

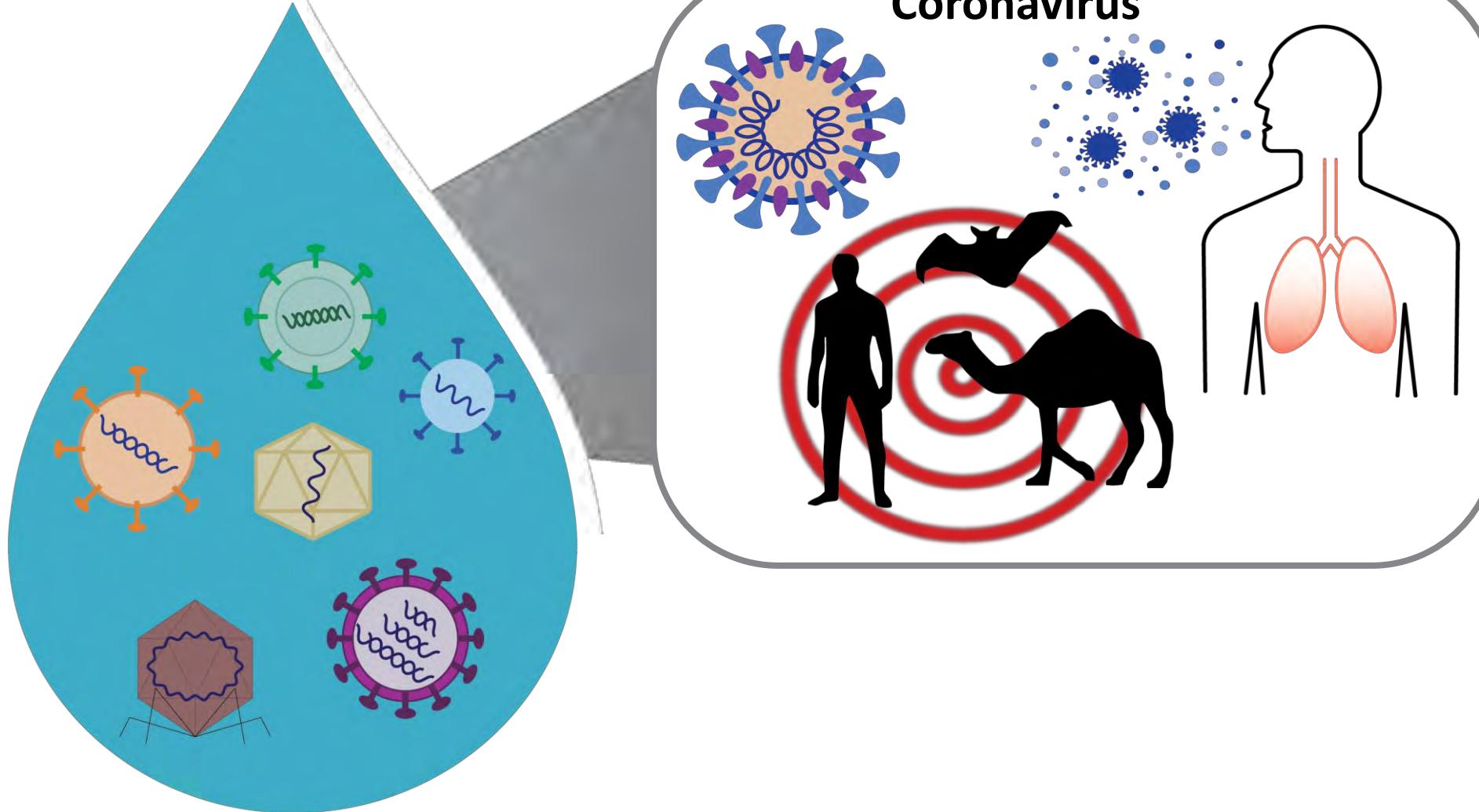
COVID19
-VS-
Désinfection par Ultraviolet

Webinar BOMA
Québec, 8 Juin 2021

NORMAND BRAIS ING. M.SC.A., PH.D.

SANUVOX
PURIFYING AIR AT THE SPEED OF LIGHT™

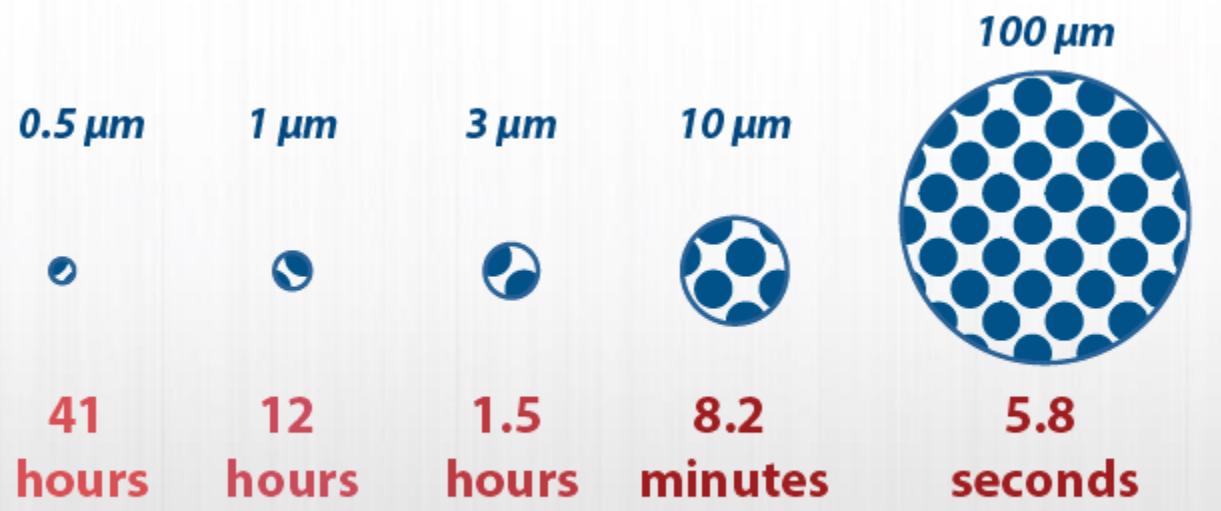
Les virus sont des microorganismes dont la réPLICATION nécessite un hôte



COVID-19: Aérosols sont le principal vecteur du virus SARS-CoV-2

Références: CDC, FDA, OMS, REHVA, ASHRAE, Harvard school of public health, The Lancet COVID Task force.

Temps de déposition d'une hauteur de 1.5 mètre
en milieu stagnant

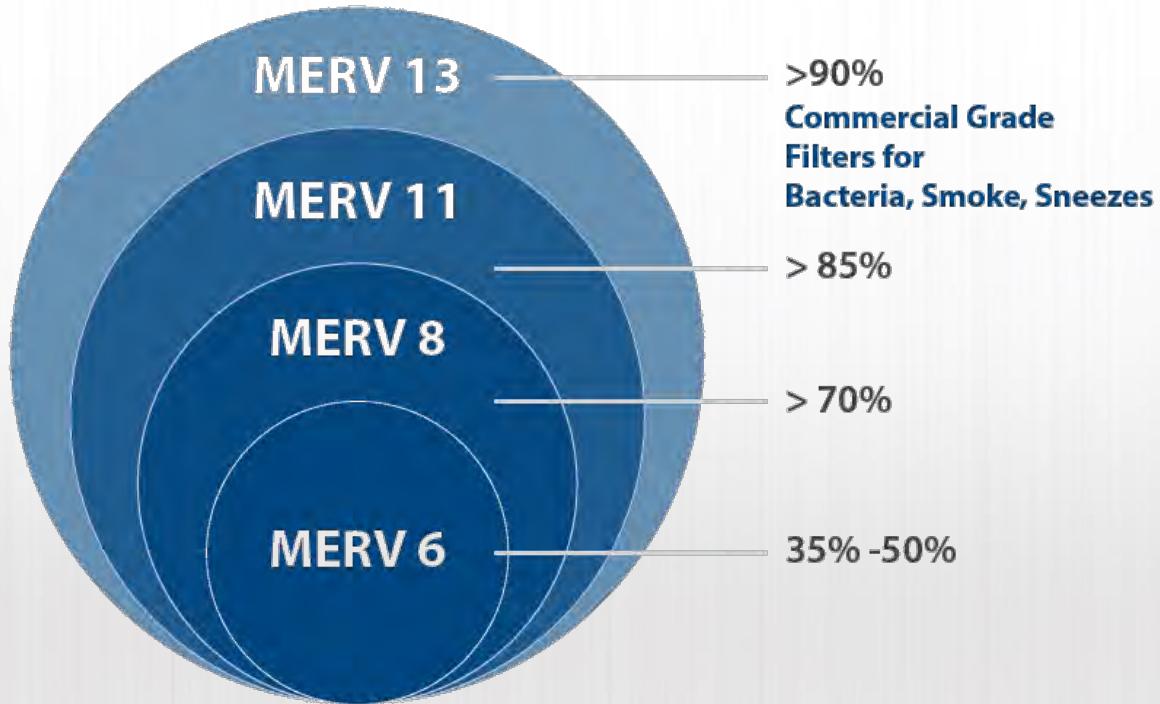


- Aérosols typiques: 5 to 10 μm
- Taille Moyenne du virus: entre 0.06 – 0.15 μm
- Les aerosols contaminés en suspensions dans l'air propagent le virus.
- Lorsqu'il y a mouvement d'air la durée de suspension des aerosols est augmentée.

Filtration des Aérosols

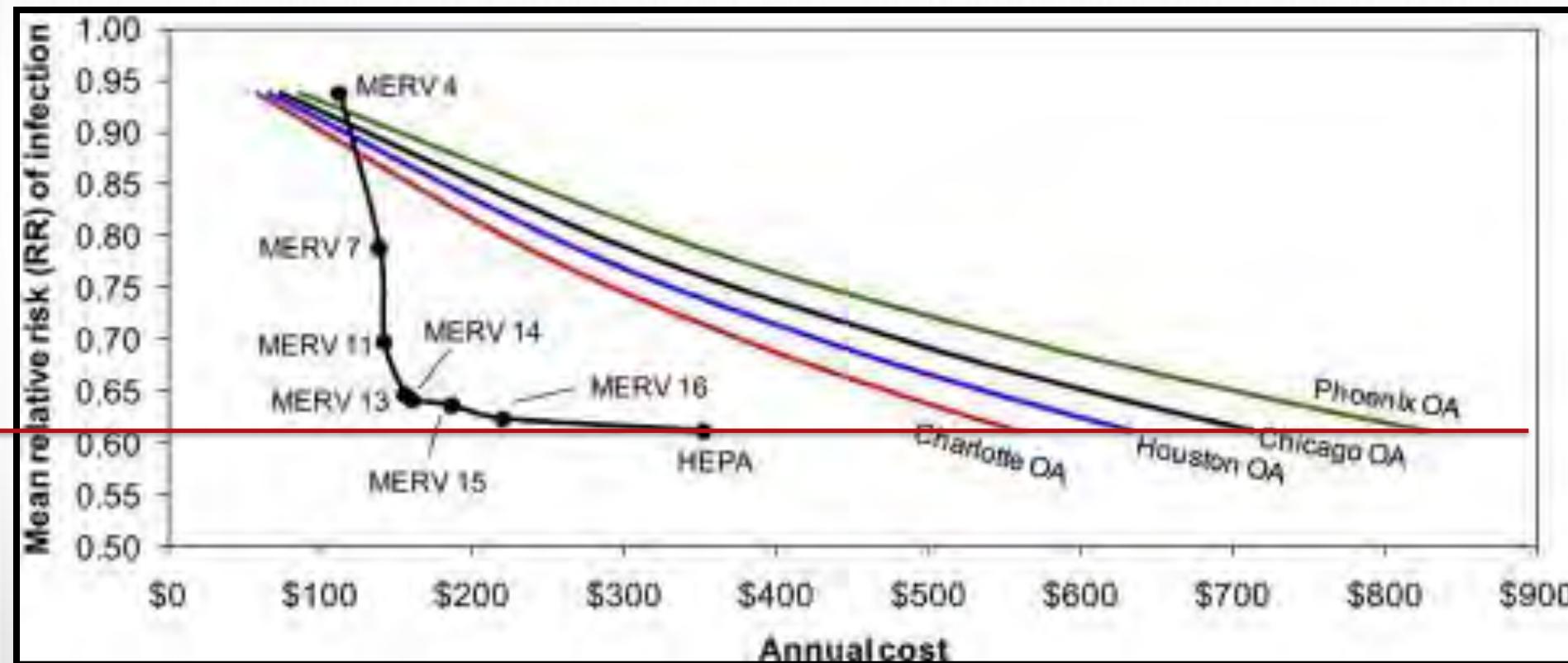
MERV Rating

Trap particles size 3 to 10 microns



- Aérosols: 5 à 10 µm
- Virus: 0.06 – 0.15 µm
- Filtre MERV-13 capture 90% entre 3 to 10 µm

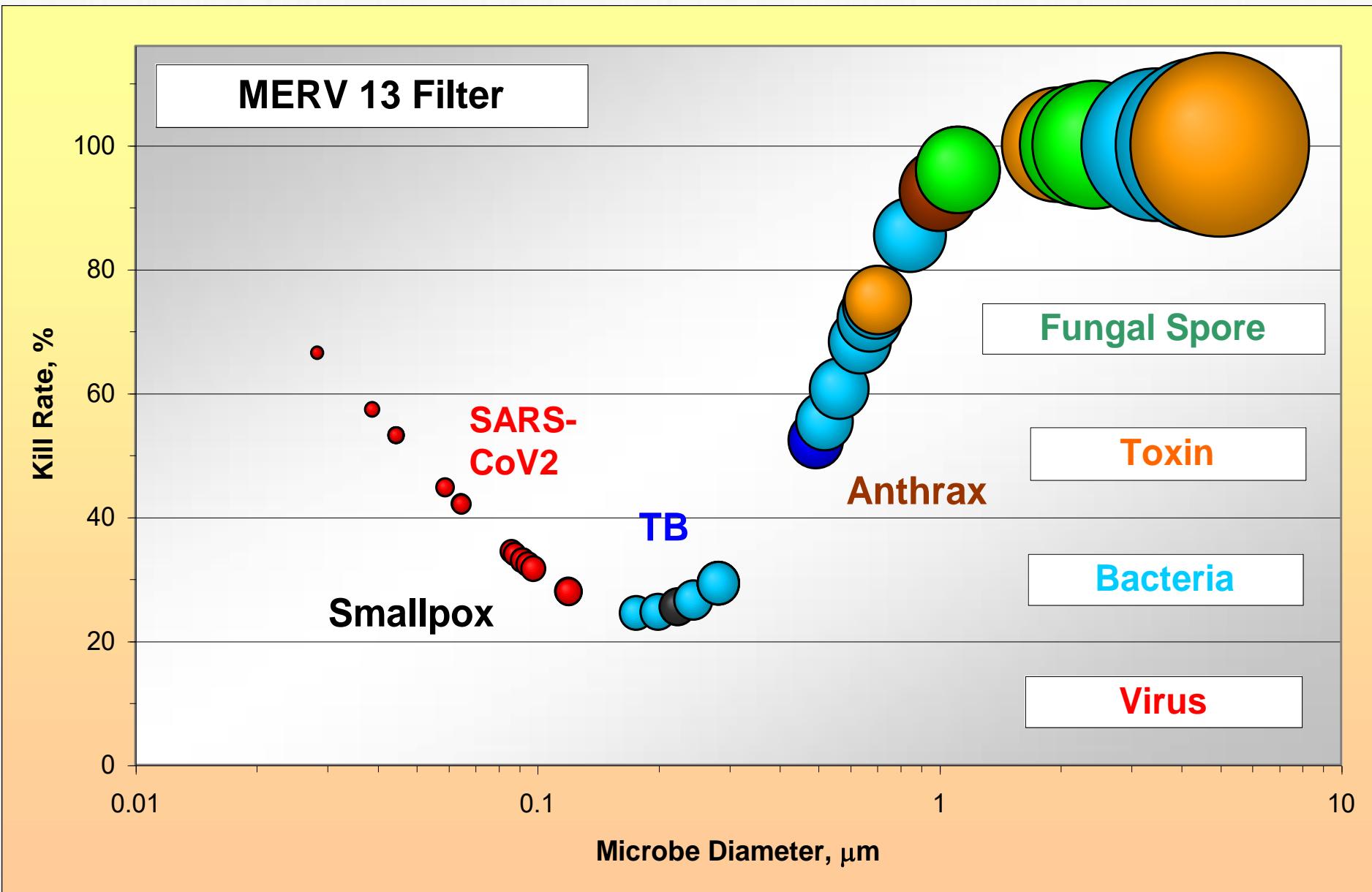
Efficacité de Filtration vs. Coût



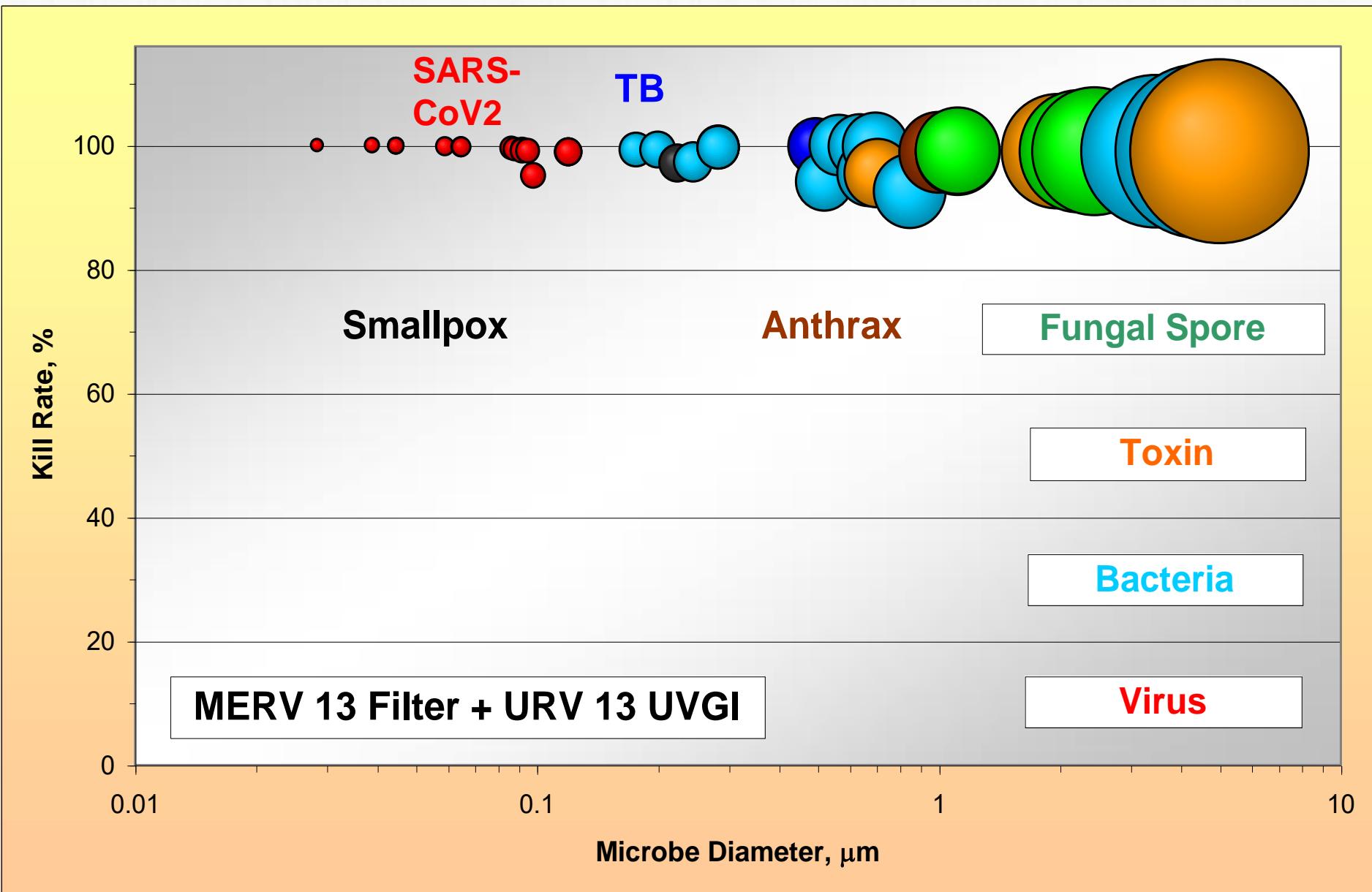
P. Azimi and B. Stephens, "HVAC filtration for controlling infectious airborne disease transmission in indoor environments: Predicting risk reductions and operational costs," 04 09 2013. [Online]. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7127325>

Point optimal
MERV
13

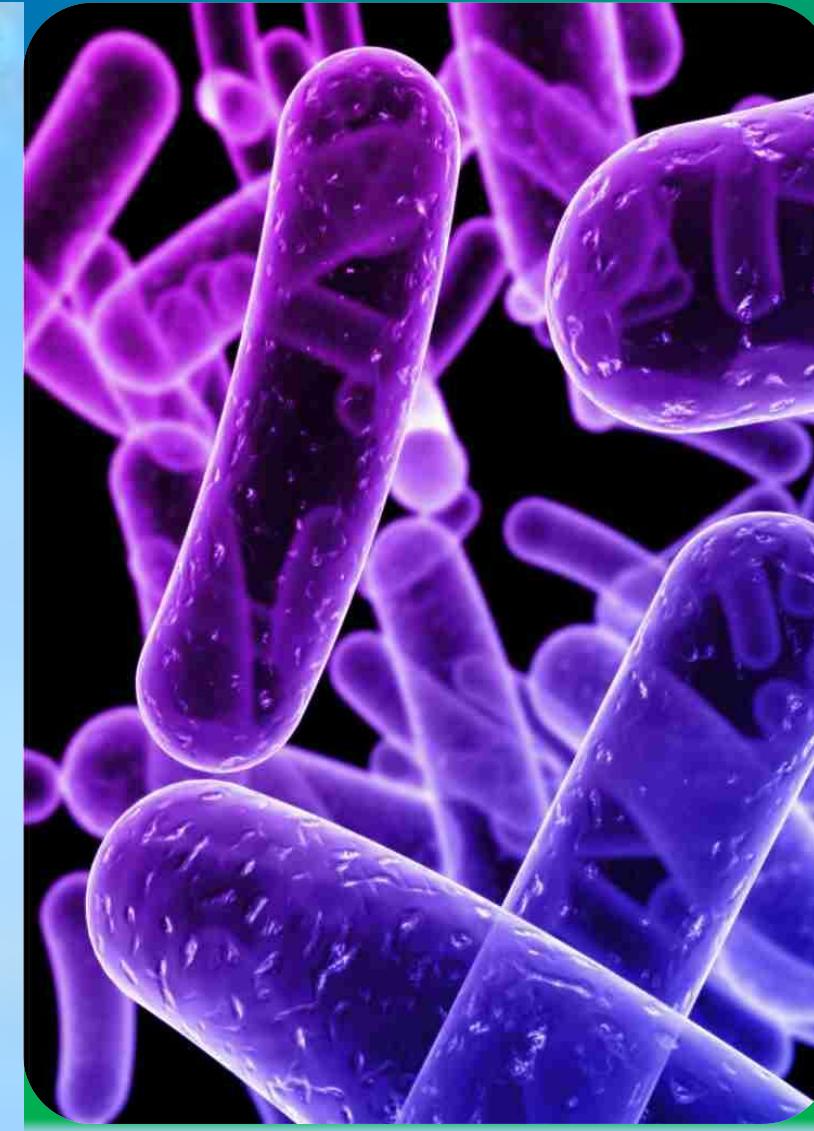
MERV 13 : Performance



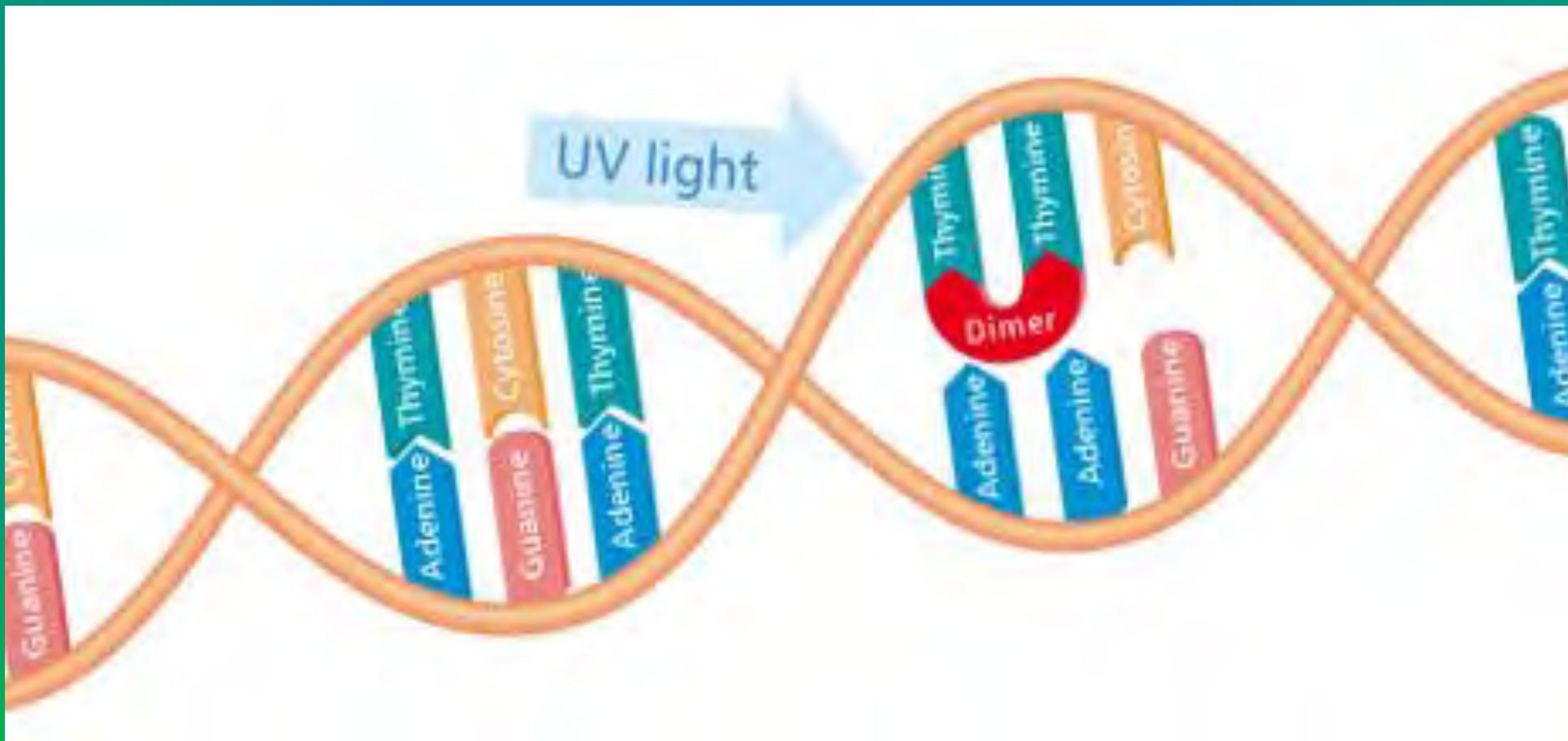
Filtration + UV



ADN/ARN : Watson et Crick 1953



Principe fondamental de la désinfection UV



Désinfection UV

Dose UV = intensité x temps

joule/ m²

watt/m²

sec

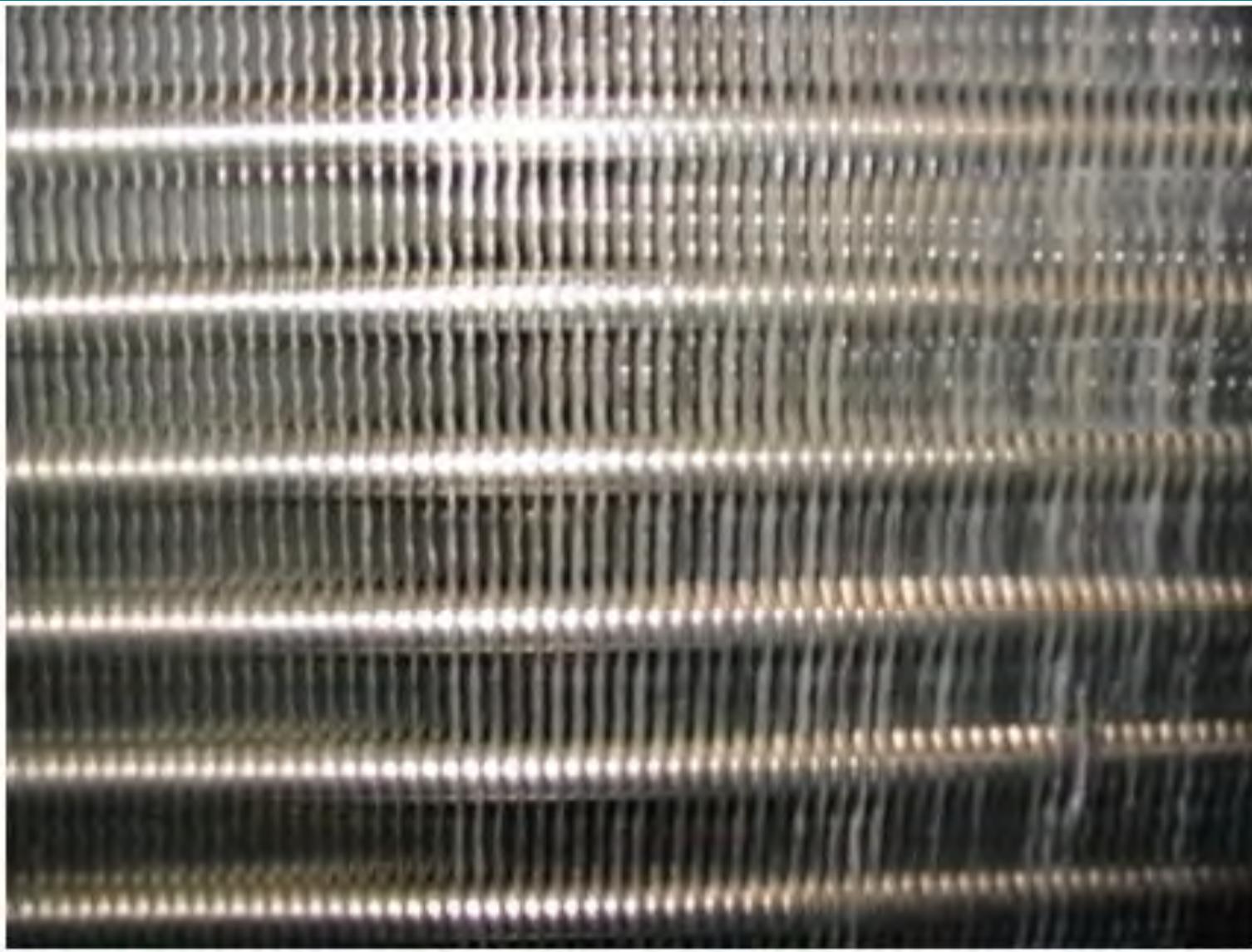
Plus la Dose est grande,
plus il y a d'altérations de l'ADN / ARN

SANUVOX Standard UV dose Disinfection Scale

Bio-contaminants	AIR disinfection range			SURFACE disinfection range				
	Offices	Hospital	Operating room	Bio-lab 1	Bio-lab 2	Black Belt-1	Black Belt-2	Black Belt-3
	2,5	5	10	20	40	100	1 000	10 000
	mJ/cm2	mJ/cm2	mJ/cm2	mJ/cm2	mJ/cm2	mJ/cm2	mJ/cm2	mJ/cm2
Mycobacterium tuberculosis	99,9993%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Legionella pneumophila	99,9986%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Candida auris	99,9986%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Coronavirus (SARS-CoV-1)	99,9919%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Proteus mirabilis	99,9272%	99,9999%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Mycoplasma pneumoniae	99,9067%	99,9999%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Listeria monocytogenes	99,6841%	99,9990%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Salmonella	99,6014%	99,9984%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Aeromonas	99,3765%	99,9961%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
SARS-CoV-2 (Covid-19)	99,0674%	99,9913%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Ricksettsia prowazekii	98,7723%	99,9849%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Staphilococcus epidermidis	98,2621%	99,9698%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
E. Coli	97,9814%	99,9593%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Yersinia enterocolitica	97,8458%	99,9536%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Coxiella burnetii	97,8453%	99,9536%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Lactobacillus reuteri	97,8453%	99,9536%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Vaccinia virus	97,8182%	99,9524%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
smallpox	97,8072%	99,9519%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Newcastle disease	97,2676%	99,9253%	99,9999%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Acinetobacter baumanii	95,9238%	99,8338%	99,9997%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Influenza A virus	94,8953%	99,7394%	99,9993%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
MRSA	94,0691%	99,6482%	99,9988%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Coxsachievirus	93,7651%	99,6113%	99,9985%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Avian Influenza virus	92,9349%	99,5008%	99,9975%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Measle virus	92,7741%	99,4779%	99,9973%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Pseudomonas aeruginosa	92,7015%	99,4673%	99,9972%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Serratia marcescens	90,6986%	99,1348%	99,9925%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Parvovirus H-1	89,9741%	98,9948%	99,9899%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Proteus vulgaris/mirabilis	85,3210%	97,8453%	99,9536%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Corynebacterium diphтерiae	82,6660%	96,9953%	99,9097%	99,9999%	100,0000%	100,0000%	100,0000%	100,0000%
Ustilago zeae	80,6987%	96,2746%	99,8612%	99,9998%	100,0000%	100,0000%	100,0000%	100,0000%
Streptococcus pyogenes	78,5672%	95,4064%	99,7890%	99,9996%	100,0000%	100,0000%	100,0000%	100,0000%
Haemophilus influenza	77,6311%	94,9963%	99,7496%	99,9994%	100,0000%	100,0000%	100,0000%	100,0000%
Yeast	76,2835%	94,3753%	99,6836%	99,9990%	100,0000%	100,0000%	100,0000%	100,0000%
Klebsiella pneumoniae	74,5893%	93,5430%	99,5831%	99,9983%	100,0000%	100,0000%	100,0000%	100,0000%

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influenza A virus	94,8953%	99,7394%	99,9993%	100,0000%	100,0000%	100,0000%	100,0000%	100,0000%
Aspergillus niger spores	1,7348%	3,4395%	6,7606%	13,0642%	24,4216%	50,3415%	99,9088%	100,0000%

Vos serpentins de refroidissement
sont ils propres ?



Pas vraiment...



Croissance Exponentielle !

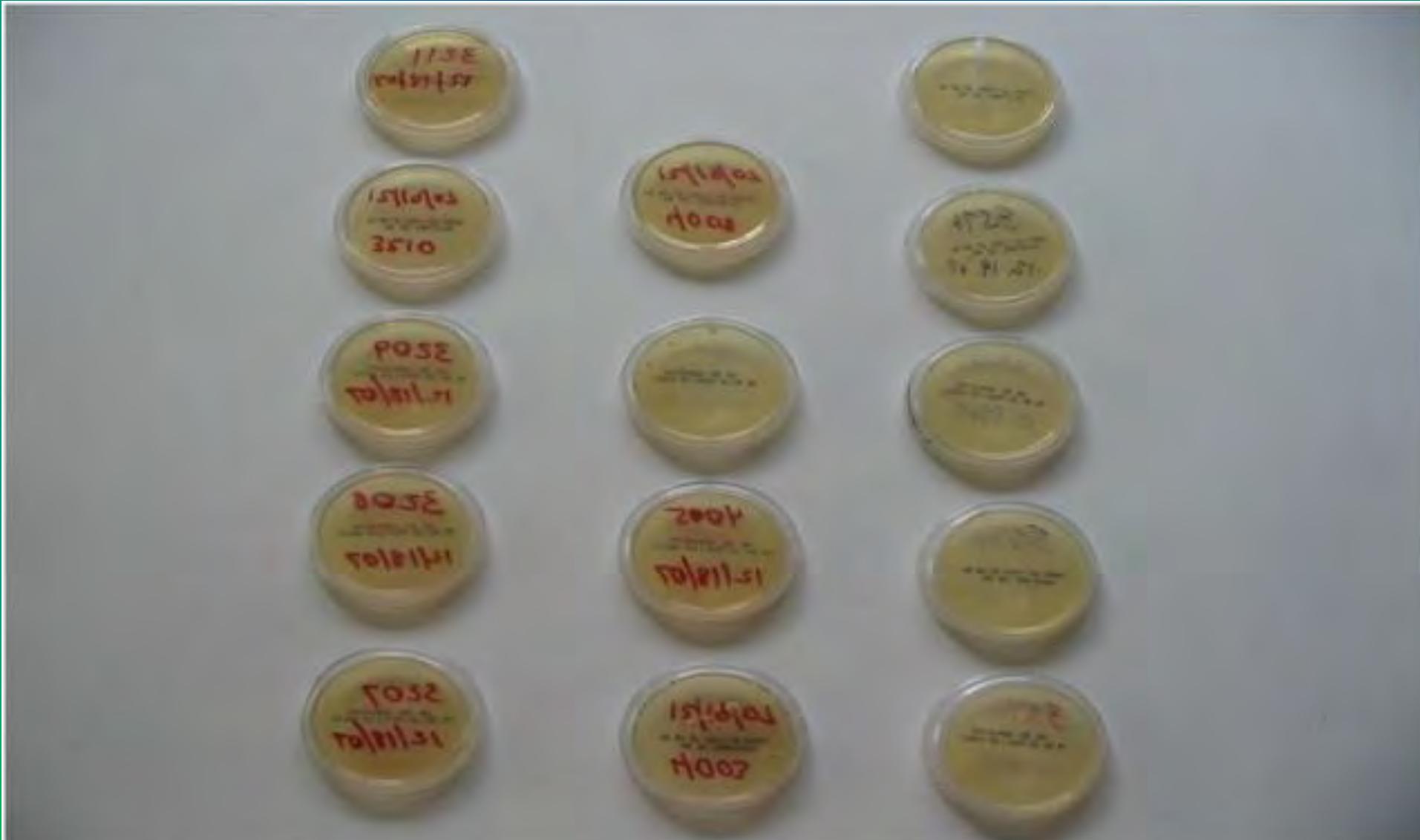
2 x 2 x 2 x 2 x....x 2 = ?

$$2^{10} = 1,024$$

$$2^{20} = 1 \text{ million } +$$

$$2^{30} = 1 \text{ milliard } +$$

Serpentins avec UV





Désinfection

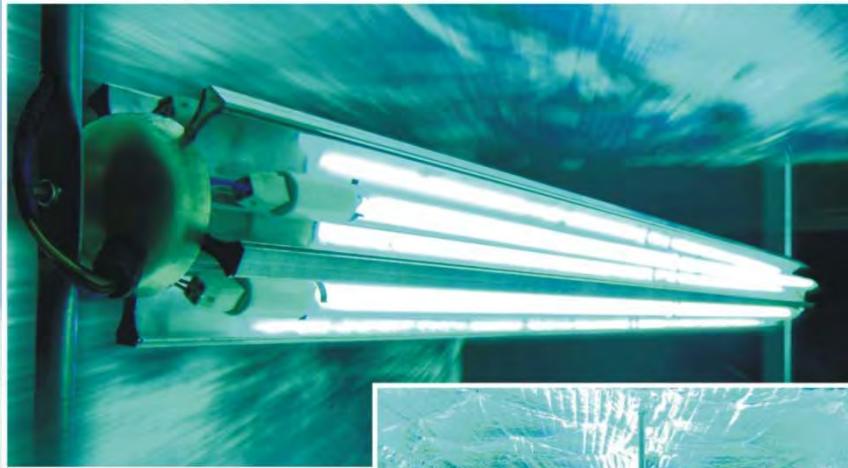
- Elimination du bio-film de moisissures
- Réduction de la perte de pression
- Augmentation du transfert de chaleur
- Économie d'énergie

Désinfection de l'air en gaine



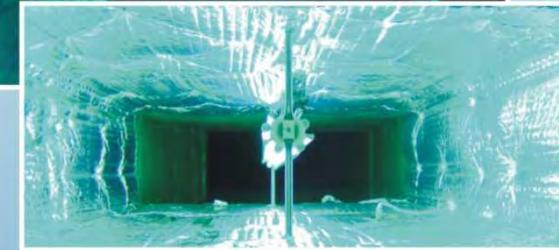
UV Bio-Wall QUATTRO

- Treat 100% of the air on one pass



UV Bio-Wall

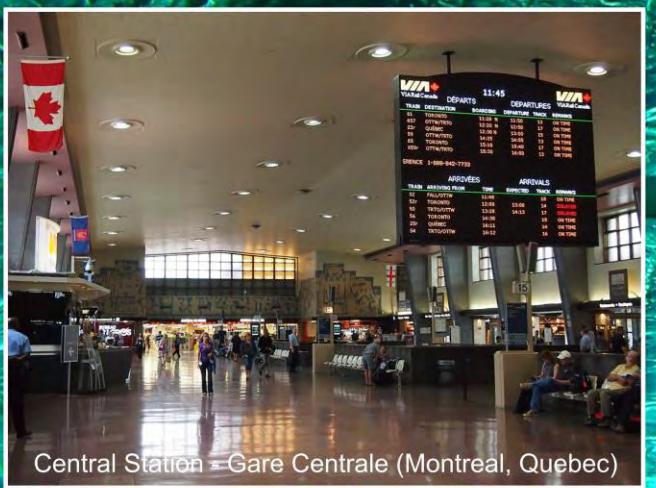
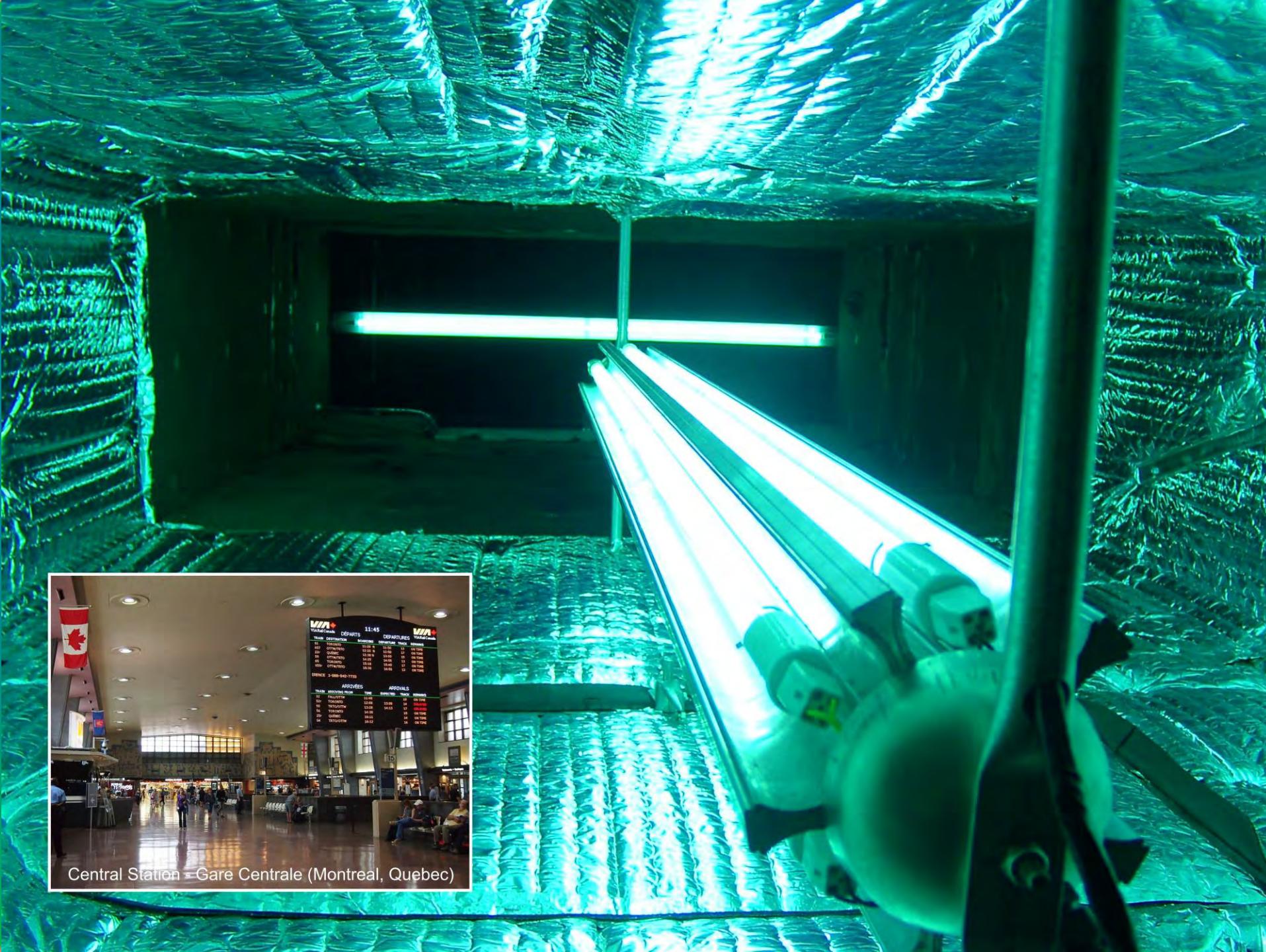
- Available in sizes up to 60" in length
- For large systems



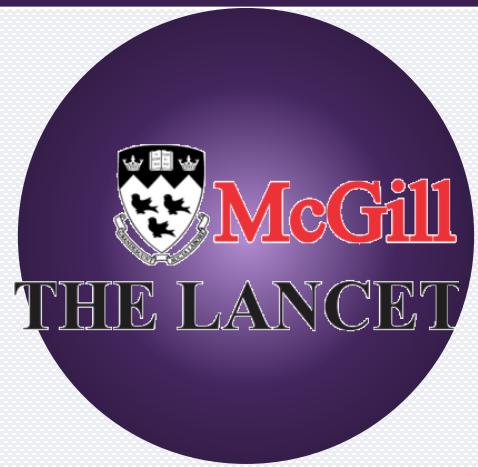
The UV Bio-Wall was EPA & Homeland Security (NHSRC) tested against Biological Warfare agents (BWAs).



SANUVOX
PHIOLADY



Central Station - Gare Centrale (Montreal, Quebec)



Revue Médicale : The Lancet Medical Journal

“Sanuvox diminishes 20% overall sickness, 40% respiratory symptoms and 99% reduction of microbial and endotoxin concentration on surfaces within the ventilation system”

“UGVI installation in North American offices could resolve work-related symptoms in about 4 million employees caused by microbial contamination of HVAC systems”



The US Center for Disease Control and Prevention

“UV in times of Covid” recommends the use of UV to inactivate airborne viruses



US Environmental Protection Agency (EPA)

and the Office of Research and Development - National Homeland Security have tested Sanuvox products for their technology



ASHRAE

Proud to contribute to the norms and practices of Chapter 16 *“Ultraviolet Air & Objects Purification”*, 2018 ASHRAE manual about HVAC systems and equipments

Coût annuel par pied carré pour assurer l'immunité de l'air d'un bâtiment

2.3 cents/ pi²	2.6 cents/ pi²	- 3.3 cents/ pi²
Immobilisation équipements (amortissement: 15 ans)	Maintenance (Remplacement des lampes UV tous les 2 ans)	Économies d'Energie (Serpentins HVAC propres)

Coût annuel net: 1.6 cent / pi²