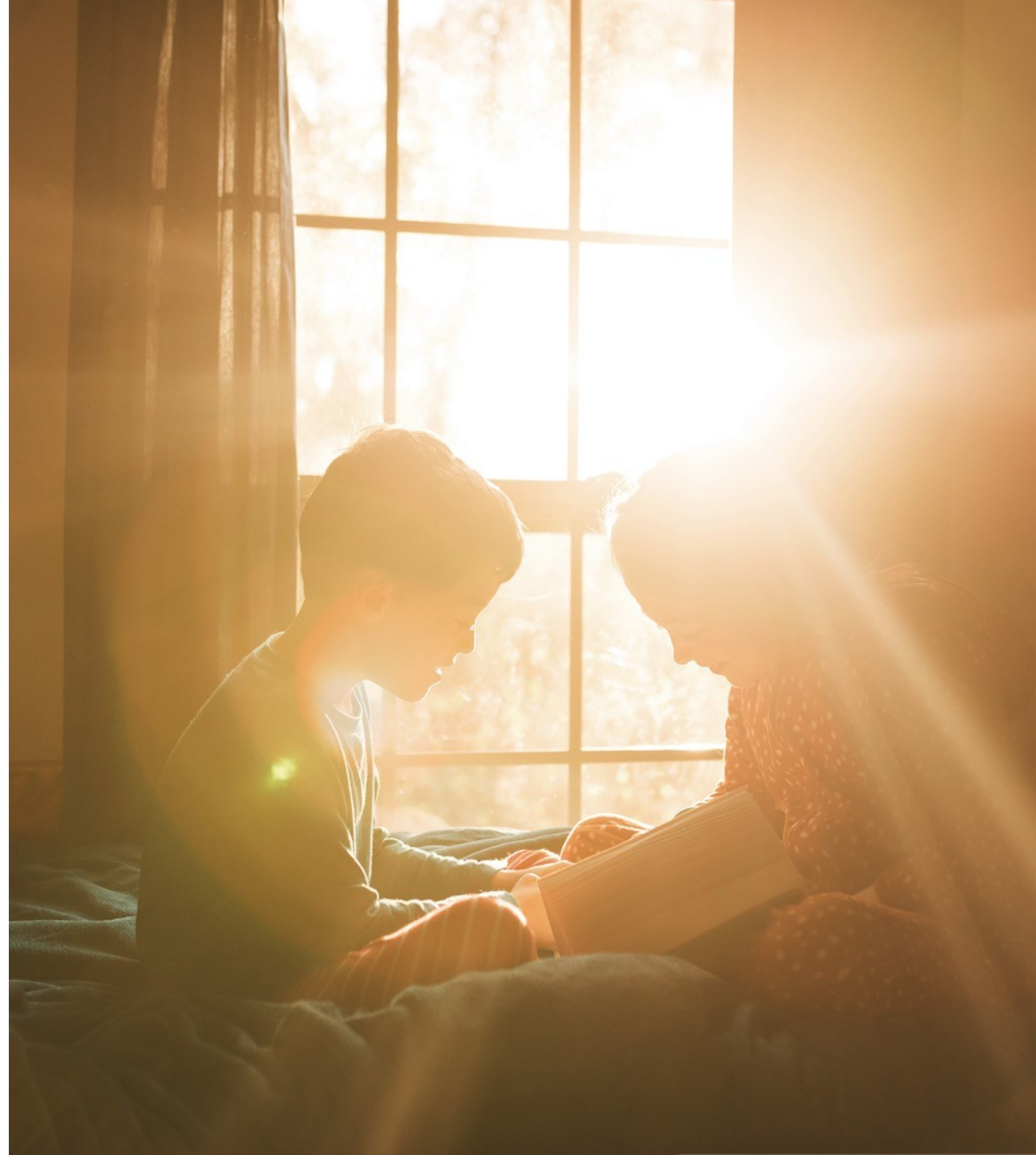




# Overview of Air & Surface Sanitization

Fall 2020



# Our Story

Healthē Inc. is a collective of scientists and pioneers who are passionate about using light science to solve humanity's biggest challenges. For over 20 years we have adopted NASA technology to engineer UV sanitization and LED circadian lighting solutions that help build healthier and more productive environments here on Earth.

Today, our key Healthē® solutions are harnessing the unique properties of UVC 222 to create safer indoor spaces for the surfaces we touch and air we breathe so we can experience life in a different light.

Proprietary and confidential



## Is UV Harmful?

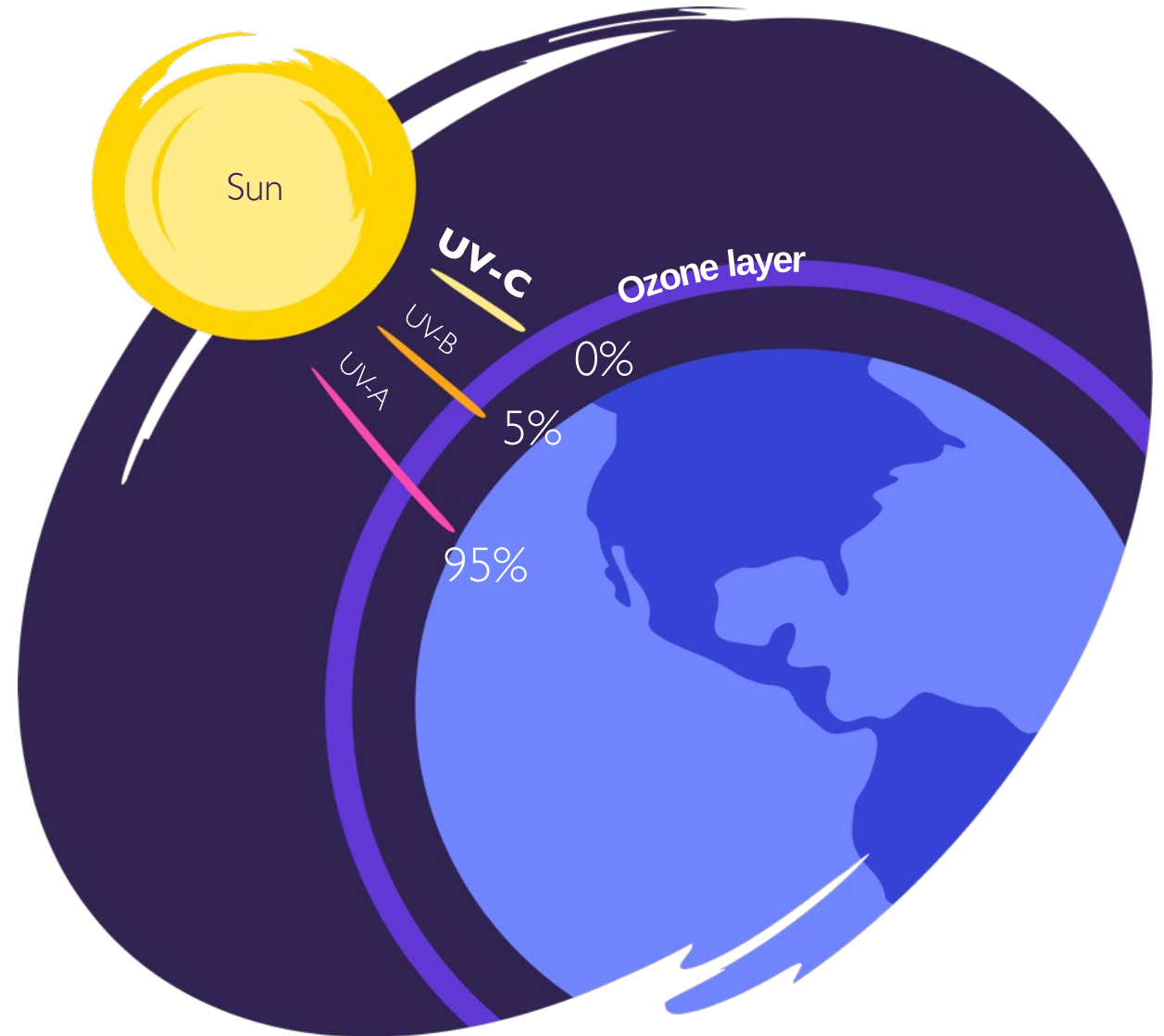
There are many different wavelengths within the broad UV spectrum, each with their own potential application and safety profile.

Higher wavelengths like UVA and UVB can be hazardous to your health, but UVC **222nm is safe** for occupied indoor spaces **and highly effective for inactivating bacteria and viruses.**

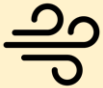


# Why can't I experience UVC by going outside?


While it comes from the sun, it is **not able to be experienced on Earth** because our ozone blocks it out



# 222 is a frequency of light that naturally kills **99.9% viruses & bacteria**



In the air you  
BREATHE



On the  
surface you  
TOUCH

**Technology available TODAY**



In the water  
you DRINK

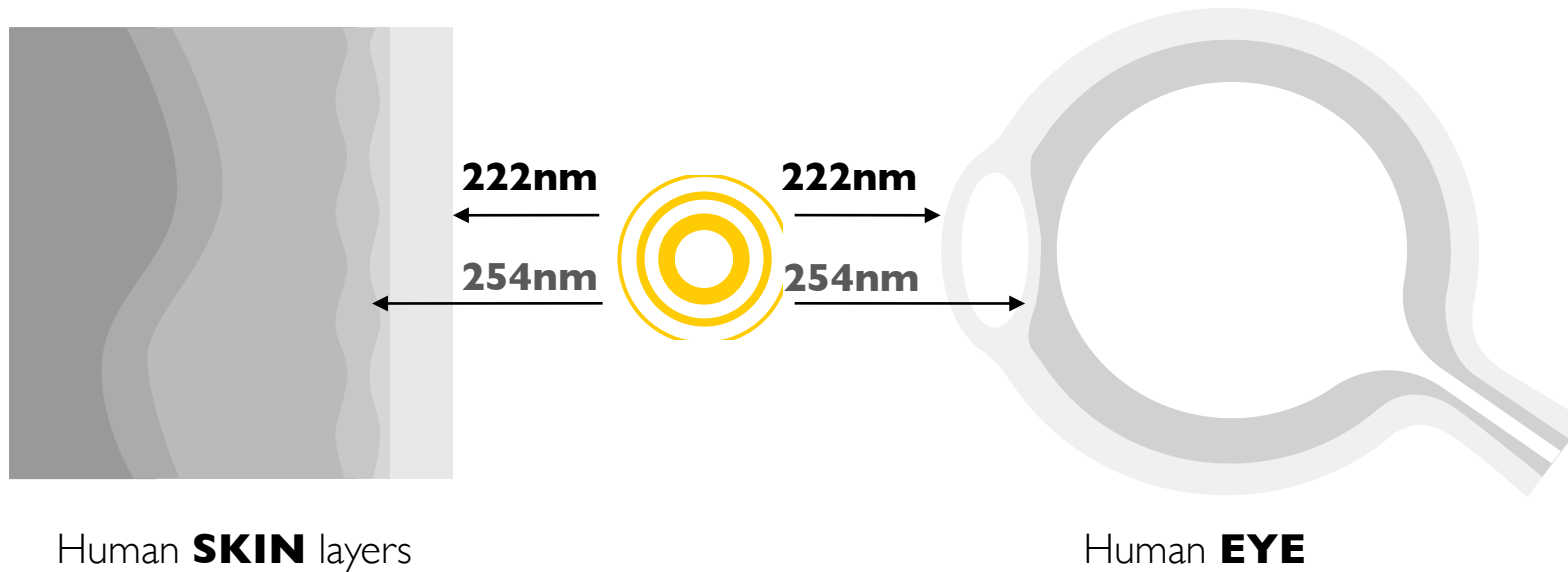


On the food you  
EAT

In development

# How is Healthe® 222 safe?

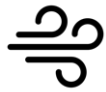
The type of far-UVC 222 light used in Healthe® is strong enough on inactivating viruses but **IS NOT** strong enough to **penetrate human skin or tear layers**



# Where to start with Healthe<sup>®</sup> solutions

Three easy steps to start making your indoor spaces healthy and safe

1



First, address the **AIR** you breathe via self-contained units



Healthe Air™

2



Second, combat pathogens within any indoor **SPACE** (both the surfaces you touch and the air in between)<sup>1</sup>



Healthe Space™

3



Third, protect any indoor space at its **ENTRY** from pathogens that can be transported on people and their belongings



Healthe Entry™

1. Because these utilize Healthe 222™ technology, it is safe for occupied indoor spaces but can also be programmed to only go on when people are not present in the room

# Why does the **quality of indoor** air matter?

## **COVID19 transmits via AIR**

COVID19 virus' main means of transmission are airborne through respiratory droplets, but also through aerosols, or tiny particles, that can linger in the air and travel far distances within indoor spaces



## **Office/classroom air recycled up to 3-6X LESS than subways<sup>1</sup>**

The standard rate of recycled air for offices is six to eight times an hour, while classrooms is three to four times an hour; This is far lower than subway cars which are replaced on average at least 18 times an hour



## **Overnight cleaning is NOT ENOUGH**

Given that the transmission of the virus is airborne, traditional cleaning and overnight sanitizing methods are not enough, especially when contamination can be introduced or reintroduced in crowded or poorly ventilated indoor settings

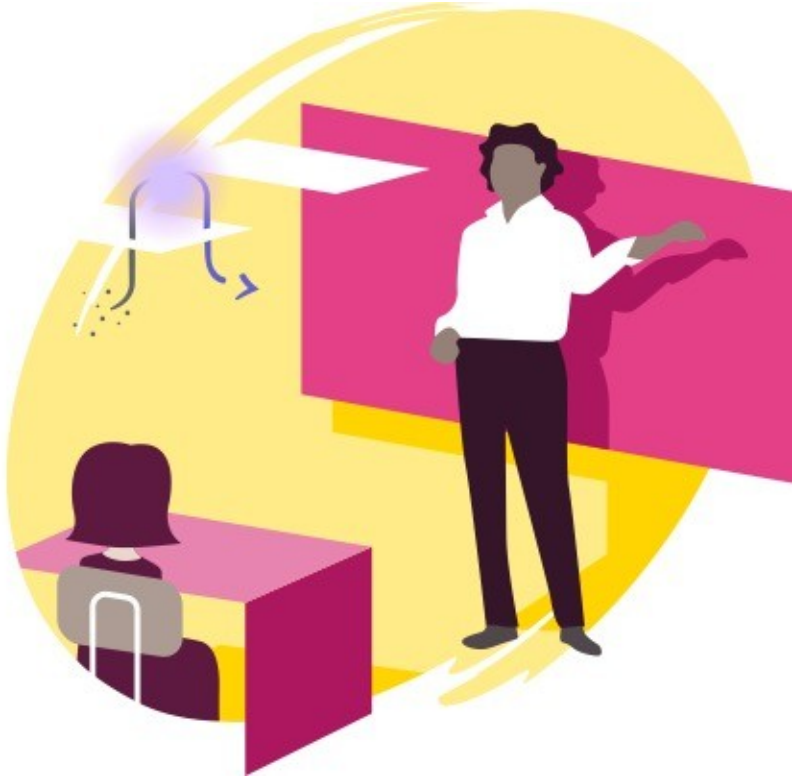





<sup>1</sup>. Based on ASHRAE standards. <https://www.nytimes.com/interactive/2020/08/10/nyregion/nyc-subway-coronavirus.html>

Sources: Dr. Rainald Löhner, George Mason University, Center for Computational Fluid Dynamics; Dr. Linsey Marr, Virginia Tech; Dr. Don Milton, University of Maryland; Dr. Krystal Pollitt, Environmental Health Sciences, Yale School of Public Health; Dr. Jelena Srebric, University of Maryland; John Santamaria, vice president of the car equipment division at New York City Transit.



# What is the **Health Air**?



	<p>Fixtures that clean the air <b>before</b> reaching HVAC's duct openings to go into central system</p>
	<p>Provides care for people within the <b>spaces they live, work, play</b></p>
	<p>At source <b>where</b> viruses and bacteria are spread most and <b>exposure is highest</b></p>

# Healthe Air Troffers

## Inactivated viruses & bacteria



- Multi-stage air sanitization features HEPA-Carbon activated filtration with UV sanitization
- HEPA filter captures up to 99.97% of airborne pathogens as small as 0.3  $\mu$  while activated carbon reduces gases, odors and VOC from the air.

## Form Factor



- Easily retrofits into any existing 2 x 4 ft troffer without breaching plenum—keeping facility disruptions and installation costs to a minimum.
- Recommended 8–10 ft on center spacing, the Healthe® AIR provides 800 ft<sup>3</sup> of sanitizing coverage and conducts four air changes per hour (50cfm) for a 10 x 10 x 8 ft space.

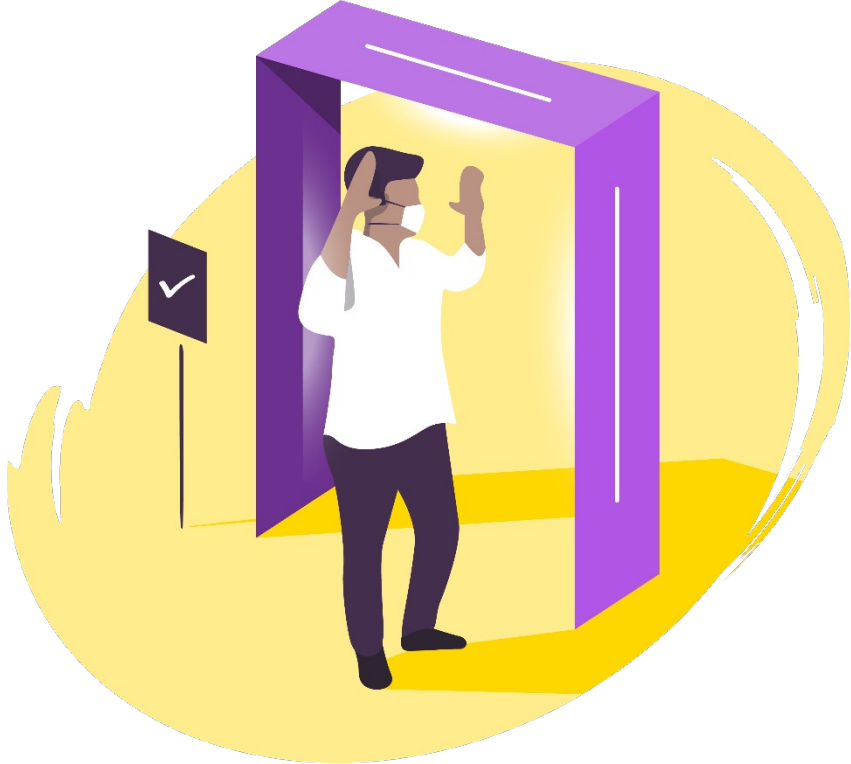
## Specs






- Advanced control features via proprietary Bluetooth wireless switch enable fan speed adjustments and dimming capabilities for general illumination.
- Choice of Healthe's GoodDay® 4000K/5000K, GoodNight® 2700K or Standard 3000K.
- UV LED are safe to use without hazardous material and waste disposal concerns of a low pressure mercury UV lamp.



# Health Entry



	Use of UVC 222 to protect any <b>entrance</b>
	Provides care for people within the <b>spaces they live, work, play</b>
	At source <b>where</b> viruses and bacteria are spread most and <b>exposure is highest</b>

# Health Entry

## Inactivated viruses & bacteria



- Utilizes Far-UVC that sanitizes clothing and personal belongings
- Far-UVC technology penetrates and inactivates bacteria and viruses in the air and on surfaces exposed to the light

## Form Factor



- Entry way form factor is equipped with (5) Far-UVC modules
- Motion-controlled option via built-in motion sensor can help preserve longevity of Far-UVC module during periods of inactivity.

## Specs






- Universal input voltage, 85—264V AC with power consumption of 60W.
- Complies with ADA doorway width requirement and can be deployed as a free-standing structure or be bolted to the ground near any entrance or door.



# What is the **Health Space**?



	Use of UVC 222 to protect <b>open spaces</b> (air you breathe, surfaces you touch)
	Provides care for people within the <b>spaces they live, work, play</b>
	At source <b>where</b> viruses and bacteria are spread most and <b>exposure is highest</b>

# Health Space

## Inactivated viruses & bacteria



- Far-UVC technology penetrates and inactivates bacteria and viruses in the air and on surfaces exposed to the light
- Microbial reduction depends upon distance and time and surface type

## Form Factor



- 6-inch downlight can be retrofitted to conventional recessed can fixture for installation
- Downlight is integrated with conventional illumination light source, i.e., conventional LED with a separate UVC emitter

## Specs



- Firmware keeps within the NIOSH/ACGIH Threshold Limit Value (TLV) ('on' state to no more than 4 hours out of every 8 hours)
- Multiple input voltage available (120V or 220V) with power consumption of 20W



# Example use cases for sanitization solutions

**Classroom**  
(Healthe Space, Air)

**Locker rooms**  
(Healthe Air)

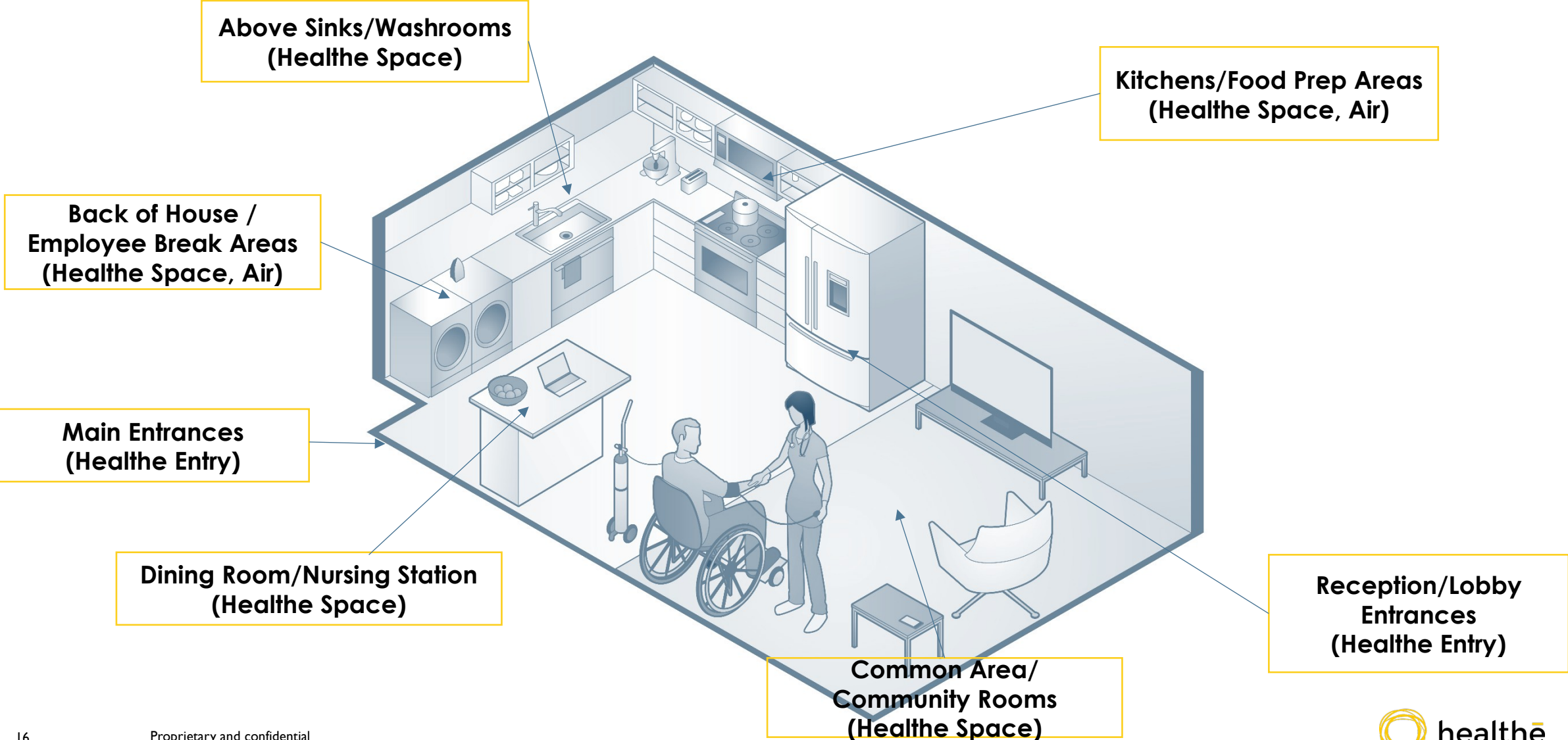


**Bathrooms**  
(Healthe Air)

**Entrance**  
(Healthe Entry)

**Hallways**  
(Healthe Space, Air)

# Example use cases for sanitization solutions





# Research of far-UVC

Columbia University (June 2020)

On June 24, 2020, Columbia University published its latest research showing that Far-UVC light can safely kill more than 99.9% of seasonal coronaviruses present in airborne droplets

- New paper extends previous research to seasonal coronaviruses, which are structurally similar to SARS-CoV-2, the virus that causes COVID-19

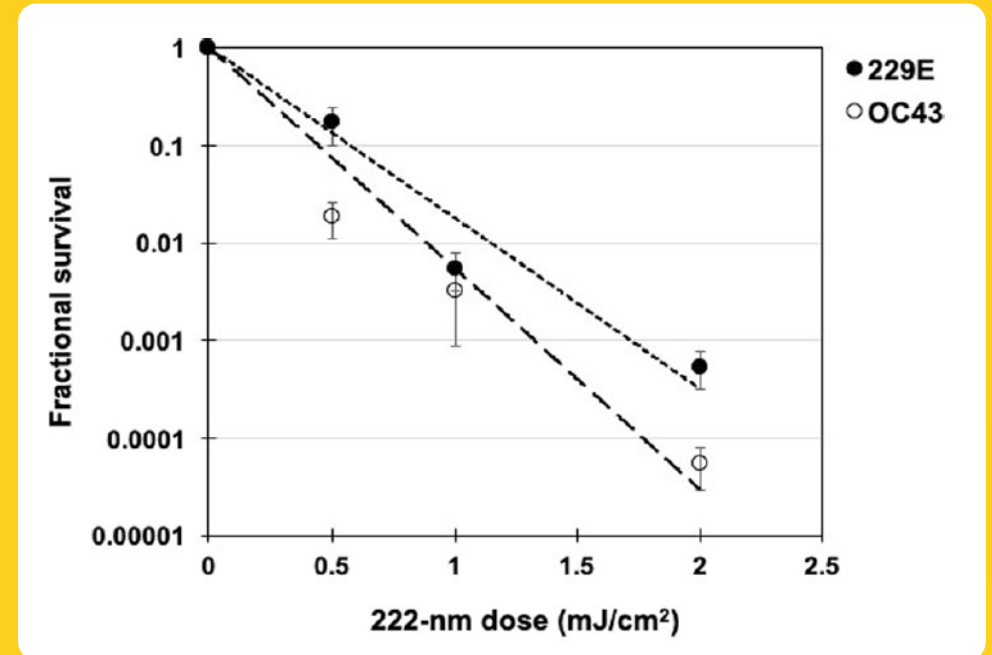
Researchers concluded that continuous exposure to Far-UVC light at the current regulatory limit would kill 90% of airborne viruses in ~8 minutes, 95% in ~11 minutes, 99% in ~16 minutes, and 99.9% in ~25 minutes



**99.9%**  
in 25min

Buonanno, M., Welch, D., Shuryak, I. et al. Far-UVC light (222 nm) efficiently and safely inactivates airborne human coronaviruses. *Sci Rep* 10, 10285 (2020). <https://doi.org/10.1038/s41598-020-67211-2>  
Columbia University Irving Medical Center;  
<https://www.cuimc.columbia.edu/news/far-uv-light-safely-kills-airborne-coronaviruses>

## Coronavirus survivals as function of the dose of far-UVC light <sup>(1)</sup>



*“Based on our results, continuous airborne disinfection with far-UVC light at the current regulatory limit could greatly reduce the level of airborne virus in indoor environments occupied by people.”*

– David Brenner, PhD

(1) Fractional survival,  $\text{PFU}_{\text{UV}} / \text{PFU}_{\text{controls}}$ , is plotted as a function of the 222-nm far-UVC dose. The results are reported as the estimate plaque forming units (PFU)/ml using the conversion  $\text{PFU}/\text{ml} = 0.7 \text{TCID}_{50}$  by applying the Poisson distribution. Values are reported as mean  $\pm$  SEM from multiple experiments ( $n = 3$  alpha HCoV-229E and  $n = 4$  for beta HCoV-OC43); the lines represent the best-fit regressions to equation (see research text and Table 1 for further detail).

# Designed to meet the NIOSH/ACGIH incidental exposure standard

# 222nm is safe

Healthē 222nm products are **designed to meet all safety standards**

A person can pass through the Healthē Entry 45 times in an 8-hour period, with a 20 second duration per pass, before ever reaching the exposure limit

A person can stand directly beneath the Healthē Space for a continuous 8-hour period before ever reaching the exposure limit

**Threshold Limit Values (TLV) guidelines** are put forth by the American Conference of Governmental Industrial Hygienists (**ACGIH**) and used by the National Institute of Occupational Safety and Health (**NIOSH**)

TABLE 1. Ultraviolet Radiation TLV<sup>®</sup> and Relative Spectral Effectiveness

Wavelength <sup>A</sup> (nm)	TLV <sup>®</sup> (J/m <sup>2</sup> ) <sup>B</sup>	TLV <sup>®</sup> (mJ/cm <sup>2</sup> ) <sup>B</sup>	Relative Spectral Effectiveness, S(λ)
180	2500	250	0.012
190	1600	160	0.019
200	1000	100	0.030
205	590	29	0.051
210	400	40	0.075
215	320	32	0.095
220	250	25	0.120
225	200	20	0.150
230	160	16	0.190
235	130	13	0.240

# Our customers



And lots more...



Thank you  
from  
Lighting  
Systems and  
Healthe Inc.

