
Clean air.
For everyone.
Everywhere.
Sanuvair® M8
Our most adaptable solution yet
SANUVOX
Learn more at www.sanuvox.com

Modularity as a design principle

Introducing the Sanuvair® M8, a cutting-edge portable and adaptable UV purification solution designed to revolutionize your air quality. At its core, the M8 offers a powerful and scientifically proven base unit that sets the foundation for a personalized air purification experience.

The modular design allows you to tailor the unit to your specific needs. Enhance its functionality with a range of versatile accessories, including a duct adapter for seamless integration into your HVAC system, a convenient cart for effortless mobility, a top deflector for optimized airflow, a sleek front grill for added aesthetics, and wall mounting brackets for space-saving solutions.

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Core
What

Kits
How

Subkits
Why

Germicidal

Stand Alone

Odor Reduction

Ducted

Odor Control

Cart

Sanuvair® M8

Modularity as a design principle

General Specs

Speeds:
Low/Medium/High

Airflow:
150/312/479 CFM

Noise:
52/59/71dB

UVC dose/pass:
20/9/6 mj/cm^2

Power:
400W

M8 Stand Alone
Germicidal

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M8 Ducted
Odor Control

M8 Cart
Germicidal

Ultraviolet disinfection technologies can have an important role in making schools safe.

Ultraviolet Disinfection for COVID-19 in Schools; Edward Nardell, M.D.; Salmaan Keshavjee, M.D., Ph.D.; Aaron Shakow, Ph.D. Department of Global Health and Social Medicine, Harvard Medical School.

We didn't say it, they did.

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Sanuvair® M8 helps keep students safe in schools

"Ultraviolet (UV) disinfection technologies can have an important role in making classrooms, cafeterias, hallways and other indoor spaces safe by preventing transmission of the virus that causes COVID-19." [1]

Rationale

Indoor air quality is a critical part of every built environment, especially in schools where the density of occupants is very high and where students share their living and breathing space for extended periods of time every day.

Classrooms have been shown to be hubs of transmission of respiratory pathogens, such as SARS-CoV-2, Influenza (flu) virus, measles, and many others (cold viruses, tuberculosis, RSV) [2][3][4][5].

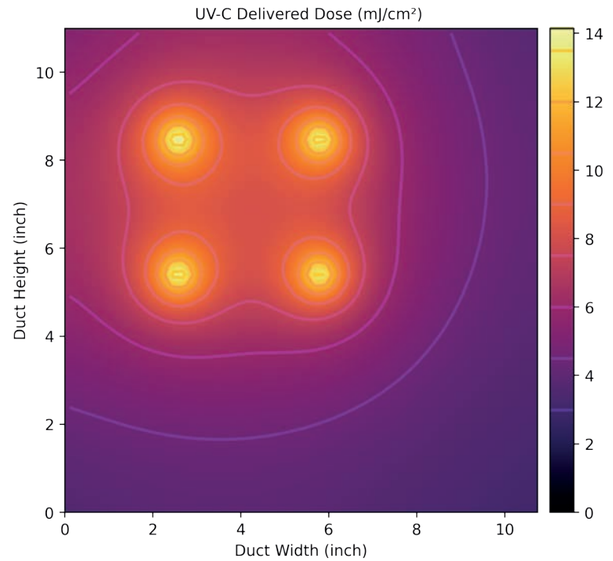
Students can also be exposed to high concentrations of mold spores and other pollutants from aging school buildings, which can negatively affect their health and that of the school staff as well [5][6].

Thus, improving IAQ in schools through reducing the biological load of the air would contribute to improve the health of children and school staff, as well as reducing transmission of airborne disease stemming from outbreaks that can spread into the community.

Proposed Solution

ASHRAE Standard 241 recommends 40 CFM per person of equivalent clean air (eCAi) to reduce the risk of propagation of infectious aerosols. For a typical classroom of 20 students, this would mean that 800 CFM of eCAi is needed.

- Installing 2x Sanuvair® M8 would provide 958 CFM of eCAi.
- One unit should be installed towards the front of the classroom and the second unit towards the back to provide even mixing of air.
- The unit towards the front of the classroom could also be set on medium speed, which would still provide the necessary eCAi whilst being quieter.



	Passes	1	2	3	4	5	6
SARS-CoV-2	~Disinfection Rate	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	~Log	15	>16	>16	>16	>16	>16
	Passes	1	2	3	4	5	6
Influenza A	~Disinfection Rate	99.63%	100.00%	100.00%	100.00%	100.00%	100.00%
	~Log	2	4	7	9	12	14

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UVC air recirculation units show very good results and remarkable economic performance.

Manea, A.; Crisan, D.; Baciut, G.; Baciut, M.; Bran, S.; Armencea, G.; Crisan, M.; Colosi, H.; Colosi, I.; Vodnar, D.; et al. The Importance of Atmospheric Microbial Contamination Control in Dental Offices: Raised Awareness Caused by the SARS-CoV-2 Pandemic. Appl. Sci. 2021, 11, 2359. https://doi.org/10.3390/app11052359

Clean air.
Smart care.

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Sanuvair® M8 is useful in healthcare facilities

"UVC air recirculation units show very good decontamination results and remarkable economic performance, since the time between patients is significantly reduced.

Another aspect worth mentioning regarding UVC recirculation units is the fact that, by reducing the air contamination both between and during treatments, they can make the office a safer place for both patients and medical professionals." [1]

Rationale

Nosocomial infections, also known as Hospital Acquired infections (HAI) are defined as infections caused by microorganisms that are transmitted in hospital and healthcare facilities.

These microbial agents are known to be transmitted by different routes, such as surfaces (fomites), respiratory droplets, but also through aerosols which can stay airborne for extended periods of time. Methicillin resistant staphylococcus aureus (MRSA), tuberculosis, *Acinetobacter* and *pseudomonas* are common HAI that have been shown to be transmissible through the airborne route [2].

More recently, the COVID-19 pandemic has highlighted the role of airborne transmission for respiratory viral diseases in hospital and healthcare settings [3].

Other healthcare related facilities, such as dentist offices, have also been shown to be hub of respiratory disease transmissions, such as tuberculosis, influenza and cold [4 5]. As such, the Canadian Standards association proposed that dentists' offices improved their ventilation to 6 air changes per hour (ACH) to limit the risk of propagation [6].

UVGI has been shown to be able to not only reduce the concentration of airborne contaminants in healthcare facilities but also the risk of transmission of HAI [7], as well as reducing post surgical length-of-stay, discharge outcomes, and reduce hospital-related fees [8].

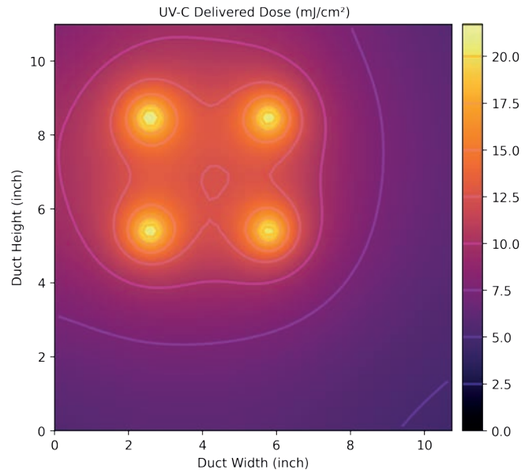
Proposed Solution

According to ASHRAE standard 241, Hospital patient rooms should be supplied with 70 CFM of equivalent clean air (eCAi).

- Two Sanuvair® M8 on medium speed would provide 312 CFM of clean air which would be adequate for patients' room of up to 4 occupants, also factoring visitors and hospital staff.

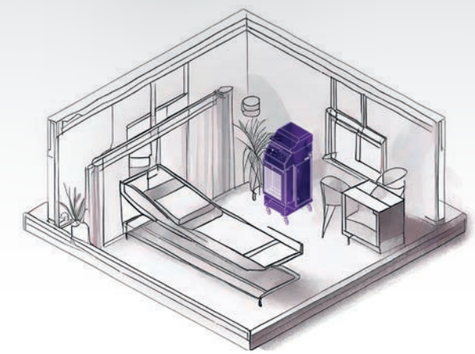
For exam rooms (and dental offices), ASHRAE 241 recommends 40 CFM per person.

- One Sanuvair® M8 on low speed (146 CFM) is adequate to supply eCAi to the patient, dentist and assistant.



	Passes	1	2	3	4	5	6
MRSA	~Disinfection Rate	97.21%	99.92%	100.00%	100.00%	100.00%	100.00%
	~Log	1	3	4	6	7	8
Acinetobacter baumanii	Passes	1	2	3	4	5	6
	~Disinfection Rate	99.98%	100.00%	100.00%	100.00%	100.00%	100.00%
	~Log	3	7	11	15	>16	>16
Pseudomonas aeruginosa	Passes	1	2	3	4	5	6
	~Disinfection Rate	99.93%	100.00%	100.00%	100.00%	100.00%	100.00%
	~Log	3	6	9	12	16	>16

Sanuvair® M8 Cart Germicidal



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To inactivate 99% of PRRSV, you need 5 mJ/cm².

Li, P.; Koziel, J.A.; Zimmerman, J.J.; Zhang, J.; Cheng, T.-Y.; Yim-Im, W.; Jenks, W.S.; Lee, M.; Chen, B.; Hoff, S.J. Mitigation of Airborne PRRSV Transmission with UV Light Treatment: Proof-of-Concept. Agriculture 2021, 11, 259.

We'll give you 6, just to be sure.

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Sanuvair® M8 helps clean the air in pig farms

"Since its initial documentation in the late 1980s, porcine reproductive and respiratory syndrome (PRRS) has been one of the most impactful diseases affecting the [USA] swine industry. (…) Given its infectivity and airborne survivability, proper treatment or decontamination of PRRSV aerosols could effectively reduce transmission (…).

The results show that UV-C (…) effectively inactivated aerosolized PRRSV ~99% (2-log) with a dose <5 mJ/cm² for UV-C (254 nm) (…)" [1]

Rationale

Airborne transmission route of PRRSV have been studied over the past decade, with the focus on long-range transmission between farms.

However, studies have shown the presence of high concentrations of viral and bacterial contaminants in indoor environments of animal farms [2 3 4]. In-situ concentrations of these biocontaminants can be reduced by different methods, including filtration and UVC air disinfection [3 4].

It has been demonstrated that PRRSV can be inactivated up to 99.9% (3-log) with UVC doses between 0.3 mJ/cm² and 5 mJ/cm² [1]. With an average UVC dose of 5.96 mJ/cm², the Sanuvair® M8 provides sufficient UVC energy to properly inactivate PRRSV and other airborne contaminants that have been measured in swine farms, such as African Swine fever virus (ASFV), porcine epidemic diarrhea virus (PEDV), influenza A viruses (IAV) and Foot and Mouth disease virus (FMDV) [5].

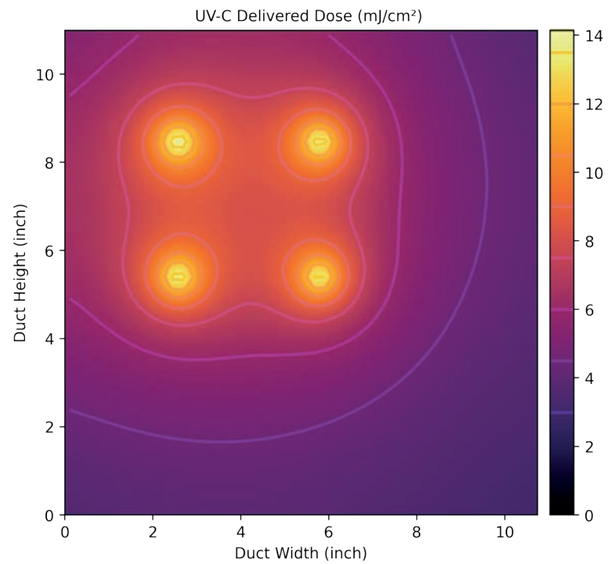
Furthermore, the Sanuvair® M8 is equipped with HEPA-grade filters that can contribute to removal of fine particulate matter, that can also affect animal and workers health.

Proposed Solution

Based on Wells-Riley model of airborne transmission of infectious disease, an additional 10 equivalent air changes per hour (eACH) free of biological contaminants would greatly reduce the concentration of aerosols in those environments, thus reducing the risk of disease transmission.

Using a typical pig farm weaning room as example, of the following dimensions : 44' x 81' x 8" (28 512 ft³).

- Installing 10x Sanuvair® M8 unit would provide 4800 cubic feet per minute of air, which amounts to 10 eACH.
- The 10 eACH provided by the M8 units is achieved at very little energy cost when compared to outside air ventilation.



	Passes	1	2	3	4	6	7
PRRSV	~Disinfection Rate	99.37%	99.99%	99.9999%	100.00%	100.00%	100.00%
	~Log	2	4	6	8	13	15
	Passes	1	2	3	4	6	7
Influenza A	~Disinfection Rate	99.63%	99.99%	100.00%	100.00%	100.00%	100.00%
	~Log	2	4	7	9	14	>16
	Passes	1	2	3	4	6	7
Haemophilus sp.	~Disinfection Rate	95.33%	99.78%	99.99%	99.999%	100.00%	100.00%
	~Log	1	2	4	5	7	9

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Using ultraviolet to break and then oxidize most odor molecules.

Brais. N., Odors removal by Ultraviolet Photo-oxidation. 2017.
(unpublished, available upon request)

We've been saying it for over 25 years.

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Clean air. For everyone. Everywhere.

Sanuvair® M8 helps reduce odors in garbage rooms

“The first reflex when dealing with odors is as old as the history of civilization: it starts by waving our hands around our nose and opening all the windows to ventilate the area. The idea is to ventilate the room with enough fresh air to dilute the smells below their detectable threshold concentration.

(…) The ventilation rates specified in codes and regulations are often insufficient to control odors. Furthermore, evacuation of this vitiated air turns out to be a nuisance for the neighborhood. Not only ventilation often fails to solve the problem, but it amplifies it by spreading it around.” [1]

Rationale

The perception of odors is analogous to the operation of a lock where the key is a molecule whose form makes it suitable to unlock and thus activate one of the multiple olfactory sensors of the nose. There are three ways to mitigate the odors of a garbage room. The first one is dilution, the second is by refrigeration, and the third consists in oxidizing the odorous molecules by thermal or photolysis to convert them into molecules without or with less odors.

The first proposed method is to ventilate the room with enough fresh air to dilute the smells below their detectable threshold concentration. However, some odor molecules have very low smell threshold, meaning that you would need very high ventilation rates to be effective at diluting them low enough to not smell them. Also, evacuating “polluted” air is often a nuisance to next door neighbors in densely populated places.

Refrigeration is the fall back alternative when constraints and drawbacks of ventilation does not allow the evacuation of the odors outside. Odorous molecules being by-products of the digestion of organic waste, biologic activity maybe significantly slowed down by cooling the garbage storage area. This alternative to ventilation ends up being very expensive not only to operate but also in maintenance costs.

The third method to eliminate odors is based on chemical oxidation of the odorous molecules. This is the process that occurs naturally outside in the atmosphere by interaction with the sun light. There is however another way to initiate chemical oxidation reactions by using high energy photons such as UV light. This process of oxidation at ambient temperature is called "photolysis" or "photo-oxidation".

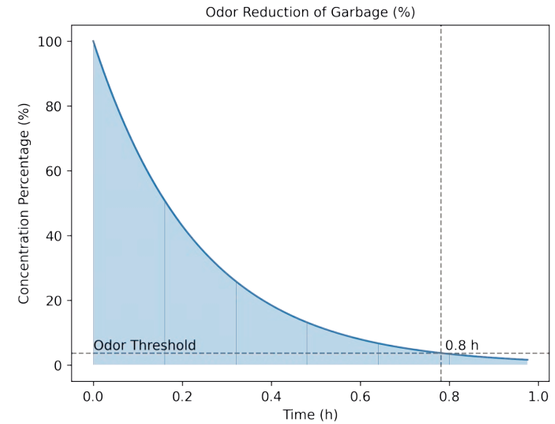
By using ultraviolet light sources with wavelength of 254 nm for UV-C and 185 nm for UV-V respectively, it is possible to emit photons with energies large enough to break and then oxidize most odor molecules [1].

The operating principle requires the circulation of vitiated air through a chamber where its exposure to intense ultraviolet sources combination of UV-C and UV-V ensures the oxidation of odorous molecules. UVV photooxidation is a cost effective and energy efficient method for controlling odor, especially when factoring installation, operating and maintenance costs.

Proposed Solution

For UVV photooxidation to be effective at reducing odor levels, it is recommended to have the equivalent of about 6 air recirculation per hour, at minimum.

- One (1x) Sanuvair® M8 at max speed (480 CFM) can provide these 6 air recirculation in rooms of up to 4800 cubic feet.



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Modifying environmental conditions to reduce pathogen development.

Punja ZK. Emerging diseases of Cannabis sativa and sustainable management. Pest Manag Sci. 2021 Sep;77(9):3857-3870. doi: 10.1002/ps.6307. Epub 2021 Feb 27. PMID: 33527549; PMCID: PMC8451794.

Less of the bad, more of the good stuff.

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Clean air. For everyone. Everywhere.

Sanuvair® M8 helps indoor growers prevent mildew

"Increased production [of cannabis] has seen a rise in the incidence and severity of plant pathogens, causing a range of previously unreported diseases. Sustainable disease management approaches include (…) modifying environmental conditions to reduce pathogen development [and] implementing sanitation measures, (…)" [1]

Rationale

Powdery mildew is probably one of the most common and widely distributed disease of plants in indoor spaces. This disease is responsible for significant economic losses in many greenhouses. More recently, powdery mildew has been found to be a serious threat to marijuana production. Although infections usually do not result in plant death, they reduce the yield as well as crop aesthetics and value.

For cannabis, *Botrytis cinerea* is the dominant parasite fungi. *Botrytis cinerea* spores are found almost everywhere in outdoor air and are found as common contaminants in about half of indoor environments in North America [2].

Although chemical control and standard greenhouse keeping practice continues to be a key component of management of powdery mildew, other new strategies complement and enhance control efforts.

Furthermore, spores of different species of powdery mildew, as well as Botrytis species, F. oxysporum and Penicillium are known to spread throughout the air, both indoors and outdoors [1].

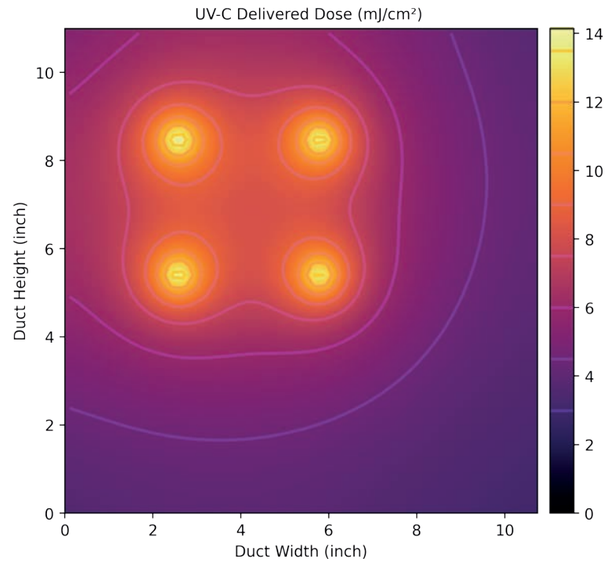
It is then critical to consider reducing the concentration of airborne spores to lower the risk of diseases outbreaks.
Experience has shown that a well engineered combination of UVC air disinfection and filters can drastically reduce such outbreaks in indoor cannabis facilities and greenhouses through reduction of airborne concentration of biological contaminants. Moreso, the effect of germicidal UVC on pathogens of cannabis plants is well known and documented.

Several studies have documented germicidal UVC disinfection of Botrytis cinerea spores and other common cannabis pathogens [3 4 5].

Proposed Solution

To get the air properly disinfected from common pathogens of cannabis plants with standalone units, it is recommended to aim for a minimum of 8 to 10 air recirculation per hour.

- Since the Sanuvair M8 provides 480 CFM of clean air, one unit would be recommended for every 3600 cubic feet of air.
- The combination of ≈6 mJ/cm² of UV dose and HEPA grade filtration is adequate to greatly reduce concentrations of airborne biological contaminants.



	Passes	1	2	3	4	6	7
Powdery Mildew	~Disinfection Rate	52.42%	77.36%	89.23%	94.88%	98.84%	**99.45%**
	~Log	0	0	0	1	1	2
Botrytis cinerea	Passes	1	2	3	4	6	7
	~Disinfection Rate	41.25%	65.48%	79.72%	88.08%	95.89%	97.58%
	~Log	0	0	0	0	1	1
Fusarium oxysporum	Passes	1	2	3	4	6	7
	~Disinfection Rate	55.45%	80.15%	91.16%	96.06%	**99.20%**	**99.65%**
	~Log	0	0	1	1	2	2

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