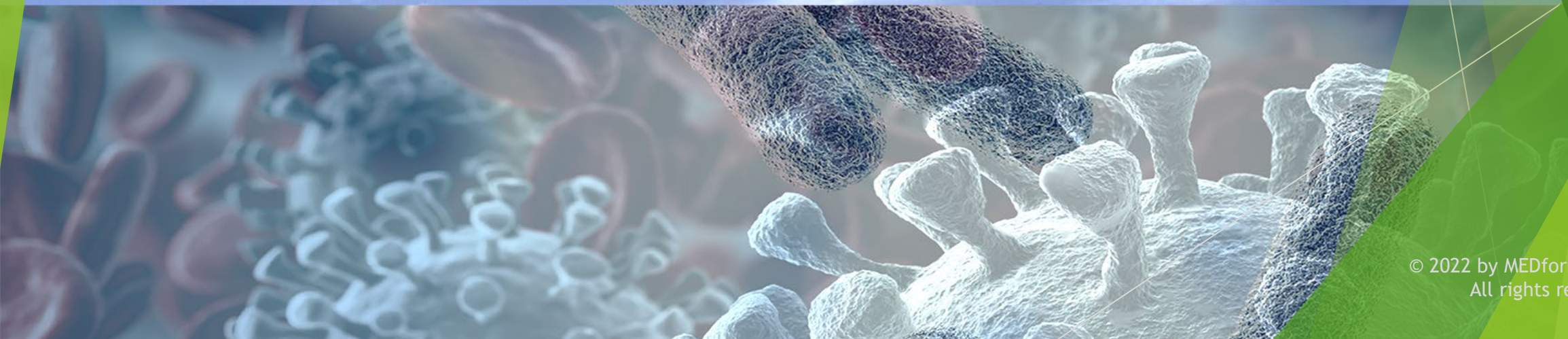
THE ROI FROM AIR



Why Better Air Matters to CFOs

1. Airborne Transmission of Human Pathogens (Risk Mitigation)
   a. Doing all that can be done to be safe as masks come off
   b. What works and why
2. The Clinical Side of 'Iffy' Air
3. The Data behind ROI Impact
   a. Loss avoidance – ADA
   b. Human Performance Improvement
   c. Healthcare & Staffing
   d. Heating & Cooling
4. Wrap-Up & Business Case
5. Q & A

Correlating Indoor Air to Student Academic Performance

by Richard J. Shaughnessy

Nearly 55 million people in the United States — 20 percent of the population — spend their days inside K-12 schools. Few realize the air within those walls can adversely affect both their health and their learning potential.

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Our Presenters

- *Pile, RN, BSN*
- Health Services Coordinator
- Murray Head Start

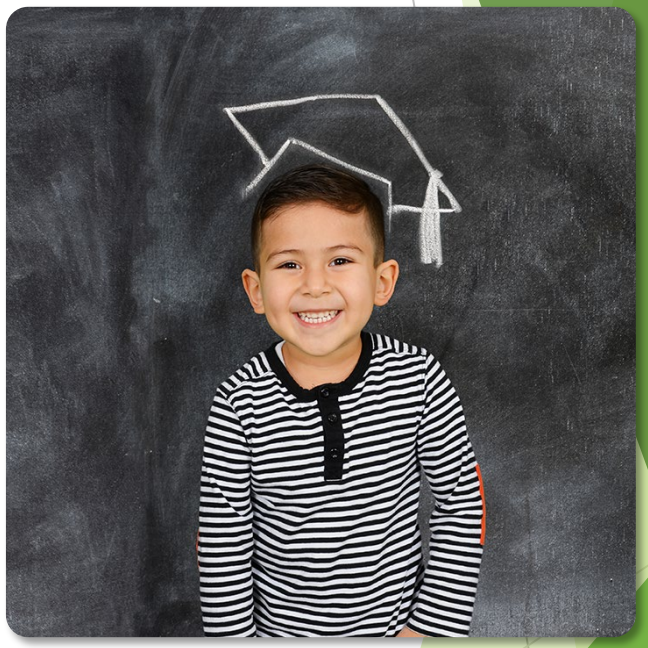
- *Richard Aballay, M.D.*
- Medical Director
- MEDformance

- *John Nycz*
- VP Marketing
- MEDformance

WE MAKE BREATHING BETTER.™

Mission

Deploy the most effective “Healthcare Proven” air disinfection and purification solutions to combat the transmission of human pathogens while simultaneously improving indoor air quality, human performance, and knowledge transfer effectiveness.



WE MAKE BREATHING BETTER.™

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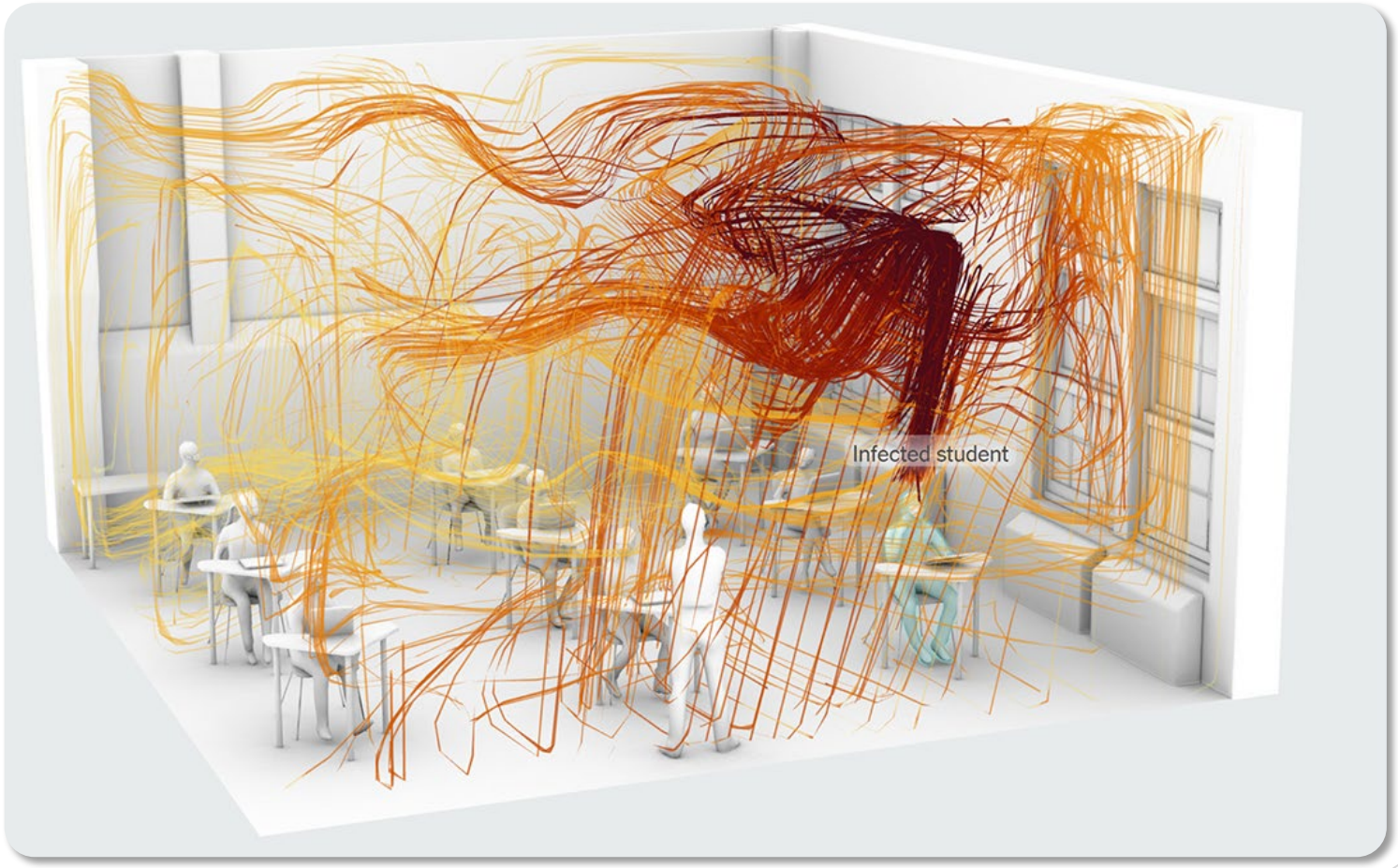
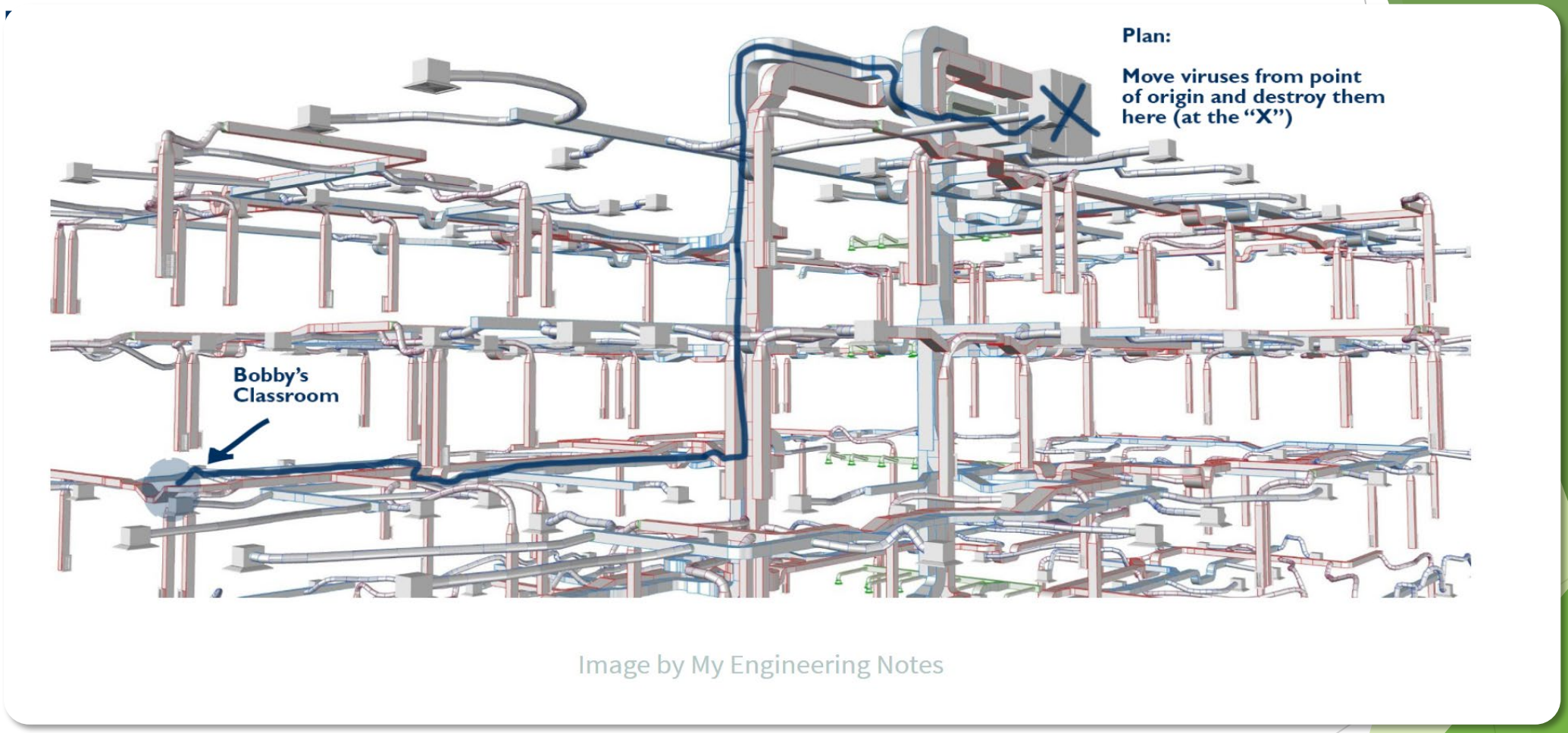
At the Point of Origin



Play Interactive Presentation – 1:00

Simulation: NBPI



Moving aerosolized pathogens through HVAC duct work to then destroy them on the opposite end of that system raises even more questions about the real impact on controlling infectious viruses, bacteria, and other pathogens with ionization.

Lightning in a Coil

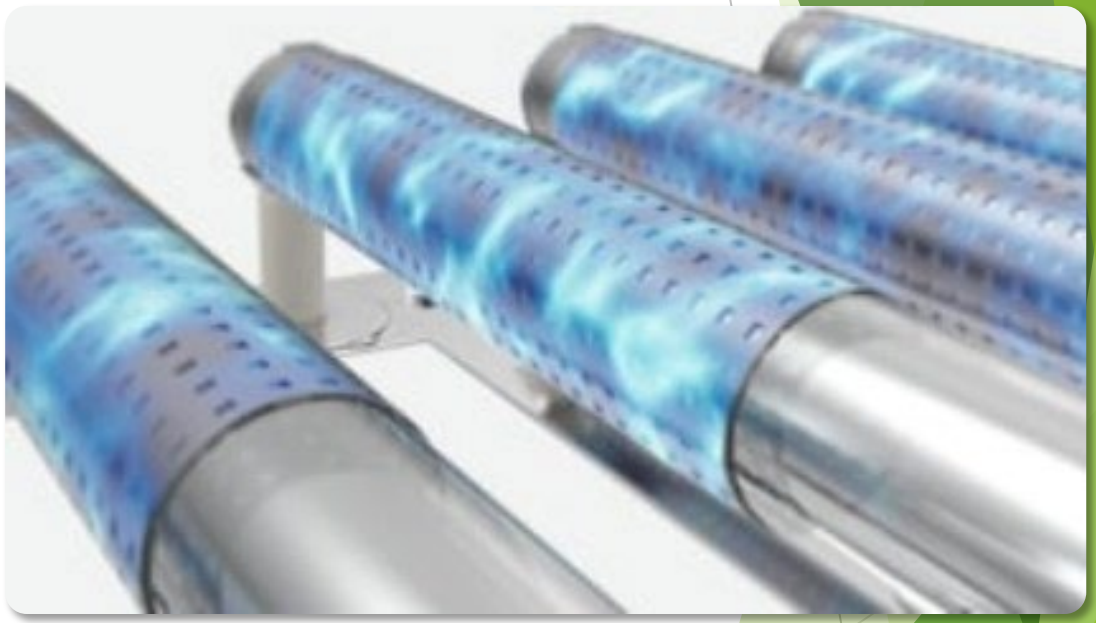
NANOSTRIKE PLASMA

MEDIUM ROOMS

FAN SPEED CONTROL

FDA Cleared
510(k) Class II Medical Device

How NanoStrike Works



Play Video - 2:33

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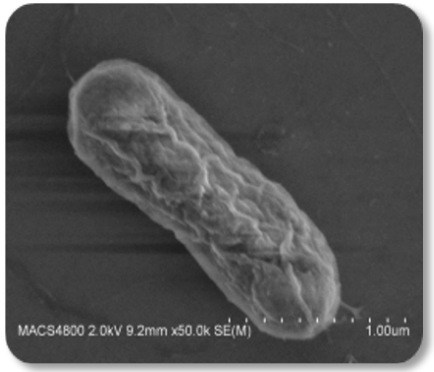
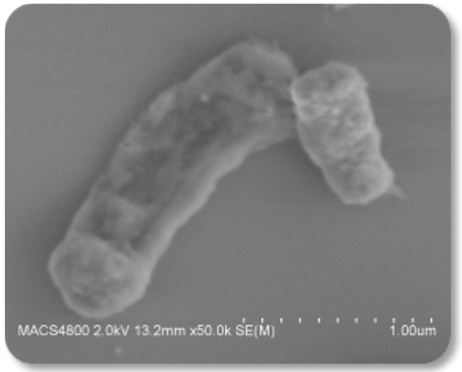
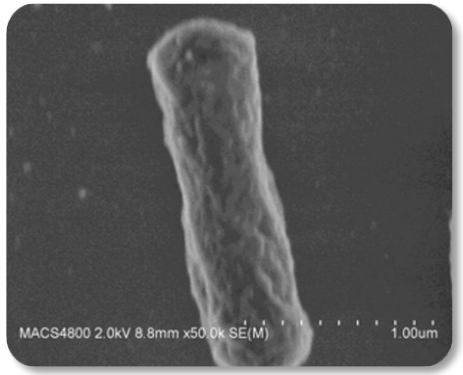
Under the Microscope*



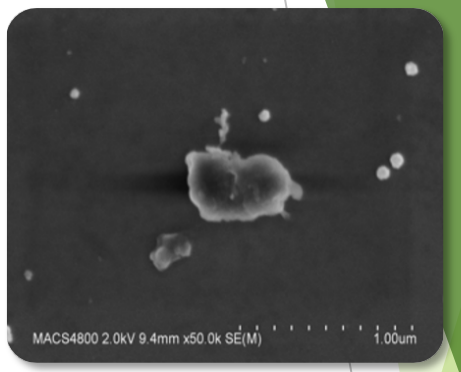
'Healthy' E.coli Bacteria prior to exposure



Ozone at 350,000 ppb - 2 Hours



Autoclave at 160°C - 2 Hours



NanoStrike - 0.002 Seconds

*Scale is 1 Micrometer or 1 millionth of a meter; images taken under scanning electron microscope at NASA Ames Research Laboratory

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

- Dr. Ram Prasad Gandhiraman, Research Scientist, NASA

Asthma Triggers: The IAQ Connection

"Asthma is a major cause of missed time from school and work."

NIH National Institute of Environmental Health Sciences
Your Environment. Your Health.

- Approximately seven million children in the U.S.—about 1 in 10 school-aged children—have asthma.
- Asthma is a leading cause of school absenteeism.
- Every year, more than 10.5 million missed school days are attributed to this disease.

> ***"Asthma is also a leading cause of school absenteeism."***

EPA United States Environmental Protection Agency

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Mold and Asthma

Effectively managing a child's asthma is best accomplished through a comprehensive plan that addresses both the medical management of the disease ***and the avoidance of environmental triggers.***

EPA United States Environmental Protection Agency

https://www.epa.gov/iaq-schools/managing-asthma-school-environment

Allergic reactions to mold are common. They can be immediate or delayed. Molds can also cause asthma attacks in people with asthma who are allergic to mold. In addition, mold exposure can irritate the eyes, skin, nose, throat, and lungs of both mold-allergic and non-allergic people. Symptoms other than the allergic and irritant types are not commonly reported as a result of inhaling mold. Research on mold and health effects is ongoing.

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Mold Symptoms

Spore Illness

Sinusitis
Asthma/Allergies
Lung Irritation
Fungal Infections

Dr. Jill Crista

https://www.youtube.com/watch?v=XoBi_M4Knjs

All Symptoms

Spore Illness
Sinusitis
Asthma/Allergies
Lung Irritation
Fungal Infections

Respiratory
Chronic Sinusitis
Allergic/Hay Fever
- especially new onset
Ear Ringing
Asthma/Wheezing
Burring Sensation in Lungs

Immune
Frequent Infections
Difficulty Recovering from Colds
Skin Rashes – Burning Sensation
Can Cause Cancer

Digestive
Nausea/Vomiting
Diarrhea
Stomach Pain
Fungal Infections
Food Sensitivities
Ulcers

Liver and Kidney
Liver Pain
Intolerance/Sensitivity to Chemicals & Alcohol
Frequent Urination
Sensitive Bladder

Nervous System
Anxiety
Headache
Dizziness
Nerve
Pain/Neuropathy
Insomnia
Memory Impairment

"I would come in to work and leave with a rash. Others reported more common sinus, itchy watery eyes, and respiratory symptoms. We suspected a problem, but the results of our tests were eye opening. With the devices running I am symptom free."

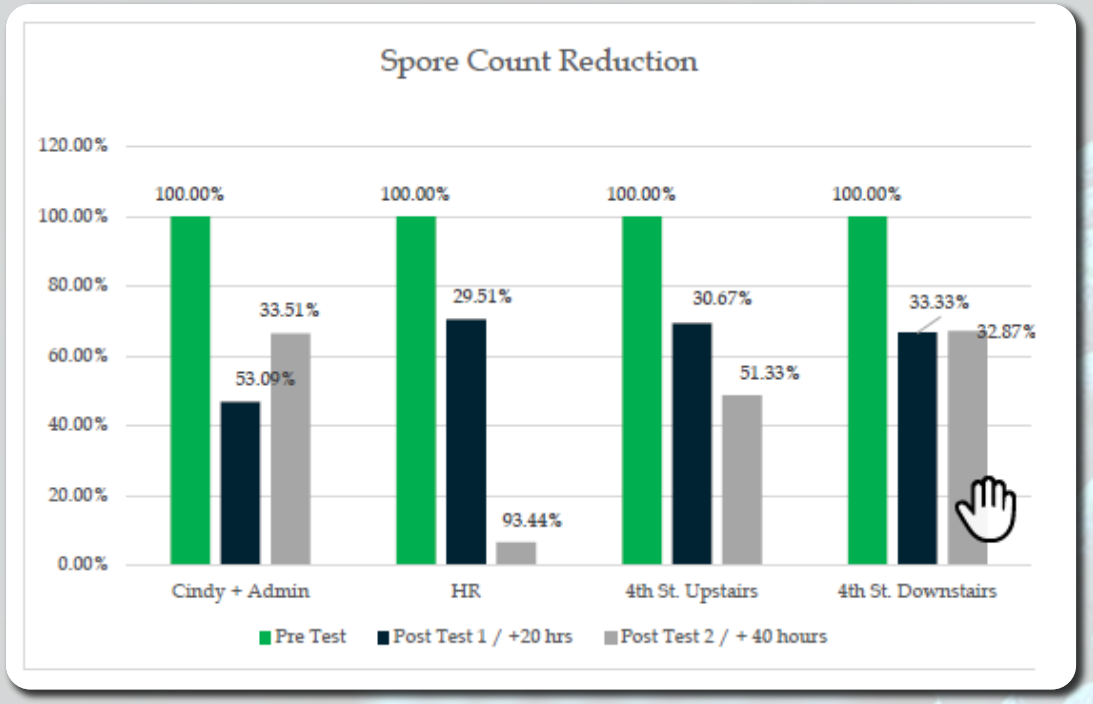
School Nurse

Head Start Admin Building

Average Spore Reduction 44%

Average Bacteria Reduction 66%

Average Mold Reduction 60%



Summary

The results shown in the graphs represent percentage reductions in total counts for the following:

1. Spores (cumulative) in spr/m³
2. Bacteria (cumulative) in CFU/m³
3. Fungi (cumulative) in CFU/m³

The average reduction across all four (4) locations tested for both intervals (≈ +20 hrs and +40 hours) are:

Test	Reduction
Spores	44%
Bacteria	66%
Fungi	60%

Species Isolated

- Aureobasidium species
- Alternaria species
- Cladosporium species
- Fusarium species
- Non-sporulating colonies
- Paecilomyces species
- Penicillium species
- Pithomyces species
- Rhodotorula species
- Yeast

More on Mold

Common Indoor Molds
Cladosporium
Aspergillus
Penicillium
Stachybotrys
Chaetomium
Fusarium

Common Mycotoxins (gasses)
Aflatoxin
Ochratoxin
Gliotoxin
Trichothecenes
Other Gases – VOCs, Aldehydes, Alcohols

Care and Feeding of Mold

All you need is:

- Water Intrusion
- Indoor Humidity
- Dust

1. **Both Spores & Gasses Can Cause Illness**
2. **1 in 4 U.S. Buildings Have Mold Issues**
3. **1 in 3 Remediations Need to be Redone**

Mycotoxins

In addition to harming the liver and kidneys, mycotoxins have been shown to cause chronic inflammation, migraine headaches, and severe fatigue.

Headaches

1. **100 offices in 25 states**
2. **More than 4,300 workers**
3. **8% reported having a headache daily**
4. **38% reported a headache 1-3 days per month**

Researchers from the University of Toledo, Ball State University and Virginia Tech teamed up to better understand the connection among migraine, headache and indoor environmental parameters, such as the levels of carbon monoxide and dioxide, particulate matter and volatile organic compounds as well as temperature and humidity.

Contributors

- Volatile Organic Compounds (VOCs)
- Molds & Allergens
- PM (Particulate Matter – particularly ultrafine)
- Formaldehyde
- Low 0_2
- CO & CO2

"Regular Use of Common Disinfectants … "

Association of Occupational Exposure to Disinfectants With Incidence of Chronic Obstructive Pulmonary Disease Among US Female Nurses

"In a cohort study of 73,262 US female nurses participating in the Nurses' Health Study II who were followed up from 2009 to 2015, *occupational exposure to cleaning products and disinfectants was significantly associated with a 25% to 38% increased risk of developing chronic obstructive pulmonary disease* independent of asthma and smoking."

SEE JAMA POST

Walk-off mats at entrances, least-toxic cleaning products and integrated pest management practices greatly reduce the introduction of pollutants to the school environment and should be incorporated into every school building.

AASA THE SCHOOL SUPERINTENDENTS ASSOCIATION

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ROI Impacts

Human Performance Improvement

"In conclusion, there is compelling evidence that elite athletes are at increased risk for airway dysfunction. This risk however varies across sports, depending mainly upon the mechanical and dehydration stresses generated within the airways, and the level of noxious agents (i.e., airborne pollutants, irritants or allergens) inhaled by athletes during exercise ."

British Journal of Sports Medicine
Respiratory health of elite athletes – preventing airway injury: a critical review

Patented & Proven Medical Technology

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Better Work Performance

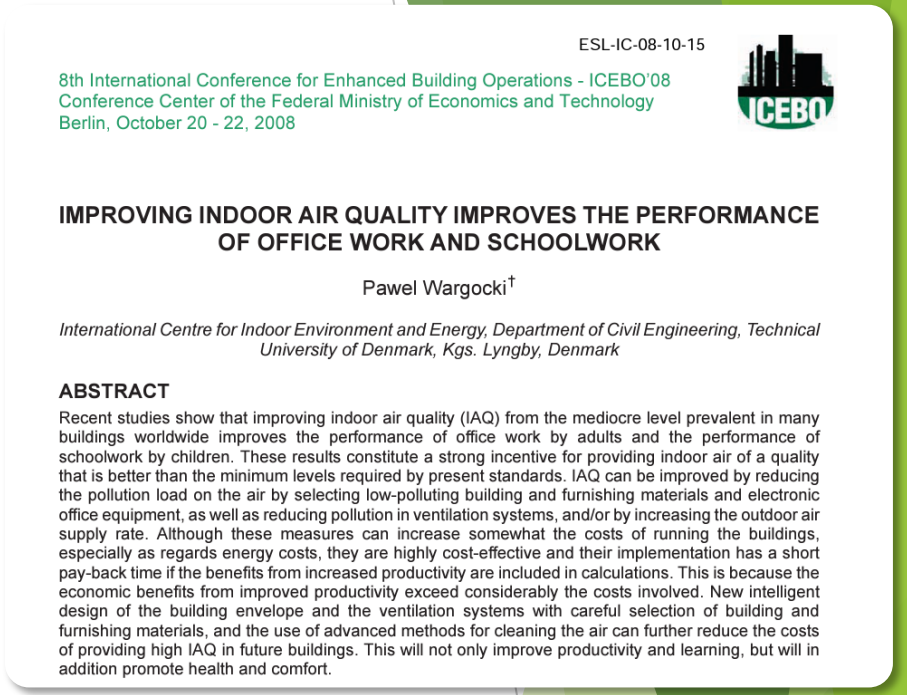
CONCLUSIONS

• … improving IAQ improves the performance of office work by adults and schoolwork by children.

• The benefits of improving IAQ by reducing pollution sources or increasing outdoor air supply rates are much higher than the costs involved.

• The present results constitute a powerful argument and strong incentive for providing indoor air of a better quality …

• IAQ should be improved while decreasing energy. New and energy-efficient technologies to improve IAQ are thus required; understanding the mechanisms by which IAQ affects humans would aid the development of such technologies.



ESL-IC-08-10-15

8th International Conference for Enhanced Building Operations - ICEBO'08
Conference Center of the Federal Ministry of Economics and Technology
Berlin, October 20 - 22, 2008

IMPROVING INDOOR AIR QUALITY IMPROVES THE PERFORMANCE OF OFFICE WORK AND SCHOOLWORK

Pawel Wargocki†

International Centre for Indoor Environment and Energy, Department of Civil Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

ABSTRACT

Recent studies show that improving indoor air quality (IAQ) from the mediocre level prevalent in many buildings worldwide improves the performance of office work by adults and the performance of schoolwork by children. These results constitute a strong incentive for providing indoor air of a quality that is better than the minimum levels required by present standards. IAQ can be improved by reducing the pollution load on the air by selecting low-polluting building and furnishing materials and electronic office equipment, as well as reducing pollution in ventilation systems, and/or by increasing the outdoor air supply rate. Although these measures can increase somewhat the costs of running the buildings, especially as regards energy costs, they are highly cost-effective and their implementation has a short pay-back time if the benefits from increased productivity are included in calculations. This is because the economic benefits from improved productivity exceed considerably the costs involved. New intelligent design of the building envelope and the ventilation systems with careful selection of building and furnishing materials, and the use of advanced methods for cleaning the air can further reduce the costs of providing high IAQ in future buildings. This will not only improve productivity and learning, but will in addition promote health and comfort.

SEE STUDY

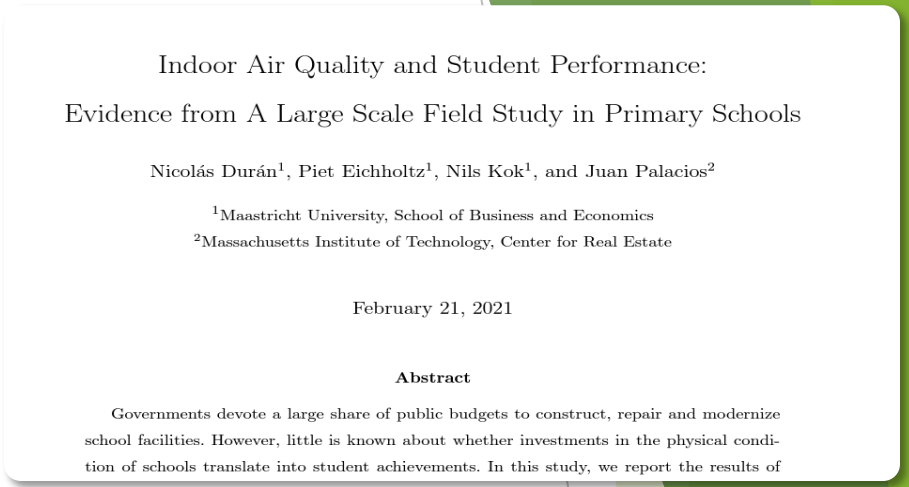
At a critical age …

"Our results suggest that upgrades in indoor air quality in schools is relevant besides reduction of the spread of viral diseases, such as COVID-19, and supports children's cognitive capacities, precisely at a critical age for human capital accumulation and skill formation."

February 2021, Indoor Air Quality and Student Performance: Evidence from A Large-Scale Field Study in Primary Schools

Maastricht University, School of Business and Economics
Massachusetts Institute of Technology, Center for Real Estate

See Study



Indoor Air Quality and Student Performance:

Evidence from A Large Scale Field Study in Primary Schools

Nicolás Durán[1], Piet Eichholtz[1], Nils Kok[1], and Juan Palacios[2]

[1]Maastricht University, School of Business and Economics
[2]Massachusetts Institute of Technology, Center for Real Estate

February 21, 2021

Abstract

Governments devote a large share of public budgets to construct, repair and modernize school facilities. However, little is known about whether investments in the physical condition of schools translate into student achievements. In this study, we report the results of

1. Poor indoor air quality is a key risk factor for the health and performance of students and staff in schools.
2. 235 classrooms across 27 schools
3. 3,000 students ages 6–12
4. 14,000 nationally standardized tests

The Value of Improved Performance

"Practical implications: It has now been shown beyond reasonable doubt that poor indoor air quality in buildings can decrease productivity in addition to causing visitors to express dissatisfaction. **The size of the effect on most aspects of office work performance appears to be as high as 6-9%**, the higher value being obtained in field validation studies. It is usually more energy-efficient to eliminate sources of pollution than to increase outdoor air supply rates."

6-9% Work Performance Improvement

SEE STUDY

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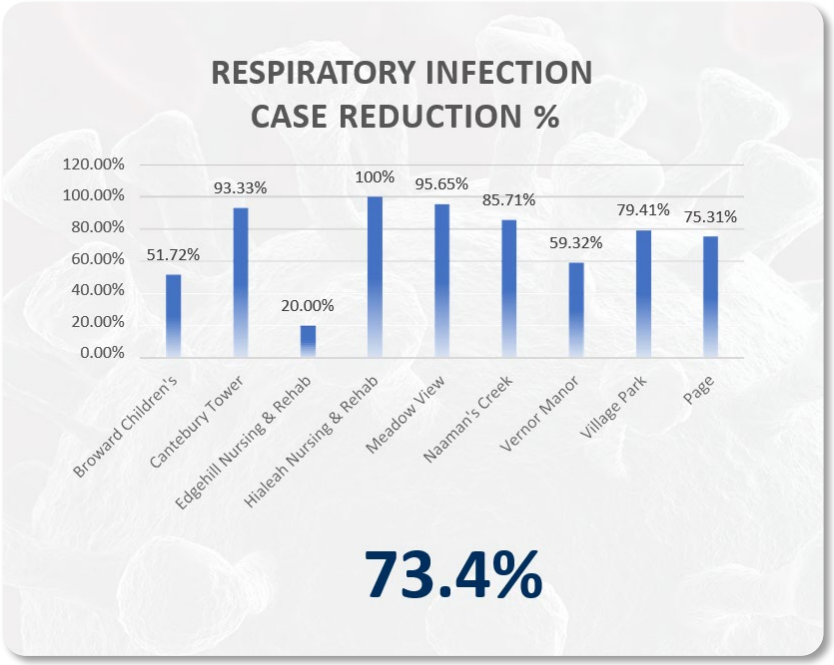
The ADA Metric



This graph represents case count reductions in respiratory infections across nine (9) healthcare facilities.

Assumptions

- Half of absences are due to illness
- Respiratory issues represent half of all illness related absences
- Assumed 36.7% (half) effectiveness

Approximately 9%
Reduction in ADA Days Lost

$1.7 mil for every 1% gain
@ 25,000 students

Risk Mitigation

Lowest risk of airborne transmission of human pathogens

- This pandemic
- The next pandemic
- H1N1, C. Diff, Norovirus, Legionella, Influenza, MRSA, et. al.
- VOC reduction – COPD risk to staff

The Value of Outside Air

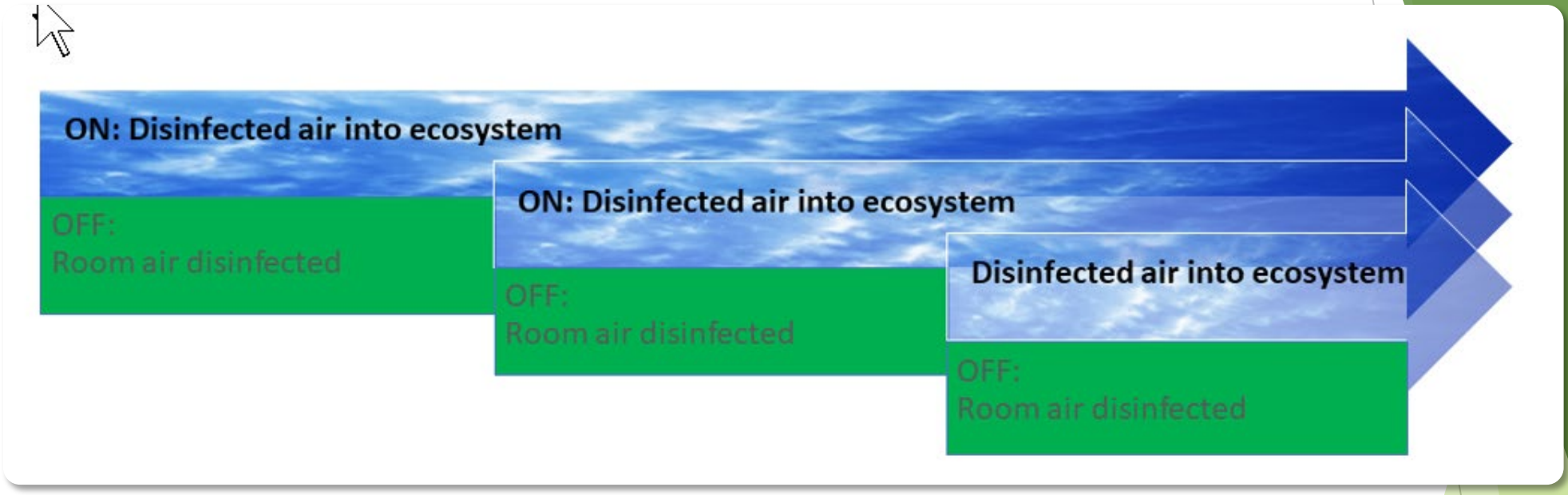
It has a value because there is a cost.

- Heating and cooling
- Filtration
- Controlling humidity
- Failures with controlling humidity

The climate zones in the United States as defined in ASHRAE 90.1-2013 Appendix B show that over half of the country is in what is referred to as a "moist climate," and nearly a quarter of the country is defined as "humid."

LEARN MORE ABOUT RH!

1.5 Million ft^3 of Disinfected Air Per Day



When portable air disinfection technology is deployed at the source of origin (in classrooms) there is a compounded “cumulative impact” from pushing disinfected and purified air into the air ecosystem. Facilities managers at a school system in Kentucky with over 600 units deployed are taking advantage of this.

Ex.

- Classroom Size: 900 sf – 10 ft ceiling height – 9,000 ft^3
- Average Elementary School – 30 classrooms
- 2 hr air movement cycle times in off hours (16-hours per day class day)
- 4 cycles per 16-hour interval (air moving normally while building occupied)

Healthcare Costs

The fiscal benefits of health and well-being.

- Lower absenteeism and presentism
- Lower healthcare costs
- Healthier people cost less!

Staffing

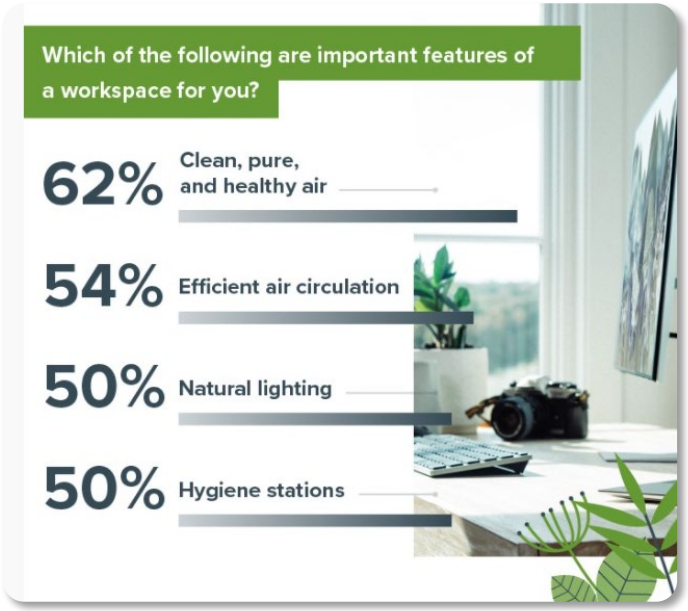
The benefit of clean air when hiring.

- Shortages are now the norm
- Substitute teacher resources strained
- Lower absenteeism
- Safest environment for teachers and staff
- Better health and well-being highly rated by job seekers

16% of teachers miss 18+ days per year

Cost: ≈$1,500/teacher/day

Survey: *3,000 employed adults across*
The survey asked those working in a range of environments, including factory and warehouse floors, hospitals, restaurants, schools, and general offices about their most important features of future workplaces." (6)



SEE SURVEY

PR

“Our decision to deploy portable air disinfection devices was supported by significant data from Healthcare. These technologies are the safest approach to augment efforts already underway as the masks came off.

These improvements to our indoor air ecosystem will make our teachers more effective at teaching, and our kids more effective at learning and thinking. Better overall health and well-being for students and staff will be delivering ROI every day.”

LINK TO PRESSER

Cumulative Impact

1. **ADA** – optimize reimbursement
2. **HVAC** – reduce the cost of outdoor air
3. **Mitigate Risk** – took proactive data-based approach
4. **PR** – Proven in Healthcare, best tech, improve IAQ
5. **Human Performance** – students and staff
6. **Healthcare Costs** – healthier staffs cost less
7. **Staffing** – recruits value air, safest environment

Devices returned for failure over 10 years: 0.5%[1]

1. NV 900 unfiltered unit

Summary

Managing air quality opportunities at the source, with proven medical technology is the best solution for reducing bacteria, viruses, mold spores, particulates and pollutants, and most volatile organic compounds (VOCs) resulting in improved IAQ which drives better overall health and human performance.

1. **Portable/transportable air disinfection systems deliver deployment flexibility** (fills a gap for occupied buildings that need remediation, renovation or replacement while options are planned & scheduled).
2. **A layered approach can improve multiple IAQ problems delivering benefits to all students and staff.**
3. **Improved IAQ Benefits**
    - Better overall health
    - Improved test scores – human performance
    - Lower asthma event numbers
    - Lower absences due to illness
    - Virtually eliminate increased risk of COPD from disinfectants and cleaners

"Overall, the study suggests that poor indoor air quality affects health and productivity significantly more than we previously understood."

September 2021, Harvard, T.H. Chan School of Public Health

SEE STUDY

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MORE INFO >

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Need a Business Case?

WANT HELP MAKING THE BUSINESS CASE FOR OPTIMIZED AIR?

1. **1-2 hr facilitated session (Remote)**
2. **We plug your data into our assumption sets (and share the data they are built from)**
3. **Deliverable** – complete customized business case lining out the benefits for students, teachers, and the budget

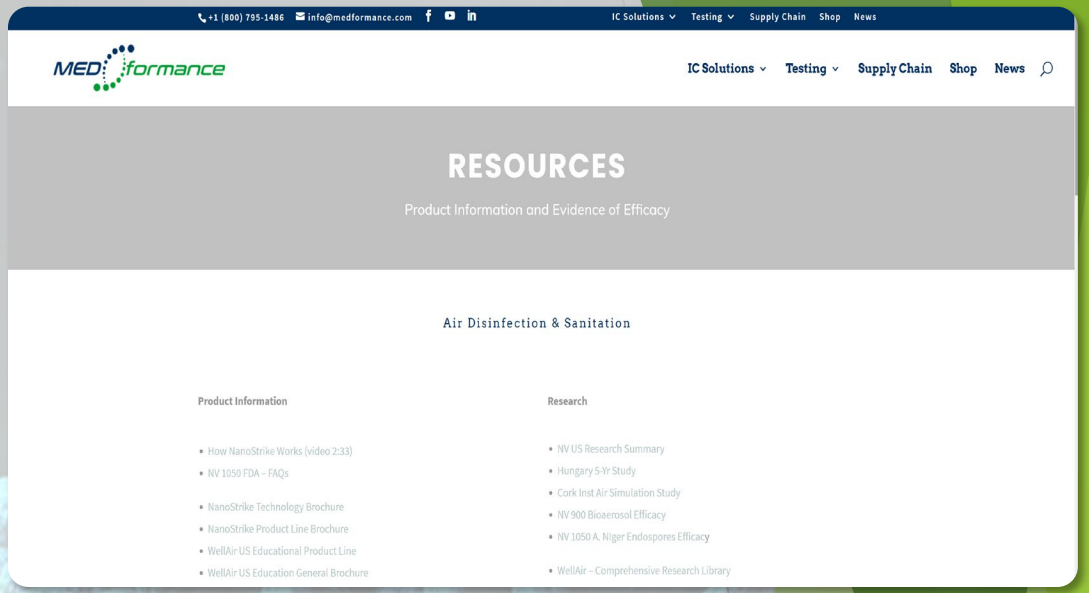
*** Plus - we'll send you a Protect 900 to test drive!**

Drop us an email!

Resources

1. **Product Spec Sheets -** plus other information on the technology, applications, and research links (includes link to complete WellAir research library)
2. **Other Assets & Research** – IAQ, Infection Control & Prevention

[Link to Resource Page]



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