Light Progress Products Tests

Brief Overview

November 2020

LIGHT PROGRESS

FOREWORD

To whom t may concern

We hereby declare that all Ultraviolet Germicidal Irradiation systems manufactured by Light Progress are useful in fighting COVID-19 outbreaks.
UV disinfection technologies can play a role in a multiple barrier approach to reducing the transmission of the virus causing COVID-19, SARSCoV-2, based on current disinfection data and empirical evidence.

All bacteria and viruses tested to date (many hundreds over the years, including other coronaviruses) respond to UV disinfection. Some organisms are more susceptible to UVC disinfection than others, but all tested so far do respond at the appropriate doses. COVID-19 infections can be caused by contact with contaminated surfaces and then touching facial areas (less common than person-to-person, but still an issue)[vi].

Minimizing this risk is key because COVID-19 virus can live on plastic and steel surfaces for up to 3 days[vii].
Normal cleaning and disinfection may leave behind some residual contamination, which UVC can treat suggesting that a multiple disinfectant approach is prudent.
UVC has been shown to achieve a high level of inactivation SARS-CoV-2[viii] and this can lead to an important step ahead also possible air disinfection and elimination of COVID-19 airborne route for transmission, whereas airborne transmission hasn't been proved, yet.

Light Progress main effort is to provide the most scientific approach possible promoting the use of UV-C technology for infection prevention, since 1987.

Giulia Santi
Chief Executive Office
LIGHT PROGRESS S.r.l.

References:
[i] "Miscellaneous Inactivating Agents - Guideline for Disinfection and Sterilization in Healthcare Facilities (2008);"Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases (NCEZID), Division of Healthcare Quality Promotion (DHQP) ***(https://www.cdc.gov/infectioncontrol/guidelines/disinfection/disinfection-methods/miscellaneous.html)***
[ii] "Large-scale preparation of UV-inactivated SARS coronavirus virions for vaccine antigen," Tsunetsugu-Yokota Yet al. Methods Mol Biol. 2008;454:119-26. doi: 10.1007/978-1-59745-181-9_11.
[iii] "Efficacy of an Automated Multiple Emitter Whole-Room Ultraviolet-C Disinfection System AgainstCoronaviruses MHV and MERS-CoV," Bedell K et al. ICHE 2016 May;37(5):598-9. doi:10.1017/ice.2015.348. Epub 2016 Jan 28.
[iv] "Focus on Surface Disinfection When Fighting COVID-19"; William A. Rutala, PhD, MPH, CIC, David J. Weber, MD,MPH; Infection Control Today, March 20, 2020 (*https://www.infectioncontroltoday.com/covid-19/focus-surfacedisinfection-when-fighting-covid-19*)
[v] Ibid.
[vi] "Preventing the Spread of Coronavirus Disease 2019 in Homes and Residential Communities"; National Centerfor Immunization and Respiratory Diseases (NCIRD), Div. of Viral Diseases (*https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-prevent-spread.html)*
[vii] "New coronavirus stable for hours on surfaces"; CDC (extracted from N van Doremalen, et al. Aerosol andsurface stability of HCoV-19 (SARS-CoV-2) compared to SARS-CoV-1. The New England Journal of Medicine. DOI: 10.1056/NEJMc2004973 (2020)) (*https://www.nih.gov/news-events/news-releases/new-coronavirus-stable-hourssurfaces)*.
[viii] "Inactivation of SARS coronavirus by means of povidone-iodine, physical conditions and chemical reagents;"Kariwa H et al. Dermatology 2006;212 (Suppl 1): 119 (*https://www.ncbi.nlm.nih.gov/pubmed/16490989)*
[ix] "Ultraviolet Radiation and the Work Environment (Revised. See: 74-121)," The National Institute for Occupational Safety and Health (NIOSH), Page last reviewed: March 29, 2017 (*https://www.cdc.gov/niosh/docs/73-11005/default.html)*
[x] "Pathway to Developing a UV-C Standard – A Guide to International Standards Development", C. Cameron Miller and Ajit Jillavenkatesa, IUVA News / Vol. 20 No. 4, 2018
[xi] "Healthcare Associated Infections Workshop Advances Development Of Ultraviolet Disinfection Technologies,"

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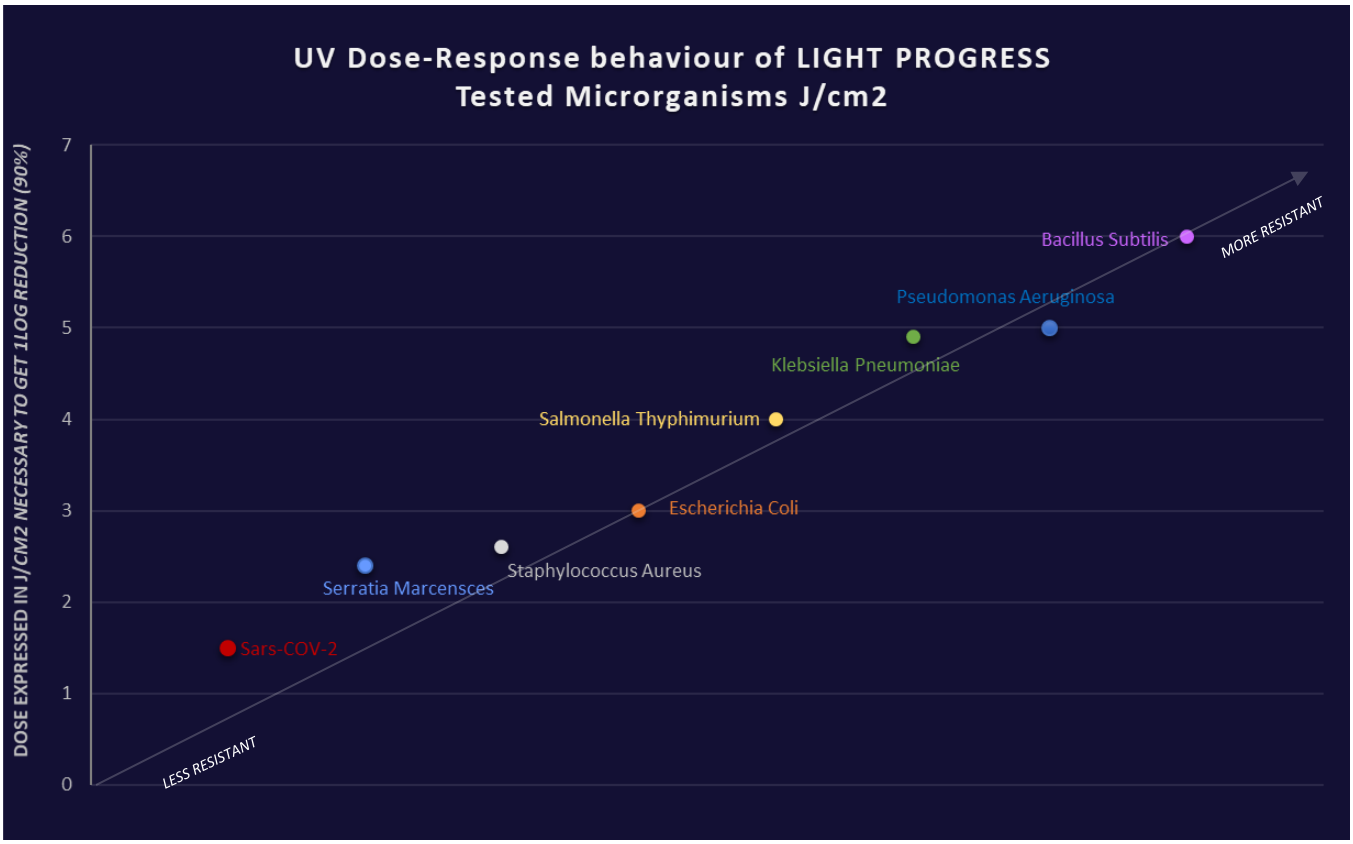
INTRODUCTION

The aim of this document is to collect data on Light Progress products' efficacy tests for different application of UV-technology.

A first test against Sars-Cov-2 dated June, 2020 has been made to determine the virucide activity of LIGHT PROGRESS technology against the SARS-CoV-2.
For safety reason the laboratory experimented Light Progress lamp in a "closed" system to avoid any possible virus spread during tests. This first approach to prove our products efficacy is only a first step on Sars-Cov-2 tests, even though **is very easy to prove efficacy on Corona viruses in general throughout experimental data on other microorganisms much less susceptible with UV-C irradiation.**

Microorganisms tested and their UV-dose response:



All tests collected here are coming from 3rd part laboratories mentioned, related reports can be found at www.lightprogress.it download area and/or please ask one of our representatives for the original documents.

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Test 1: Evaluation of Virucide activity against Sars-Cov-2 of Light Progress products

University of Siena, Department of Molecular and Developmental Medicine

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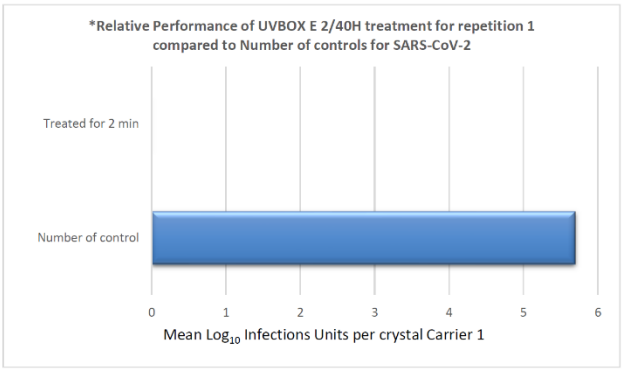
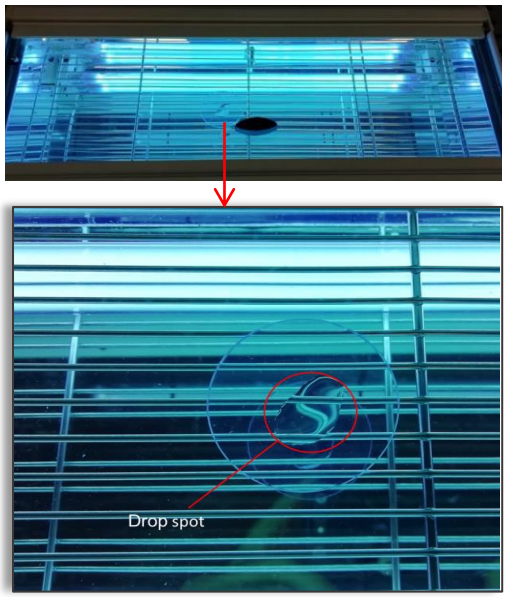
TESTS PARAMETERS:

Name of product tested: UV BOX E 2/40H
UV Power = 40 W High Output lamp
Period of analysis: 10/06/20 – 13/06/20
Temperature of incubation: 37°C
Identification of Viral strain: SARS-CoV-2 (Lot: VMR –SARSCPV2 VERO E6_28042020)
Incubation period: 3 days
Irradiation time: 2 minutes
Repetition of tests: 3 times
Experiment method:
Crystals (UV-C permeable) were positioned in the center on the grid, then inoculated with 100 µL of viral suspension. The suspension virus used was 107.2 TCID50%/mL (7.2 expressed by Log10).

TESTS RESULTS:

After Irradiation, Sars-Cov-2 was inactivated with a Log Reduction of 5.7 LOG_{10} (>99.999%) which means total virucidal inactivation.





Repetition	Time of exposition	Log suspension virus TCID50%	Log TCID50% after treatment	Log reduction TCID50%
1	2 min	7.2	1.5*	5.7
2	2 min	7.2	1.5*	5.7
3	2 min	7.2	1.5*	5.7

*The value of Log TCID50 = 1.5 means total viral inactivation

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Test 2: Evaluation of Disinfectant efficacy Light Progress surface irradiation product following FDA (Food and Drug Administration) protocol described in "Guidance for Industry about enforcement Policy for Sterilizers, Disinfectant Devices, Air Purifier during the Coronavirus Disease 2019 (COVID-19 Public Health Emergency"

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TESTS PARAMETERS:

Name of product tested: UV PENTALIGHT
Microrganisms Tested:

- Pseudomonas Aeruginosa ATCC 27853
- Escherichia Coli ATCC 8739
- Stafilococco Aureus ATCC 43300
- Salmonella Typhimurium ATCC 23853
- Klebsiella Pneumoniae ATCC BAA-1705

Inocolum Carriers: 20 cm^2 stainless Steel carriers
Concentrations: $1.5x10^7$; $1.5x10^6$ CFU/mL
Exposure Times: 4, 7 and 10 minutes
Distance Surface – Source: 3,5 m
Repetitions: tests were performed 3 times in triplicate between August and September 2020

Experiment method:

2 PCB solution to suspend inoculum colonies were spread on the stainless-steel carriers, one placed under UV irradiation and the other out of device reach. At the end of the exposure time both the samples were transferred into 90 mm Petri dishes and D/E medium added. Plates were incubated at 36°C for 48h.

TESTS RESULTS:

After Irradiation, all Microrganisms tested were eliminated with value from 4 Log_{10} (99,99%) to 7 Log_{10} (99,99999%). The higher effect was of course achieved at 10 minutes exposures (distance was fixed at 3,5 m).


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Image 3 Light Progress UV PENTALIGHT: lateral view

Image 4 Light Progress UV PENTALIGHT: UV-C ON

REPORT V 1.0 "TEST ON UV-PENTALIGHT BY LIGHT PROGRESS"

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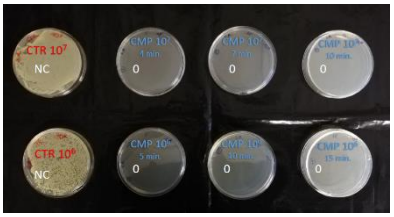

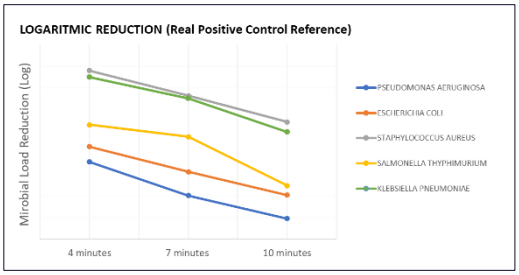

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Test 3: Evaluation of Airborne Microorganisms inactivation transiting in-duct on a Light Progress UVGI air purifier according to ISO 15714:2019

TECNAL Srl - laboratory accredited by ACCREDIA (nr 0299 L) UNI CEI EN ISO/IEC 17025:2018

LABORATORIO ANALISI TECNAL

TESTS PARAMETERS:

Name of product tested: UV FAN-XS
Period of analysis: November 2020

Microrganisms Tested:

- Serratia Marcescens ATCC13880
- Bacillus Subtilis ATCC6633
- Cladosporium sphaerospermum ATCC11289

UV-C Device features:

- UVC lamp power: 40W
- - Power supply: 230 Volt -50/60Hz -40Watt
- - Maximum AIR FLOW rate: 125 m^3/h
- - Flow Speed: 2m/sec
- - Passage Section area: 0.0166 m^2

Environmental Conditions:
Temperature: 25°C+-2°C
Relative Humidity: 50% +-10%

Experiment Method and Goals:
Besides certifying an Air Purifier itself, the main goal was to assess the performance of our UVGI devices for air disinfection, which are usually mounted in AHUs or duct in heating, ventilating and air-conditioning (HVAC)

Bacterial strains were initially reconstituted in broth culture; then the microorganisms are grown on plates; until the dilution obtained is the desired CFU/ml concentration for the inoculum. The microorganisms are then inserted in the air purifier by an aerosol generator; using a Anderson impactor with the cultivation soil plates provided for the microorganism, performs preliminary flow checks of the flow generator.
Connect the aerosol generator in the inlet hole and the impactor Anderson in the output hole of the device and start collecting the microorganisms following the operational protocol as per indications of point 7.3 of ISO 15714:2019 protocol.
The test is performed 3 times both with the UVC light OFF and ON.
The plates are finally placed to incubate for 24 -48 hrs at 32°C+-1°C. For Cladosporium Sphaerospermum: 72/120 hours at 25°C+-1°C.

TEST RESULTS:

The percentage of inactivation of aero dispersed microorganisms foreseen ISO 15714:2019 technical standard; specifically, the following results have been obtained:
Serratia Marcescens bacterial inactivation: 100% - calculated UVC dose: D=11.58 J/m^2
Bacillus Subtilis bacterial inactivation: 99.99% - calculated UVC dose: D=56.56 J/m^2
Cladosporium Sphaerospermum inactivation: 44.1% - calculated UVC dose: D=276.53 J/m^2.

Germicidal efficacy has been fully demonstrated.

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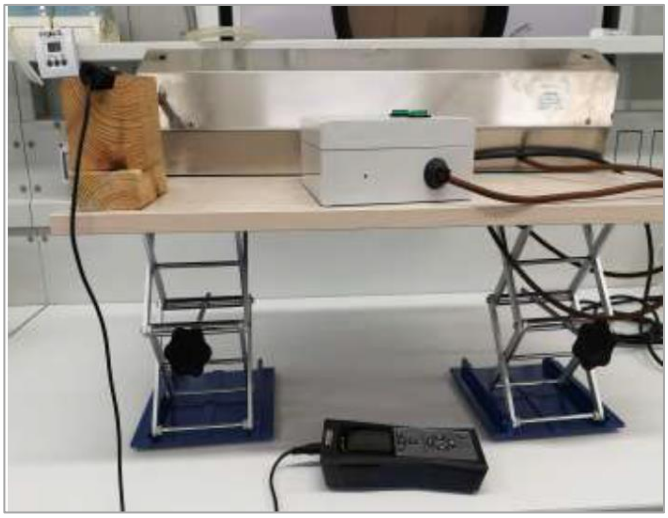
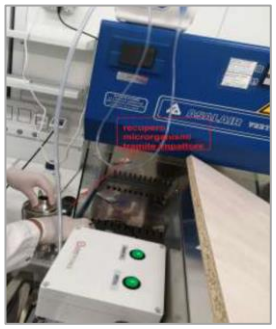




1- Serratia marcescens:

ufc/m³ valore medio lampada UVC spenta		*ufc/m³ valore medio lampada UVC accesa*	
UV LAMP OFF	32.596	UV LAMP ON	1

INACTIVATION RATE (punto 3.1.9)	
N0/N%= (N0-N)/N0x100	Log(N0/N)
100,0	4,6

2- Bacillus subtilis:

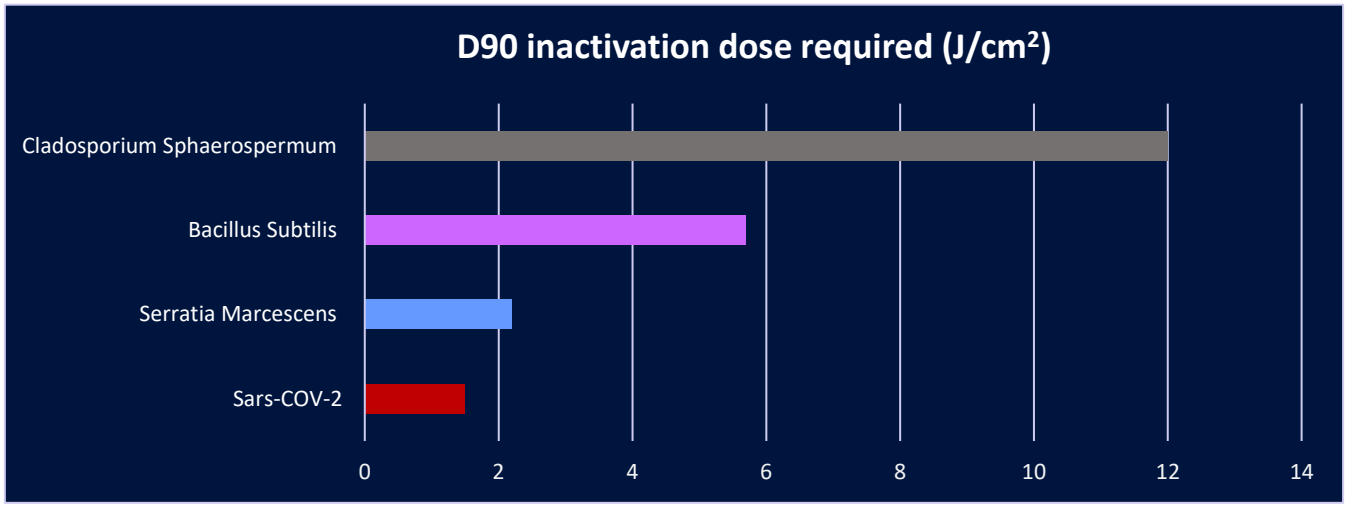
ufc/m3 valore medio lampada UVC spenta		*ufc/m3 valore medio lampada UVC accesa*	
UV LAMP OFF	32.045	UV LAMP ON	2

INACTIVATION RATE (punto 3.1.9)	
N0/N%= (N0-N)/N0 x100	Log(N0/N)
99,99	4,14

3- Cladosporium sphaerospermum:

ufc/m3 valore medio lampada UVC spenta		*ufc/m3 valore medio lampada UVC accesa*	
UV LAMP OFF	5.583	UV LAMP ON	3.124

INACTIVATION RATE (punto 3.1.9)	
N0/N%= (N0-N)/N0 x100	Log(N0/N)
44,1	0,25



LIGHT PROGRESS UV-C sources are capable of irradiating the volume of air treated with a sufficient amount of energy to break down up to *99.9% of microorganisms tested by Tecnal, laboratory accredited UNI CEI EN ISO / IEC 17025: the laboratory carried out germicidal efficiency test using various microorganisms such as: Serratia marcescens, Bacillus subtilis, Cladosporium sphaerospermum, as prescribed by the ISO 15714 Standard. These elements are representative of gram positive bacteria, gram negatives and fungi. Their reduction percentage it is a guarantee of the product's ability to break down a wide range of bacteria, viruses, including coronaviruses and other microorganisms that are much less resistant to UV-C wavelegth (see complete chart, page 3).

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Test 4: Evaluation of the effect of Light Progress UV-C air Purification devices on the microbial and fungi load present in the air

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TESTS PARAMETERS:

Name of product tested: UV FAN-95HP
Period of analysis: April 2010

Microorganisms Tested:
- Mesophyl Load
- Psicrofila Load

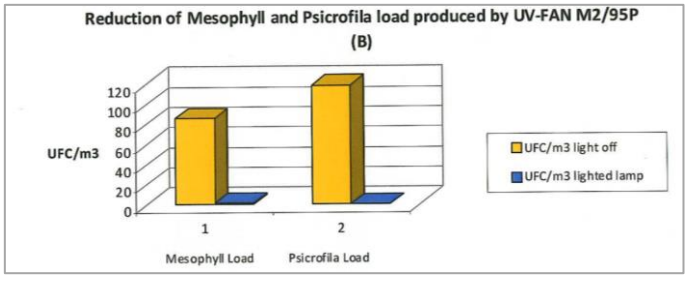
Test Method:

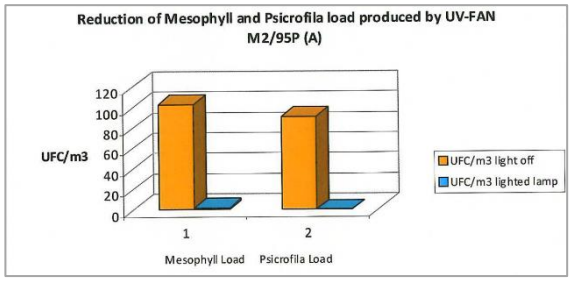
The experimental protocol provides active sampling of 1 m^3 air next to the exit slot of the air purifier with both UV lamps ON and OFF. Tests have been conducted in a University classroom where administration activity and lessons took place.
Results are expressed as Unit Forming Colonies for Air Cubic Meter (UFC/m^3).

Experiment Goals:
Indoor pollution concerns confined rooms such as workplaces, schools, hospitals, transportation, etc. where we spend most of our time. International scientific community has been investigating for years how public health can be affected by poor Indoor Air Quality environments.
This study regards the purifying effect of UVGI technology provided by LIGHT PROGRESS in spaces where a normal working and social activity is held.
The goal is to prove that there is a certain benefit in using UV air purifier, especially in crowded and closed areas, due to the decreasing of Microbial and Fungi load in air.

TEST RESULTS:

LIGHT PROGRESS device succeeded in reducing almost completely the total load of both Mesophyll and Psicrofila microorganisms showing almost no UFC/m^3 of aspirated air when lamps were ON. Chart below shows results.





reduction of Mesophyll Load (CMT at 36°C)

LAMP TYPE	UFC/ m^3 AIR ENTRANCE	UFC/ m^3 AIR EXIT	REDUCTION %
(A) UV - FAN M2/95P	103	2	>98,00
(B) UV - FAN M2/95P	86	<1	>99,99

reduction of Psicrofila Load (CMT at 22°C)

LAMP TYPE	UFC/ m^3 AIR ENTRANCE	UFC/ m^3 AIR EXIT	REDUCTION %
(A) UV - FAN M2/95P	91	<1	>99,99
(B) UV - FAN M2/95P	119	1	>99,00

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