ANTIMICROBIAL TEST LABORATORIES

Study Report

www.AntimicrobialTestLabs.com - Info@AntimicrobialTestLabs.com - (512) 310-8378

Study Title

Evaluation of the Antimicrobial Effect of Spectra254 Ultraviolet Radiating Room Disinfection Device Against Airborne Microorganisms

Test Method

Custom Air Quality Study

Study Identification Number

NG6090-II

Study Sponsor

George Jay Lichtblau

Test Facility

Antimicrobial Test Laboratories
1304 W. Industrial Blvd Round
Rock, TX 78681
(512) 310-8378

History of the Laboratory

Antimicrobial Test Laboratories was launched in 2006 to provide testing services to the antimicrobial industry. The company has grown considerably since then but its focus remains the same: Test antimicrobial agents, test them well, and test them fast! Antimicrobial Test Laboratories operates a 15,000+ square foot facility near Austin, Texas, where hundreds of studies are conducted annually by a staff of friendly, knowledgeable, and experienced microbiologists and virologists.

Laboratory Qualification Statement

Antimicrobial Test Laboratories was founded by microbiologist Dr. Benjamin Tanner. The laboratory ensures consistent, reproducible results by utilizing a well-trained and educated scientific staff who work from a comprehensive system of Standard Operating Procedures, official standard methods from ASTM, AOAC, and other organizations, and custom study protocols. The laboratory provides testing services to dozens of Fortune 500 companies and has been inspected for GLP compliance by the US government.

Scientist Qualifications

This study was designed, conducted, and reported by: Blake Rolland, B.S.

Blake graduated from the University of Oklahoma with a Bachelors of Science in Microbiology.

Blake is well-versed with regard to a variety of microbiological test methods and procedures. As a Microbiologist at Antimicrobial Test Laboratories, he has taken part in hundreds of studies and mastered several test methods. Blake enjoys seeing large projects through to completion. His scientific character, coupled with his strong work ethic bring a high degree of efficiency and care to every study he leads.

If you have any questions about your study, please don't hesitate to contact Blake at:

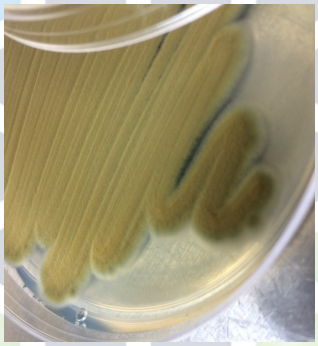
Blake@AntimicrobialTestLabs.com
or
(512) 310-8378

Test Device Information

The following test device was received on 22APR2015:

Test Microorganism Information

The test microorganism(s) selected for this test:



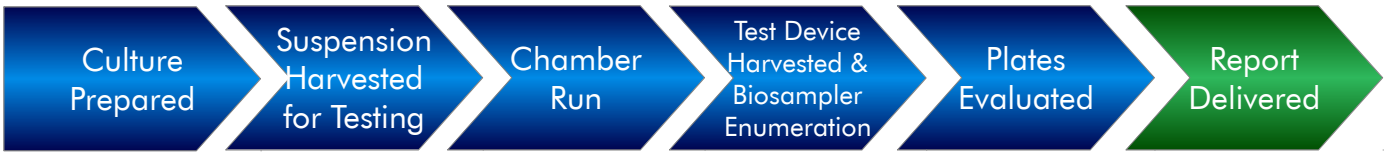
Cladosporium cladosporioides ATCC 16022

This heavily sporulating fungi is a dematiaceous mold, meaning that it is characterized by the olive-to-black pigmentation of its conidia and hyphae. It is prevalent in indoor and outdoor environments, and is a plant pathogen that affects wheat. Frequently isolated from air, *Cladiosporium* has a world-wide presence and is one of the early colonizers of humid indoor environments growing on such substrates as gypsum, paper, paint, and textiles. As a common allergen, this species has been known to induce hay fever and asthma in humans.

Summary of the Procedure

- Fungal Test microorganism was grown for 11 days on appropriate media.
- Fungal cultures used for test inoculum were washed and concentrated in sterile RO water upon harvesting.
- Fungal culture was diluted to target concentration.
- 14 ml of test inoculum was added to each nebulizer (total of 28 ml) and nebulized for 60 minutes.
- An SKC biosampler was used to take a Time Zero sample to determine starting chamber concentration for baseline comparison.
- Device was activated for 15 minutes then an air sample was taken.
- Samples were enumerated using standard dilution and plating techniques.
- Fungal concentrations were determined after 7 days of incubation
- Reductions of microorganisms were calculated relative to concentration at Time Zero.

Study Timeline



25JUL2015	06JUL2015	06JUL2015	06JUL2015	13JUL2015	13JUL2015

Criteria for Scientific Defensibility of a Custom Device Study

The following criteria must be met in order for ATL to consider this study scientifically defensible:

1. The average number of fungal spores recovered from the samples taken at time zero must be approximately 1 x 10^4 CFU/m^3 or greater.
2. Positive/Growth controls must demonstrate growth of the appropriate test microorganism.
3. Negative/Purity controls must demonstrate no growth of test microorganism.

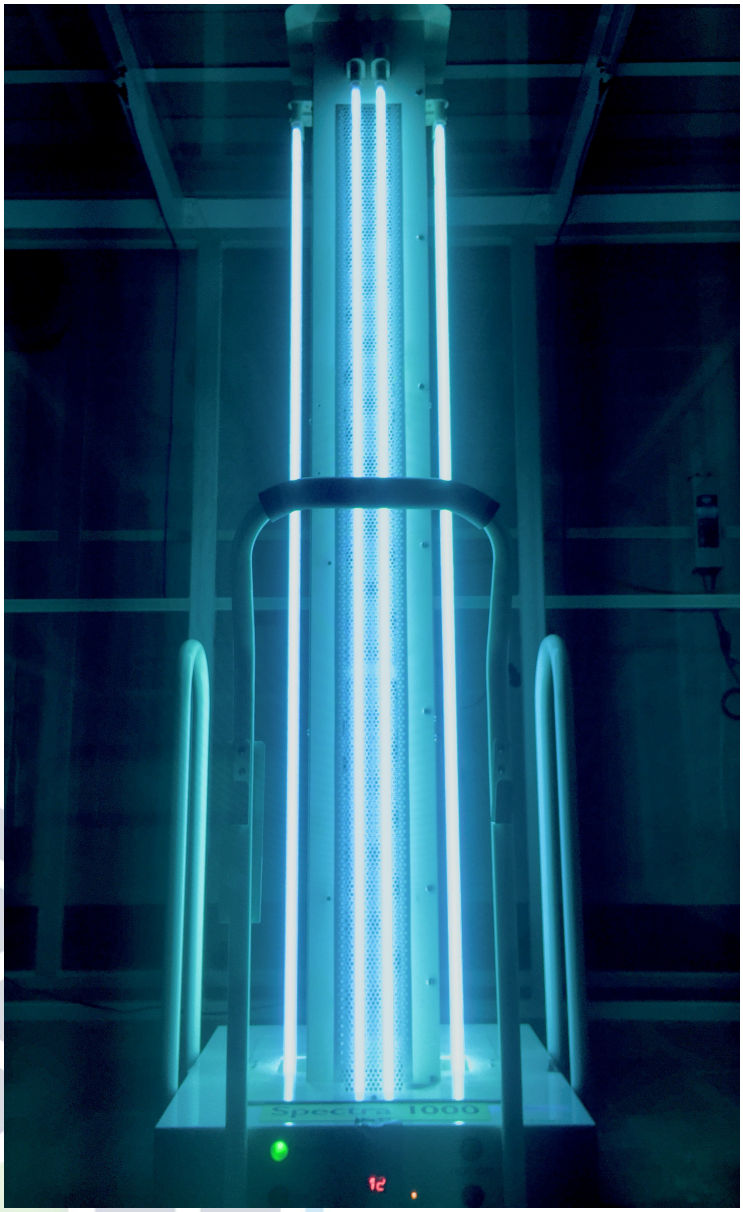
Testing Parameters used in this Study

Test Microorganism:	*C. cladosporioides* 16022
Culture Growth Media:	Potato Dextrose Agar
Culture Growth Time:	11 Days
Culture Dilution Media:	Reverse Osmosis (RO) Water
Target Concentration:	≥1.0 x 10^7 CFU/ml
Enumeration Plating Media:	Potato Dextrose Agar
Enumeration Plate incubation Time:	5-10 Days
Volume of Inoculum Added to Nebulizer:	14 ml/Nebulizer (28 ml total)
SKC Biosampler Medium and Volume:	20 ml Phosphate Buffered Saline
Nebulization Duration:	60 Minutes
SKC Biosampler Sampling Time	10 Minutes
Sampling Time Points:	Time Zero, after one 15 minute cycle
SKC Biosampler Sampling Rate (L):	12.5 L/minute
SKC Biosampler Liters (L) Sampled:	125 L

Study Notes

No additional observations or notations were made for this study.

Study Photographs



Above: Spectra254 1000A. Picture taken mid-cycle.

Calculations

$$\text{Percent Reduction} = \left(\frac{B-A}{B}\right) \times 100$$

Where:
B = Number of viable test microorganisms on the control carriers immediately after inoculation
A = Number of viable test microorganisms on the test carriers after the contact time

$$\text{Log}_{10}\text{Reduction} = \text{Log}\left(\frac{B}{A}\right)$$

Where:
B = Number of viable test microorganisms on the control carriers immediately after inoculation
A = Number of viable test microorganisms on the test carriers after the contact time

$$\text{CFU/m}^3 = 1000 \times \left(\frac{\frac{\text{CFU}}{\text{ml}} \times (V_s)}{T_s(12.5)}\right)$$

Where:
V_S = Biosampler volume (ml)
T_S = Time sampled (min)

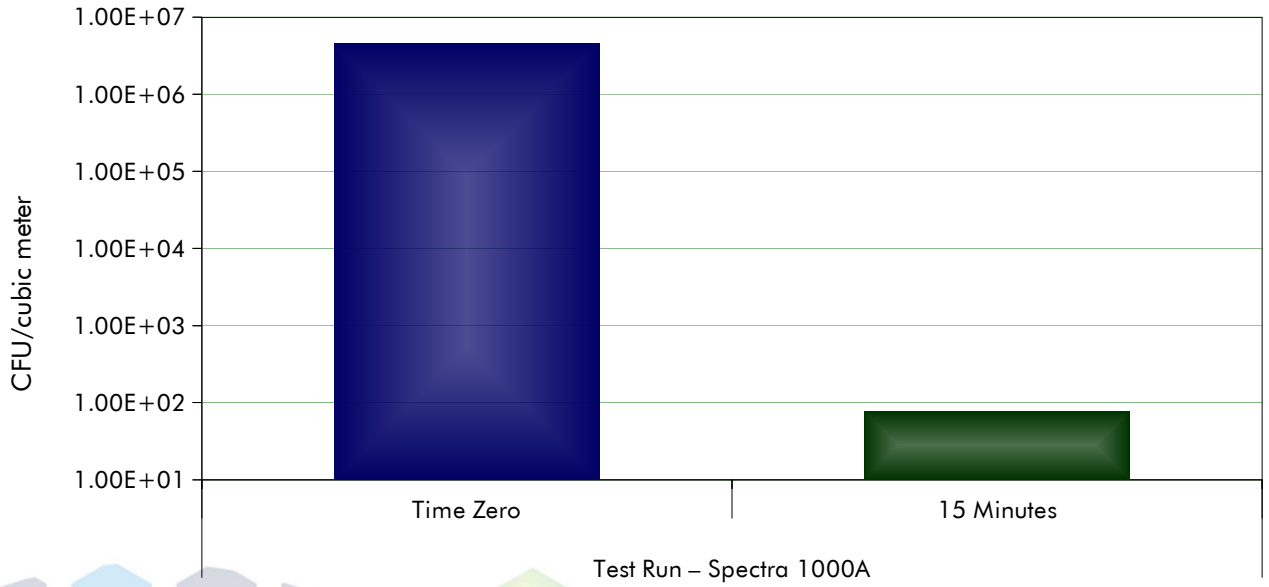
Control Results

Neutralization Method: N/A
Growth Confirmation: Confirmed (Morphology)
Media Sterility: Sterile

Results of the Study

Microorganism	Inoculum Concentration (CFU/ml)	Test Device	Treatment Time Point	Recovery (CFU/m³)	Percent Reduction vs. Time Zero	Log_{10} Reduction vs. Time Zero
C. cladosporioides ATCC 16022	2.30E+08	Spectra 1000A	Time Zero	4.56E+06	N/A	
			15 Minutes	7.76E+01	99.9983%	4.77

Note: The limits of detection for this study is 7.76E+01. Values below the limit of detection are represented as <7.76E+01 in the chart above and 0 in the graph below.



The results of this study apply to the tested substances(s) only. Extrapolation of findings to related materials is the responsibility of the Sponsor.