



Pilot Study to Improve Indoor Air Quality

Supported by

The Massachusetts Support Group of the Alpha 1 Association

“Since I have been using the ICON, I am using less oxygen and I am feeling much better. I am using a lower liter flow than a few months back. I am having fewer bad breathing days. On a recent visit to my pulmonologist, I told him about the ICON. He was very impressed with the system and technology it uses. In addition, he saw improvement in my condition. He indicated that my lungs had improved air flow and the actual results of my Pulmonary Function Tests had improved. Not only am I subjectively feeling better but my actual test results have improved as well. I'm very happy with the ICON.” SF

Results contained in this study reflect data collected from August 2011 through January 2012.

“Effectiveness of Using Air Replacement Technology to Reduce Levels of Indoor Air Pollution”

This study was conducted in cooperation with the Massachusetts Support Group of the Alpha 1 Association.

Author & Manufacturer:

This study was conducted by
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19 Abbot Street, Andover, MA 01810

Pilot Study

The pilot study explores the ability of a new concept, Air Replacement Technology (A.R.T.™*) to reduce airborne contamination in the home. The study compares A.R.T. to a recent national study that used air filtration products to reduce airborne contamination and quantify the health benefits.

The pilot study was conducted in the Greater Boston area in seven homes identified by the Massachusetts Support Group of the Alpha 1 Association.



What is known about airborne particle reduction and health:

1990: A four week 32 patient study was conducted to evaluate the health benefits of using High-Efficiency Particulate Air or HEPA filtration to capture particles ≥ 0.3 microns (μ) in patients bedrooms. The HEPA systems achieved an average of 73% in one room reduction of airborne particulate. Only at the end of the four weeks was a small statistical health benefit reported.

R.E. Reisman: Journal Allergy Clinical Immunology 1990; (6):1050-1057

2010: A one year 200 patient study funded by the National Institutes of Health (NIH) using HEPA capture achieved a modest 20% reduction in airborne particulate levels $\geq 0.3 \mu$ in bedrooms. An 18% reduction in unscheduled hospital visits in the last months of the study was attributable to the absence of asthma exacerbations.



What this pilot study adds:

Replacing all forms of aeroallergens through an entire home with fresh clean air is far more effective than using HEPA filters to capture only airborne particles in a room or vent. Removal of all forms of aeroallergens significantly shortened the time required for patients to experience a stronger positive response. (Testimonials p. 6)

* Patent Pending

NEW TECHNOLOGY



Air Replacement Technology (A.R.T.) is based on two scientific principles:

- ▶ Two bodies can not occupy the same space at the same time.
- ▶ The effects of differential air pressure creating air flow.

For each cubic foot of clean, sterile air pushed into the home a cubic foot of contaminated air is forced out. Each cubic foot of air leaving the home will contain contamination which will include mixtures of particulate and gases (triggers).

The process of air replacement technology begins at the entrance point of fresh sterile air and gradually moves throughout the home eventually reducing airborne contamination throughout the entire living space.

In sharp contrast to air replacement technology, traditional re-circulating air filter products are designed to address particulate contamination and do not address the issue of introducing clean, fresh air or removing volatile organic compounds (VOC's).

PILOT STUDY

OBJECTIVE: Study the effectiveness of air replacement technology in a typical home setting.

METHODS: ICON™ air replacement systems were installed in the homes of seven members of the Massachusetts Support Group of the Alpha 1 Association.

The ICON is specifically designed to maximize the benefits of air replacement technology.

The ICON computer controls differential pressure to create a stream of conditioned, clean, fresh, sterile air into the home and displaces all sizes and types of airborne micro-contamination, VOC's, and harmful gases. (See figure 2 for the distribution of harmful pathogens).

A.I.R. Corp. monitored the airborne particulate levels in the size range typical of pathogens responsible for respiratory exacerbation. Baseline indoor air pollution data was collected at the time of installation of the ICON systems and measured monthly in each home for average of four months.

Study Site Selection

The homes varied in style, size and occupancy, with some including pets. The homes were constructed between 1960 and 2000 and heated with forced hot water or forced hot air. The only requirement was the availability of a double hung window to accommodate the *ICON* system installation.

(See figure 1)



The majority of the installations occurred in late summer 2011 to include both the fall allergy season and part of the winter heating season.

Figure 1

Study Design

All particle count data reported in this study was taken with a MetOne GT-321 Hand Held Particle Counter. Particle counts were taken in seven homes over four months. The data taken at installation and throughout the study includes five different particle sizes from 5.0 μ to 0.3 μ .

All site visits first verified that the clean, fresh sterile air entering the room from the *ICON* contained zero particles from 5.0 μ to 0.3 μ .

Particle counts were also taken at two other locations.

Location one was the center of the room selected for the *ICON* A.R.T. system installation.

Location two was a kitchen or living room chosen by the participant.

The data presented in this report focuses on the most dangerous particle size 0.3 μ . And all calculated averages are based on concentrations of 0.3 μ particles.

- ▶ During installation data taken was taken in all seven homes at location number one. The data was averaged to determine a baseline concentration, of 1,231,493 at 0.3 μ particles per cubic foot.
- ▶ Also at installation data was taken at location number two. The data was averaged for all seven homes to determine a baseline of 858,516 at 0.3 μ particles per cubic foot.
- ▶ At each subsequent visit the data from each location was averaged and compared to the baselines data for those locations and reported as a percent of particulate reduction.

For percent particle reduction at location one – See Table 1.

For percent particle reduction at location two – See Table 2.

The choice of a cubic foot air as a sample size has respiratory significance. The average adult inhales about one cubic foot of air per minute. The concentrations of dangerous 0.3 μ particles tracked in this study have respiratory significance for three other reasons.

1. They float and stay airborne for days.
2. The 0.3 μ size particles can travel deep into the lungs.
3. They can be absorbed by the body and trigger respiratory inflammation.

The 0.3 μ particles float in the air as part of the mixed cocktail of respiratory triggers we inhale with each breath that include volatile organic compounds (VOC) and exhaled gases.

(See figure 2)

Importance of this study

The data shows that air replacement technology provided the greatest improvement in indoor air quality at the point of installation. Throughout the pilot study, the particle count of the replacement air delivered by the *ICON* was zero for particles between 5.0 and 0.3 microns. The zero particle count readings at the *ICON* were consistent for all homes for the duration of the study.

The effectiveness of the fresh sterile air being introduced into the *ICON* installed location varied with the greatest individual reduction in airborne particulate of 87% and an average 4 month group reduction of 70%. (See Table 1)

Data was taken in all seven homes at a second remote location. The contribution of the supply of fresh sterile air flowing through the first location to the second location also varied. The greatest individual reduction in airborne particulate was 77% with an average 4 month group reduction of 51%. (See Table 2)

Time to Clean a Room

Two short studies were conducted to determine how quickly a room responds to air replacement technology. In both cases, the room responded at a contamination reduction rate of approximately 1% per minute.

Conclusions

The use of available air cleaners to determine the health benefits of reducing airborne particulate in the home was previously reported in a 2011 nationwide study funded by National Institutes of Health (NIH).

A 20% reduction of airborne particulate equals an 18% reduction of unscheduled hospital visits.*

The study preceded the introduction of air replacement technology (A.R.T.) and the ICON system. Constrained by the use of available air cleaning technology, the NIH study could only explore the benefits of removing the tip of the indoor air pollution iceberg. The NIH study specifically expresses disappointment in removing only 20% of the airborne particulate leaving all other forms of airborne pathogens behind.

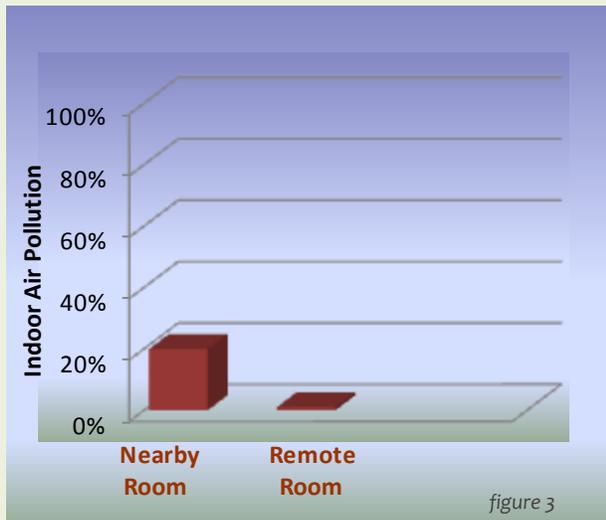
In sharp contrast, the availability of new technology documented in this study, removed 70% of the particulate and the physics of particle disbursement tell us that all forms of indoor air pollution were present in each cubic foot of air that left the home.

The data taken at a second location in the homes support the concept of differential air pressure transporting the benefits of the clean fresh air to other parts of the home. The transport of clean, fresh air to other parts of the home is a vast improvement over the localized air cleaning limitations of re-circulating air filter cleaners.

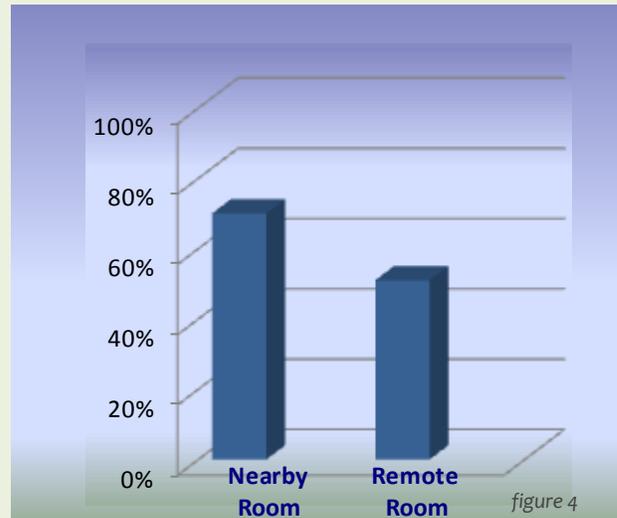
The ability of the ICON Air Replacement Technology system to address all forms of indoor airborne contamination is unprecedented. This pilot study shows great potential for exploring the health benefits for respiratory challenged people by reducing airborne particulate by 70%, 3.5 times more than the NIH report, to a new standard as reflected in this study. See table 1

The A.R.T. and ICON combination now enables physicians to consider new attainable levels of improved indoor air quality as part of an overall program to mitigate exposure to airborne triggers inhaled by respiratory challenged people.

Portable Air Filtration System 2010 VS



ICON Portable Clean Air Delivery System



Effectiveness of Air Replacement Technology throughout the home.

Notes:

Everyone who participated in this ground-breaking study should take pride in knowing that their contribution will enable thousands of respiratory challenged people to take control of the air quality in their homes.

Special thanks to the Massachusetts Support Group of the Alpha-1 Association members who participated in this pilot study by volunteering their time and their homes to make this study possible.

*It has been clinically established by the National Institutes of Health (NIH) that a 20% reduction in indoor airborne particulate (triggers) in the homes of asthmatics, which participated in the NIH study, resulted in an 18% reduction in unscheduled hospital visits.

Pilot Study Results

The average particle count for all seven homes, pre-installation of the ICON system, was at a baseline of 1,231,493 at 0.3µ particles per cubic foot of air.

The early participants in the pilot study were visited four times; later participants were visited two times.

Location #1 - ICON Installed Room

	At Time of ICON Installation Average of 7 Homes	Average Reading of 7 Homes Visit #1	Average Reading of 5 Homes Visit #2	Average Reading of 5 Homes Visit #3	Average Reading of 2 Homes Visit #4	Average Particle Count Reading of 7 Homes for visits 2 - 4	Average Percent (%) Particle Reduction
Particle Count Reading @ ICON	Zero	Zero	Zero	Zero	Zero	Zero	Zero
Particle Count Reading in Room Cleaned by ICON	1,231,493	383,206	304,610	291,030	519,309	374,539	70%

Average particle concentration at 0.3 µ during each visit

Table 1

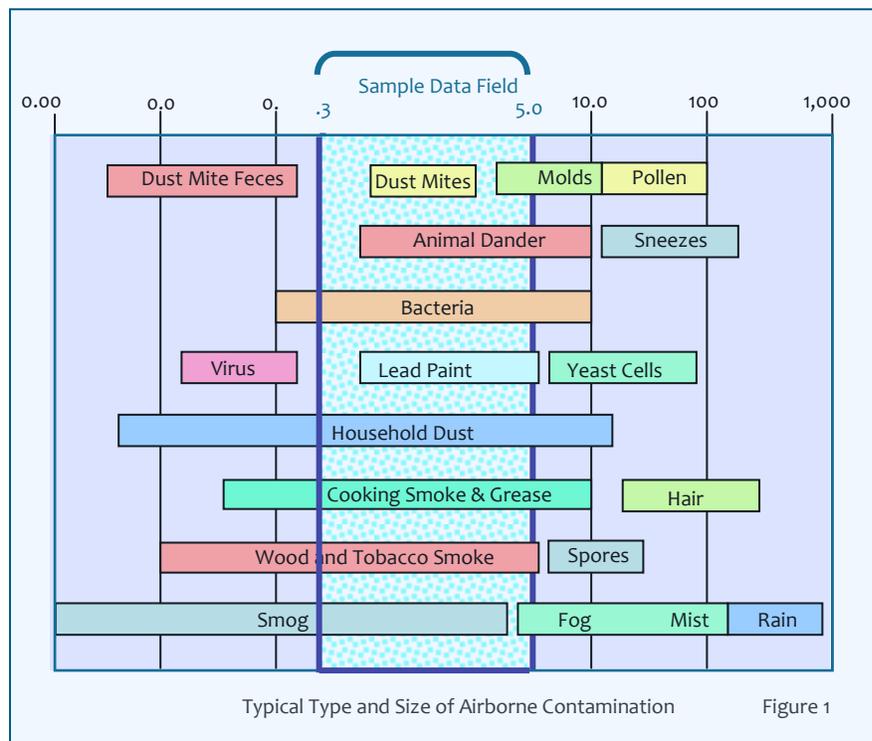
The average particle count for all seven homes location #2, pre-installation of the ICON system, was at a baseline of 858,516 at 0.3µ particles per cubic foot of air.

Location #2 - Reflecting Whole House Effect

	At Time of ICON Installation	Average Reading of 7 Homes Visit #1	Average Reading of 5 Homes Visit #2	Average Reading of 5 Homes Visit #3	Average Reading of 2 Homes Visit #4	Average Particle Count Reading of 7 Homes for visits 2 - 4	Average Percent (%) Particle Reduction
Particle Count Reading in Additional Room	858,516	477,687	487,683	469,231	239,297	418,474	51.3%

Average particle concentration at 0.3 µ during each visit

Table 2



Comments from the Pilot Study Participants ~

"I noticed the difference immediately. I can feel the difference in my lungs and my breathing."

"I'm very happy with the unit."

"I can smell the difference in the air."

"The air feels better. It feels like being in a cleanroom."

"I can feel the difference in my lungs when I breathe."

"I'm very happy with the unit. I feel like it is making a difference."

"Since I have been using the unit, I'm sleeping better at night and wake up less congested. I definitely noticed the difference immediately. I can feel the difference in my lungs and my breathing. I'm feeling better when I am in my house because it is making a positive impact. My wife also suffers from allergies. The ICON eliminates the harmful triggers and brings in sterile air. I'm very pleased with the ICON clean air delivery system." BH

"I don't wake up as many times during the night, and I've been able to sleep now. The other night I woke up to go to the bathroom and I realized my cannula was off. I'm not saying that I don't need oxygen at night, but it was amazing that I was able to stay asleep without 2 liters of air going through my nose," "I don't reach for my inhaler first thing in the morning anymore, either—that's a difference." FW

"I can smell the difference in the air. The air feels better. It feels like being in a clean room. I can feel the difference in my lungs when I breathe. Both I and my wife are waking up in the morning less stuffy and congested. She suffers from allergies. It is a noticeable difference. After going to my pulmonologist the results of my pulmonary function tests had improved and I'm feeling better. I'm very happy with the unit. I feel like it is making a difference." RM

For additional information please contact A.I.R. Corp at 866.437.0044 or visit our website at www.air-us.com.