



EnviroKlenz®

Advanced Air Purification for Chemicals, Odors and Pathogens



HOW VIRUSES SPREAD

Concerns about airborne contaminants, and the spread and viability of viruses have gained worldwide attention with the COVID-19 pandemic. As with any new and emerging pathogen, researchers' knowledge about the spread, viability, transmission, etc. are basic and not fully understood in the early stages of an outbreak.

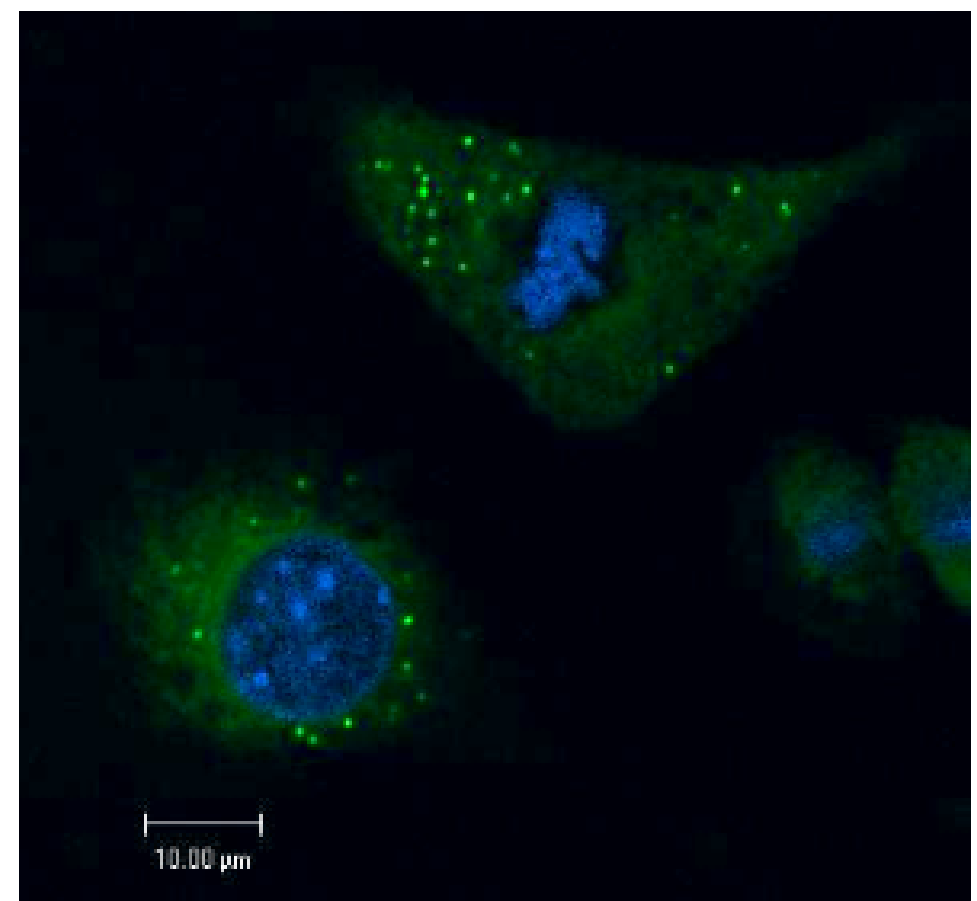
The spread of pathogens between humans falls into direct or indirect contact.

For indirect contact, the main routes are:

- **Airborne transmission**
- **Contaminated object and surface contact**
- **Food and drinking water contamination**

These three routes of indirect spread are often the result of contamination by the spray of droplets during coughing and sneezing, which can spread an infectious disease.

Aerosolized droplets from humans range in size from .6 microns to over 1000 microns (reference 1, 2).



UV LIGHT FOR VIRUS INACTIVATION

Ultraviolet light (UV light) is a known method for the inactivation or reduction in viability of pathogens according to the CDC (reference 3), but the correct wavelength and control measures must be considered to avoid damage to skin and eyes (reference 4).



The EnviroKlenz UV System solves this dosage problem by placing the UV-C light before the HEPA filter which captures biological contaminants 0.3 microns and larger.

The droplet size from coughing or sneezing humans is very broad, and a HEPA filter can capture the bulk of that range. By having the UV lamp continually bathing the collection side of the HEPA filter, the items collected on the surface of the HEPA filter get a lengthened or even infinite residence time. In the EnviroKlenz Mobile Air System with UV light, the pathogens are exposed to the UV-C light as long as the unit and its lights remain on.

This means that even though the UV lamp is relatively low intensity given the airflow of the unit (approximately 80-250 cfm), the UV-C dosage required for destruction is created for the trapped pathogen because it will continue to be exposed to the UV-C radiation regardless of how quickly air is passing through the unit.

References

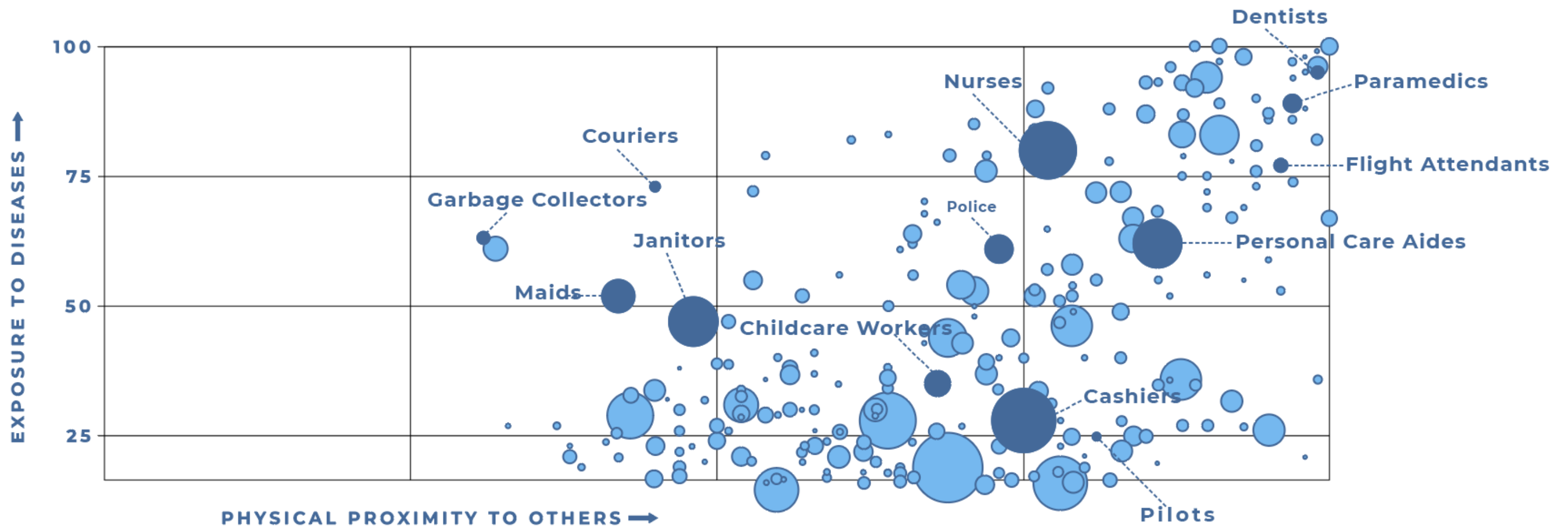
1) *Dynamics of infectious disease transmission by inhalable respiratory droplets*
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2894888/>

2) *Characterizations of particle size distribution of the droplets exhaled by sneeze*
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3785820/>

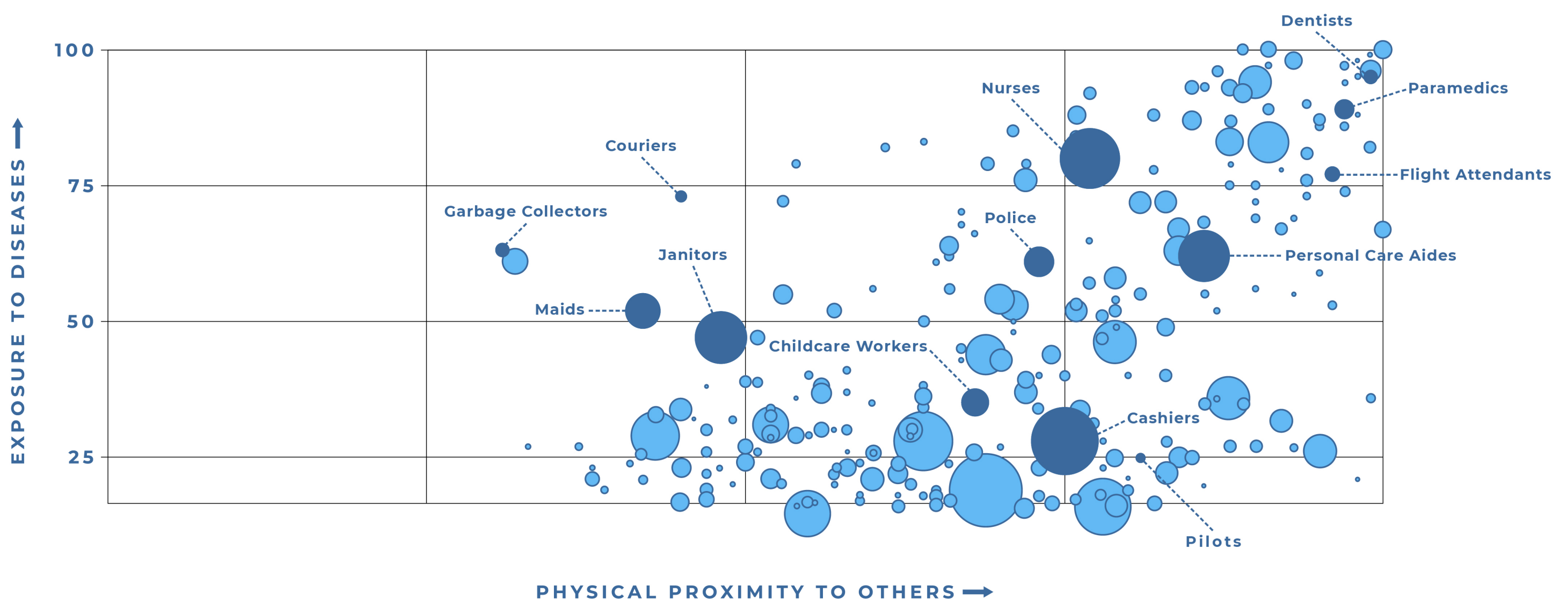
3) *CDC website, https://www.cdc.gov/infectioncontrol/guidelines/disinfection/disinfection-methods/miscellaneous.html*

4) *America Cancer Society website, https://www.cancer.org/cancer/cancer-causes/radiation-exposure/uv-radiation.html*

RISK OF EXPOSURE BY OCCUPATION IN THE UNITED STATES



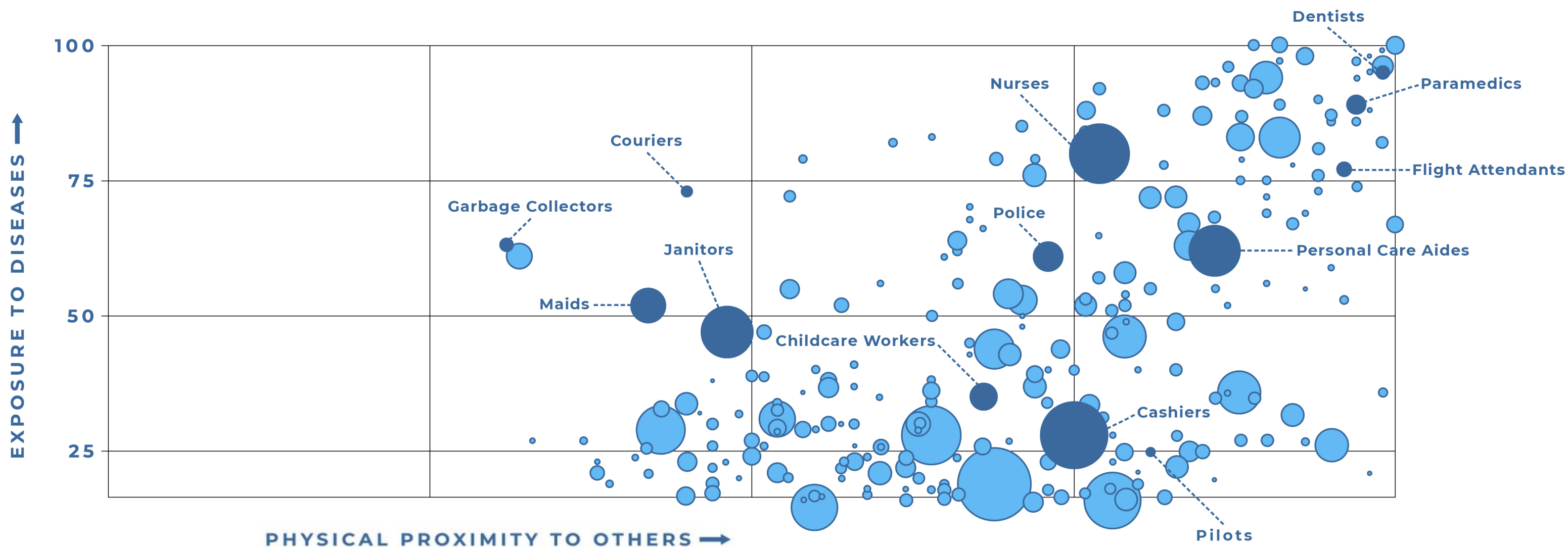
THE X-AXIS DEPICTS THE FREQUENCY THAT EACH PROFESSION IS EXPOSED TO DISEASE AND INFECTIONS



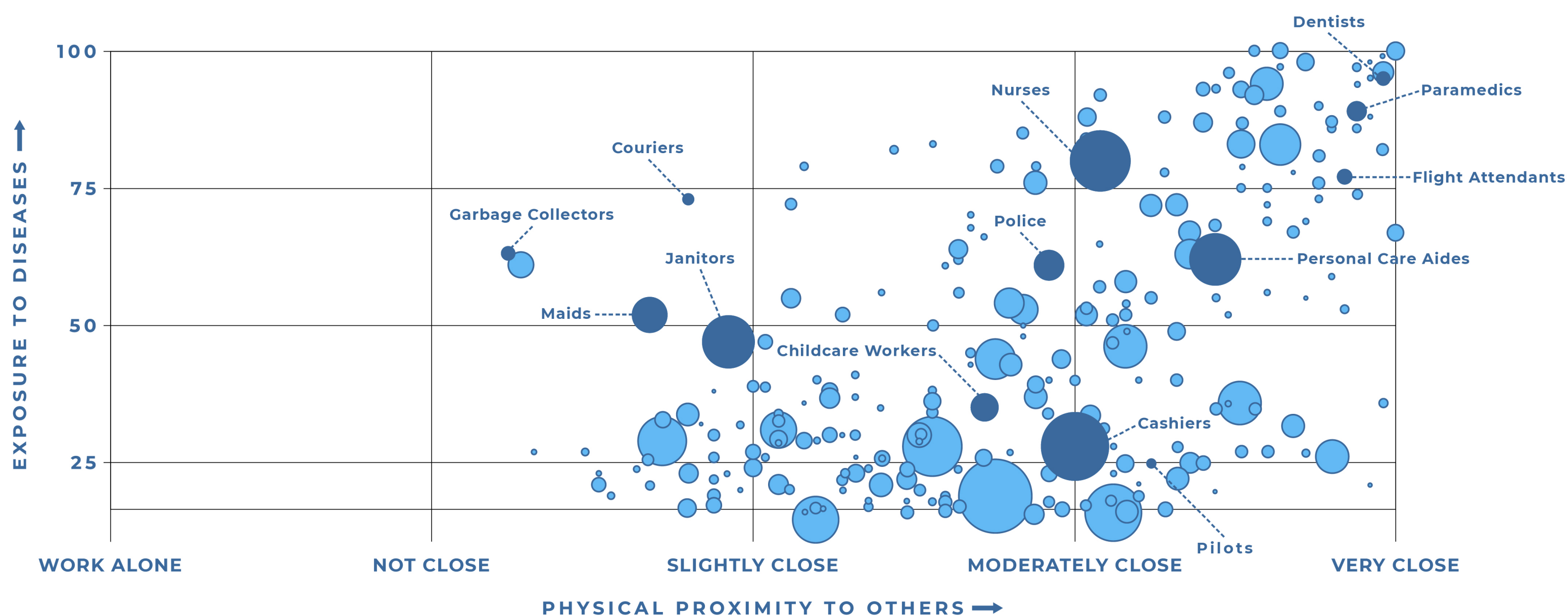
AS THE CORONAVIRUS CONTINUES TO SPREAD, ESSENTIAL WORKERS WITH THE CLOSEST PROXIMITY TO OTHERS HAVE THE GREATEST RISK OF EXPOSURE

Original Source data credited to NY Times:

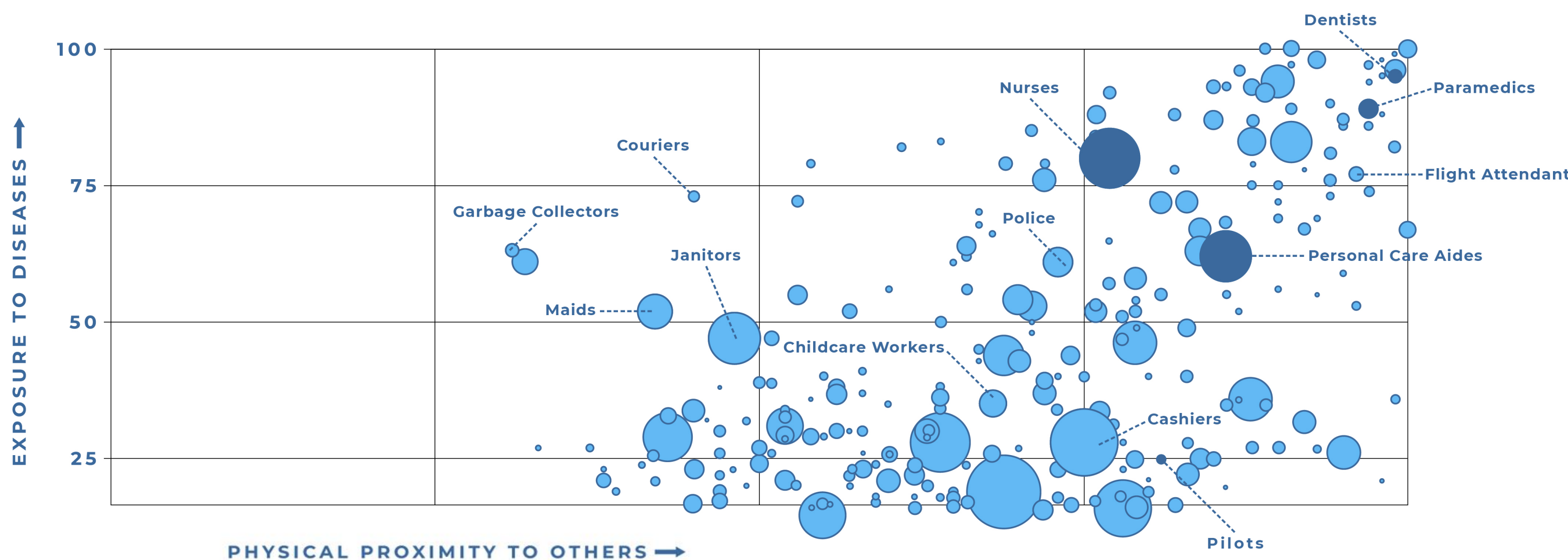
<https://www.nytimes.com/interactive/2020/03/15/business/economy/coronavirus-worker-risk.html>



THE BUBBLES DEPICTED ON THIS CART ILLUSTRATE THE OCCUPATION AND THE LARGER THE BUBBLE THE GREATER THE POPULATION IN THAT WORKFORCE



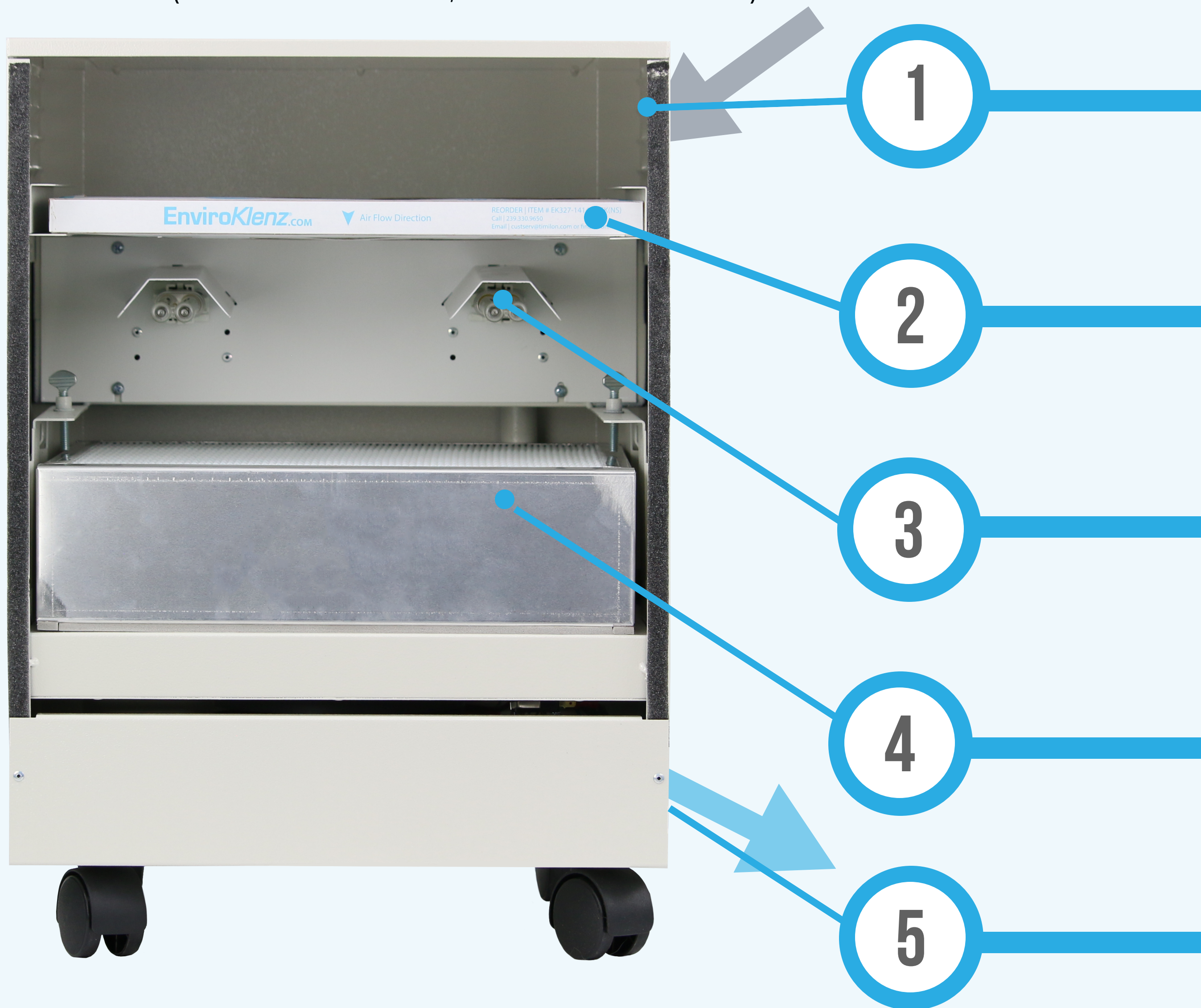
THE Y-AXIS REPRESENTS THE AVERAGE PROXIMITY TO OTHERS DURING A WORKDAY.



HEALTH CARE WORKERS ARE AT THE GREATEST RISK TO DISEASES AND INFECTION DAILY AND HAVE THE HIGHEST PROXIMITY TO ONE ANOTHER AND PATIENTS.

ENVIROKLENZ UV SYSTEM

The EnviroKlenz® Mobile Air System with UV Light combines Advanced EnviroKlenz technology for toxic and noxious chemical and odor removal with HEPA filtration and ultraviolet germicidal radiation (UVC) to remove airborne particulates and allergens, and inhibit growth of captured microorganisms (such as bacteria, mold and viruses).



Technical Specifications:

CFM: 85, 150, 200, 250

Power: 115 volts

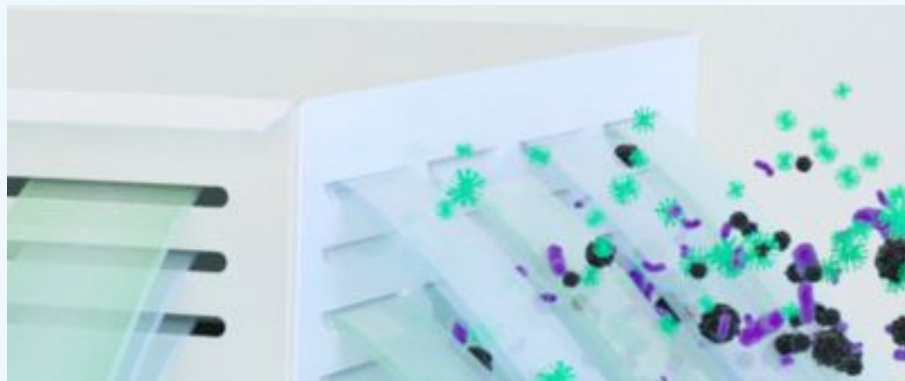
Decibel: 55, 56, 59, 62

Weight: 38lbs

Dimensions: 22" x 15.5" x 15"

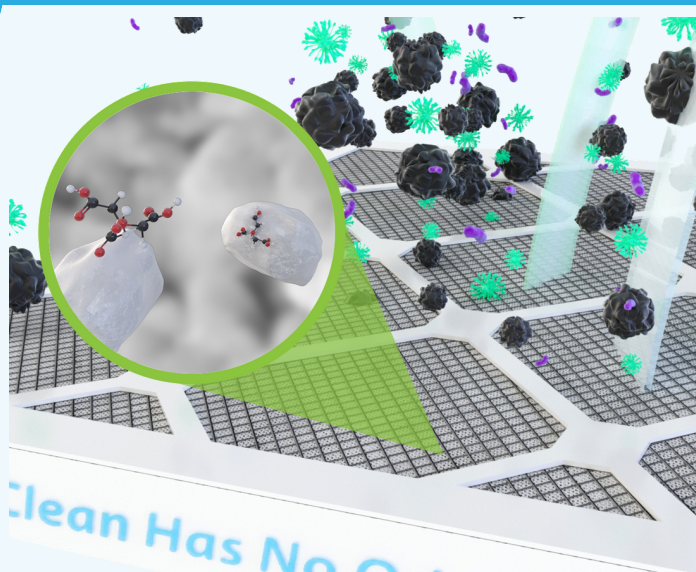
Room Size: Treats Up to 1000 Square Feet

Air Intake



- Air is pulled into the EnviroKlenz System through vents on three sides of the System.
- 250 CFM

EnviroKlenz Air Cartridge



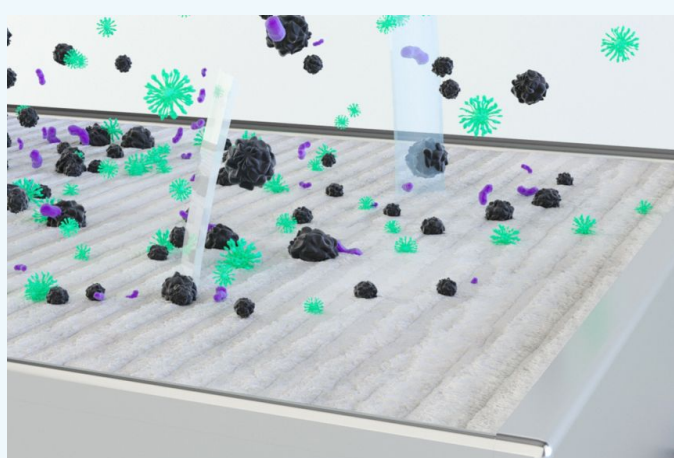
- Earth Mineral Technology
- No by products or harmful agents
- EnviroKlenz Air Cartridge is effective against toxic or noxious odors and chemicals through our proprietary “Adsorptive Neutralization” process.
- The EnviroKlenz Air Cartridge is designed to last 4-6 months, ensuring that the unit operates at peak odor removal efficiency at all times.

UVC Bulbs



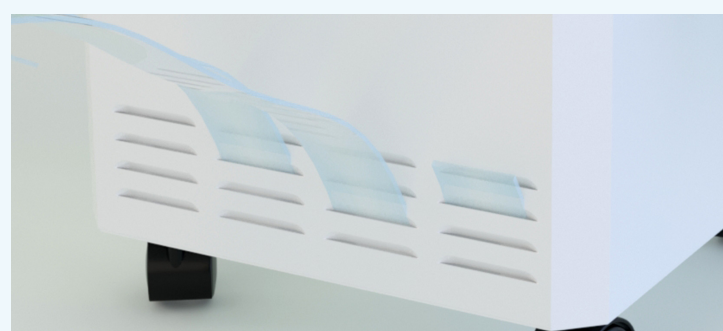
- 254nm wavelength
- UVC lamps are located before (and radiating on) the collection side of the HEPA filter. Unlike systems that depend on killing/inactivating the organisms as they pass through the UVC light in a very short period of time, the UVC light is continuously shining on the collected organisms with a very high efficiency of kill.

HEPA Filter



- Capture Particulates as small as 0.3 microns at a 99.99% rate
- The HEPA filter captures harmful dust, particulate, allergens, pet dander, microorganisms, and more.
- Because there is no bypass around the HEPA filter, every unit performs at HEPA efficiency.

Air Out-take



- Clean air flows through vents on the front of the system

[Learn More](#)

EnviroKlenz Cartridge for VOCs & Odor Neutralization

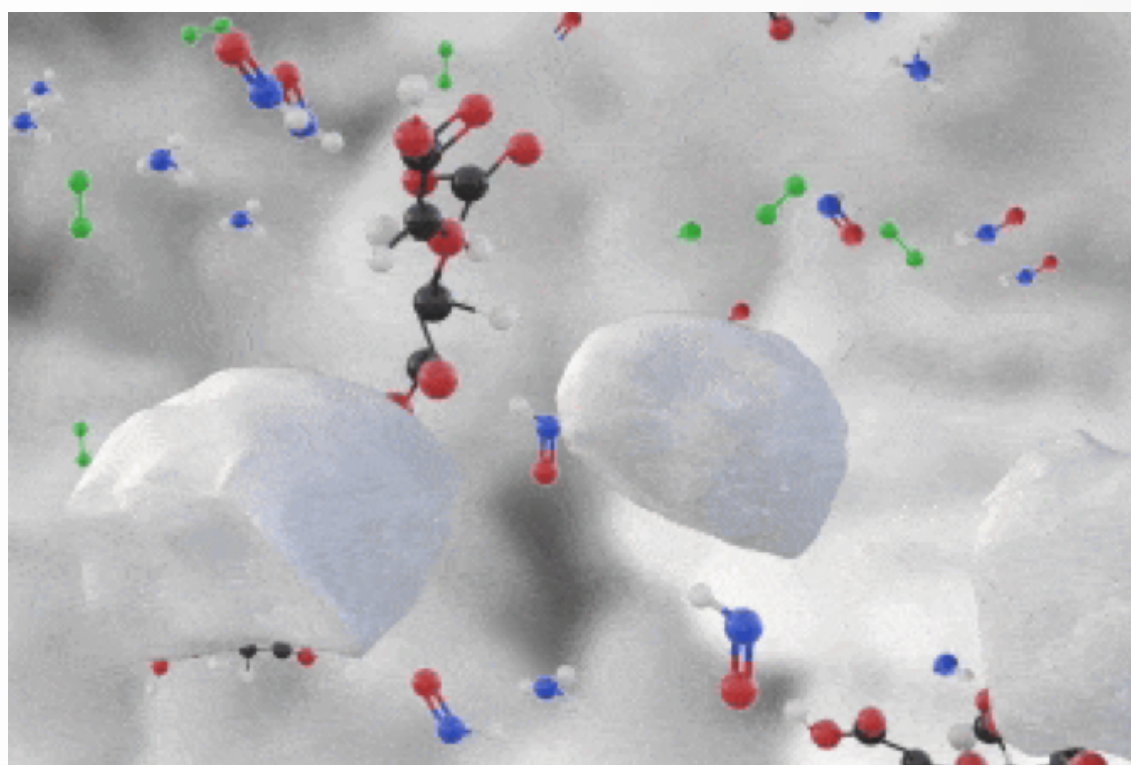
Specs: 14" x 14" x 1"

Coupled with our medical-grade HEPA filter, the EnviroKlenz Air Cartridge makes an unstoppable system in cleaning your indoor air by removing harmful VOC's and indoor toxins.

The Cartridge utilizes the EnviroKlenz patented earth mineral technology which works through a process of destructive adsorption of the chemical odors and VOCs. As the polluted air comes into contact with the EnviroKlenz earth minerals it adsorbs, neutralizes, and breaks down the chemistry of the chemical compound while actively capturing dust, dander, and allergen particles.

How EnviroKlenz® Works

As the chemical pollutants come into contact with the EnviroKlenz® earth minerals, the earth minerals adsorb, neutralize, and break down the chemistry of the chemical compound(s).



EnviroKlenz HEPA Filter

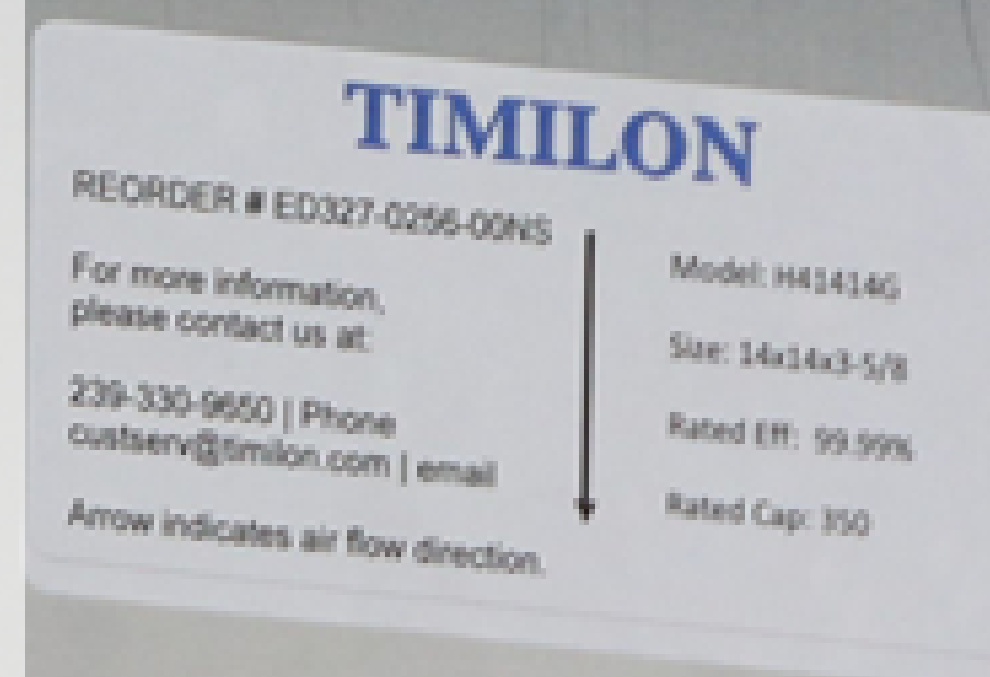
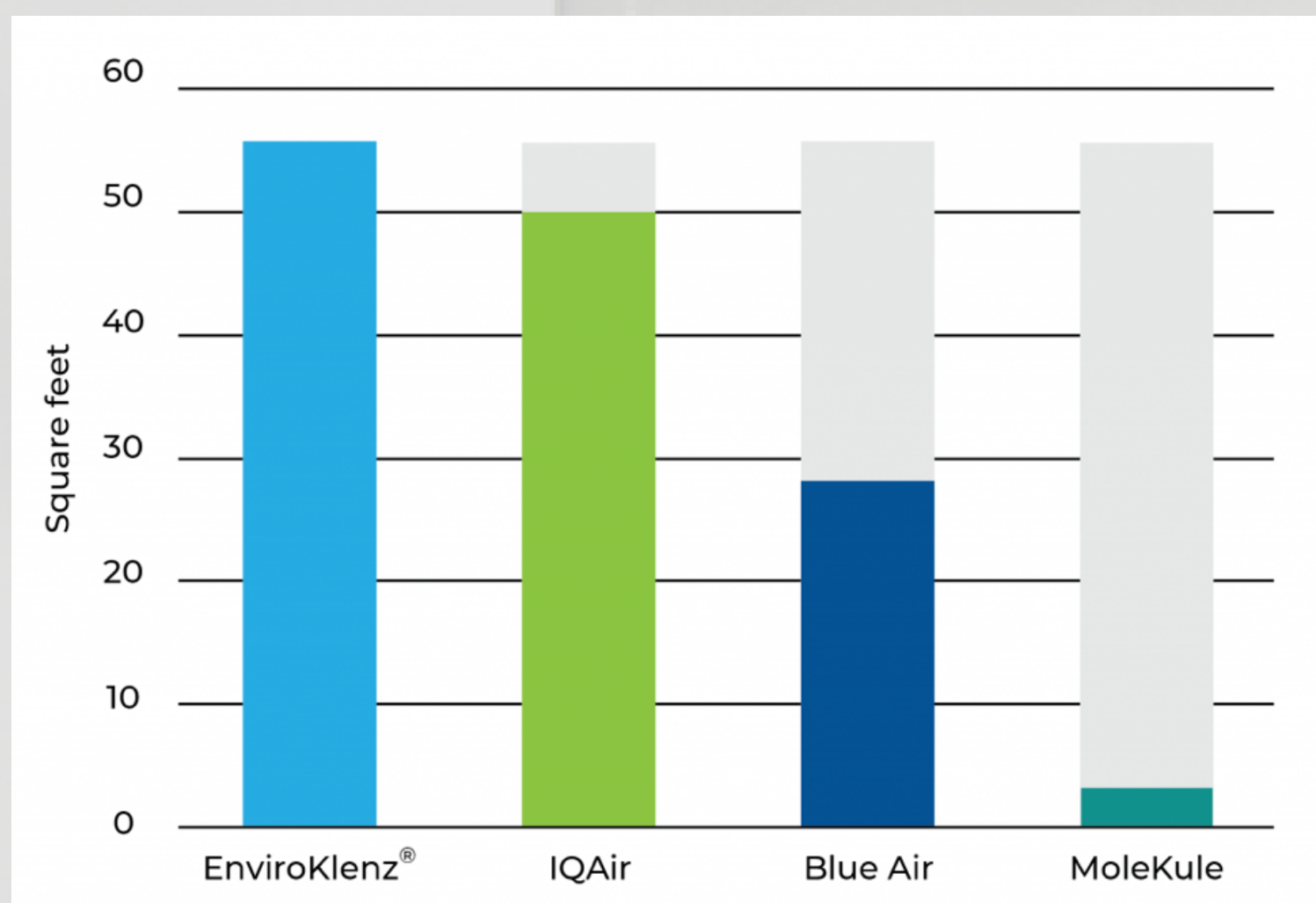
Specs: 14" x 14" x 4"

The EnviroKlenz HEPA filters trap air contaminants in a complex web of fibers. Depending on the size of the particle, this can happen in four different ways: Inertial Impaction, Diffusion, Interception, or Sieving.

Larger contaminants are trapped via inertial impaction and sieving. The particles either collide with the fibers and become trapped or are trapped while attempting to travel through the fibers. Medium sized particles, as they move through the filter, are grabbed by the fibers via interception. Smaller particles are dissipated as they travel through the filter and eventually collide with a fiber and are trapped.

Particulate Matter Filter Media

The EnviroKlenz Air System has the highest amount of particulate matter filter media with over 56 square feet. The more square feet of particulate matter media results in a filter that can capture more particulate matter before needing to be changed.



- Viruses can be aerosolized when humans cough or sneeze. Despite viruses often being submicron in size, the droplets that carry them are typically micron-size dispersed.
- HEPA filters can capture matter 0.3 microns and larger.
- UV light contains multiple wavelengths, but the wavelength of 254 nm specifically can produce germicidal effects. This wavelength is in the UVC spectrum.
- UVC light is known to inactivate viruses and other pathogens.
- Inactivation and kill by UVC increases with more exposure or dosage.
- Deployment of UVC on the collection side of a HEPA filter results in longer exposure to the UVC for collected matter.

ENVIROKLENZ TECHNOLOGY AGAINST PATHOGEN AND MICROBIALS

Plaque Forming Units After Exposure of MS2 to Metal Oxide Formulations. (Standardized Data)

BASE FORMULATION	POWDER CONCENTRATION	CONTACT TIME	
		5 MIN	90 MIN
HIGH SURFACE AREA MGO	10 MG/ML	0	0
HIGH SURFACE AREA MGO	1 MG/ML	0	0
HIGH SURFACE AREA MGO	100 µG/ML	26.9	19.6

The bacteriophage MS2 (a simulant of a human virus) was initially propagated by inoculating a rehydrated aliquot of MS2 into a culture host of E. coli and incubating with shaking in nutrient broth. Bacteriophage replicate by infecting the host bacteria and passing their genetic code into the host cell where the cell replicates phage. In turn, the new generation of phage lyse the cell wall of their host escaping into the surrounding media furthering the propagation in unexposed host cells. To ensure no further interaction of MS2 and host cells after propagation of phage, the culture was centrifuged to remove cell debris and sterile filtered.

A plaque titer assay was performed to enumerate the propagated MS2 bacteriophage. The number of MS2 phage per mL in this stock culture was determined by plating E. coli host culture. Negative and positive control plates for the titer assay were performed prior to and after plating the diluted MS2 stock culture samples to provide evidence that host culture and diluent were not contaminated, and that bacteriophage were present in the MS2 stock culture.

Positive and negative control tests were performed. All high surface area MgO samples tested exhibited a formula dose-related response to the metal oxide formulation. In addition, a time of exposure-response of the bacteriophage to all three powder concentrations was evident. In the 5 minutes, the exposure test completely inhibited the MS2 bacteriophage’s ability to replicate at the formula concentration of 10 mg and 1 mg/ml. As for the 90 minutes exposure tests, bacteriophage inhibition was increased at the 100 ug/ml testing. It is concluded that metal oxide formations have disinfecting ability towards MS2.

High Surface Area Zinc Oxide (ZnO)

ORGANISM	48 HOUR SUBCULTURE RESULTS			POSITIVE CONTROL	NEGATIVE CONTROL	STERILITY CONTROL
	1	2	3			
ESHERICHIA COLI ATCC # 10536	(-)	(-)	(-)	(+)	(-)	(-)
KLEBSIELLA PNEUMONIAE ATCC # 4352.	(-)	(-)	(-)	(+)	(-)	(-)

(+) Growth demonstrates that the organism was not killed
(-) No Growth demonstrates that the organism was killed

The tests were conducted using various concentrations of the high surface area Zinc Oxide for exposure to the organisms. Subculture tubes were prepared and evaluated for growth. Positive, negative, and sterility controls were also prepared. The results in the table demonstrate that the high surface area ZnO is effective against the gram-negative organisms E.coli and Klebsiella and against the gram-positive Staphylococcus aureus. This illustrates the ability of the compound to be used for inhibition of growth of bacteria.

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