

# **Advanced Air Sanitization in a Medical Office Setting A Clinical Study of Indoor Air Quality Data from the Use of a Photocatalytic Air Purification System**

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**ABSTRACT.** An onsite study determined changes in the colony forming unit (CFU) count of airborne bacteria and fungi/mold in two waiting rooms of a primary care pediatric office as a result of using an AiroCide™ Air Quality Improvement™ system. The data supports the hypothesis that levels of airborne bacteria and mold/fungi begin to increase when the AiroCide™ is turned off after continuous operation for a given period of time.

## **Background**

With the increasing importance of keeping indoor environments safe and clean, especially in medical facilities where harmful pathogens may be present, many air purification and sanitizing systems have been developed to attempt to accomplish this objective.

The AiroCide™ Air Quality Improvement System utilizes a unique combination of ultraviolet germicidal light (UVGI) and hydroxyl radicals inside the unit to destroy bacteria, viruses, fungi, molds, and spores. With this technology there is no residue or filtering system that may store pathogens.

## **Purpose**

An onsite study was formulated to compare airborne bacteria and mold/fungi levels with the AiroCide™ unit turned on and turned off in medical office waiting rooms.

## **METHODS**

### **Study Design**

The facility selected for the study is a high volume primary care pediatric practice in a suburb of Atlanta, Georgia. The office is located on the third floor of a five-story building in a modern medical office complex. Total area of the office is 4900 ft<sup>2</sup> (volume 44,100 ft<sup>3</sup>.) On each day of testing, there were sixteen (16) staff members in the offices (including four physicians.) The number of patients using the office averages 80-100 per day. The office features separate waiting areas for “sick” and “well” patients in an attempt to reduce cross-contamination. One AiroCide™ unit (ACS-100) was installed in a hallway in the center of the office in February 2003 approximately 25 feet from the waiting room areas.

One central Heating, Ventilation & Air Conditioning (HVAC) unit supplies the entire office area and all rooms share the same conditioned air with no outside air exchanges. There are no high efficiency particulate filters, ultraviolet lights, or other air purification devices in use.



### **AIROCIDE DIMENSIONS**

Height – 24 ½" (.62m)

Length – 46 ½" (1.18m)

Depth – 3 ½" (.09m)

Weight – 59 lbs (26.8 ks)

### Study Protocol

Air samples were taken with a slit air sampler (similar to the Anderson N6 sampler) on 15 x 100 mm plastic Petri dishes. Bacterial samples were measured on Tryptic Soy Agar plates with 5% sheep blood and incubated at 25° C. Fungal samples were measured on Potato Dextrose Agar plates incubated at 28° C.

Samples were taken in both waiting rooms in the office on two (2) separate days. Baseline samples were taken for airborne bacteria and for airborne mold/fungi in both the sick and well waiting rooms after the AiroCide™ unit had run continuously for five (5) months. After baseline sampling counts, the AiroCide™ unit was turned off for 24 hours and air sampling was repeated in the same two locations.

## RESULTS

**Table 1** shows the “well” waiting room sampling data comparing baseline levels of bacteria and mold/fungi after continuous use of the Airocide™ unit with levels after the unit was turned off for 24 hours. Results showed a 272% increase in bacteria CFU/m<sup>3</sup> and a 219% increase with mold/fungi after the unit was off for 24 hours.

**TABLE 1 – Well patient waiting room**

Sample Day	1	2	
Airocide™ unit	<u>ON</u> for 6 months	<u>OFF</u> for 24 hours	% change
Bacterial *CFU/m <sup>3</sup>	130	483	+272
Mold/Fungi CFU/m <sup>3</sup>	59	188	+219

\*CFU/m<sup>3</sup> – colony forming units per cubic meter

**Table 2** similarly shows the “sick” waiting room sampling data comparing baseline levels with levels with the Airocide™ unit turned off for 24 hours. Results show a 89% increase in bacteria CFU/m<sup>3</sup> and 196% increase with mold/fungi.

**TABLE 2 – Sick patient waiting room**

Sample Day	1	2	
Airocide™ unit	<u>ON</u> for 6 months	<u>OFF</u> for 24 hours	% change
Bacterial CFU/m <sup>3</sup>	212	400	+89
Mold/Fungi CFU/m <sup>3</sup>	24	71	+196

Bacterial cultures showed various gram positive cocci and gram positive and negative bacilli. Mold/fungi cultures showed Cladosporium, Mycelia Sterilia, and Penicillium species. AeroTech Laboratories, Inc., in Phoenix, Arizona analyzed cultures and reported the CFU/m<sup>3</sup> data.

## CONCLUSION

Airborne pathogens in medical facilities have been found to increase the likelihood that patients and staff would contract illnesses from the environment by cross contamination. The removal of microbes from the environment without any residue or filters is a new and exciting concept in indoor air sanitization with many potential applications in medicine.

In this study, bacteria and mold/fungi were shown to increase in the waiting room air samples when the Airocide™ unit was turned off compared to previous levels.

The continuous use of a photocatalytic air purification system such as the AiroCide™ Air Quality Improvement System seems to be an effective modality for sanitizing air and possibly reducing cross-contamination among patients and staff. The application of this system for infection control and bioterrorism protection in medical, residential, or commercial settings may prove extremely valuable.

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