



Breathe Clean

Inmicro Indoor Air Inc.

Bioaerosol Control
Energy Savings
Air sanitizer

Overview of Technology

Cedar leaf oil vapor is dispersed through buildings using [Sentinel](#) our diffuser that attaches to the HVAC, air ducts.

Cedar trees are immune to the devastating effects of bacteria and mold and viruses due to their ability to emit volatile organic compounds (VOC's) from the leaf that protect them.

Sentinel copies the trees by releasing cedar leaf oil vapor in (ppb) parts per billion dose into the environments of buildings.

Like *Vicks VapoRub* and just as safe CLOV penetrates spaces in buildings, utilizing the natural air movement and building pressurization to combat bioaerosols that float in the air.

Controlling growth, on cooling coils saves energy.

Surfaces like keyboards, telephones and bathrooms are sanitized throughout the ventilation cycle giving buildings a proactive cleaning 24/7 with no labor.

Benefits

Controlling surface and airborne microbes is beneficial to your facility at many levels. These include improved IAQ, reduced sick days, [energy savings](#), and improved service life, water conservation, and LEED point's.

- **Installing UV lights on every coil in a building simply isn't possible.**
- **Retro fitting with HEPA filters is expensive and increases energy requirements.**
- **Cleaning coils in areas above ceilings is difficult time consuming.**

HVAC uses 60% of building energy

Biofilm Thickness & Energy Costs (Air conditioning coils)

Film Thickness on Fins	Increase in Energy Consumption
0.006in/150 microns	5.3%
0.012in/300 microns	10.8%
0.024in/600 microns	21.5%
0.036in/900 microns	32.2%

Energy savings: Studies show that even a thin (0.024-inch/0.61-mm) layer of biofilm build-up on a coil increases energy consumption by at least 21.5 percent. Installing CLOV reduces biofilm much more effectively than conventional cleaning methods. The energy savings will pay for our technology.

Phase 1 of our science was conducted by Dr. Jim Hudson at the Department of Pathology and Laboratory Medicine at the University of British Columbia, completed in December of 2010. It confirmed that CLOV technology is a safe method to kill H1N1, MRSA and more. Additional tests done in 2019 show that human coronavirus, COVID-19 every 15 minutes in buildings with Sentinel. The EPA has classified cedar leaf oil vapour as an Air sanitizer.

Today, [forest bathing](#), is popular and studies from Japan show that walking through forests exposes us to natural chemicals from cedar trees that increase the production of NK natural killer cells boosting our immune system, allowing us to fight off attacks from viruses that cause COVID-19 as well as many other respiratory diseases.

Dr. Hudson is one of the foremost virologists in Canada. His experience includes researching viruses with humans, animals, fish and invertebrates; naturally occurring anti-viral and anti-microbial substances; molecular approaches to elucidating mechanisms of action of herbal medicines. His career in academia included assistant professor, University of British Columbia (UBC); department of microbiology, associate professor, UBC; department of microbiology, professor, UBC; department of pathology, UBC; and is currently professor emeritus at UBC. His published papers and books include the Book of Antiviral Compounds from Plants, various invited book chapters as well as papers in over 130 publications in peer-reviewed journals. Degrees he has earned include a BSc (chemistry/physiology), an MSc (biochemistry), a PhD (molecular biology) and post-doctoral fellow.

These are three published peer-reviewed journals on CLOV

[The Antimicrobial Properties of Cedar Leaf \(Thuja plicata\) Oil; A Safe and Efficient Decontamination Agent for Buildings](#)

[The Activity of Cedar Leaf oil Vapor Against Respiratory Viruses: Practical Applications](#)

[Cedar leaf oil vapor in buildings and forests: Health benefits & mechanisms](#)

Field-testing CLOV

In April 2008 we were commissioned by GWL Reality to study the levels of microbial contaminants in the Park Place Building, 666 Burrard Street, Vancouver Canada. Park Place is a 35-story office building, 600,325 square feet and is AAA rated.

We first needed to find a way to gain samples that would represent the bioaerosols present in the building. We wanted as much information as possible gathered in a cost-effective manner. A study performed at the University of British Columbia (UBC) titled "[Evaluating Indoor Air Quality: Test Standards for Bioaerosols](#)" showed that this was going to be a difficult task using current methods and technologies. To-date no standard methodology is available.

We did come up with a simple solution using swabs taken from the HVAC filters located on all 35 floors of the building and had them processed (cultured) at a local microbial lab.



This technique yielded phenomenal results giving us the ability to not only provide a history of bacterial and mold spore numbers, but also the ability to tell if any events occurred during the 30-day sampling period. We were able to evaluate the entire building for \$500.

Samples were taken to determine the existing levels of bacteria and mold in the building. Viable spores can multiply very quickly on wet surfaces like, cooling coils, ducting, and exterior walls being key areas of concern. Once we determined the levels of mold and bacteria that existed, we installed Sentinel on air handler #1 of the

building's fresh air make-up system, which supplies floors 21 to 35. This unit's air capacity is 26,000 cfm. The graph on page 5 shows the reduction of bacteria by 90% and the reduction of mold by 50%.

We repeated the test on air handler #2 which supplied floors 1 through 20 to see if the results from the previous floors were reproducible. Over 100 swabs were taken throughout the test period with one set of tests taken before the vapor was released, one set during, and a final set after the tests were completed. The swabs were processed at IG MicroMed Laboratories (ISO # 17025) in Richmond BC.

Sentinel diffuser

The patent pending Sentinel diffuser is attached in minutes to air handlers. It is designed to mitigate levels of bacteria, mold and viruses in buildings 24 seven with no labour. Sentinel distributes cedar leaf oil throughout the building envelope in a gaseous state, which penetrates the entire building services including air ducts, wall cavities, humidifiers, cooling coils telephones, keyboards and other areas that harbor and propagate bioaerosols.

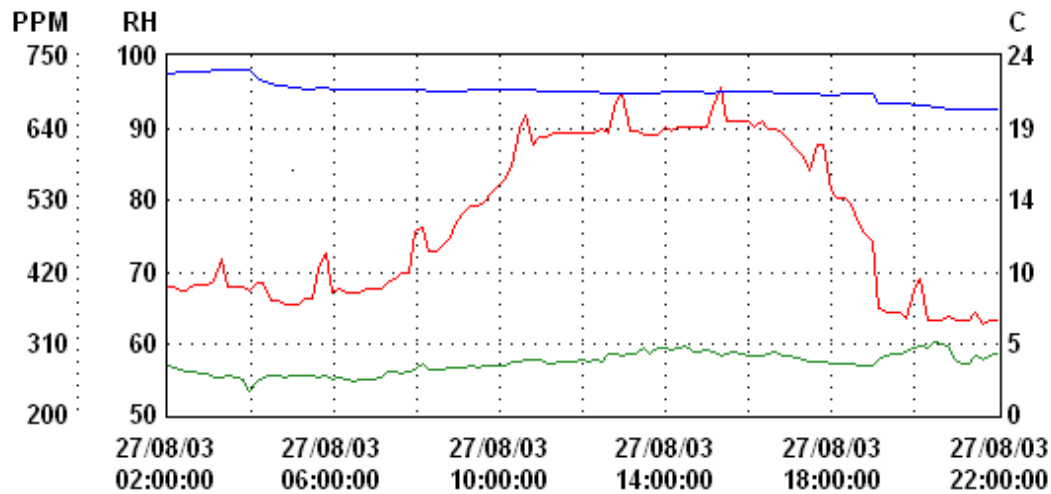
Today we know that one sneeze emits 40,000 particles. HEPA filters being the best in class filters available today can only filter 99.9% of these particles. That's If the air change rate in the building is six air changes per hour or higher. Very few buildings are capable of air change rates of even four ACH. This means that even with a reduction of 99.9%, particles still linger in the building which is why people continue to be infected at very high rates in the built environment.

Following is our analysis of the trial program. Two separate tests were conducted, using both intermittent and full-time exposures (two release per hour). The vapor concentration was measured 10 to 20 PPB (parts per billion) and was below levels detectible by the building's occupants.

In 2019 we were using an ATP meter that required only 10 seconds for readings that shows the levels of bacteria. In 2020 air monitoring technology took a big leap forward with a company called [Poppy](#). They can provide 24/7 monitoring for ventilation performance and airborne viruses that cause flu, COVID, and RSV.

Background

Below is a graph that represents the levels of CO₂, Humidity and Temperature recorded during a 20-hour period on August 27, 2003. This graph represents a snapshot of the conditions that exist in this building on any given day during the test period. All recorded levels are well within ASHREA guidelines, indicating the air handling systems operates within industry policy.



10 div at 2 hours/div = 20 hours (dd/mm/yy hh:mm:ss)

28MECHRM.SPL		PPM	CO ₂
28MECHRM.SPL	28th Floor Mechanical Room	RH	Humidity
28MECHRM.SPL		C	Temperature

It is important to note, that the Relative Humidity shows levels between 50% and 60% well within ASHREA Guidelines.

Relative humidity plays an important role in the amplification of mold and bacteria. The levels shown above are high enough to allow condensation on surfaces within their dew point range, such as cooling coils, pipes, cool ducting and many other hidden surfaces that are overlooked, not visible to investigators. In cities such as Miami, Florida gallons of water are deposited through condensation on a daily basis. Fresh air handlers are typically not operated on weekends. It was noted that on weekends, and after the normal operating hours when HVAC was requested by the tenants, only the floor's air handlers were engaged without the fresh-air fans being turned on. As a result of this, a little-understood phenomenon called "Monday Fever" is explained by the build-up of the MVOC's produced by bioaerosols in wet and damp spaces that exist in large buildings.

Most indoor air quality complaints are resolved by controlling the CO₂, temperature and humidity levels. However, even with a good Air Handling System, indoor air quality problems still exist. Parameters such as temperature, relative humidity, CO₂, volatile organic compounds (VOC's) measured in the part per billion, and ultra-fine particles (UFP's) can be quantified using real-time hand-held equipment. Few Indoor Air Quality (IAQ) companies own the equipment to detect levels of UFP'S and VOC's at low levels in PPB (parts per billion). The fact that IAQ investigators test the outdoor air for ambient levels of contaminants illustrates that a building's intake air will always be contaminated and that the solution must incorporate a steady state type of delivery to combat this constant influx of microorganisms that utilizes the building air flow as its transport mechanism.

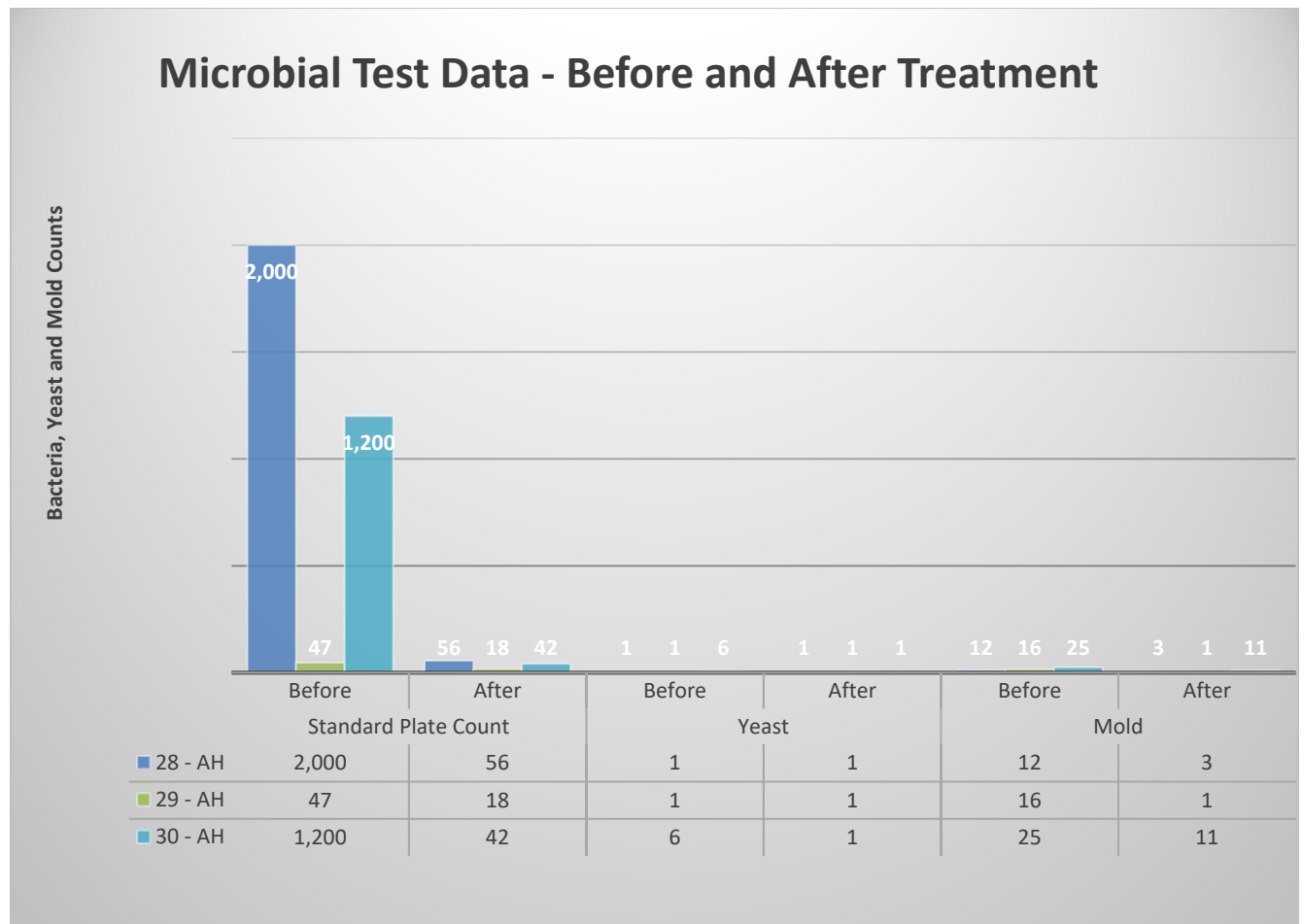
Inmicro Indoor Air Inc. believes that the lowest levels of contamination are the safest levels. Our solution to controlling bioaerosols indoors is simple, safe and effective, without the use of dangerous or regulated chemicals.

Park Place IAQ Information

In conjunction with RH, Temperature and CO2, common factors that are measured to evaluate IAQ complaints are volatile organic sources. VOC's are emitted from a variety of organic and non-organic materials including: photocopiers, laser printers, photo processors, gases, vapors, dusts, odor from parking garages, public transit stations, restaurants, laundries, in-building health clubs, cleaning fluids, detergents, emissions from carpets, carpet glues, furniture, polishes and adhesives, scents from perfumes, colognes and air fresheners, body odors, outdoor air contaminants that enter the ventilation system, fungi and molds from damp areas.

VOC's from microbial organisms may be categorized by their particle size, with the smaller particles being more easily and deeply ingested in the lungs making them a greater concern for indoor air quality. Ultra-fine particles (UFP's) are a newly recognized class of particles that are now defined as particles that have a diameter of less than .01 micrometer (mm) in diameter. UFP's are often the by-products of the combustion of fuels such as diesel oil and fungi spore fragments. They can enter buildings along with the outside air or result from various processes within the building. Some UFP sources include building and vehicle exhaust, tobacco smoke, certain manufacturing operations, cleaning solvents, boiler gasket leaks or malfunctioning photocopiers.

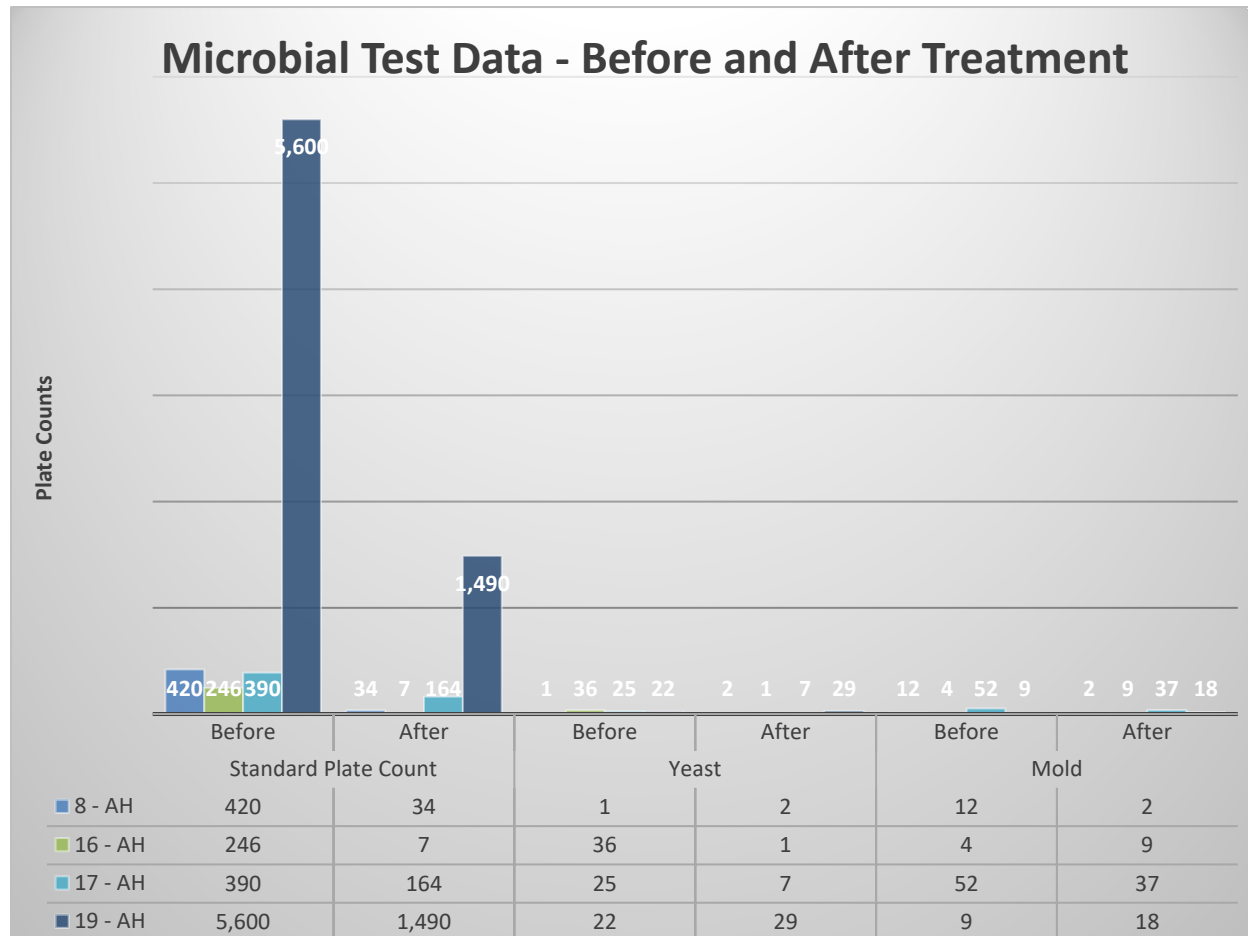
First Set of Test Results:



The above data was collected from the 28th, 29th, and 30th floors. We focused on these floors as they indicated the highest microbial counts in our preliminary tests.

Swabs were taken on April 11, 2003. The CEDARSOS system was active only during the evenings and weekends for four consecutive weeks. After this time, a second set of swab tests were taken on May 5, 2003. Note the dramatic drop in the standard plate count on the 28th and 30th floor (Standard Plate Count represents the count of viable bacterial organisms). The important thing to recognize from this set of data is that microbial levels decreased after diffusion of Cedar Leaf Oil vapor.

Second Set of Test Results:



This second set of data was taken from the 8th, 16th, 17th, and 19th floors. These floors were identified as having the highest plate counts in the preliminary tests.

Swabs were taken on June 30, 2003. Bio Aerosol Technologies Inc. VAPOR TEC 3D system was activated during the weekdays from 9:00 am to 5:00 pm. The system was deactivated during the weekends. Tests taken after 1-month showed significant reductions in the standard plate count.

The system was activated during the daytime in this round of testing, as we wanted to ascertain whether the building’s occupants could detect the cedar oil fragrance. During this time, two occupants made inquiries about why the building smelled like a forest. In response to these inquiries we reduced the level of oil being diffused. No further inquiries were reported. If any such inquiries are made when our system is fully installed, we would investigate to determine

whether an air-balancing adjustment would correct the situation. Typically, this will be the case and a simple adjustment to the correct air balancing would not only satisfy the inquiry, but would also improve air balancing throughout the building, further improving the area's IAQ.

Cedar Leaf Oil Vapor eliminates the majority of Indoor Air Quality Variables through the diffusion of Cedar Leaf Oil in the building's Air Handler. Science done at the department of pathology and laboratory medicine shows CLOV kills all tested medically important pathogens.

If you would like more information on this topic try the link listed below.

[Aerobiology and Its Role in the Transmission of Infectious Diseases](#)