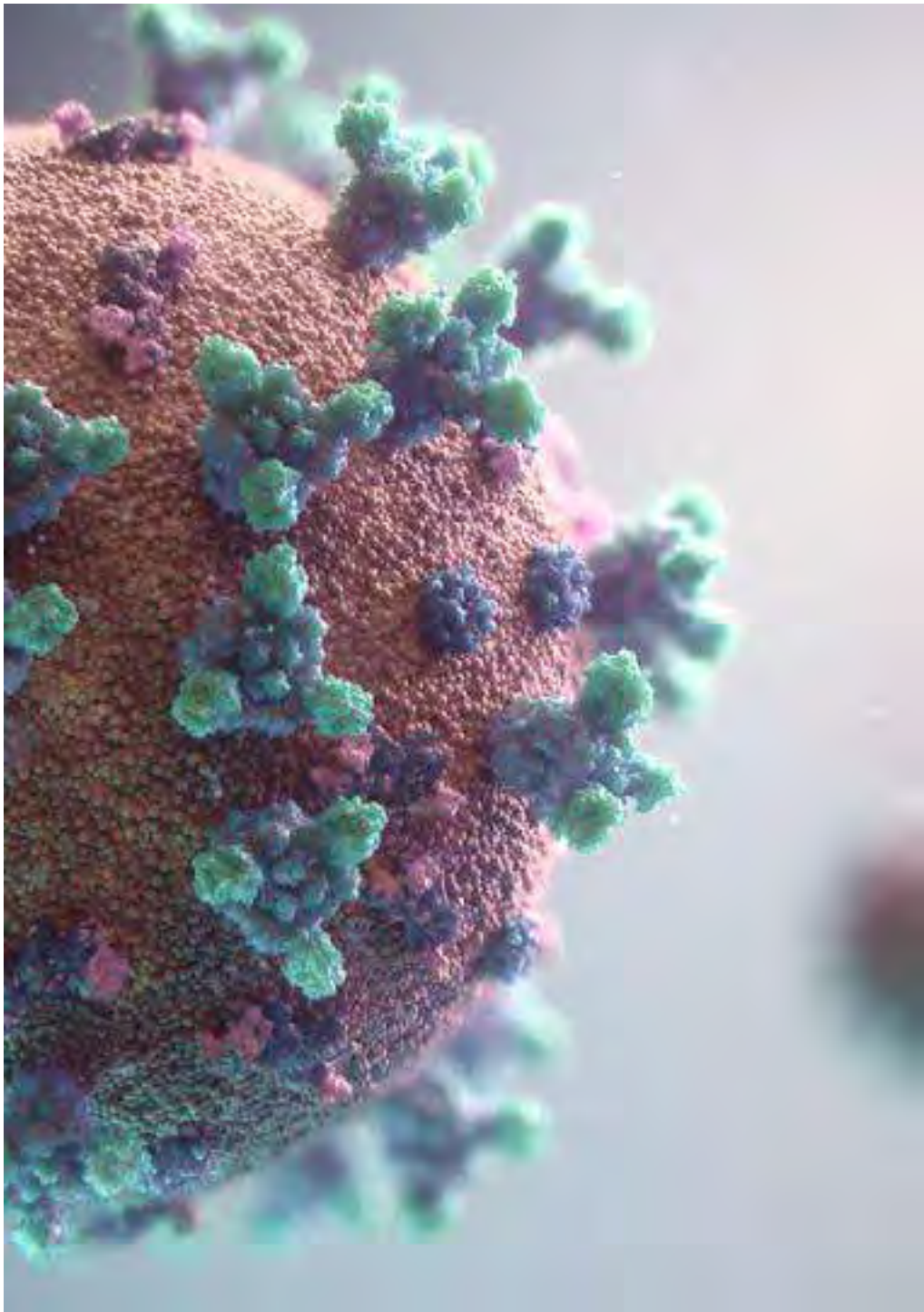
Take control with uHoo and #StayOnTopOfSafety

Take your first step to a healthier, safer and more productive workplace.

ALLIANCE-USA.COM

uHoo

Using Indoor Air Quality Data to Create the uHoo Virus Index



Why Indoor Air Quality Matters

COVID-19, or the coronavirus, has drastically changed our routines. Due to the lockdowns put in place in affected regions around the world, people are spending more time indoors than ever. And that's a big point of concern when talking about air quality because indoor air is usually two to five times worse than outdoor air.

Before the COVID-19 pandemic began, people were already spending a lot of time indoors, which has been intensified by efforts to combat or slow the spread of the disease. For many people, they are unaware that the air they are breathing indoors is often more polluted than outside air. This can induce anxiety as our homes are supposed to be the place where we feel the safest.

"We can then utilize air quality data within our homes and workplaces to create an environment that helps to deactivate viruses and to enhance our immune system."

Research has shown that air quality and COVID-19, together with other viruses, are correlated. We can then utilize air quality data within our homes and workplaces to create an environment that helps to deactivate viruses and to enhance our immune system.

uHoo's goal is to empower you to make better decisions about your health and your home/workplace environment using accurate and actionable air quality data.

uHoo Virus Index

The 'uHoo Virus Index' is a patent pending technology that uses the power of air quality data to help you know how to deactivate viruses in your home/workplace and how your air quality affects your health and immune system.

Various factors affect air quality, including your unique habits and spaces, and it's important to take these into consideration. With uHoo, your air quality data can be transformed into actionable insights.

The table below shows you the uHoo Virus Index. It ranges from 1 to 10 sub-categorized into 4 levels.

1 to 3 (Good)
Virus survival is low and airborne virus spread is unlikely.

4 to 6 (Mild)
Virus survival is moderate and airborne virus spread is possible but air quality poses little to almost no direct health risk for people who are usually not sensitive to air pollution. Sensitive people may experience health effects. More attention to air quality should be given and actions to improve air quality is recommended.

7 to 8 (Bad)
Virus survival is prolonged and airborne virus spread is likely. Air quality poses some health risk. Critical assessment of your air quality is necessary and actions to improve air quality is required.

9 to 10 (Severe)
Virus survival is high and airborne virus spread is likely. Air quality would affect most people and actions to improve air quality is necessary.

These levels are determined based on scientific analysis of five air quality factors which includes temperature, relative humidity, $PM_{2.5}$, Carbon Dioxide, and Nitrogen Dioxide. Let's look at how these factors affect your uHoo Virus Index.

Ideal Ranges

Temperature

19°C to 24°C (66°F to 75°F)

According to research by Casanova Lisa, et al., published in the American Society of Microbiology[1], the infection rate of viruses is significantly reduced at room temperature (20°C or 68°F) compared to colder temperatures (e.g. 4°C or 39°F). Whereas, at warmer temperatures (30°C or 86°F), transmission of influenza viruses is blocked or becomes highly inefficient. Maintaining temperature at the ideal level not only lessens the risk of virus transmission but also keeps you comfortable indoors.

Relative Humidity

40% - 60%

In environments with lower than 40% Relative Humidity (RH), droplets from a cough or a sneeze lose their moisture quickly. This results in droplets becoming 'dry aerosols' and capable of staying in the air for longer periods. Viral particles remain infectious much longer below 40% and above 80%.

Virus particles are most inactive at 50% humidity, and retain their infectiousness the further from that median value, plateauing at 20% and 80%, respectively[2]. Staying within 40% to 60% relative humidity is ideal from a comfort perspective but 50% is the most ideal in terms of fast virus inactivation.

Keeping the humidity at the ideal range not only helps you stay comfortable but also keeps you healthy. Low humidity (less than 30%) may promote dry nasal passage which makes people more susceptible to cold viruses while high humidity (more than 70%) may promote mold growth which can be harmful to people with weakened immune systems.

$PM_{2.5}$

Below 15µg/m³

Particulate Matter also known as "Particle Pollution" is a complex mixture of extremely small particles and liquid droplets. Particulate Matter at 2.5 microns in size or smaller can be inhaled deep into the lungs and cause irritation and corrosion of the alveolar wall, which impairs lung function[3]. They are also known to carry microbiomes[4].

These particles are small enough to stay suspended in the air. A study conducted by Feng, Cindy et al published in the Journal of Environmental Health[5] showed an increased vulnerability to influenza-like illnesses when levels of $PM_{2.5}$ were above the ideal range. The data suggests that $PM_{2.5}$ stays airborne longer, creating a "condensation nuclei" which virus droplets attach to. These are then inhaled by people, resulting in infection.

Thus, it is best to keep your $PM_{2.5}$ levels low to minimize risk of infection.

Examples of sources of $PM_{2.5}$ indoors: smoking, cooking, candles, space heaters, furnaces, and poorly-maintained HVAC system.

Ideal Ranges

Carbon Dioxide

Below 800ppm

Carbon Dioxide has long been used as an indicator of good indoor air quality primarily because of its association with ventilation. When carbon dioxide levels are high, it may indicate that your space is not well ventilated. The ideal level of CO_2 is needed to reduce the risk of lung inflammation[6].

Chronic inflammation caused by persistent high CO_2 levels is not ideal for your health. Moreover, longer exposure to high CO_2 can cause fatigue, headaches, and dizziness. It is also possible to develop hypercapnia acidosis[6], characterized by increased levels of carbon dioxide in the blood. This suppresses immune function and can make one more susceptible to disease.

Some causes of carbon dioxide elevation indoors: improperly maintained combustion devices and poor ventilation.

Nitrogen Dioxide (NO_2)

Below 53ppb

High levels of Nitrogen Dioxide indoors is the result of outdoor NO_2 entering your indoor environment as well as combustion sources inside the home / workplace. According to a study published in the Environmental Research journal, short-term exposure can irritate airways while long-term exposure can lead to chronic illness and respiratory infections with viruses[7]. Asthmatics may also experience longer symptomatic periods and increased medication use for children.

Examples of sources of nitrogen dioxide: Automobiles from attached garage or near a busy street, appliances with defective installations, gas stoves, kerosene heaters, chimneys, etc.

How do these Parameters Differ from Standards

When it comes to dealing with viruses, the lower the risk the better. The thresholds set in uHoo's Virus Index are different from the default air quality safety thresholds set inside the uHoo app, which is based on US EPA, the World Health Organization (WHO) and the Occupational Safety and Health Administration (OSHA) standards. The uHoo Virus Index thresholds are based on specific environments, derived from scientific research conducted by governments, scientists, and universities, suitable for viruses to survive. It has stricter guidelines compared to the air quality safety thresholds set by the above mentioned organizations.

In-Depth Analysis: Air Quality & COVID-19

COVID-19 is a highly infectious disease compared to its 2003 counterpart, SARS. Its health effects vary among people from having no symptoms at all to having severe respiratory distress. According to the CDC[8], people with serious underlying medical conditions are “at higher risk for severe illness from COVID-19.”

Scientists also found that air pollution contributes to the severity of the disease. A nationwide study[9], conducted by Harvard University, showed that counties in the USA with high levels of air pollution before the COVID-19 crisis have higher death rates (defined as COVID-19 deaths per total population).

Can Coronavirus Travel in the Air?

Research groups have suggested that air pollution particles could help coronavirus travel further in the air[10].

A statistical analysis[11] conducted by scientists from various Italian Universities and Health Institutions showed correlation between higher levels of particle pollution and higher rates of infection in parts of northern Italy before a lockdown was imposed. It’s important to take note that this study has not been peer-reviewed as of the writing of this paper (May 2020).

In contrast, a peer-reviewed research study conducted by Wei Su et. al published in the BMC journal found that high levels of particulates in the air corresponded to more cases of influenza and influenza-like illnesses during the flu season[12].

Previous studies have also shown that air pollution particles harbour microbes[4], and that pollution is likely to have carried the viruses causing bird flu, measles, and foot & mouth disease over considerable distances.

How Does COVID-19 Spread?

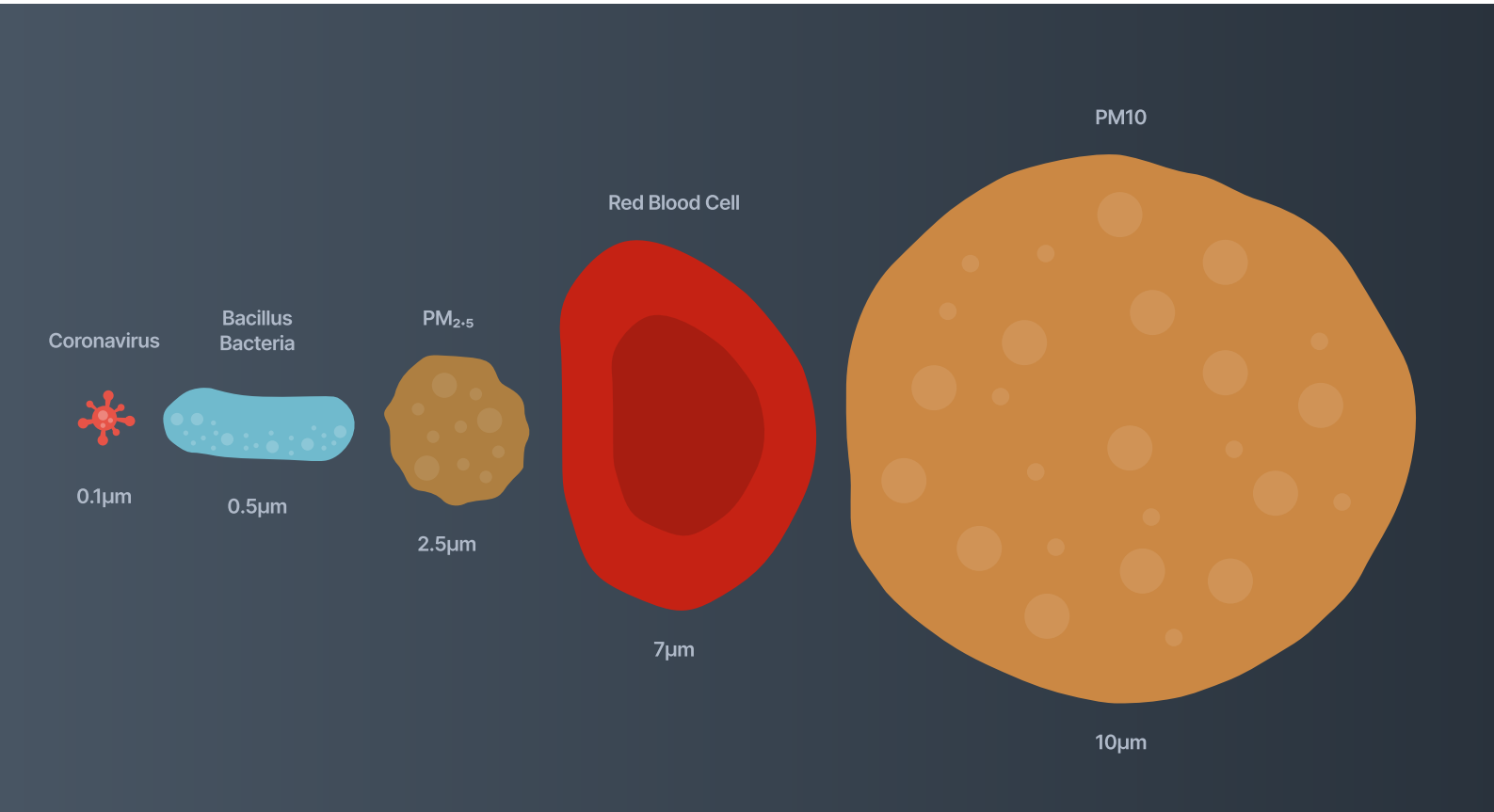
Large virus-laden droplets from infected people's coughs and sneezes fall to the ground within a meter or two. But much smaller droplets, less than 5 microns in diameter, can remain in the air for minutes to hours and travel further.

Ke Lan and his colleagues, expert virologists from Wuhan University, hypothesized that these tiny airborne droplets can cause coronavirus infections[13]. Scientists from the Department of Community and Family medicine in Hong Kong found evidence that SARS coronavirus was spread in the air[14].

How Air Pollution & Indoor Air Quality Affect Mortality Rate

Long before COVID-19 arrived at our doorsteps, air pollution and poor indoor air quality have been linked to higher rates of illness and mortality.

According to Harvard University[9], the same trend holds true for COVID-19. Their study looked at the data from the year 2000 to 2016 and found that long-term exposure to particulate matter results in an increase in COVID-19 death rate, based on their data, as of April 24, 2020.



Ways to Maintain Good Air Quality

Now that we know how vital good air quality is to reduce our susceptibility to viruses, let's look at some practical tips below based on the uHoo Virus Index.

Keep your Temperature and Humidity under Control

WHO's Guide For Worker Safety[15] in March 2020 notes that a person can be infected by touching contaminated objects or surfaces, and then touching their face.

According to The National Institute for Public Health and the Environment of the Netherlands (RIVM)[16], under the right conditions, SARS-CoV2, the virus that causes COVID-19, can survive outside of the body for several hours and surfaces for several days.

Aside from good personal hygiene and cleaning surfaces, there are ways to lessen our risk of getting infected through the right management of temperature and relative humidity. A study published in the American Society for Microbiology[1] found that the right level of humidity rendered more SARS-CoV surrogate viruses unable to infect, a process called viral inactivation.

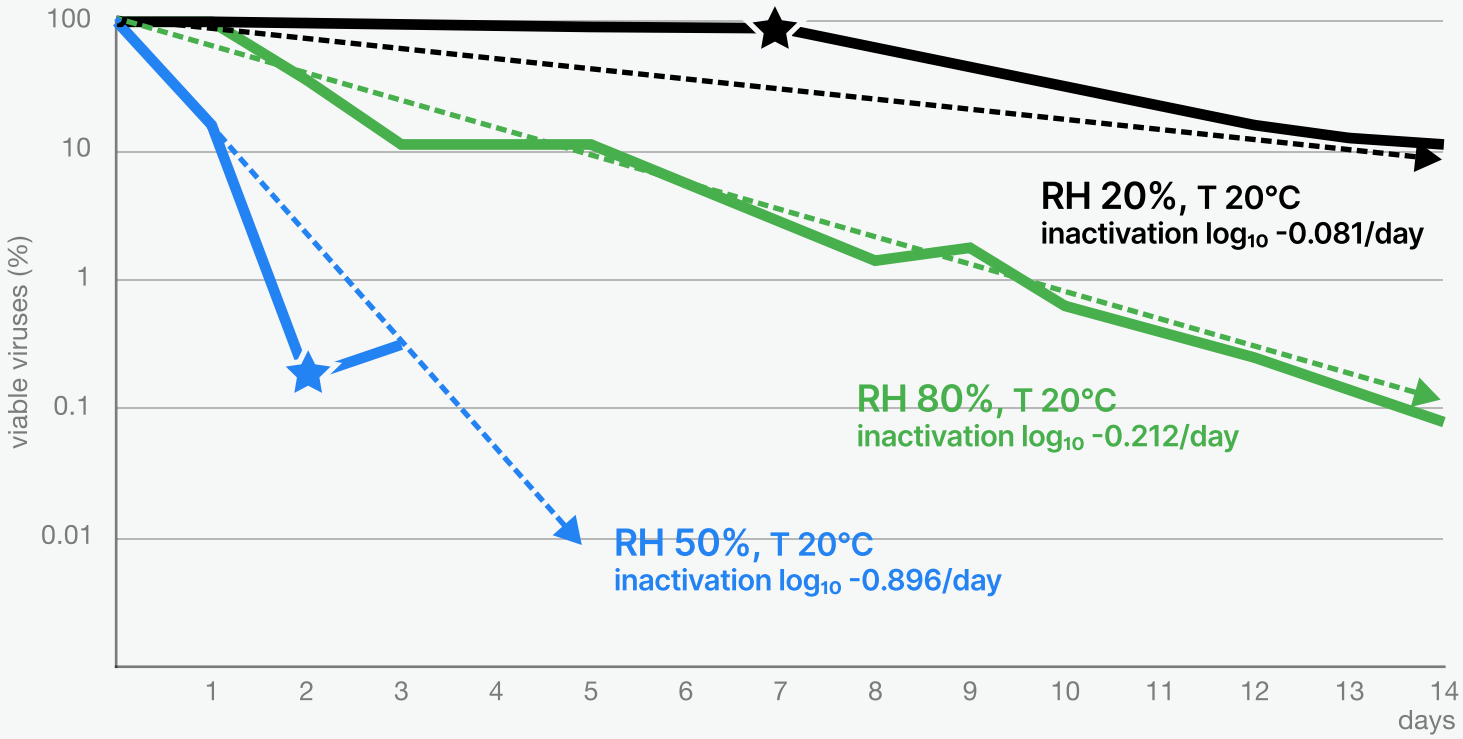
Here are the results of their study:

- The greatest level of virus inactivation took place at 50%RH.
- The lowest level of virus inactivation took place at 20%RH.
- Inactivation was more rapid at 20°C (68°F) than at 4°C (39°F) at all humidity levels.
- There was greater survival for viruses at low RH (20%) and high RH (80%) than at moderate RH (50%).
- Infectious virus deposited on stainless steel surfaces stayed for at least 3 days at 50%RH (20°C) and for up to 28 days at 20%RH.

The results show that keeping Relative Humidity at 50% and a temperature of 20°C lessens your risk in being infected as it promotes faster virus inactivation. Thus, it's essential that healthcare facilities, offices, and homes keep the humidity at the ideal range to reduce transmission risk of COVID-19 in indoor environments. However, it is important to note that virus particles on smooth steel surfaces can last up to 3 days at 50%RH and 20°C, more so, if the temperature and humidity is lower than that. Disinfecting surfaces should still be an important part of our daily routine.

To understand this data better and its implication on our health, let's look at the charts below, from the study conducted by Lisa M. Casanova, et al published in the American Society for Microbiology[1].

Chart 1: Inactivation of SARS-CoV Surrogate TGEV at 4°C and at different humidities.

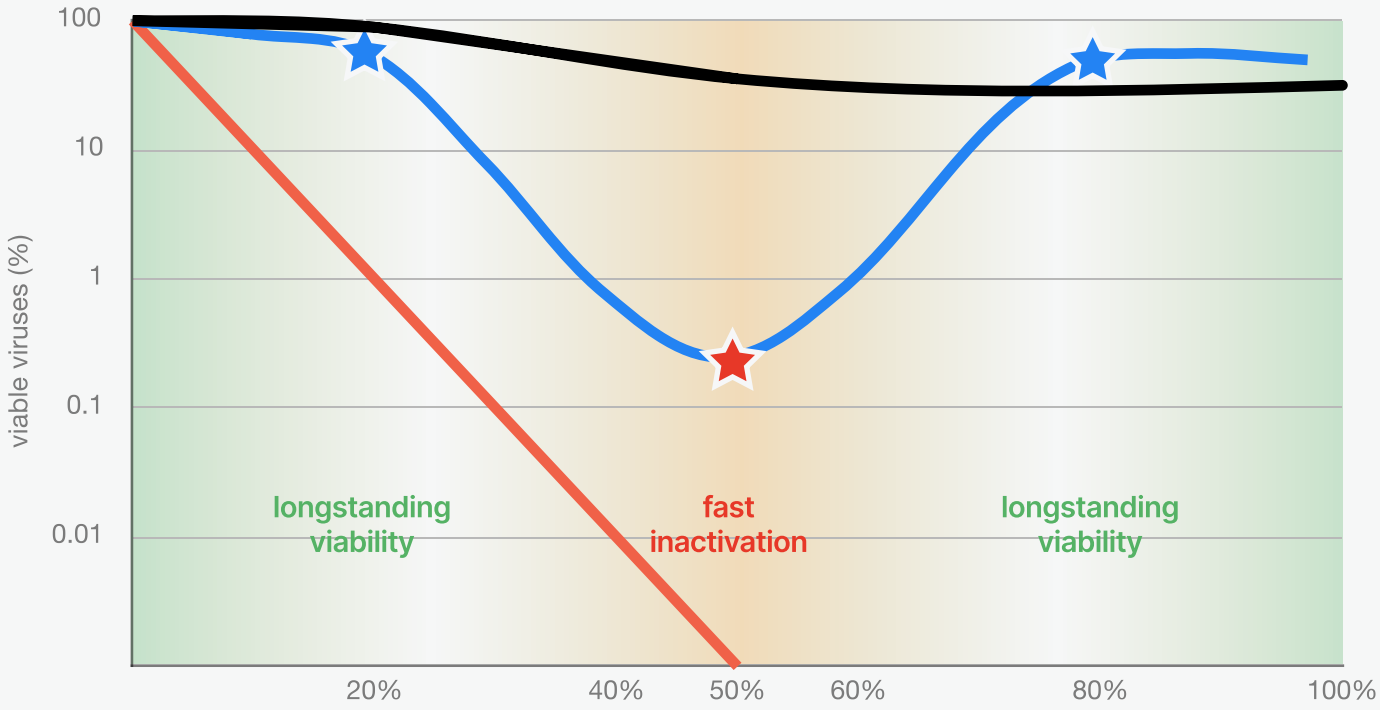


Fastest inactivation of viruses happened at 50%RH.

Knowing our infection risk using temperature and humidity is essential in maintaining a healthy indoor environment where we spend 90% of our time.

This chart shows that in dry indoor air at 20°C and 20% RH, 80% of coronaviruses remain viable on surfaces for a week. This significantly increases our infection risk through touch, resuspension, and inhalation of virus particles. Humidifying your home or office to 50% RH reduces viable viruses to less than 1% after two days, which significantly decreases infection risk.

Chart 2: Inactivation of SARS-CoV surrogate TGEV at different temperatures and humidities.



Fastest inactivation at all temperatures is at 50% RH.

Virus particles are most inactive at 50% humidity, and retain their viability the further from that median value, plateauing at 20% and 80% respectively as represented by the blue line.

At 20°C (68°F) with dry air (20%RH) and humid air (80% RH) coronaviruses survive for up to two to three days as represented by the blue star. At 20°C (68°F) with 50%RH, on the other hand, less than 1% of the viruses remain viable after 1 day as represented by the red star.

The study also showed that low temperatures increase the persistence of viable viruses (black line) while high temperatures decrease the persistence of viable viruses (red line), on inanimate objects such as stainless steel.

What does this data mean?

Dr. Walter Hugentobler from the University of Zurich states:

"This study clearly shows that maintaining a mid-range humidity in hospitals and healthcare establishments would be an effective measure to reduce the risks of coronavirus transmission. Although this study set out to gain insight into potential measures to control SARS-CoV (the virus of the SARS pandemic in 2002/2003), the results are most likely relevant to the spread of COVID-19, the disease transmitted by SARS-CoV-2, a coronavirus genetically very close to SARS-CoV."[17]

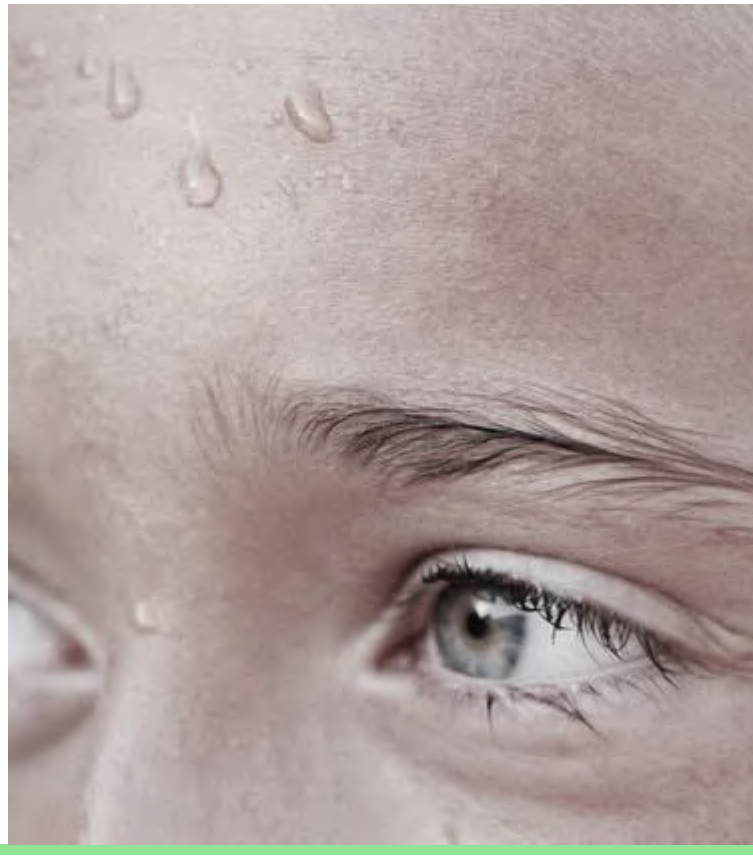
How does Temperature Affect the Spread of Viruses?

Ambient temperature can have a strong influence on the activity and spread of viruses. For example, other viruses that cause respiratory infections often occur in the winter months. According to Frank van Kuppeveld, professor of virology at Utrecht University, this stems from reduced resistance of the mucous membranes[18] in the nose when cold air is inhaled. Keeping the temperature at the ideal range indoors, 19°C to 24°C (66°F to 75°F), helps you avoid drying of the nasal passage that makes you more susceptible to viruses.

How does Relative Humidity Affect the Spread of Viruses?

Scientists from the Department of Epidemiology and Biostatistics in Peking University[19] proposed that the moisture in exhaled bioaerosols quickly evaporates in a low-humidity environment, which then forms into airborne droplet nuclei. When the fluid of pathogenic droplets quickly evaporates, it allows them to stay suspended in the air for a long time.

This is supported by another study conducted by the US CDC[20] on the effect of relative humidity on aerosolized viruses. They found that rapid inactivation of viruses happens at relative humidity of 43% even if they are suspended in the air. Maintaining an indoor relative humidity at the ideal range will then significantly reduce the infectivity of aerosolized viruses.



Get Fresh Air and Maintain Good Ventilation

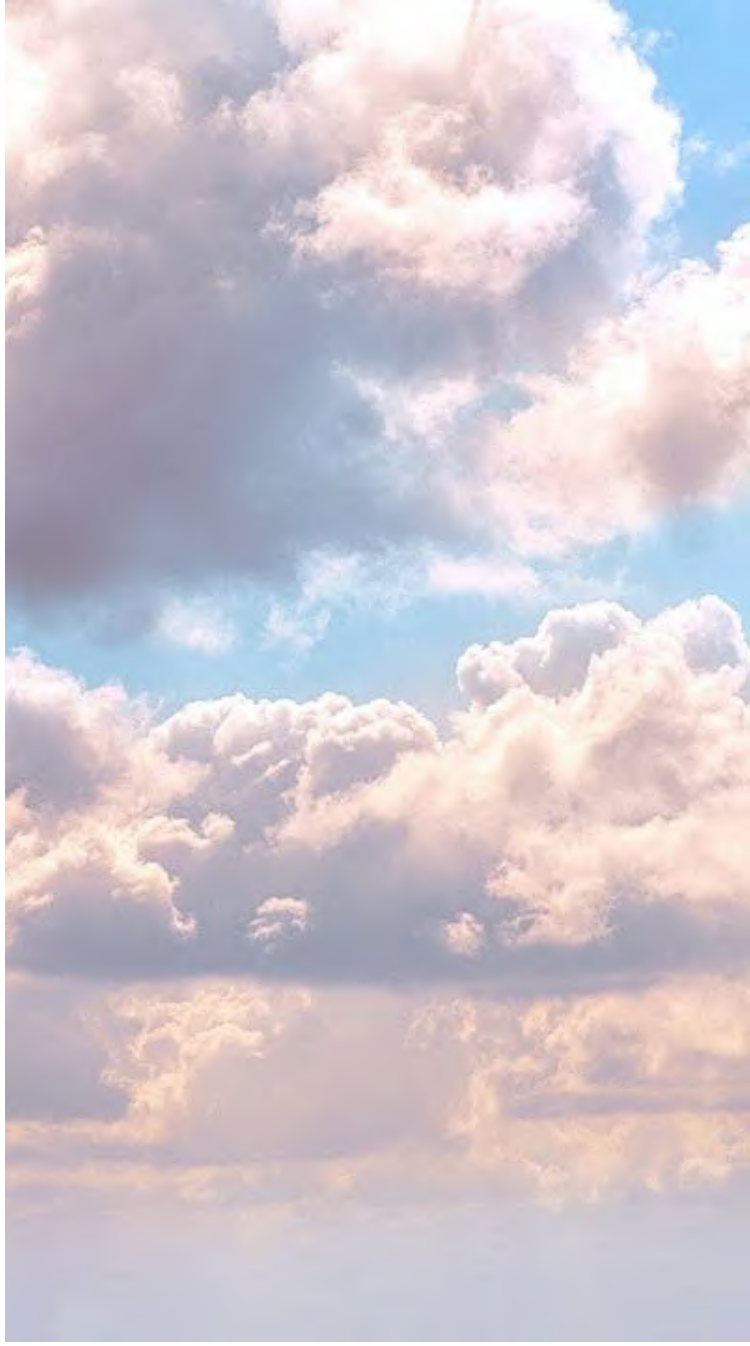
For people living in apartments, fresh air is a precious resource. To keep the air healthy in these spaces, what you can do is to replace your HVAC filters more often than normal, install ventilation fans, and keep the house free of dust to reduce particulate matter in the air.

If you live in a home with more windows, you can open them at regular times each day to let fresh air in. However, you have to take note that outdoor pollution can also enter and increase $PM_{2.5}$ levels indoors. Improving the filter used in your HVAC system can significantly reduce the amount of $PM_{2.5}$ entering your home. Houses with bigger spaces can also put up plants to help improve the air.

At your workplace, you need to make sure that the building's ventilation system is working efficiently and is able to ensure an effective flow of fresh air so that the stale air inside the workplace can be dissipated.

Aside from good ventilation, our activities can also have an impact on our indoor air.

Cooking, for example, generates a high amount of $PM_{2.5}$. Maintaining good ventilation is crucial to lessen health risks.



Maintain Good Ventilation while Cooking

Research conducted by Jennifer M. Logue, et al, published in the Journal of Environmental Health Perspectives, showed that cooking is a major source of $PM_{2.5}$[21]. The small particulates generated from heat combustion are small enough to stay suspended in the air indefinitely, increasing the risk of inhaling them. Once inside your lungs, they can cause irritation or damage to your respiratory system.

How to Reduce High $PM_{2.5}$ Levels while Cooking

According to researchers from the Netherlands TNO, there are four factors that can increase $PM_{2.5}$ levels in the air while cooking. These include:

Cooking Method. The level of $PM_{2.5}$ released during cooking is highly dependent on three things - cooking with lids, cooking using gas or induction, and the type of dish. Meat frying, in particular, releases $PM_{2.5}$ more than other dishes. Using induction instead of gas is more efficient. However, the type of dish being cooked is still a big factor.

Type of Range Hood Used. Aside from using motorized hoods, improving flow rate and adding a damp buffer can significantly reduce $PM_{2.5}$ levels. According to the study[22] done by Jacobs, Cornelissen, & Borsboom published in the Indoor Air Conference at Ghent, these have reduced $PM_{2.5}$ levels from above 800 µg/m3 (unhealthy level) to below 100 µg/m3 (moderate level).

Amount of Ventilation in Relation to the Size of the Kitchen/Living Room. The right ventilation must be used in order for $PM_{2.5}$ to quickly dissipate after cooking. Using the wrong ventilation will cause $PM_{2.5}$ to stay in the air longer.

Impact of Energy Recovery Ventilator and Kitchen Exhaust Hood

A study conducted by Jinglin Jiang and Dr. Brandon Boor of Purdue University in collaboration with Whirlpool, utilized uHoo sensors to test the effect of Energy Recovery Ventilator (ERV) and range hood ventilation on reducing $PM_{2.5}$ levels indoors. Using stir frying as a cooking method, they observed that $PM_{2.5}$ can be reduced within 15 minutes when both the ERV and hood are turned on[23].

When both are turned off, it took approximately one hour to reach the same level of $PM_{2.5}$ before cooking started. This means there are higher chances for people to breathe in higher amounts of $PM^{2.5}$ when ventilation is insufficient.

Be Careful in Using Cleaning Products

During the COVID-19 pandemic, people are regularly disinfecting their homes with sprays and wipes. While these items are useful for killing viruses, disinfecting products contain VOCs[24], which can trigger allergies and weaken immune system[24].

According to the US EPA, VOCs or Volatile Organic Compounds are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects[25]. They can also react with other chemicals in the air and become more dangerous to human health.

Although using disinfectants is a recommended step to prevent virus infection from our hands or surfaces, it must be done in a way that it does not affect our lungs and overall health.

Exposure to VOCs over 24 hours can irritate the lungs, causing nausea and making it difficult to breathe. Long term exposure to harmful VOCs over months can affect the liver, kidneys, and central nervous system.

You can reduce VOCs in your home through proper ventilation. Opening a window will allow the trapped gases to escape and will dilute any remaining VOCs with fresh air.

Another way is to get a purifier with a carbon filter that can trap VOCs. Knowing the specification of a purifier is important because not all can clean VOCs. Some purifiers also emit ozone (O_3) while cleaning which can cause respiratory conditions. Having an indoor air sensor, such as uHoo, helps you know if your air purifier actually works and is safe for your family.

You may also want to consider changing cleaning products you use to ones that are low VOC. This helps you to reduce the actual source.

Avoid Polluting Compounds

Nitrogen Dioxide is considered as one of the most polluting compounds in the air. NO_2 is produced by automobiles and other kinds of combustion.

Long-term exposure to NO_2 may cause a wide spectrum of severe health problems such as hypertension, diabetes, heart and cardiovascular diseases, and even death.

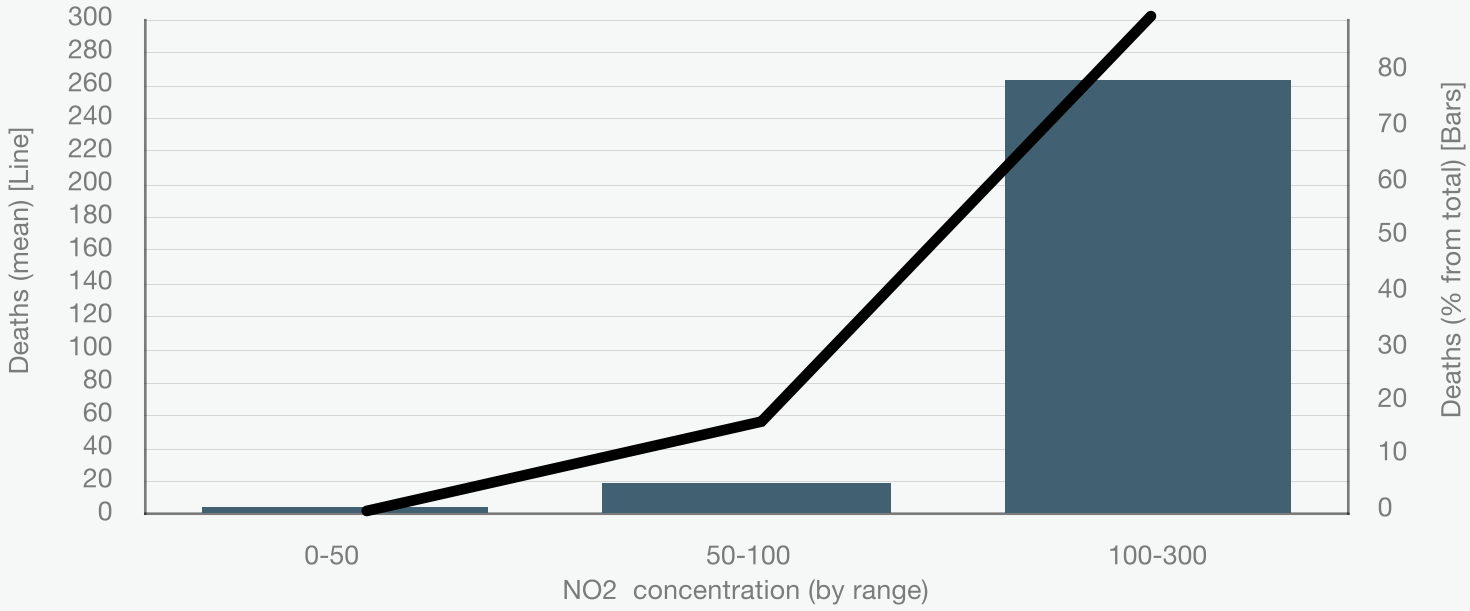
NO_2 can also form indoors when fossil fuels like wood or natural gas are burned. Current guidelines by the WHO says that one hour exposure to 106 ppb of Nitrogen Dioxide[26] is acceptable.

At about twice this level, asthmatics may find it harder to breathe due to reduced pulmonary function. For normal people, breathing in NO_2 at this level can cause slight difficulties in breathing.

Yaron Ogen, a scientist from Tel-Aviv University, examined the relationship between long-term exposure to NO_2 and coronavirus fatality in Italy, Spain, France and Germany[27]. The number of death cases caused by COVID-19 were taken from 66 administrative regions. Results show that out of the 4,443 fatality cases, 3,487 (78%) were in five regions located in north Italy and central Spain. Additionally, the same five regions show the highest NO_2 concentrations combined with downwards airflow which prevented an efficient dispersion of air pollution.

The chart below shows that most of the fatalities occurred in high concentrations of NO_2 ranging between 100 to 300, where NO_2 readings between 177 and 294 $\mu g/m^3$ making up 83% of it.

These results indicate that the long-term exposure to NO_2 may be one of the most important contributors to fatality caused by the COVID-19 virus in these regions and most likely across the world.



Try to get a Good Night's Sleep

Poor air inside bedrooms greatly reduces quality of sleep.

Research conducted by scientists from Tsinghua University found that an increase of 77.5 points in the Air Quality Index (AQI) was able to reduce a person's amount of sleep by more than half an hour per day[28]. An AQI reading of 77.5 is considered to be in the moderate range.

These research studies are consistent with the findings of scientists from Harvard, Yale and Emory University studying the effect of black carbon[29] on an adult's quality of sleep. An increase of 0.21 $\mu g/m^3$ of black carbon resulted in 23 to 25 minutes of less sleep per day. Some sources of black carbon include diesel engines, residential fuels, burning, and other industrial processes. Aside from having less sleep, black carbon increases risks of developing cardiovascular and respiratory diseases which weakens immune systems.

Good air quality is not only important for healthy lungs but also healthy sleep. Research done by Luciana Besedovsky, Tanja Lange, and Jan Born published in the US National Library of Medicine showed that good sleep promotes a healthy immune system[30], which is crucial in keeping virus symptoms at bay. The immune system is strongly-linked to the circadian sleep-wake rhythm, and poor sleep can increase the risk of getting sick.

Stop any Kind of Smoking

Tobacco smoke can negatively impact air quality, even if you yourself don't smoke. Smoke from cigarettes, cigars, or pipes contains over 70 chemicals known to cause cancer. The US CDC estimated that secondhand smoke[31] has contributed to around 2.5 million nonsmoker deaths since 1965.

Tobacco smoking also has long lasting effects. Research done by Peyton Jacob III, et al on the effects of "Thirdhand Smoke", published in the US National Library of Medicine showed that tobacco smoke residue produces secondary organic pollutants[32] and releases VOCs over time.

Opening windows and turning on an air purifier may help reduce the concentration of smoke in your home, but keep in mind that the best level of tobacco smoke is to not have any at all.

Know What You're Breathing In

"Make the invisible, visible."

Like viruses, air pollution cannot be eliminated when we cannot see what we are dealing with. Seeing the problem allows us to create solutions that actually work instead of guessing.

The only way to make the problems in the air visible is by using an indoor air quality monitor. So how can uHoo help?

uHoo Is Your First Step - It Gives You Actionable Insights

uHoo helps people make the right choices based on their air quality. Each person has unique habits, homes and workplaces and it's important to take this into consideration when addressing indoor air quality.

uHoo Helps You Know Your Air So You Can Take The Right Action

Research has consistently shown that air quality has a strong impact on health. Our immune system not only relies on the kind of food we eat but also the air we breathe. uHoo would be able to help you stay healthy and strong by providing insights on what air quality issues we have and how these affect our health.

The uHoo Virus Index goes the extra mile to help you take control of your environment and help you know how to deactivate viruses in your home/workplace. The uHoo Virus Index utilizes data on temperature, relative humidity, $PM_{2.5}$, carbon dioxide and nitrogen dioxide in calculating the index. It also tells you which specific air quality factors you need to address so you can immediately take action.

uHoo Helps You Automate Things at Home and at the Workplace

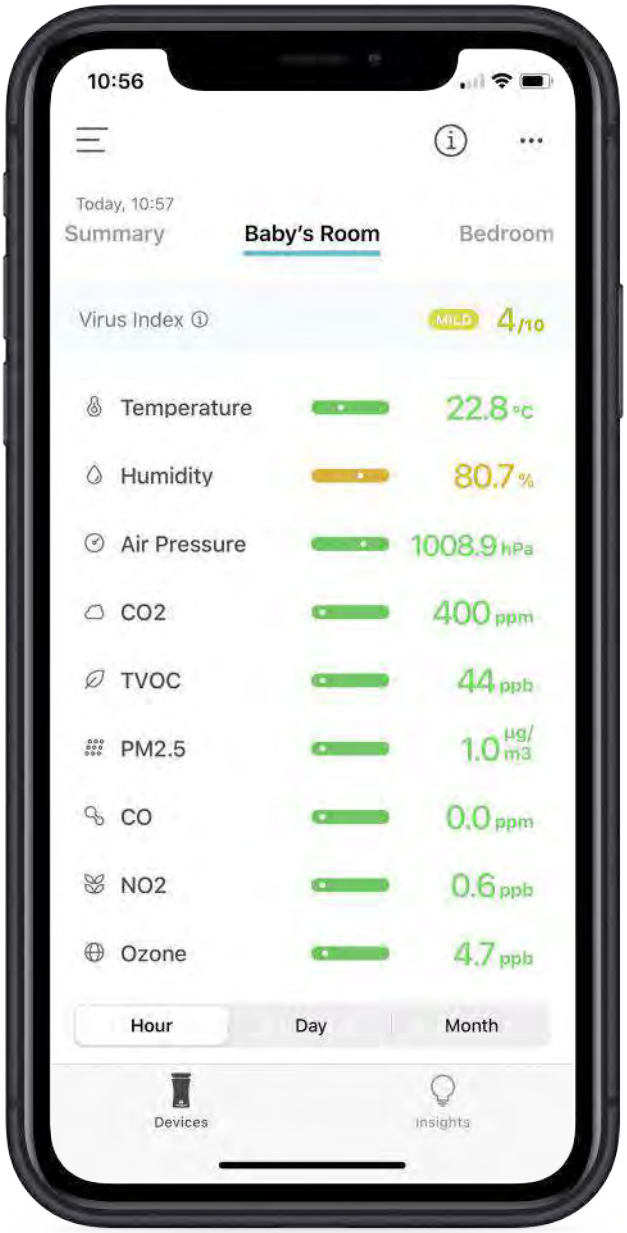
uHoo complements your HEPA air purifiers, humidifiers, ventilation system, etc. by providing you with data and insights on how to effectively use them. You can also use uHoo to control your other equipment, be it at home or in the workplace, to automatically respond based on what uHoo detects.

Conclusion

Taking care of your air quality and making sure it is at optimal levels increases virus inactivation and helps to keep your immune system healthy.

Knowing how to fight an invisible enemy using uHoo allows us to make educated decisions about our health and measure the impact of our actions. Now that we are living in the new normal and spending most of our time indoors, gaining insights about our indoor air and how it affects our immune system is more important than ever.

The uHoo Virus Index and all parameters that uHoo measures gives us the ability to know what action to take to maintain a healthy indoor environment whether at home or in the workplace. Taking care of the space where we work and live, by keeping air quality healthy, is more than just for our own benefit, it's also about saving lives.



Disclaimer

The uHoo Virus Index is intended to provide you information on indoor air quality to help you know how to deactivate viruses in your home/workplace and how your air quality affects your health and immune system. The uHoo Virus Index is not, and is not intended, for use in detecting, in any manner, the presence of any kind of virus or bacteria in your area.

With the uHoo Virus Index, your air quality data can be transformed into actionable insights. Nevertheless, users should exercise their own independent judgment in conjunction with implementing such actions with proper cleanliness and sanitation measures. We at uHoo do not take responsibility for any decision taken by the user based solely on the information provided by uHoo. Users are solely responsible for any action that they may take.

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