



**2023**

**UVC  
GERMICIDAL**  
AIR PURIFICATION

# Welcome to Our Company



Zeb Viana - Managing Director  
Anne Marie Kirwan - Customer Relations

27 Years experience in Med tech - Ethicon Johnson & Johnson

We are an Irish based company since 2016

GUVTEC\* part of QUAVEL\* Investments Ltd

Distributor rights for TECHNILAMP\* international

Our focus - investing in dreaded disease solutions



# Differences between Droplets and Aerosol

## Phase 1

### Generation and exhalation

- Generation mechanisms
- Viral load at generation sites
- Size distribution of exhaled aerosols
- Number of virions in aerosol

## Phase 2

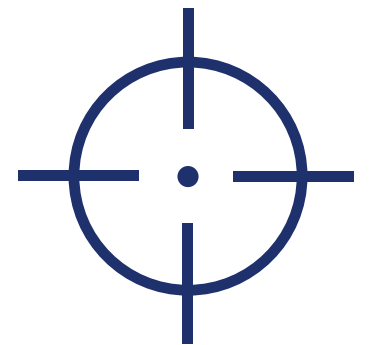
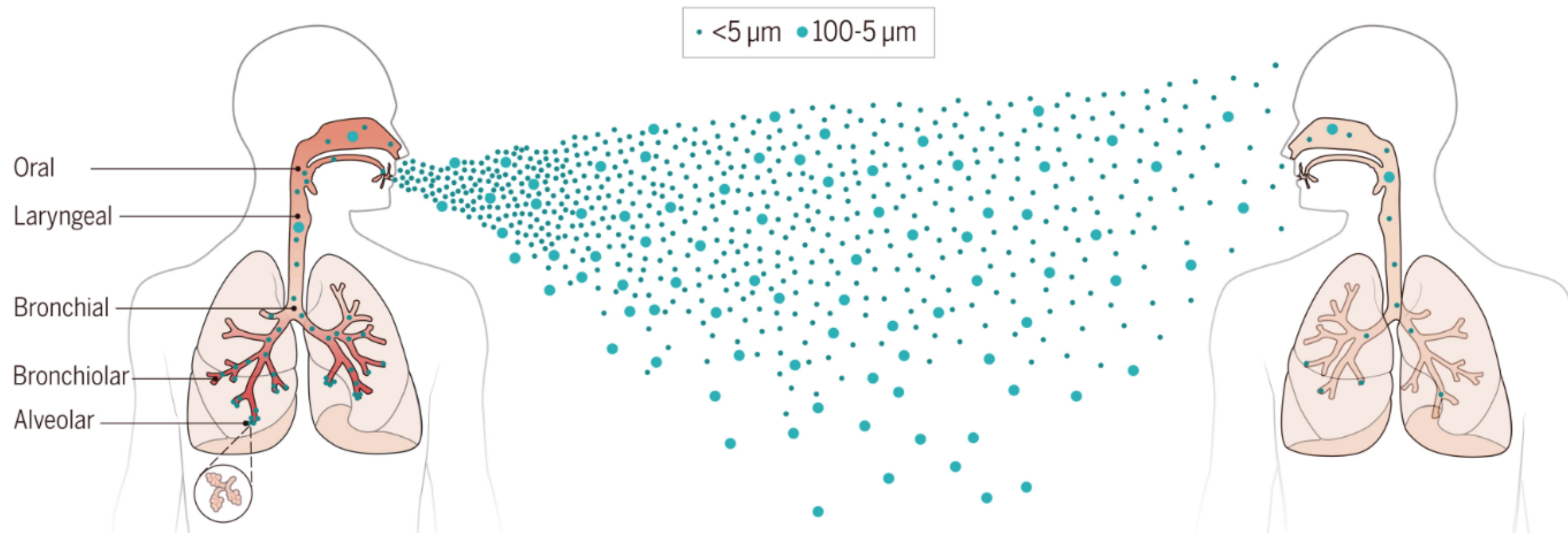
### Transport

- Settling velocity and residence time in air
- Size change during transport
- Persistence of viruses in aerosols
- Environmental factors: temperature, humidity, airflow and ventilation, UV radiation

## Phase 3

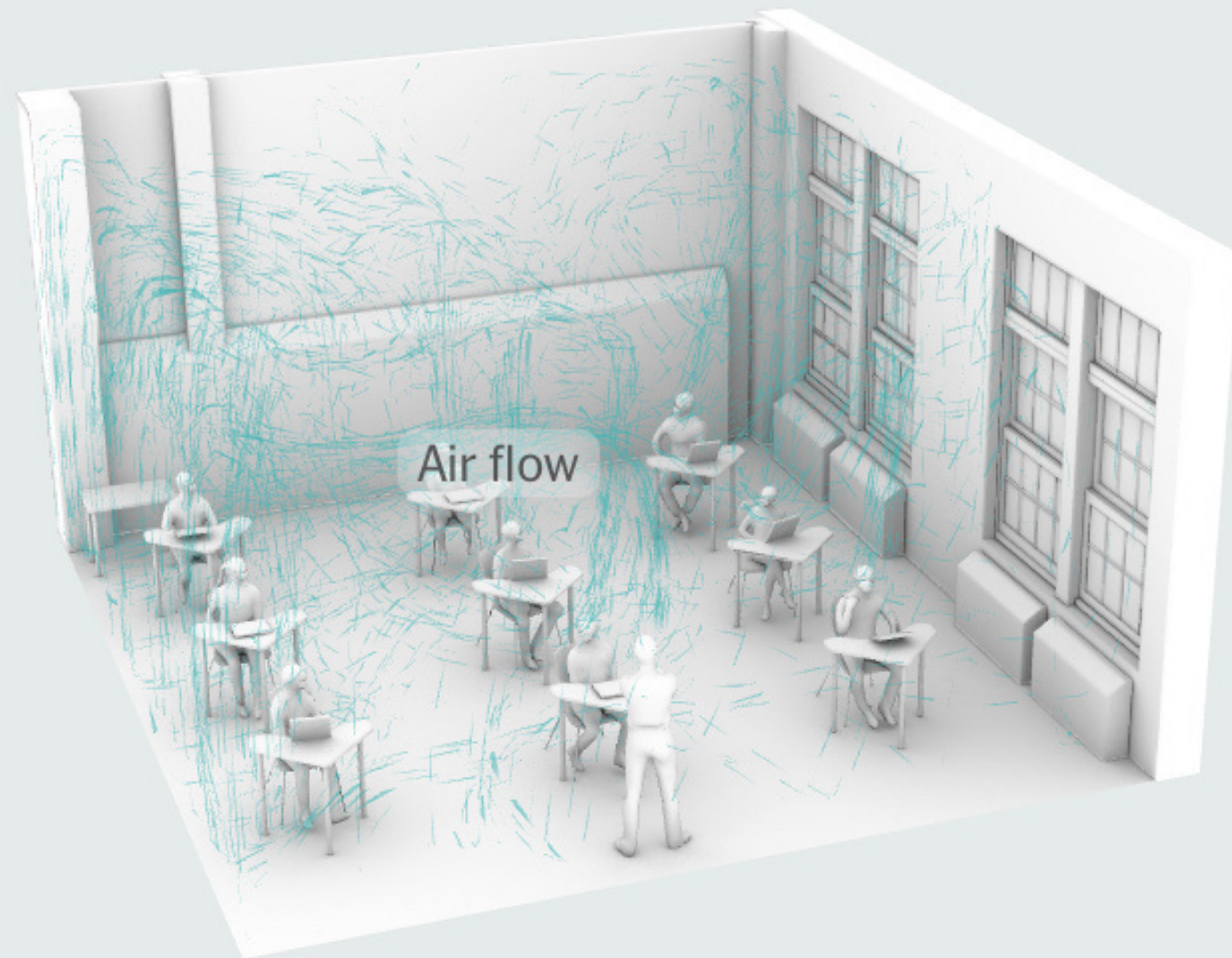
### Inhalation, deposition and infection

- Size distribution of inhalable aerosols
- Deposition mechanisms
- Size-dependent deposition sites
- Deposition site susceptibility





# How virus spread in rooms

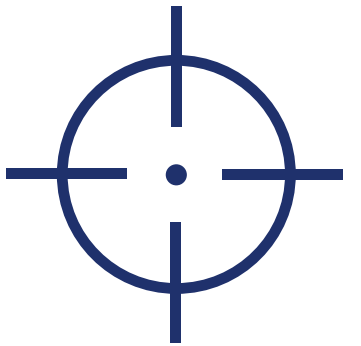


Air movement is both your friend and your enemy it is what spreads foreign pathogens

it is circulation of air that spread viruses through the law of convection

With Natural or Mechanical ventilation the amount of cycles from lower to upper part of the room are considered air cycles

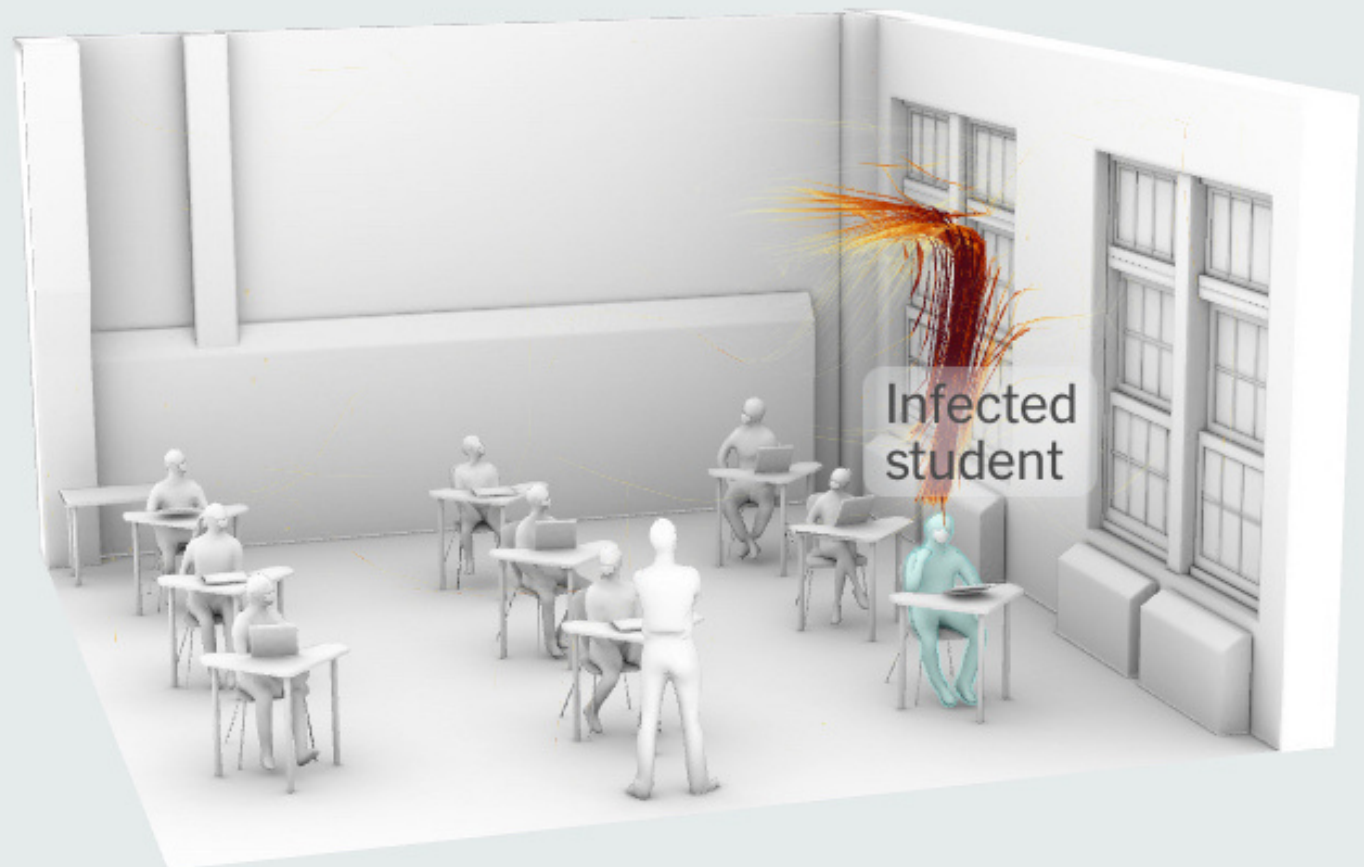
A cycle is measured in ACH



References : wall street journal oct 2021



# Takes one infected child in a classroom



Concentration of contaminants

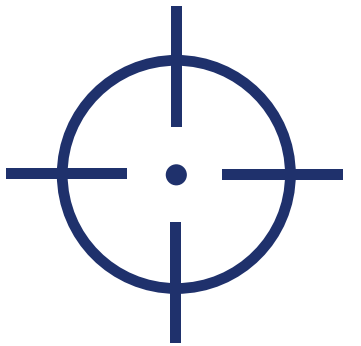


Less

More

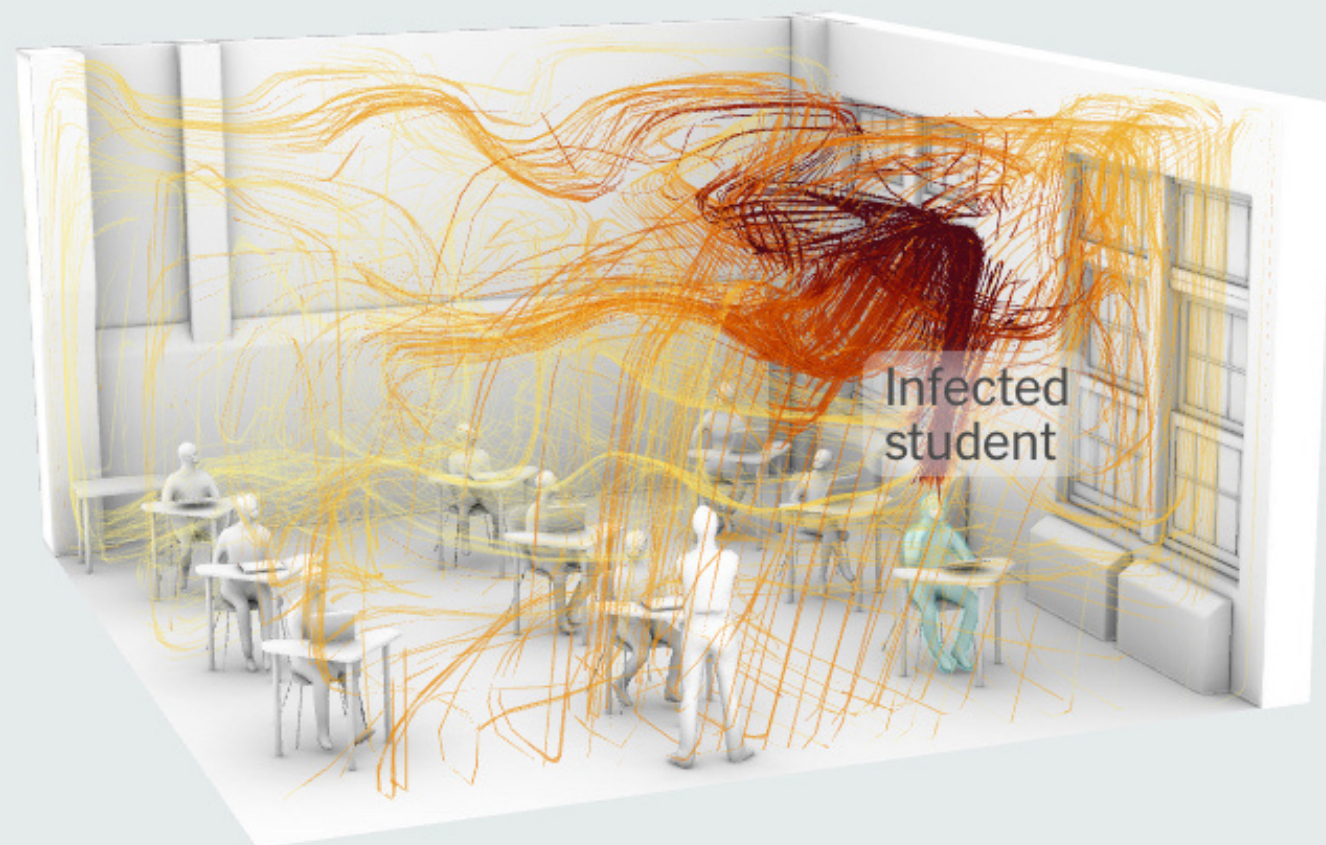
As hot air rises viruses attach to dust particles and circulate with the air flow, from where the spread of infection starts

Droplets that are heavy, drop to the floor, however aerosol particles move upwards with the flow of air (9)



References : wall street journal oct 2021

# The impact of law of convection

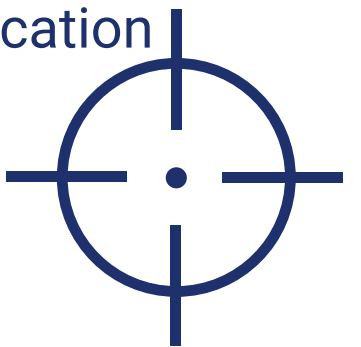


Concentration of contaminants



it is Hot air rises and cool air descends, law of convection that circulates air

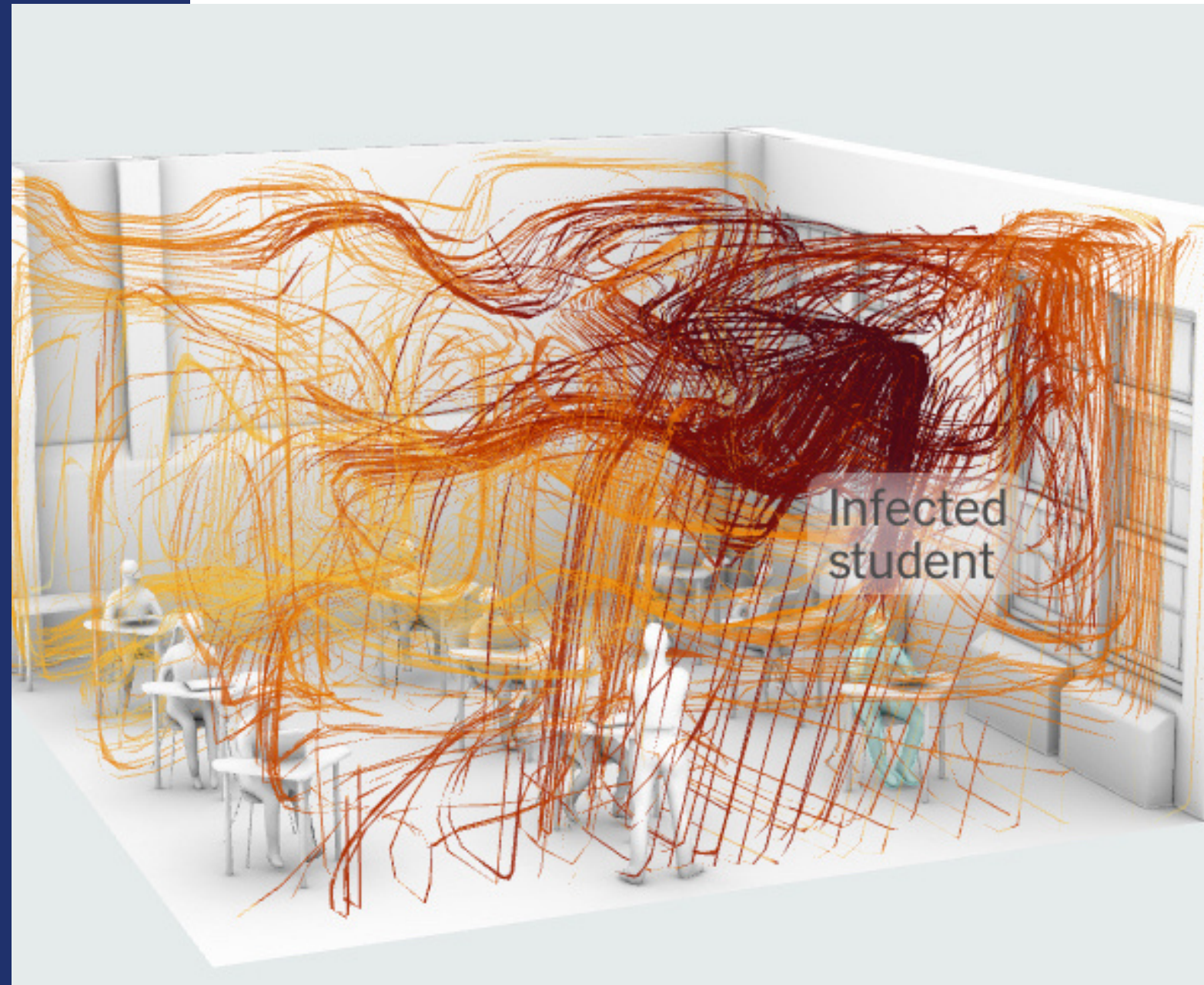
It is the only solution that fully captures all the circulating air - critical for 100% purification



References : wall street journal oct 2021



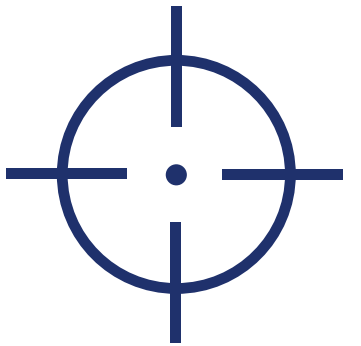
# Zones of levels of infection



The ceiling is the area where the highest level of infection and consolidation occurs over time as they begin there downward path - hot air expands and moves upwards faster than cool air descends

With UVC light at ceiling height the foreign pathogens are broken down, ensuring 100% purification

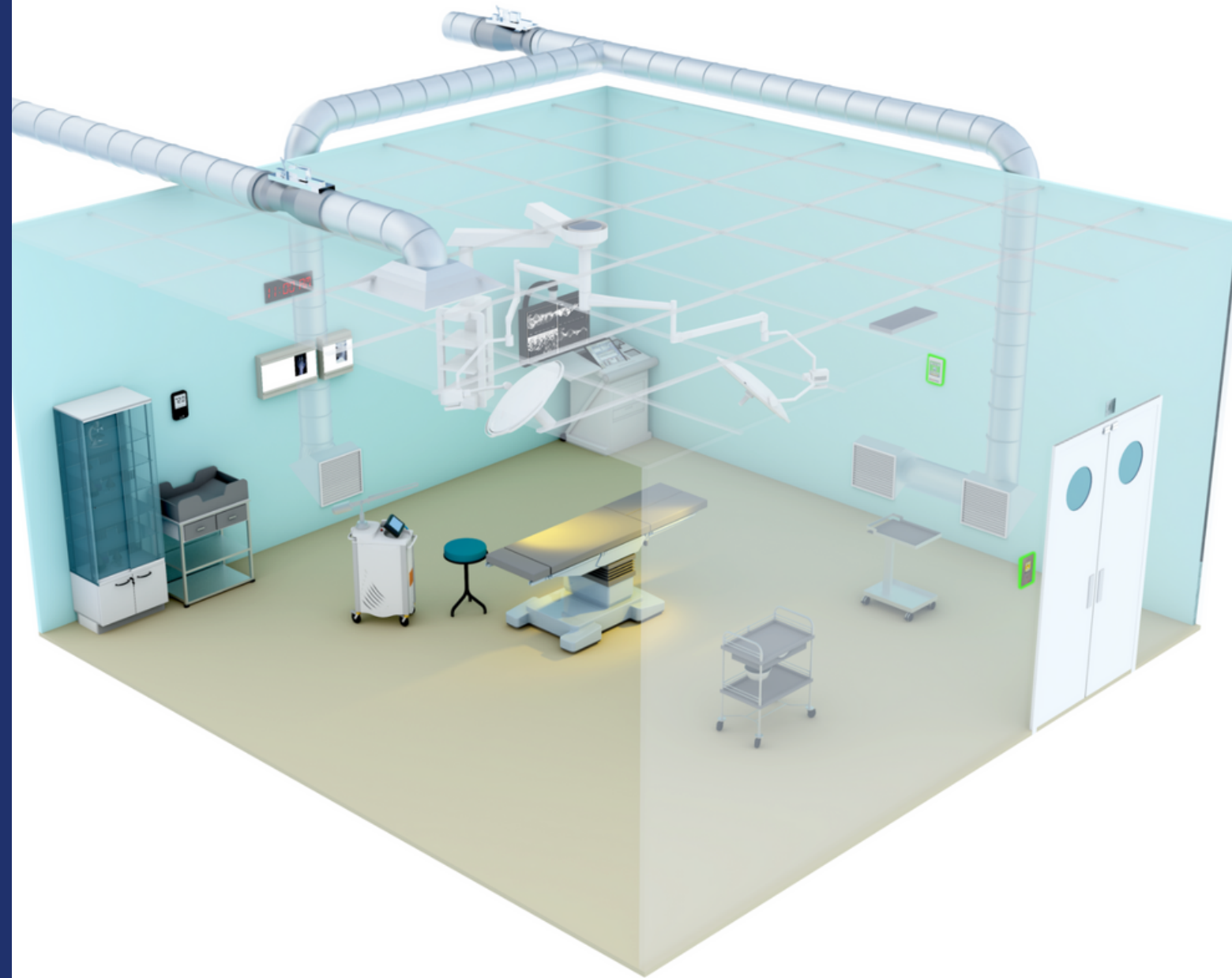
As all the air moves upwards, we can claim 100% air capture, therefore 100% purification



References : wall street journal oct 2021



# HVAC Systems effectiveness in purification

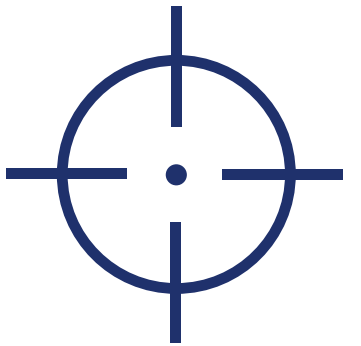


Most Ventilation systems 80% of the air is Recycled - cost saving (7)

Most HVAC systems do not meet the 6-12 Cycles set by CDC - inadequate (21)

Not all the air is captured and recycled in a HVAC system

Some have UVC purification - challenge still remains cycles of air



# Hospital Infection Hot Spots



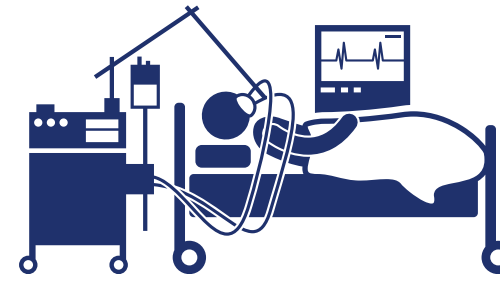
## Canteen /Lounges

Staff Interact after contact with Patients  
Have to remove PPE to eat



## Waiting Rooms

Patients sit next to each other long periods of time  
Enter Consulting Rooms



## High Care

High Care patients vulnerable  
Infectious disease wards high risk



## Trauma

Patients entering not sure there health status until tested

# How does UVC air purification work

## UVC LIGHT

UVC light emits a high-frequency, shortwave electromagnetic radiation that effectively kills bacteria, viruses and many harmful microorganisms by altering the DNA which renders the cells unable to replicate.

This inactivation of the microbes causes cell death, mutations, and failure to reproduce thus rendering cells harmless.

## LAW OF AIR CONVECTION

This movement is called natural air convection, Hot air rises and cool air descends, this expansion and contraction moves dust and foreign pathogens in the air.

The speed of air transfer can be improved by mechanical or natural ventilation, (air conditioner, fans)

We define cycle of air transfer from the lower half of the room to the upper half of the room as a cycle and is measured in ACH (13)



# UVC Luminaire placed at ceiling height - normal daily activities

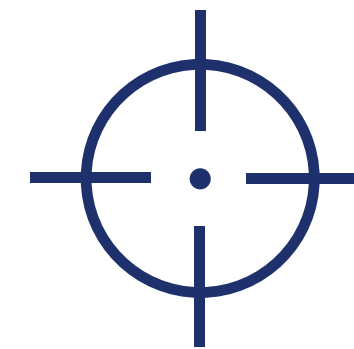
UVC Kill Zone

Air movement from lower half to upper half

Over 24 ACH per hour (11)

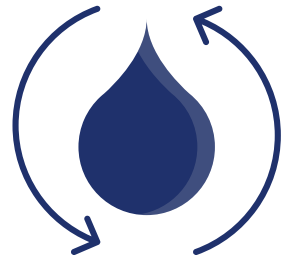


Hot air rises  
Cool air descends



Patented design ensures no downward emission - safe and effective

# Four main standards in air purification



**AIR  
PURIFIED**



**AIR  
CAPTURED**

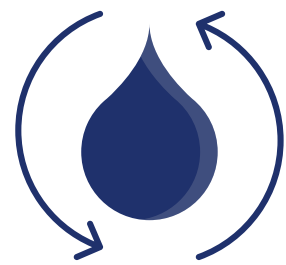


**AIR  
CYCLES**



**CHEMICALLY  
FREE / SILENT**

# UVC germicidal level of performance



## AIR PURIFIED

UVC 99.9% Proven to eliminate Viruses. Bacteria and Mould



## AIR CAPTURED

100% Air captured in each cycle as the air moves upwards to ceiling height



## AIR CYCLES

Most amount of cycles per hour - fastest level of Purification



## CHEMICALLY FREE / SILENT

No chemical exposure and no noise



# Study in South Africa



Professor Ed Nardell

Harvard University

Professor in the Departments of  
Department of Environmental Health  
Department of Immunology and Infectious  
Diseases

## CLINICAL REVIEW

Latest clinical review on all air purification solutions recommendations of UVC germicidal

## SA TUBERCULOSIS STUDY

7 Month trial in a Tuberculosis hospital carried out by Prof E Nardell using our Products

Photochemistry and Photobiology, 2021, \*\*, \*-\*

### Special Issue Invited Review

#### Air Disinfection for Airborne Infection Control with a Focus on COVID-19: Why Germicidal UV is Essential†

Edward A. Nardell\*

Division of Global Health Equity, Brigham & Women's Hospital, Harvard Medical School, Boston, MA, Received 7 January 2021, accepted 16 March 2021, DOI: 10.1111/php.13421

#### ABSTRACT

Aerosol transmission is now widely accepted as the principal way that COVID-19 is spread, as has the importance of ventilation—natural and mechanical. But in other than health-care facilities, mechanical ventilation is designed for comfort, not airborne infection control, and cannot achieve the 6 to 12 room air changes per hour recommended for airborne infection control. More efficient air filters have been recommended in ventilation ducts despite a lack of convincing evidence that SARS-CoV-2 virus spreads through ventilation systems. Most transmission appears to occur in rooms where both an infectious source COVID-19 case and other susceptible occupants share the same air. Only two established room-based technologies are available to supplement mechanical ventilation: portable room air cleaners and upper room germicidal UV air disinfection. Portable room air cleaners can be effective, but performance is limited by their clean air delivery rate relative to room volume. SARS-CoV-2 is highly susceptible to GUV, an 80-year-old technology that has been shown to safely, quietly, effectively and economically produce the equivalent of 10 to 20 or more air changes per hour under real life conditions. For these reasons, upper room GUV is the essential engineering intervention for reducing COVID-19 spread.

#### INTRODUCTION

It is not an exaggeration to claim that the most effective, evidence-based, cost-effective, safe and available engineering intervention to disinfect air is being largely ignored during a lethal viral pandemic spread predominantly by the airborne route. That intervention is germicidal ultraviolet (GUV) air disinfection (1).

Given the current COVID-19 pandemic, this perspective will focus on SARS-CoV-2 virus transmission, but GUV is effective against all known microbial pathogens (2). GUV is widely used for potable water disinfection where its efficacy against a wide range of water-borne pathogens is well established (3). Because GUV works primarily by causing damage to nucleic acids (DNA

or RNA), universally present in pathogenic microbes, its efficacy against protozoa, fungi, bacteria and viruses is assured, with some variability in the dose required (4). Fungal spores are among the hardest pathogens to inactivate, but GUV is effective in reducing mold growth in air conditioning coils and drip pan surfaces (5). Although there is some potential among microbes to repair nucleic acid UV damage (photoreactivation), tests in biological test chambers and field studies shows no significant resistance to GUV microbial inactivation (6). Drug resistant pathogens, such as multidrug resistant tuberculosis, are fully UV susceptible (1).

#### AIRBORNE TRANSMISSION AND THE ROLE FOR IN-ROOM AIR DISINFECTION

For many months early in the pandemic, the predominant transmission pathways of COVID-19 were unclear and largely attributed to large droplets and surface contact spread (7). Determining exactly how respiratory viruses transmit from person to person is challenging. The mode of spread of common upper respiratory viral infections and seasonal influenza have long been controversial—large respiratory droplets and surface contact spread versus airborne spread by minute respiratory droplets (8). Not only is the distinction blurred in most cases, many respiratory infections spread by all 3 pathways. Now, well into the epidemic, the evidence suggests less transmission by large (ballistic) droplets and surfaces, and more by the airborne route. The Washington State Chorus transmission event has proven informative (9). Careful interviews with members showed that social distancing and contact precautions largely precluded significant large droplet and surface contact spread, and that the extensive transmission of COVID-19 and 2 deaths were almost certainly the result primarily of airborne transmission. Likewise, Jones has attributed only 8% of transmission among healthcare workers to surface contact—initially said to be a major pathway of transmission (10). The great seasonal changes in transmission between warmer and colder months is largely attributable to indoor airborne transmission, although proximity indoors also favors large droplet and surface contact spread (11).

For airborne infections, the most common way to reduce risk indoors is dilution and removal of infectious particles in room air through ventilation (12). Very large rooms (an auditorium or sports arena) reduce airborne infection risk indoors in the short

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†This article is part of a Special Issue dedicated to the topics of Germicidal Photochemistry and Photobiology  
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### ORIGINAL ARTICLE

#### Institutional Tuberculosis Transmission Controlled Trial of Upper Room Ultraviolet Air Disinfection: A Basis for New Dosing Guidelines

Matsie Mphahlele<sup>1</sup>, Ashwin S. Dharmadhikari<sup>2</sup>, Paul A. Jensen<sup>3</sup>, Stephen N. Rudrick<sup>4</sup>, Tobias H. van Reenen<sup>5</sup>, Marcelo A. Pagano<sup>6</sup>, Wilhelm Lauschner<sup>7</sup>, Tim A. Sears<sup>8</sup>, Sonya P. Milonova<sup>9</sup>, Martie van der Walt<sup>9</sup>, Anton C. Stoltz<sup>10</sup>, Karin Weyer<sup>11</sup>, and Edward A. Nardell<sup>12</sup>

<sup>1</sup>MDR-TB Program, JHRC/RECQ, Pretoria, South Africa; <sup>2</sup>Division of Pulmonary and Critical Care Medicine and <sup>12</sup>Division of Global Health Equity, Department of Medicine, Brigham and Women's Hospital, Boston, Massachusetts; <sup>3</sup>CDC Division of Tuberculosis Elimination, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Atlanta, Georgia; <sup>4</sup>Department of Environmental Health, Harvard School of Public Health, Boston, Massachusetts; <sup>5</sup>Council for Scientific and Industrial Research, Pretoria, South Africa; <sup>6</sup>Harvard School of Public Health, Boston, Massachusetts; <sup>7</sup>Department of Electronic and Computer Engineering, University of Pretoria, Pretoria, South Africa; <sup>8</sup>Acuity Brands Lighting, Cornors, Georgia; <sup>9</sup>Medical Research Council, Pretoria, South Africa; <sup>10</sup>Division of Infectious Diseases, Internal Medicine, University of Pretoria Medical School, Pretoria, South Africa; and <sup>11</sup>Global Tuberculosis Programme, World Health Organization, Geneva, Switzerland

ORCID ID: 0000-0002-5323-3196 (E.A.N.).

#### Abstract

**Rationale:** Transmission is driving the global tuberculosis epidemic, especially in congregate settings. Worldwide, natural ventilation is the most common means of air disinfection, but it is inherently unreliable and of limited use in cold climates. Upper room germicidal ultraviolet (UV) air disinfection with air mixing has been shown to be highly effective, but improved evidence-based dosing guidelines are needed.

**Objective:** To test the efficacy of upper room germicidal air disinfection with air mixing to reduce tuberculosis transmission under real hospital conditions, and to define the application parameters responsible as a basis for proposed new dosing guidelines.

**Methods:** Over an exposure period of 7 months, 90 guinea pigs breathed only untreated exhaust ward air, and another 90 guinea pigs breathed only air from the same six-bed tuberculosis ward on

alternate days when upper room germicidal air disinfection was turned on throughout the ward.

**Measurements and Main Results:** The tuberculin skin test conversion rates (>6 mm) of the two chambers were compared. The hazard ratio for guinea pigs in the control chamber converting their skin test to positive was 4.9 (95% confidence interval, 2.8–8.6), with an efficacy of approximately 80%.

**Conclusions:** Upper room germicidal UV air disinfection with air mixing was highly effective in reducing tuberculosis transmission under hospital conditions. These data support using either a total fixture output (rather than electrical or UV lamp wattage) of 15–20 mW/m<sup>2</sup> total room volume, or an average whole-room UV irradiance (fluence rate) of 5–7 μW/cm<sup>2</sup>, calculated by a lighting computer-assisted design program modified for UV use.

**Keywords:** tuberculosis transmission; infection control; air disinfection; ultraviolet irradiation; tuberculosis prevention

(Received in original form January 11, 2015; accepted in final form April 29, 2015)

Supported by CDC/National Institute for Occupational Safety and Health grant 1R01 OH009050 and National Institutes of Health Fogarty International grant 1D43TW009379.

**Author Contributions:** Conception and design, M.M., A.S.D., P.A.J., K.W., and E.A.N. Study management, M.M., A.S.D., P.A.J., M.v.d.W., K.W., and E.A.N. Provision of key expertise and measurements, P.A.J., S.N.R., T.H.v.R., W.L., T.A.S., S.P.M., A.C.S., K.W., and E.A.N. Analysis and interpretation, A.S.D., S.N.R., T.H.v.R., M.A.P., S.P.M., and E.A.N. Drafting the manuscript for important intellectual content, M.M., A.S.D., and E.A.N. Review and editing of manuscript, M.M., A.S.D., P.A.J., S.N.R., T.H.v.R., S.P.M., and E.A.N.

Correspondence and requests for reprints should be addressed to Edward A. Nardell, M.D., Brigham and Women's Hospital, Division of Global Health Equity, 641 Huntington Avenue, 3A-03, Boston, MA 02115. E-mail: enardell@partners.org

This article has an online supplement, which is accessible from this issue's table of contents at [www.atsjournals.org](http://www.atsjournals.org)

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Internet address: [www.atsjournals.org](http://www.atsjournals.org)

# Summary of clinical review

The evidence suggests less transmission by large (ballistic) droplets and surfaces, more by the airborne route. (9)

Social distancing and contact precautions largely precluded significant large droplet and surface contact spread, and that the extensive transmission, but not in aerosol spread (9)

In-room transmission pattern is that the current focus on high-level air filtration in central HVAC systems is unlikely to be very helpful for COVID-19 mitigation (17).

A recent demonstration showed a doubling of RAF and risk of infection within an hour of closing a window and turning on the split system AC (19).

Portable room air cleaners seem like a simple solution, and are being widely marketed for COVID-19, but their clean air delivery rate (CADR) often results in room air changes equivalent to 1 or 2 per hour. (21)

Larger, high-output machines can produce the desired 6 to 12 ACH, but noise, drafts and recapture of just processed air (short-circuiting) limits the practical utility of room air cleaners in (26)

GUV air disinfection with good air mixing has been shown under real-life conditions to produce the equivalent of adding as much as 24 room air changes per hours quietly, safely and sustainably (1).

## Professor E Nardell Harvard University

Division of Global Health Equity,  
Brigham & Women's Hospital, Harvard  
Medical School, Boston, MA

Received 7 January 2021, accepted 16  
March 2021, DOI: [10.1111/php.13421](https://doi.org/10.1111/php.13421)





**01**

**BASED IN**

Johannesburg South Africa  
Office and Manufacturing plant

**02**

**HISTORY**

24 years experience in air purification  
Patented design of UVC luminaries  
Designed 24 years with the mines and Pretoria  
institute - combat Tuberculosis

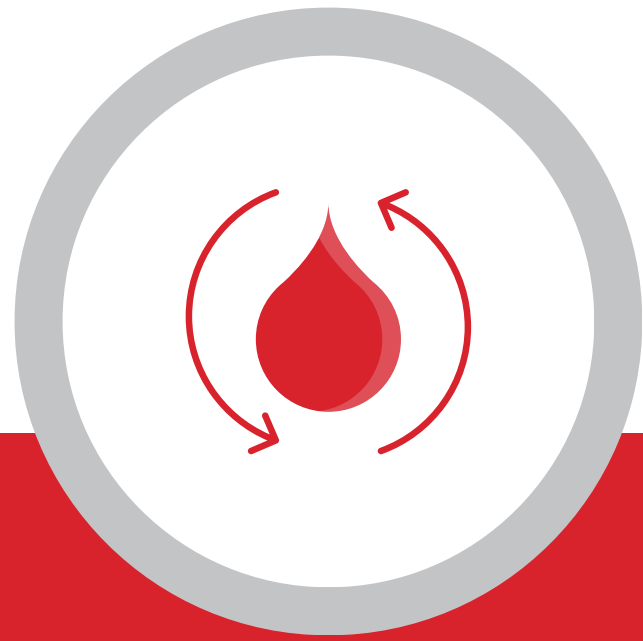
**03**

**PRODUCT PORTFOLIO**

Heat Lamps  
UVC Luminaries  
Water filtration UVC systems



# Why Technilamp UVC Luminares



## Air Purified

UVC Germicidal 99.9%  
Eliminates Viruses & Bacteria  
Only use Philips Lamps



## Air Captured

Delivers the straightest and  
most concentrated UV beam  
Ensure narrow light emission  
through the widest angle of  
coverage



## Air Cycles

Most amount of cycles as the  
Luminaire is placed at ceiling  
height  
Patented design allows for  
minium heaight of ceiling 2.1m



## Chemically Free

100% chemically free short wave  
radiation that peaks at 254nm  
Patented Louvres and reflectors  
ensure safe narrow emission of  
light



**01**

### **Louvres**

Ensures that the light does not shine downwards  
Ensures full ceiling coverage  
Provides a safe indoor space

**02**

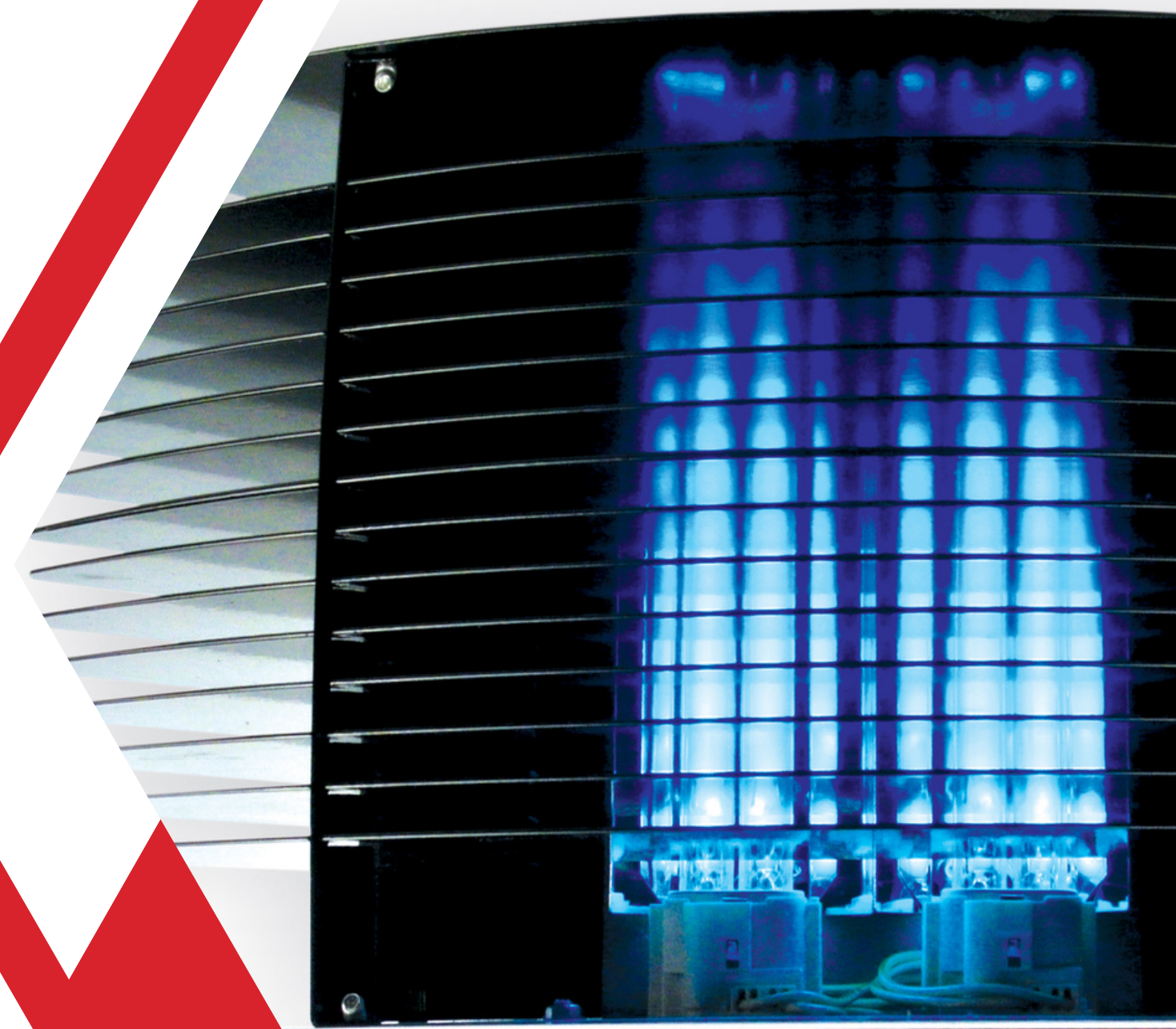
### **Reflected Prisms**

Ensures full distance coverage strength  
Ensure all angles are covered  
Ensures consistent light penetration

**03**

### **Phillips UVC 254nm**

Security of disinfection over the useful Lifetime of the Lamp  
The lowest amount of Mercury, environmentally friendly  
Short -wave UV radiation with a peak fo 253.7nm (UV-C)  
Protective coating ensures UV output



# Patented design emits a narrow band of light



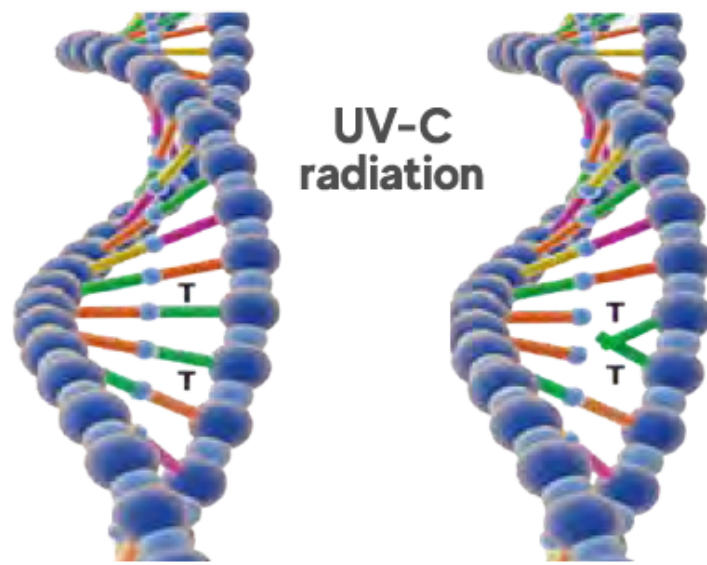
SAFE Tested independently to ensure that no UVC light is dispersed and in line with product specifications

University of Pretoria (South Africa)  
Department of Electrical; Electronic & Computer  
Engineering Radiometry & Photometry  
Laboratories (Copy available upon request)

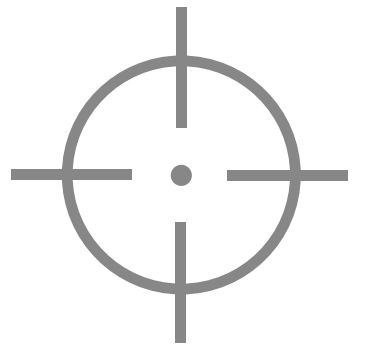
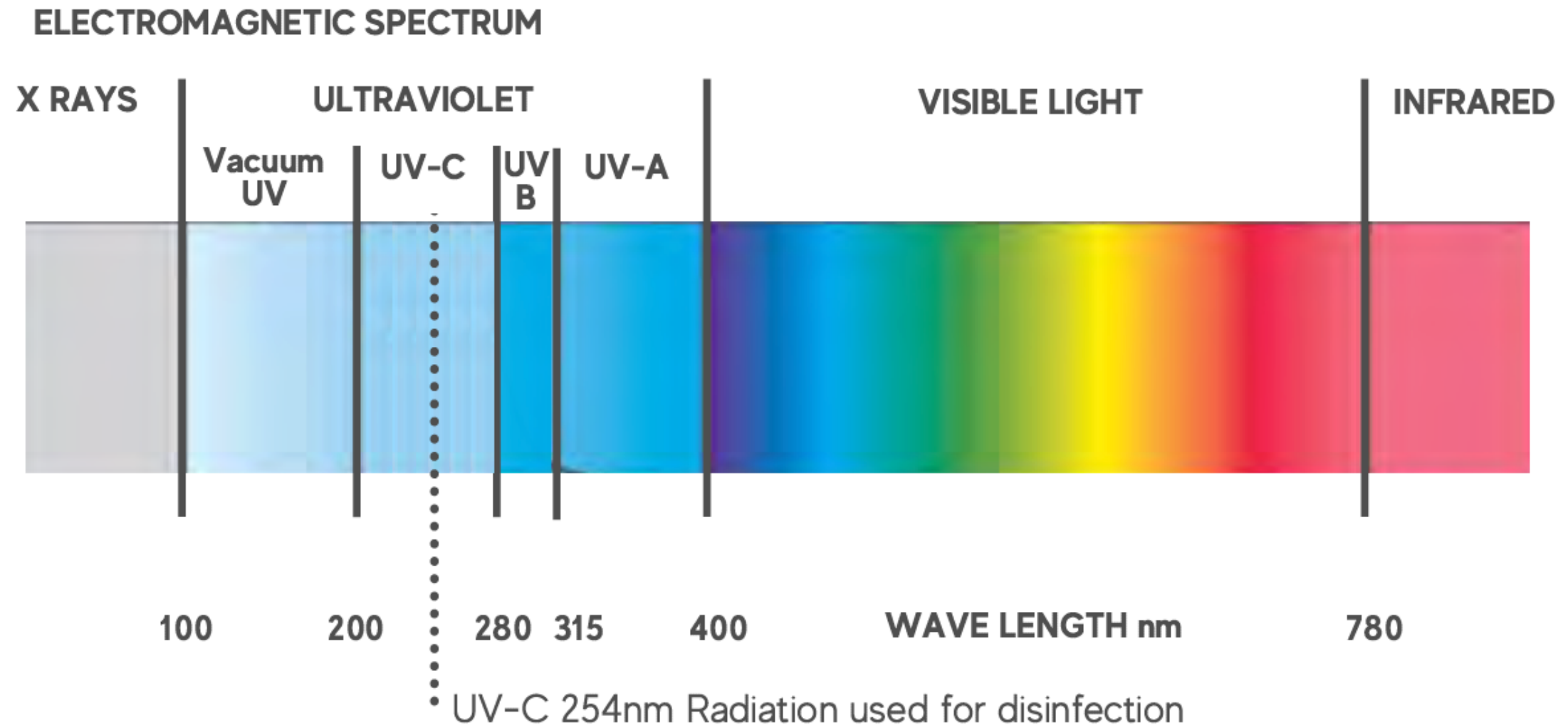




# UVC 254nm spectrum most effective



Exposure to UV-C light  
breakdown of DNA/RNA

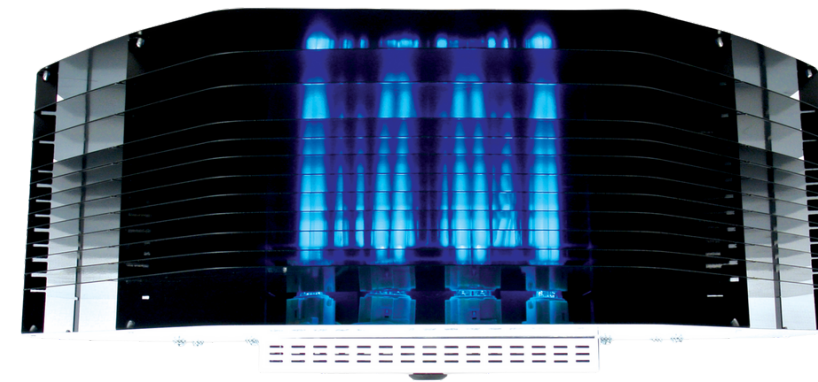


# Range of product for all rooms sizes



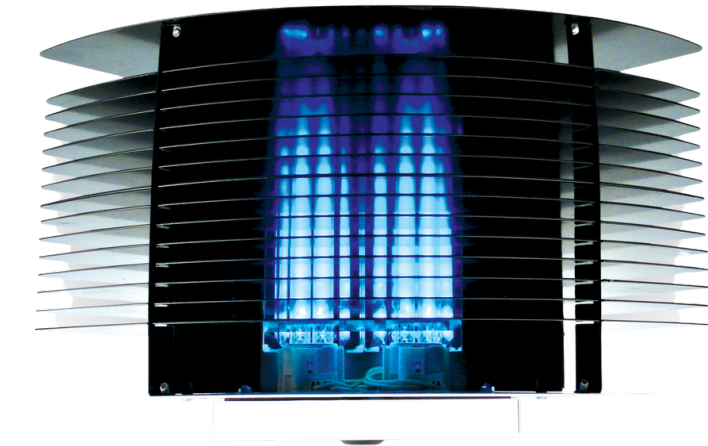
## **TLR 30** **COVERAGE 36m<sup>2</sup> 360°**

Ceiling Mounted  
Size 560x550x300cm  
Fitted Philips 6 X PL-S 9W/4P  
36m<sup>2</sup> and 360° Coverage  
Weight 23kg



## **TLR 31** **COVERAGE 25m<sup>2</sup> 180°**

Wall Mounted  
Size 550 x 320 x 340cm  
Fitted Philips 4 X PL-S 9W/4P  
25m<sup>2</sup> and 180° Coverage  
Weight 13 Kg



## **TLR 32** **COVERAGE 12m<sup>2</sup> 90°**

Corner Mounted  
Size 270 x 270 x 280cm  
Fitted Philips 2 X PL-S 9W/4P  
12m<sup>2</sup> and 90° Coverage  
Weight 7 Kg

# Wall Plaques Information



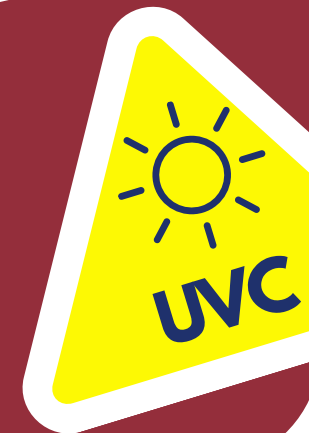
Clínica  
Universidad  
de Navarra

## THIS IS A PURIFIED AIR FACILITY



THIS FACILITY IS FITTED WITH A UVC  
TECHNILAMP\*GERMICIDAL LUMINAIRE  
PLEASE SCAN FOR MORE SAFETY INFORMATION

**WARNING:**  
DO NOT EXPOSE YOUR EYES AND SKIN IN DIRECT CONTACT OF UVC LIGHT



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8/9 Westmoreland Street, Dublin, D02 NW22







**Technilamp<sup>®</sup>**

# 25 years of experience in providing a safe purified indoor space





# For a Quote and Installation Please call



 353 1 442 8588

 [www.guvtec.com](http://www.guvtec.com)

 [info@guvtec.com](mailto:info@guvtec.com)

 8/9 Westmoreland Street  
Dublin D0 NW22



# References Clinical Review

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