WATCH WATER®
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FILTERSORB
FILTRATION
ADSORPTION
INSTANT PRODUCTS
OXY TREATMENT
SYSTEMS



OXY TREATMENT · NTD SURFACE TECHNOLOGY FOR INDOOR ENVIRONMENTS

LonGeVity-
AIR CLEAN

Surface intelligence for indoor environments.

- HOMES
- MULTI-STOREY BUILDINGS
- HOSPITALS
- NURSING HOMES
- HOTELS
- EDUCATION
- WORKPLACES

36 EVIDENCE RECORDS · BUILDING TRIALS, DEVICES AND LABORATORY STUDIES

01 / THE PRODUCT

SURFACE INTELLIGENCE FOR INDOOR ENVIRONMENTS

LonGeVity-AIR CLEAN by Watch Water® is a professionally applied, light-activated NTD surface system for selected interior walls, ceilings and architectural panels.

It brings together light-responsive materials, controlled application and measurable indoor-air performance. The focus is selected gaseous pollutants and odour-related compounds, with performance evaluated under defined light, airflow and humidity conditions.

Building-coating studies show useful precedents, while device and chemistry studies show that performance depends on the complete system. LonGeVity-AIR CLEAN is built for documented, repeatable room-level benefit and clear operating conditions. [01–06, 11, 17, 26–36]



LIGHT-ACTIVATED
NTD surface technology

PROFESSIONALLY APPLIED
Walls, ceilings, panels

MEASURED
Room-level performance

WORKS ALONGSIDE
Ventilation and cleaning

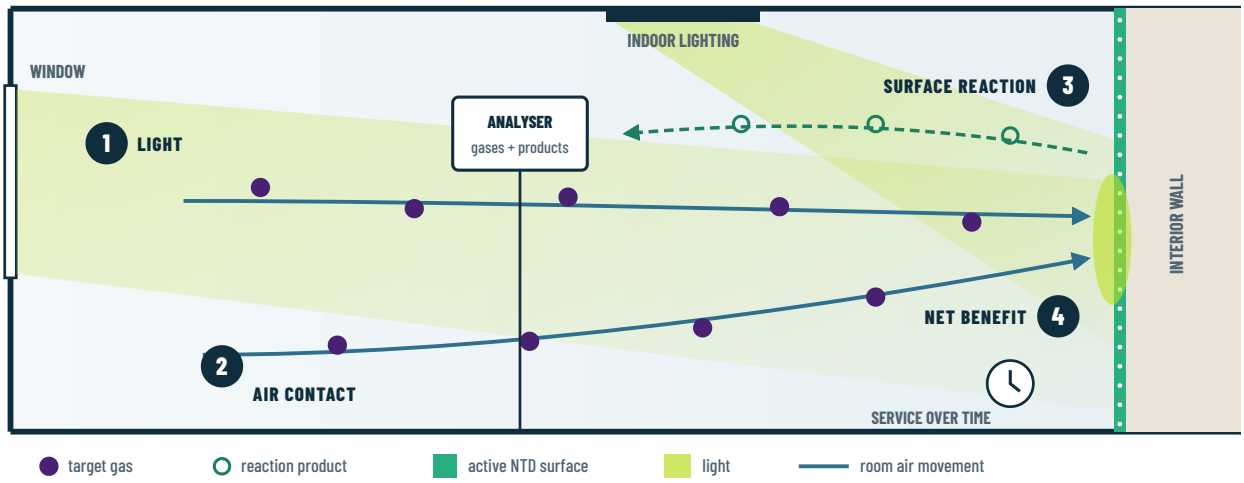
PRODUCT AT A GLANCE

Brand	LonGeVity-AIR CLEAN by Watch Water®, with NTD surface technology.
System	An interior coating qualified as a complete system: active material, binder, substrate, application and curing.
Performance focus	Net reduction of selected gases in actual room conditions, with no unacceptable secondary emissions.
Typical first setting	Residential and office rooms, followed by matched building installations. Required ventilation and routine cleaning stay in place.
Healthcare	Separate technical and clinical qualification. A room-air measurement is not a patient-outcome claim.
Powered option	Where indoor light and passive air contact are limited, a contained, powered reactor with defined illumination and gas treatment.

WORKING ALONGSIDE GOOD BUILDING PRACTICE
LonGeVity-AIR CLEAN works alongside ventilation, filtration where appropriate, source control and routine cleaning.

02 / HOW IT WORKS

LIGHT, CONTACT, CHEMISTRY AND TIME



1 MATCH THE LIGHT TO THE FORMULATION

NTD photocatalysis requires illumination with sufficient energy at the active surface. The action spectrum and intensity are established for the final formulation. Brightness in lux, daylight through glazing or ordinary LED lighting cannot by itself prove activation. [06, 28, 36]

2 BRING ROOM AIR INTO CONTACT WITH THE SURFACE

Airflow, accessible surface area, adsorption, humidity and contact time affect the reaction. A large wall provides area, but the rate at which gases reach it can limit room performance. Powered reactors provide a different contact and illumination environment. [12, 17–18, 24]

3 MEASURE THE REACTION PATHWAY

Surface reactions can transform susceptible organic compounds. Complete mineralization is a possible endpoint, but partially oxidized products can remain, and nitrogen chemistry can regenerate gaseous species. Parent gases and products are measured together. [24, 26–36]

4 MAINTAIN A NET BENEFIT OVER TIME

Ageing, deposited material, binder chemistry, cleaning agents and siloxanes can change activity. Retained removal, emissions, adhesion and appearance are verified after realistic service exposure. [13, 25, 29–35]

TERM	MEANING
PCO	Photocatalytic oxidation; an air-treatment mechanism.
VOC / TVOC	A volatile organic compound / an aggregate VOC reading; neither specifies all health-relevant gases.
CADR	Clean-air delivery rate, stated for the tested pollutant and conditions.
HONO	Nitrous acid, a reaction product considered in nitrogen-chemistry testing.

03 / APPLICATIONS

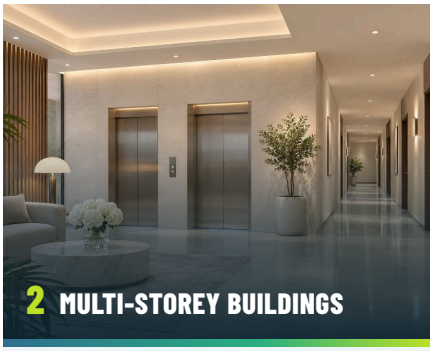
SIX BUILDING TYPES. ONE MEASURED APPROACH.



1 RESIDENTIAL BUILDINGS

Living rooms and bedrooms; formaldehyde and selected material-related VOCs. Qualification starts in a controlled furnished room.

RESEARCH RECORDS 01, 11, 28–36



2 MULTI-STOREY BUILDINGS

Apartments, lobbies and corridors. Floor, façade orientation, ventilation and occupancy are recorded separately.

RESEARCH RECORDS 02, 05, 13, 17



3 HOSPITALS

Controlled test spaces and nonclinical areas. Patient-area applications follow facility-led qualification.

RESEARCH RECORDS 03, 08–09, 16



4 NURSING HOMES AND CARE BUILDINGS

Linen rooms, common areas and bedrooms. Actual odour compounds are specified; TVOC alone is not relied on.

RESEARCH RECORDS 07, 10, 14



5 HOTELS AND RESORTS

Guest rooms, reception, corridors and meeting rooms. Cleaning-event emissions are separated from background levels.

RESEARCH RECORDS 15, 19, 24, 27



6 OTHER INDOOR ENVIRONMENTS

Offices, schools, universities, retail and public buildings. Transport cabins follow the powered-device route.

RESEARCH RECORDS 02, 05, 12–13, 17–23

CHOSEN BY OPERATING CONDITIONS

Windows and building type do not determine suitability by themselves. Each site is assessed for light spectrum at the treated surface, usable coated area, room volume, air movement, moisture, pollutant sources, cleaning practices and expected occupancy.

HEALTHCARE AND VULNERABLE RESIDENTS

Healthcare and vulnerable-resident settings carry their own evidence and operating approvals, agreed with the facility before application.

IMPLEMENTATION SEQUENCE

LABORATORY QUALIFICATION → FURNISHED-ROOM DEMONSTRATION → OCCUPIED-BUILDING MATCHED INSTALLATION → APPLICATION-SPECIFIC PERFORMANCE STATEMENT



04 / THE EVIDENCE BASE

BUILT ON 36 EVIDENCE RECORDS

Building trials, devices and laboratory studies, read endpoint by endpoint.

36	15	2007–2026	4
RESEARCH RECORDS	COUNTRIES	PUBLICATION SPAN	EVIDENCE FAMILIES

36 DETAILED EVIDENCE RECORDS

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

- **01–06** Coatings and formulation
- **07–16** Occupied buildings
- **17–25** Controlled rooms
- **26–36** Reaction products and material behaviour

EVIDENCE FAMILY	WHAT IT SHOWS	HOW IT SHAPES LONGEVITY-AIR CLEAN
Coating field studies 01–05	Dubai, Madrid and Greek building programmes report reductions in selected gases.	Proven installation designs and pollutant targets; no universal removal percentage.
Material formulation 06	A selected powder can perform well in a reactor.	The cured coating is tested separately from its active powder.
Occupied-building devices 07–16	Airflow, illumination, filters, occupancy and maintenance influence outcomes.	Active-device research informs how passive coatings are specified and measured.
Controlled rooms and methods 17–25	Device performance differs by pollutant, test conditions and elapsed time.	Chamber results are translated into furnished-room trials with controls.
Reaction products and durability 26–36	Parent-gas removal can accompany aldehyde, nitrogen-species or particle formation.	The net result is measured across gases and particles.

KEEP THE MEASUREMENTS DISTINCT

NO is different from NO_2; TVOC is different from formaldehyde; particle CADR is different from gas CADR; airborne bacteria are different from surface counts. A model room is different from an occupied building. Percentages across these endpoints are not averaged or combined.

WHOLE-SYSTEM BENEFIT FIRST

The Taiwan household crossover trial measured both pollutants and human endpoints, and shows why a decrease in aggregate gases alone is insufficient.[11] NIST and later chamber work provide complementary methods for checking reaction products.[26–28]

The 36 records are detailed research entries, not 36 independent building trials: records 04–06 belong to the LIFE VISIONS programme and records 24–25 to one Berkeley programme. Each record states what the researchers tested, what they found and how Watch Water applies the result.



EVIDENCE RECORDS 01–04

COATINGS AND FORMULATION

01 DUBAI APARTMENT: FORMALDEHYDE REDUCTION

United Arab Emirates · 2024 · Applied coating · Building field study

≈50% lower formaldehyde after application

STUDY

Four rooms in a newly constructed apartment were assessed under sealed-window, air-cleaner, photocatalyst and window-ventilation conditions.

FINDING

The authors reported about 50% lower formaldehyde after surface photocatalyst application; window ventilation produced the strongest overall improvement.

STUDY CONTEXT

Short observation periods with elevated starting concentrations show the response under a strong challenge.

APPLICATION INSIGHT

A residential installation is relevant, with ventilation, source emissions and formaldehyde measured specifically.

Jung & Alshamasi, Buildings 14, 2815; DOI 10.3390/buildings14092815.

02 MADRID CLASSROOM: ONE YEAR OF NO_2 MONITORING

Spain · 2023 · Photocatalytic paint · Matched-room field study

19.4% average NO_2 reduction over one year

STUDY

Technical University of Madrid researchers compared a painted lecture room with a reference room using passive NO_2 samplers over five campaigns.

FINDING

Reported average reduction was 19.4%; most weekly values ranged from 9.4% to 37.5%. Activity remained evident after one year without repainting or washing.

STUDY CONTEXT

Weather and prolonged window opening influenced results, which supports year-round monitoring.

APPLICATION INSIGHT

Matched rooms, repeated seasonal measurements and recorded light exposure establish a defensible coating case.

Nieto-Marquez et al., Atmospheric Pollution Research 14, 101827; DOI 10.1016/j.apr.2023.101827.

03 CRETE MILITARY MEDICAL BUILDING: PAINT TRIAL

Greece · 2019 · Visible-light paint · Lab plus building study

≈19% NO improvement in the real building

STUDY

Maggos and colleagues compared reference and photocatalytically painted rooms in a military medical building, alongside reactor experiments.

FINDING

The paper reports real-building improvements up to approximately 19% for NO and 5% for toluene; laboratory reductions reached 60% and 16%, respectively.

STUDY CONTEXT

Laboratory and building values were measured under different conditions and are reported separately.

APPLICATION INSIGHT

Supports gas-level air-quality targets in healthcare buildings.

Maggos et al., A Promising Technological Approach to Improve Indoor Air Quality; DOI 10.3390/app9224837.

04 LIFE VISIONS: DEMONSTRATION HOUSES

Greece · Final report 2024 · Organic and inorganic paints · Controlled demonstration

61.7% NO reduction, organic paint

STUDY

The project assessed photo-paints in greenhouse-style demonstration buildings.

FINDING

The final report gives NO reductions up to 61.7% for organic paint and 36.8% for inorganic paint; corresponding toluene figures were 5.8% and 2.3%.

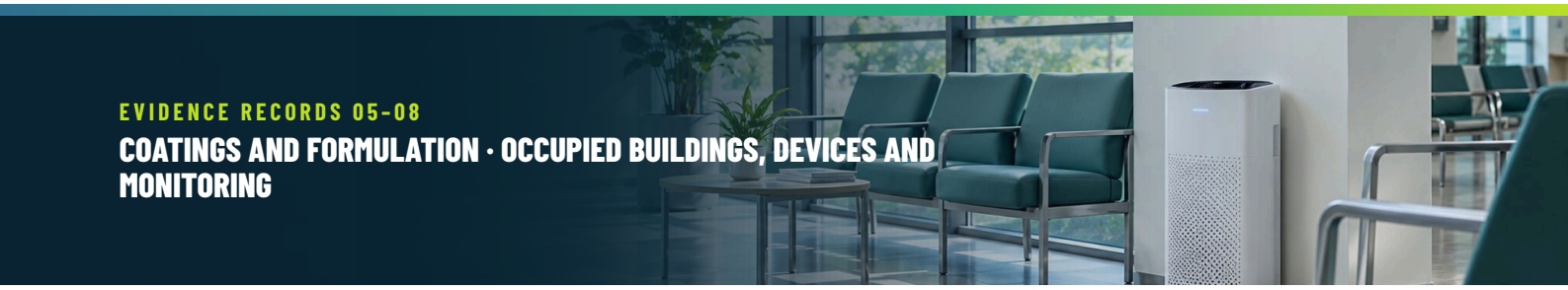
STUDY CONTEXT

Demonstration rooms provided controlled conditions. Records 04 and 05 belong to one programme.

APPLICATION INSIGHT

Performance is stated separately for each gas and formulation.

LIFE VISIONS final report, 6 May 2024.



EVIDENCE RECORDS 05-08

COATINGS AND FORMULATION · OCCUPIED BUILDINGS, DEVICES AND MONITORING

05 LIFE VISIONS: NAVAL ACADEMY CLASSROOMS

Piraeus, Greece · Final report 2024 · Paint · Five matched classroom pairs

46.1% lower NO in matched classrooms

STUDY

Treated and conventional classrooms were monitored simultaneously at the Hellenic Naval Academy.

FINDING

The final report states 46.1% lower NO, 15.3% lower benzene and 16.7% lower toluene.

STUDY CONTEXT

Matched classrooms were compared because pandemic occupancy changes affected a simple before/after comparison.

APPLICATION INSIGHT

Contemporaneous controls and a clearly identified report version give reliable results.

LIFE VISIONS final report, 6 May 2024; same programme as record 04.

06 LIFE VISIONS: POWDER-TO-PAINT DEVELOPMENT

Greece · 2024 · Modified NTD powder and paint · Formulation study

85.4% NO degraded by the powder in a reactor

STUDY

Researchers screened photocatalytic powders under visible light before incorporating a selected powder into an architectural coating.

FINDING

The most promising powder degraded 85.4% of NO and 32.4% of toluene in the reported reactor tests; the paint contained 20% powder by weight.

STUDY CONTEXT

Reactor values characterise the active powder itself, the basis for formulation development.

APPLICATION INSIGHT

The cured coating is qualified on its intended substrate after raw-material screening.

Improvement of Buildings' Air Quality and Energy Consumption Using Air Purifying Paints; DOI 10.3390/app14145997.

07 TAIWAN NURSING INSTITUTION: AIRBORNE BACTERIA

Taiwan · 2010 · Silver-doped NTD equipment · Full-scale on-site study

81% bacterial restraint, full-covering set-up

STUDY

Three air-treatment equipment arrangements were tested in a medical nursing institution, with sampling at two heights.

FINDING

Reported bacterial restraining rates were 81% for the full-covering arrangement, 66% for lateral swinging and 61% for underneath swinging.

STUDY CONTEXT

The set-up combined geometry, air movement and catalyst; measurements describe environmental bacteria.

APPLICATION INSIGHT

Shows how airflow and arrangement drive results, which Watch Water records in every qualification.

Zhao et al., Journal of the Air & Waste Management Association 60:337-345; DOI 10.3155/1047-3289.60.3.337.

08 THAILAND HOSPITAL: PHOTOCATALYTIC FILTER COMPARISON

Thailand · 2013 · Electronic cleaner with illuminated NTD filter · Hospital field study

58% bacterial reduction at 0.5 m

STUDY

An electronic air purifier was tested with and without photocatalysis in an outpatient waiting area and a burn unit.

FINDING

At 0.5 m, average bacterial reductions over 50 minutes were 53% and 58% with photocatalysis, versus 22% and 33% without it.

STUDY CONTEXT

Effects were strongest close to the treated area and varied with crowding, which is why sampling distance is recorded.

APPLICATION INSIGHT

Room mixing, sampling distance and time are specified for each measurement.

Chantharathip et al., Reduction of airborne bacteria in hospital using electronic air purifier with and without photocatalysis reactions.



EVIDENCE RECORDS 09–12

OCCUPIED BUILDINGS, DEVICES AND MONITORING

09 JAPAN CANCER WARD: LED PHOTOCATALYTIC CLEANER

Japan · 2025 · Platinum-added NTD device · Retrospective clinical study

≈75% fewer airborne microorganisms, empty room

STUDY

A hospital compared patients in the month before and after installation of 405 nm LED photocatalytic cleaners; separate room-air measurements were also taken.

FINDING

Febrile neutropenia occurred in 9/13 versus 2/12 eligible patients. Airborne microorganisms decreased about 75% after two hours in an empty-room test.

STUDY CONTEXT

A focused hospital study; results describe airborne microorganisms in the treated rooms.

APPLICATION INSIGHT

A research precedent; health claims require product-specific clinical evidence.

Nihon University hospital study, Scientific Reports; DOI 10.1038/s41598-024-82229-6.

10 US NURSING HOMES: COVID-19 NATURAL EXPERIMENT

United States · 2023 · HVAC photocatalytic systems · Time-series analysis

81 nursing homes analysed

STUDY

An interrupted time-series analysis included 81 nursing homes with systems that generated and distributed hydrogen peroxide.

FINDING

COVID-19 case estimates declined after installation, but confidence intervals were imprecise and the result was not statistically significant. Mortality did not improve.

STUDY CONTEXT

An observational study across many care homes, reported alongside concurrent operational measures.

APPLICATION INSIGHT

The study informs Watch Water's approach to environmental monitoring in care settings; LonGeVity-AIR CLEAN is specified for indoor air-quality performance.

The Benefits of Nursing Home Air Purification on COVID-19 Outcomes: A Natural Experiment.

11 TAIWAN HOMES: RANDOMIZED ASTHMA CROSSOVER TRIAL

Taiwan · 2024 / 2025 · PCO alone versus PCO plus filters · Crossover trial

65 adults in a randomized crossover trial

STUDY

A randomized, double-blind crossover study recruited 65 adults with asthma and measured home pollutants and cardiopulmonary endpoints.

FINDING

PCO alone reduced TVOC and SO_2 but worsened some lung-function and airway-inflammation measures. PCO plus filters reduced a wider pollutant range and produced marginal improvements in selected lung-function measures.

STUDY CONTEXT

The system combined several treatment stages and was evaluated as a whole, including CO_2 and perceived air quality.

APPLICATION INSIGHT

Net air quality is evaluated for the complete system, with target compounds tracked individually.

Zhang et al., Journal of Hazardous Materials; DOI 10.1016/j.jhazmat.2024.136573.

12 JAPAN SMOKING ROOM: 84-DAY FIELD OPERATION

Japan · 2014 · Photocatalysis plus plasma/filter system · Office field trial

84 days of field operation

STUDY

A prototype operated in an office smoking room during an 84-day period involving approximately 21,900 cigarettes.

FINDING

Field single-pass removal was 98.6% for total suspended particles and 43.8% for TVOC. Earlier laboratory VOC performance was higher.

STUDY CONTEXT

Particle removal, gas conversion and plasma effects worked together; single-pass and room values are reported separately.

APPLICATION INSIGHT

Long-duration, realistic loading is essential for estimating maintenance and sustained gas removal.

Office smoking-room air-purification study, Molecules 19:17424; DOI 10.3390/molecules191117424.



EVIDENCE RECORDS 13-16

OCCUPIED BUILDINGS, DEVICES AND MONITORING

13 CONNECTICUT OFFICES: CATALYST DEACTIVATION

United States · 2010 · Prototype UVPCO reactors · Two office field locations

2 office field locations

STUDY

Laboratory and office deployments examined catalyst durability in ordinary indoor air containing silicon-bearing compounds.

FINDING

The authors observed rapid catalyst deactivation; ambient siloxanes were implicated, and prefiltering extended catalyst life.

STUDY CONTEXT

Results describe specific catalysts and reactors; initial removal rates are complemented by ageing tests.

APPLICATION INSIGHT

Realistic cleaning-product exposure, ageing and a documented maintenance strategy are part of qualification.

The deactivation of photocatalytic based air purifiers by ambient siloxanes.

14 AARHUS NURSING HOMES: LAUNDRY-ROOM ODOUR TRIAL

Denmark · AIVC 2023 · Seven laboratory devices; four nursing homes

19–83% laboratory acetaldehyde reduction

STUDY

Seven cleaners were screened with acetaldehyde; selected units were then monitored in nursing-home linen and laundry rooms using TVOC sensors.

FINDING

Six carbon-containing units reduced the laboratory challenge by 19-83% after 20 minutes; the PCO-only device showed no significant effect. Field averages were not consistently lower.

STUDY CONTEXT

Sanitizer ethanol influenced TVOC readings, so target compounds were evaluated individually.

APPLICATION INSIGHT

Actual odour compounds and perceived odour are measured; TVOC is an imperfect proxy, particularly in care settings.

Koust, Rasmussen & Stoltenberg, Removal of Odorants in Nursing Homes Using Air Cleaners.

15 ITALY HOTEL: SIX-MONTH IAQ MANAGEMENT STUDY

Italy · 2022 · Whole-hotel monitoring · Operational case study

6+ months of 5-minute monitoring

STUDY

Researchers monitored a hotel at five-minute intervals for more than six months, studying indoor and outdoor influences on air quality.

FINDING

Outdoor conditions mattered more in halls and highly ventilated areas; human activities were stronger drivers in guestrooms and fitness areas.

STUDY CONTEXT

A building-management study that provides a practical model for continuous monitoring.

APPLICATION INSIGHT

Separate hotel baselines are created for guest rooms, corridors, reception and activity spaces before an intervention.

Indoor air quality monitoring and management in hospitality: an overarching framework.

16 DENTAL SURGICAL BAYS: BACTERIAL BURDEN

United States · ADA-hosted study · Advanced photocatalytic devices · Before/after study

76% lower surface bacterial counts

STUDY

Two operatories were sampled for three days before treatment and three days after two weeks of continuous device operation; 36 settle plates and 60 surface sponges were used.

FINDING

The authors reported 58% lower air-settling bacterial counts and 76% lower surface counts.

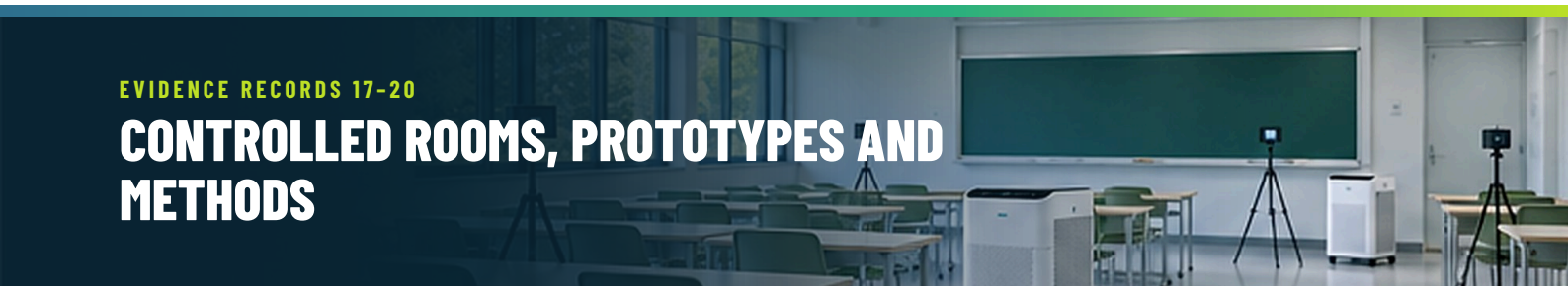
STUDY CONTEXT

Settling plates measured bacteria deposited on surfaces in clinical rooms.

APPLICATION INSIGHT

Microbial endpoints are described precisely for each setting.

Scarlett and colleagues, Photocatalytic Oxidizers as a Novel Device for Bacterial Reduction in Dental Surgical Bays.



EVIDENCE RECORDS 17-20

CONTROLLED ROOMS, PROTOTYPES AND METHODS

17 AARHUS CLASSROOM: EIGHT COMMERCIAL AIR CLEANERS

Denmark · 2023 · Multiple technologies · Unoccupied full-size classroom

8 mobile air cleaners compared

STUDY

Researchers measured VOC removal, particle removal and byproduct formation using eight mobile air cleaners.

FINDING

For seven devices, VOC clean-air delivery rates were substantially below particle rates. Adsorption explained much observed gas removal; some units re-emitted VOCs or produced byproducts.

STUDY CONTEXT

Devices were compared by pollutant type; particle and gas performance are rated separately.

APPLICATION INSIGHT

Pollutant-specific gas CADR or an equivalent removal rate is specified, with time-dependent performance.

Sorensen, Feilberg & Kristensen, Removal of volatile organic compounds by mobile air cleaners; DOI 10.1016/j.buildenv.2023.110541.

18 FRANCE: LABORATORY TESTS TRANSLATED TO PILOT ROOMS

France · 2016 / 2017 · Four devices and three passive materials

35–40 m³ furnished pilot rooms

STUDY

Five-VOC chamber tests were followed by trials of two efficient devices in furnished rooms of 35-40 m³.

FINDING

Laboratory rankings correlated with room behaviour, although lighter VOCs declined more slowly. The programme also assessed ageing and potential nanoparticle release.

STUDY CONTEXT

The most efficient devices from the screening stage proceeded to room trials.

APPLICATION INSIGHT

Chamber screening is followed by realistic furnished-room testing, rather than relying on a laboratory percentage alone.

Costarramone et al., Photocatalytic air purifiers for indoor air: European standard and pilot room experiments; DOI 10.1007/s11356-016-7607-z.

19 DENMARK: PERCEIVED AIR QUALITY DEPENDS ON SOURCES

Denmark · 2010 · Photocatalytic air cleaner · Controlled-room sensory study

3 outdoor-air supply rates tested

STUDY

A sensory panel assessed rooms with different pollution sources at three outdoor-air supply rates, with the cleaner on and off.

FINDING

Perceived air quality improved for building-material and used-filter emissions, but worsened when human bioeffluents were the dominant source.

STUDY CONTEXT

Sensory acceptability complements chemical measurement; required ventilation rates remain in place.

APPLICATION INSIGHT

Indoor systems are challenged with occupancy emissions as well as material emissions.

Kolarik et al., Can a photocatalytic air purifier be used to improve the perceived air quality indoors? DOI 10.1111/j.1600-0668.2010.00650.x.

20 DENMARK: CEMENT-BASED PAINT AND SENSORY RESPONSE

Denmark · 2012 · Commercial photocatalytic paint · 35-person sensory panel

35 person sensory panel

STUDY

Approximately 13 m² of painted gypsum board was illuminated in a test room containing building-material emissions, human bioeffluents or isopropanol.

FINDING

Illumination reduced perceived air acceptability with building-material pollution; responses differed for other sources.

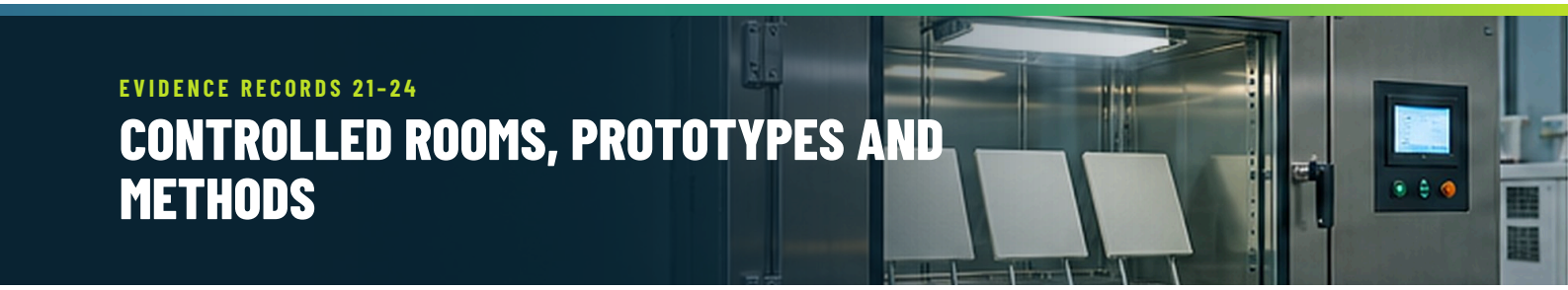
STUDY CONTEXT

Sensory outcomes were assessed for one system, alongside the chemistry of its reaction products.

APPLICATION INSIGHT

Odour-panel measurements are paired with chemical analysis of the actual finished coating.

The impact of a photocatalytic paint on indoor air pollutants: Sensory assessments.



EVIDENCE RECORDS 21-24

CONTROLLED ROOMS, PROTOTYPES AND METHODS

21 EGYPT: SCALED LECTURE-HALL MODELS

Egypt · 2025 · NTD-coated finishes under UV-LED · Model experiment

46% NO_2 decrease in scaled models

STUDY

Three scaled classroom models received a 10% water-based NTD suspension and were monitored during eight-hour, unoccupied tests without external airflow.

FINDING

The article reports NO_2 decreases up to 46% and formaldehyde decreases of 29-32%; TVOCs behaved inconsistently, including temporary increases.

STUDY CONTEXT

Scaled models provided controlled lecture-hall conditions for repeatable measurement.

APPLICATION INSIGHT

Useful for formulation screening; room-scale performance is then tested with ventilation and controls.

Elattar, Gebriel & Abdullah, university-building photocatalytic coating study; DOI 10.1186/s44147-025-00870-y.

22 AMBULANCE PROTOTYPE: SIMULATED-CABIN SPORE TEST

Thailand · 2026 · UV/catalyst air cleaner · Laboratory-simulated ambulance

>80% fewer airborne spores within 15 min

STUDY

Four UV/catalyst configurations, with and without added ozone, were compared against aerosolized Bacillus subtilis spores.

FINDING

The UVA-NTD configuration reduced airborne spores by more than 80% within 15 minutes under the reported controlled conditions.

STUDY CONTEXT

A simulated ambulance cabin allowed controlled, repeatable testing.

APPLICATION INSIGHT

Enclosed transport is a separate powered-device application, with its own airflow and exposure validation.

Efficacy of ambulance air purifiers with different photocatalytic oxidation components; DOI 10.1038/s41598-026-36581-4.

23 NORMACAT: REPRODUCIBLE MIXED-VOC TESTING

Belgium / France · 2012 · Photocatalytic device · Inter-laboratory chamber work

2 laboratories testing one device

STUDY

Two laboratories tested the same device with VOC mixtures at controlled temperature, humidity and concentration.

FINDING

The programme compared removal, mineralization and clean-air delivery rates. Transient formaldehyde depended on the starting VOC mixture and concentration.

STUDY CONTEXT

A test-method study that supports consistent and comparable qualification.

APPLICATION INSIGHT

Reproducible mixed-pollutant tests measure reaction products alongside disappearance of the challenge gases.

Kartheuser et al., NORMACAT project; DOI 10.1007/s11356-012-0797-0.

24 BERKELEY: REALISTIC OFFICE AND CLEANING-PRODUCT MIXTURES

United States · 2007 · Modified NTD UVPCO prototype · Laboratory study

27 office VOCs in the challenge mix

STUDY

A reactor was challenged with 27 office-related VOCs and a separate ten-compound cleaning-product mixture at low-ppb concentrations.

FINDING

Individual conversion efficiencies varied, often exceeding 20% and reaching about 80%. Incomplete oxidation generated aldehydes, acetone and organic acids.

STUDY CONTEXT

Formaldehyde outlet/inlet ratios of 1.9-7.2 show why byproducts are measured alongside parent VOCs.

APPLICATION INSIGHT

Realistic mixtures, especially alcohols and cleaning-product emissions, are included in product qualification.

Hodgson et al., Performance of ultraviolet photocatalytic oxidation for indoor air cleaning applications; DOI 10.1111/j.1600-0668.2007.00479.x.



EVIDENCE RECORDS 25-28

CONTROLLED ROOMS, PROTOTYPES AND METHODS · REACTION PRODUCTS AND MATERIAL BEHAVIOUR

25 BERKELEY: DOWNSTREAM BYPRODUCT CONTROL

United States · 2007 · UVPCO plus chemisorbent · Companion report

≈90% net formaldehyde removal, combined system

STUDY

Researchers added different downstream scrubber configurations to the prototype examined in the same Berkeley research programme.

FINDING

A folded chemisorbent bed substantially reduced generated aldehydes. Combined-system net removal was about 90% for formaldehyde and 40% for acetaldehyde in the reported tests.

STUDY CONTEXT

Media capacity, residence time and ageing shaped the results within the same research programme.

APPLICATION INSIGHT

A powered system may include downstream gas treatment, with validated service life and replacement criteria. Ventilation remains independently specified.

Hodgson et al., Evaluation of a Combined UVPCO / Chemisorbent Air Cleaner; LBNL-62202.

26 NIST: REMOVAL AND BYPRODUCTS MEASURED TOGETHER

United States · 2024 · Seven air-cleaning technologies · Method comparison

7 air-cleaning technologies compared

STUDY

NIST evaluated chemical and particle removal alongside formaldehyde, ozone and other emissions.

FINDING

The tested PCO device produced aldehyde emissions of 202 micrograms per hour; the tested germicidal-UV technology also produced substantial aldehydes.

STUDY CONTEXT

Emission rates describe the tested devices and conditions, supporting product-specific testing.

APPLICATION INSIGHT

Net emissions and pollutant-specific removal are part of the same acceptance test.

Link, Robertson & Poppendieck, Quantifying Byproduct Formation from Portable Air Cleaners; DOI 10.1021/acs.est.3c09331.

27 AIR-FRESHENER MIXTURE: OXIDATION CHANGES COMPOSITION

United States · 2025 · Photoelectrochemical oxidation cleaner · Chamber experiment

HCHO accumulated as an oxidation product

STUDY

An oxidation-based cleaner was challenged with the complex VOC mixture emitted by a commercial air freshener.

FINDING

Ethanol and larger organic compounds decreased while small oxygenated products, including formaldehyde and acetaldehyde, accumulated.

STUDY CONTEXT

A device-based photoelectrochemical study that highlights the value of byproduct monitoring.

APPLICATION INSIGHT

Realistic fragranced and alcohol-containing mixtures are tested; aggregate TVOC readings can conceal changes in composition.

Changes in Volatile Organic Compound Composition from an Oxidation-Based Air Cleaner.

28 ITALY: ULTRAFINE PARTICLES FROM ILLUMINATED COATINGS

Italy · July 2026 · Transparent coating and paint · Chamber study

≈10 nm particle mode under illumination

STUDY

Two photocatalytic materials were tested under darkness and solar-spectrum-like illumination at 300 and 1,200 lux.

FINDING

Particle formation occurred under illumination, with a mode near 10 nm; rates were much lower at 300 lux and absent in the dark tests. TVOC declined simultaneously.

STUDY CONTEXT

Results depend on materials and light spectrum, so light is characterised by spectrum, not lux alone.

APPLICATION INSIGHT

Ultrafine particles are measured as well as gas byproducts during illuminated finished-coating tests.

Fappiano et al., Airborne particle emissions from photocatalytic coatings and paints; DOI 10.1038/s41598-026-62862-z.



EVIDENCE RECORDS 29-32

REACTION PRODUCTS AND MATERIAL BEHAVIOUR

29 INDOOR PAINTS: SIX BINDER SYSTEMS TESTED

Finland · 2008 · Commercial and experimental photocatalytic paints

6 binder systems tested

STUDY

Dynamic chamber tests examined binder degradation, formaldehyde and a five-component VOC mixture under normal and UVA illumination.

FINDING

The study found no clear reduction in formaldehyde or the mixture, and detected emissions including aldehydes and acetone.

STUDY CONTEXT

The key result is the interaction between an active catalyst and the surrounding organic constituents, a core consideration in NTD formulation.

APPLICATION INSIGHT

Net pollutant change and coating-derived emissions are measured for every indoor formulation.

Auvinen & Wirtanen, The influence of photocatalytic interior paints on indoor air quality.

30 PHOTOCATALYTIC PAINTS CAN OXIDIZE THEIR OWN BINDER

France-led research · 2018 · NTD-containing organic paints

355 µg formaldehyde per hour per m²

STUDY

Flow-reactor measurements tracked volatile products released during illumination.

FINDING

For tested formulations, estimated emissions included 355 micrograms formaldehyde and 257 micrograms acetaldehyde per hour per m². The authors linked products to reactions involving the organic binder.

STUDY CONTEXT

Rates are specific to the tested coatings and conditions.

APPLICATION INSIGHT

Binder stability and secondary-emission measurements are part of the indoor product specification.

Gandolfo et al., Unexpectedly High Levels of Organic Compounds Released by Indoor Photocatalytic Paints; DOI 10.1021/acs.est.8b03865.

31 POROSITY: BETTER NO_2 UPTAKE CAN COEXIST WITH HONO

France-led research · 2020 · Photocatalytic paint

NO_2 ↑ uptake rises with porosity

STUDY

Researchers varied pigment volume concentration and measured NO_2 uptake and nitrous-acid formation.

FINDING

Increasing porosity increased NO_2 uptake substantially. HONO emissions were also observed, although their formation decreased as porosity increased.

STUDY CONTEXT

Nitrate formation was assessed alongside NO_2 uptake in laboratory formulations.

APPLICATION INSIGHT

Products are measured as well as reactant removal; accessible surface is optimized without overlooking emissions.

Gandolfo et al., The impact of photocatalytic paint porosity on indoor NOx and HONO levels; DOI 10.1039/C9CP05477D.

32 FRAUNHOFER WALL-PAINT CHAMBER STUDY

Germany · 2007 · Modified NTD indoor paints

NO_2 removal with air exchange

STUDY

Indoor-relevant chambers assessed NO_2, formaldehyde, other VOCs and carbon monoxide, with different air-exchange conditions.

FINDING

NO_2 removal occurred with air exchange, while formaldehyde benefit appeared at high concentration without exchange. Other VOC responses were weak, absent or reversible; secondary emissions occurred.

STUDY CONTEXT

Static chamber endpoints are complemented by tests under continuous ventilation.

APPLICATION INSIGHT

Realistic ventilation and pollutant concentrations are used in hotel or school installations.

Salthammer & Fuhrmann, Photocatalytic surface reactions on indoor wall paint; DOI 10.1021/es070057m.



EVIDENCE RECORDS 33-36

REACTION PRODUCTS AND MATERIAL BEHAVIOUR

33 INDOOR PAINT: NTD LOADING AND HONO FORMATION

European research · 2015 · Photocatalytic paints

5.6 ppb modelled HONO, 7% NTD scenario

STUDY

The study investigated NOx remediation and nitrous-acid formation while varying paint composition and humidity.

FINDING

NTD content influenced both NO_2 removal and HONO production. A room model predicted 5.6 ppb HONO for one specified 7% NTD scenario.

STUDY CONTEXT

A model result for a test formulation, linking surface chemistry to room concentration.

APPLICATION INSIGHT

Formulations are selected for favourable reaction products as well as fast initial pollutant uptake.

The effectiveness of indoor photocatalytic paints on NOx and HONO levels; DOI 10.1016/j.apcatb.2014.11.011.

34 WARM WALLS: CHANGED NITROGEN-PRODUCT RELEASE

European research · 2017 · Photocatalytic paints

°C wall temperature shifts nitrogen products

STUDY

Researchers evaluated how temperature and NTD concentration affected NO_2 removal and HONO release.

FINDING

The tested systems could remove NO_2 or regenerate gaseous nitrogen pollutants, depending on temperature and formulation; modelled HONO increased in warmer scenarios.

STUDY CONTEXT

Wall temperature influenced nitrogen products, so coatings are tested at realistic surface temperatures.

APPLICATION INSIGHT

Warm façade or indoor-wall conditions are included in validation where these are expected during use.

The influence of wall temperature on NO_2 removal and HONO levels released by indoor photocatalytic paints.

35 PAINT AS A REVERSIBLE NITROGEN RESERVOIR

Canada-led research · 2020 / 2021 · Indoor painted surfaces

NO stored in darkness, released under light

STUDY

Chamber experiments followed NO uptake in darkness and release under illumination at different humidities.

FINDING

NO was taken up in darkness and re-emitted after lighting changes; the authors proposed surface conversion and subsequent photochemistry as contributing mechanisms.

STUDY CONTEXT

Mechanistic painted-surface evidence on uptake in darkness and release under light.

APPLICATION INSIGHT

Complete light/dark cycles are run and reaction products assessed before removal is called permanent.

Jones et al., Loss of NO(g) to painted surfaces and its re-emission with indoor illumination; DOI 10.1111/ina.12741.

36 COMMERCIAL PAINT: NITROGEN CAN RETURN TO THE AIR

Canada · 2023 · Commercial photoactive paint · Mechanistic laboratory study

$NO \rightarrow NO_2$ renoxification on commercial paint

STUDY

Researchers illuminated painted surfaces with deposited nitrate or exposed them to gaseous NO, varying humidity and light sources.

FINDING

The photoactive paint converted some NO into NO_2 and nitrous acid; fluorescent lighting produced particularly strong responses. Paint composition and humidity changed the chemistry.

STUDY CONTEXT

Initial uptake and long-term removal were evaluated separately; the complete paint behaved differently from the raw catalyst.

APPLICATION INSIGHT

The nitrogen-product balance and light/dark cycling are measured for any NOx claim.

Vallieres et al., Photochemical renoxification on commercial indoor photoactive paint; DOI 10.1038/s41598-023-44927-5.

05 / QUALIFICATION STANDARD

EVERY INSTALLATION DOCUMENTED AND MEASURED

LonGeVity-AIR CLEAN is qualified as a complete treatment, from formulation to the finished room.

Acceptance criteria are agreed before testing and matched to the intended market and application. Each workstream links back to the research records that define it.



WORKSTREAM	RECORDED AND MEASURED	RECORDS
Identity and application	Complete formulation, batch, catalyst loading, primer, substrate, coverage, curing and exposed active area.	06, 29–36
Light and air contact	Spectrum and irradiance at the surface; room volume, mixing, air-change rate, temperature and humidity.	02, 06, 18–22
Gas performance	Formaldehyde, acetaldehyde and selected target VOCs; NO / NO_2 / HONO for nitrogen-gas applications.	01–06, 24–36
Net emissions	Blank coated surface, dark control and illuminated control; aldehydes, relevant gases, ultrafine particles and material release.	23, 26–36
Durability	Repeated pollutant loading, ageing, cleaning agents, siloxanes, abrasion, adhesion and retained activity.	02, 13, 25, 29–35
Room demonstration	Contemporaneous reference room, independent analytical measurements, occupancy and ventilation logs.	02, 05, 14–18
Application guidance	Supported pollutants, room conditions, maintenance and measured performance.	All records

MEASURED IN EVERY QUALIFICATION

Formaldehyde · **Acetaldehyde** · **Target VOCs** · **NO / NO_2 / HONO** · **Aldehyde byproducts** · **Ultrafine particles**

Light spectrum at the surface · **Air-change rate** · **Adhesion** · **Retained activity**

THE PERFORMANCE STANDARD

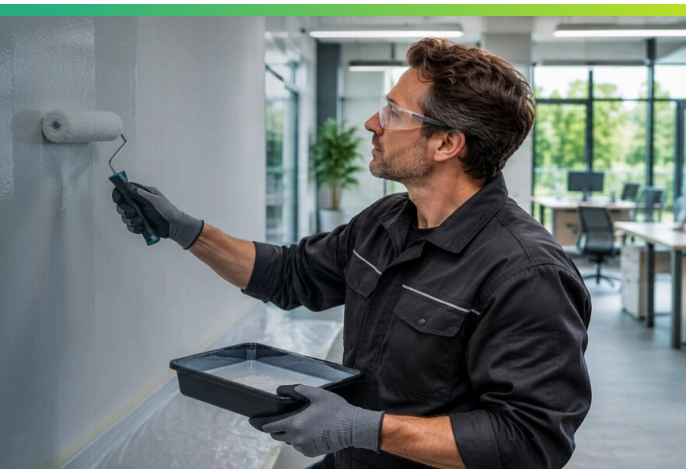
LonGeVity-AIR CLEAN is applied where the complete treatment delivers a reproducible net benefit under its intended light, ventilation and cleaning conditions. Where pollutant conversion would create unwanted secondary emissions, the formulation or system design is adapted.

Exposure criteria and applicable standards are selected with the testing laboratory for the intended market.

06 / YOUR PROJECT

FROM BASELINE TO VERIFIED RESULT

A matched-room project that becomes your own documented case study.



BEFORE APPLICATION
Laboratory qualification

BASELINE
2–4 weeks

APPLICATION AND CURING
Documented install

EVALUATION
4–8 weeks

RETENTION CHECKS
3, 6 and 12 months

STAGE	IMPLEMENTATION	OUTPUT
Before application	The coating is qualified in the laboratory; comparable residential or office rooms with measurable target-gas sources are selected.	Agreed project scope and predeclared endpoints.
Baseline · 2–4 weeks	Both rooms are monitored simultaneously; ventilation, light, temperature, humidity, activities and cleaning events are logged.	Comparable baseline with an uncertainty assessment.
Application and curing	Batch, surface preparation, treated area and curing are documented, with a concurrent reference room.	Traceable installation record.
Evaluation · 4–8 weeks	Target gases and relevant byproducts are measured with validated methods; TVOC sensors serve as supporting trends.	Treated-versus-reference result with confidence intervals.
Retention checks	Revisits after 3, 6 and 12 months, with maintenance and activity changes recorded.	A realistic service and maintenance profile.

REPORTED WITH EVERY RESULT

Building and room type, coated area, room volume, air-change rate, light spectrum, baseline concentration, measurement method, control, time period and uncertainty. Individual pollutants are presented separately, including any unchanged or increased species.

A CUSTOMER CASE YOU CAN USE

Installation photographs, occupant-operation constraints, cleaning compatibility and measured retained performance. Customer sites are identified only with permission, and the raw results and laboratory report stand behind every external statement.

MEASURED. DOCUMENTED. REPEATABLE.

Every LonGeVity-AIR CLEAN project closes with a treated-versus-reference report that owners, operators and occupants can rely on.

07 / LONGEVITY-AIR CLEAN

DESIGNED AROUND MEASURED PERFORMANCE



01 The formulation is matched to the available light.

02 The treated surface and application are documented.

03 Target gases and reaction products are measured together.

04 Retained activity is verified through realistic use and maintenance.

SUPPLIED AS A COMPLETE SERVICE

Site assessment, application by trained professionals, matched-room measurement and retention checks, delivered as one service by Watch Water.

BUILDINGS IN FOCUS

- RESIDENTIAL
- MULTI-STOREY
- HOSPITALS
- CARE HOMES
- HOTELS
- OFFICES & EDUCATION

WORKING ALONGSIDE GOOD BUILDING PRACTICE

LonGeVity-AIR CLEAN works alongside ventilation, filtration where appropriate, source control and routine cleaning, and is never a substitute for required ventilation.

CONTACT

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