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NOT FOR PROFIT

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Made in Canada  
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Canadian content

# Environmentally Responsible PPE



Supported in part by:



Innovation, Science and  
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Executive

Nancy Henry,  
Executive

Jason Zanatta,  
Executive



# Commercial Interest Disclosure

**CAPPEM is a not-for-profit organization.**

**Our member companies  
develop, manufacture and sell  
medical masks & respirators.**



# Canada's Plan

**“Challenge innovative companies to develop research-based solutions, technologies, and products that can address a variety of COVID-19 issues.”**

**WHEN TIMES GET TOUGH**



**CANADIANS GET THINGS DONE**

#MadeInCanadaProject



# Made in Canada Project

“supporting Canadian manufacturers of personal protective equipment (PPE) to build domestic capacity”

Canada Prime Minister of Canada Justin Trudeau News About The Ministry Connect Photos & Videos FR

ARCHIVED - Minister of Innovation, Science and Industry Supplementary Mandate Letter

January 15, 2021

Office of the Prime Minister Cabinet du Premier ministre Ottawa, Canada K1A 0A2

Dear Mr. Champagne:

Thank you for continuing to serve Canadians as Minister of Innovation, Science and Industry.

Since my previous mandate letters, our country has been confronted by the most serious public health crisis we have ever faced. The global pandemic has had devastating impacts on lives and livelihoods and exposed fundamental gaps in our society. Challenges that existed before the pandemic remain and others have been exacerbated. In light of these realities, I am issuing this supplementary letter to outline further responsibilities and considerations that I expect you to

AAFC Canada @AAFC\_Canada · 5m  
Replying to @AAFC\_Canada  
Have ideas about what this st should look like? Have your s online consultation: [ow.ly/4vs](https://ow.ly/4vs)

AAFC Canada @AAFC\_Canada · 7m



# Working Together



Careswell Medical Supplies  
*We Care About Your Wellbeing*



# CoVID



Reduce **Airborne Transmission**

**39,000,000**

**Canadians**





**3,000,000**

**HCWs**



**29,000,000**

**Hospitalizations**



**250,000**

**Long-Term Care Residents**



**1,000,000**

**Teachers & support staff**



**7,500,000**

**Students**



# Community Cases

Schools ~40%



Healthcare ~25%



# Threats

1. CoVID is Not Over
2. Long Covid
3. Next pandemic
4. Lab leaks
5. Bioterrorism
6. Supply chain
  1. China – Taiwan, Russia, trade war
  2. US – Defence Production Act

Regional Municipality of York  
Credit: THE CANADIAN PRESS









# Time to End Single Use Plastics

- ✓ **straws**
- ✓ **stir sticks**
- ✓ **checkout bags**
- ✓ **ring carriers**
- ✓ **cutlery**
- ✓ **foodservice ware**



# Time to End Single Use Plastics

→ **Medical Masks**

→ **Respirators**



# Federal Govt

- ✓  **Innovation support**
- ✓  **Unanimous Consent Motion – Buy Canadian PPE**
- ✓  **PSPC Policy – Buy Canadian PPE**
- ✓  **Environmental Policy – Buy green PPE**



# Directive on the Management of Procurement



**Government  
of  
Canada**

<https://buyandsell.gc.ca/modernization-of-government-wide-procurement-policy-transition-from-the-contracting-policy-to-the-directive-on-the-management-of-procurement>



# Requirements



Public Services and  
Procurement Canada

Ensuring that the intended outcomes of the procurement are aligned with the departmental mandate and priorities, available funds, and **key socio-economic and environmental benefits**:

Where appropriate, including **environmental considerations** when specifying requirements for goods, services and construction and leveraging procurement practices in accordance with the ***Policy on Green Procurement***



# Guidance to Reduce the Environmental Impacts of Waste Throughout the Personal Protective Equipment (PPE) Lifecycle



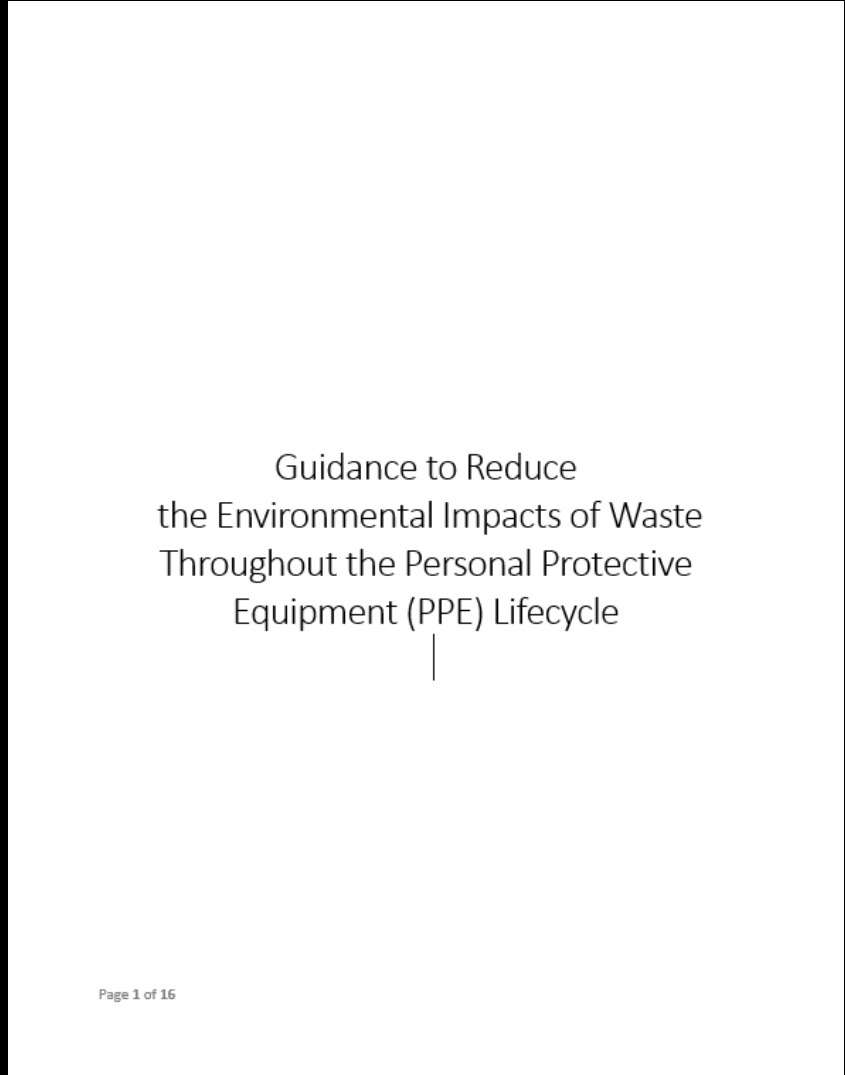
**Government  
of  
Canada**



# Canada's Green PPE Guidance

## “9.2.3 Innovation

- Take steps centrally to facilitate the systematic consideration of “green criteria”** in PPE procurement decisions. For example, including environmental considerations when PPE supply arrangements are being renewed.
  
- Identify opportunities for the federal government to lead by example** and highlight emerging technologies related to the manufacture, use and disposal of PPE, with the objective of supporting wider availability of products that aim to reduce the overall environmental impact.”







# Canada's Green PPE Guidance

Several departments, agencies and programs were consulted on specific aspects of the Guidance, including:

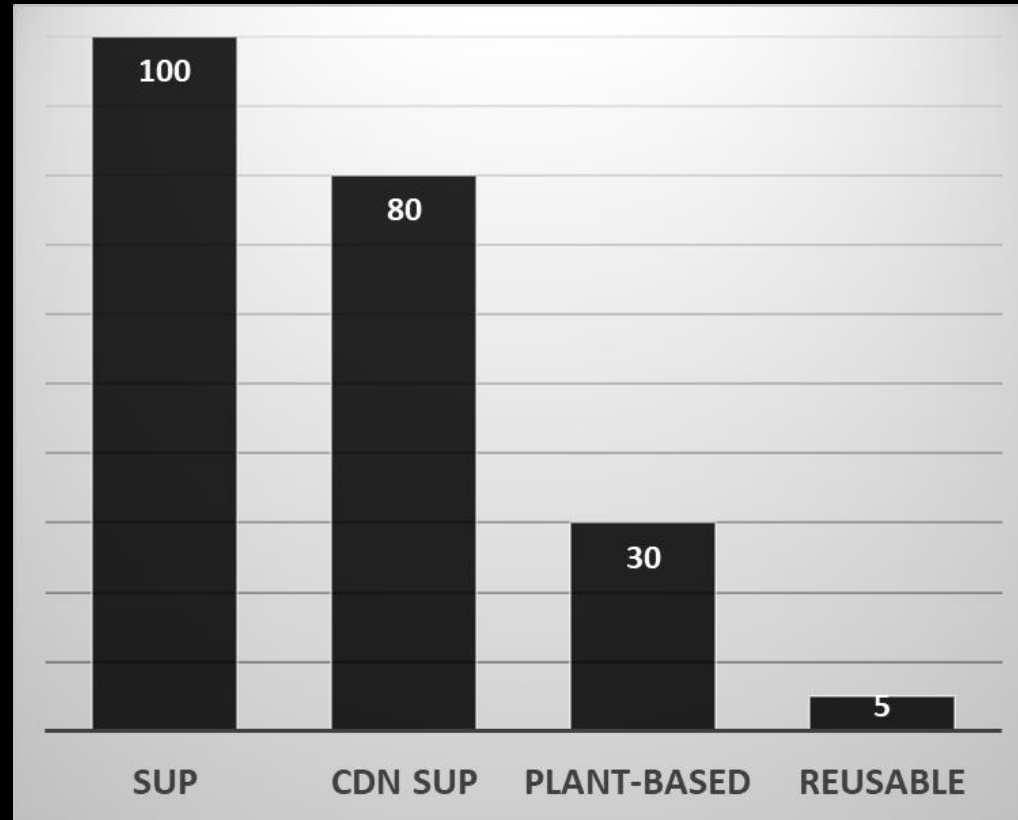
- Environment and Climate Change Canada – environmental management and waste;
- Public Services and Procurement Canada – procurement and waste;
- Public Service Occupational Health Program – health and safety requirements; and,
- Treasury Board Secretariat and the Centre for Greening Government – partnership and coordination.

In addition, the Guidance was informed by advice and input from an interdepartmental Working Group with representation from the following departments:

- Correctional Service of Canada
- Department of National Defence
- Environment & Climate Change Canada
- Fisheries and Oceans Canada
- Health Canada
- Transport Canada
- Treasury Board Secretariat
- Public Services and Procurement Canada



# Carbon Footprint



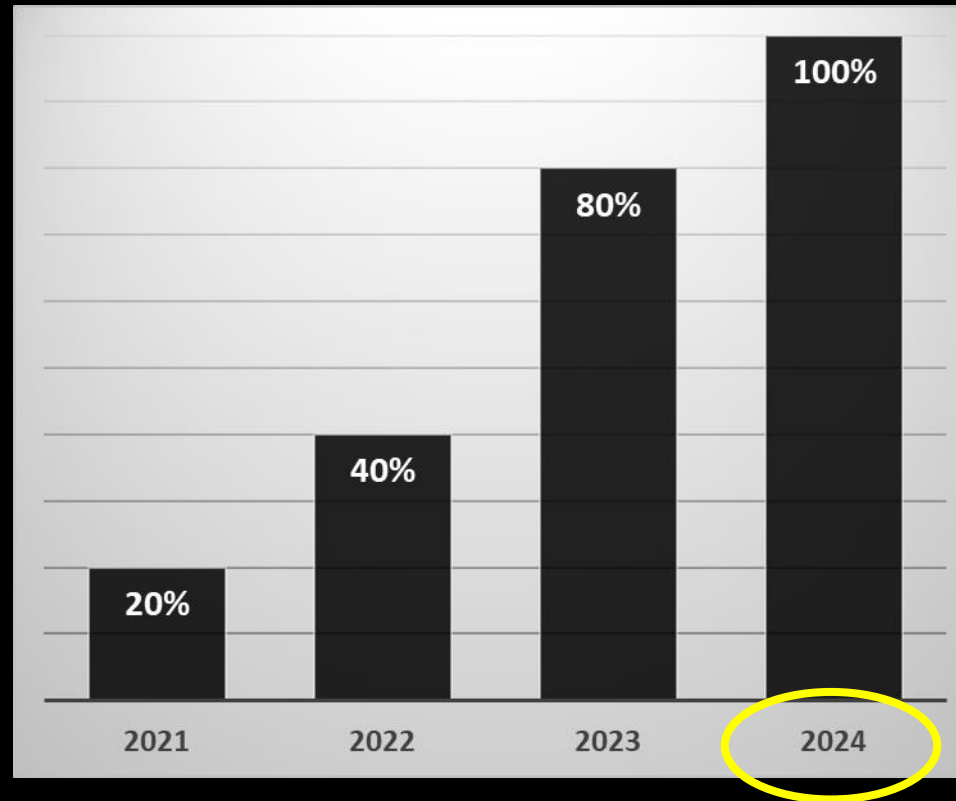
CAPPEM

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# CAPPEM Canadian Content





# Made In Canada

## Meltblown



Nanofibre  
Easy breathing  
Plant-based

## SUPs



## Disposable



## Spunbond



Plant-based

## Plant-based



## Reusable





# Made In Canada

2021

Medical Masks  
Disposable Respirators  
Reusable Respirators  
Polypropylene Meltblown

2022

Plant-based Plastic  
Plant-based Meltblown  
Plant-based Spunbond  
Nose Wire  
Ear Loops

2023

Polypropylene Spunbond  
Polypropylene Resin

2024

# PreCovid



# Made In Canada



# Plant-based





# Plant-based

Partial Funding

**NGen**

Next Generation  
Manufacturing Canada





# Reusables

**10X** more protective

**10X** more environmentally-friendly

**10X** lower cost



# Better Protection, Less Waste



## Canadian Coalition for Green HealthCare

“Made in Canada reusable respirator.

Better protection less waste. Should be standard issue by now...”



# Non-Sterile Devices

1. Personal protective device
2. **Do not** remove in a contaminated environment
3. **Do not** sterilize or change filters between patients

**Manitoba bought 500K reusable N95 respirators. 3 years later, 98% are in storage**



Respirators were bought for health-care workers in 2020, but process to clean them took too long



Vera-Lynn Kubinec · CBC News ·

Posted: Apr 11, 2023 6:00 AM EDT | Last Updated: 5 hours ago



In May 2020 the province of Manitoba announced it was buying 500,000 reusable N95 silicone respirators from Winnipeg-based company Precision ADM Inc., but the vast majority of the masks have not been used and remain in a storage warehouse. (Jeff Stapleton/CBC)



# Pragmatic Care & Cleaning

- 1. Assign to individual HCW**
- 2. Store in clean location**
- 3. Clean daily with wipes or warm, soapy water**
- 3. Decontaminate as indicated with alcohol wipes, UV, washer-disinfector**



# Pragmatic Filter Changes

	<b>Disposables (4 / day)</b>	<b>Reusables (Daily)</b>	<b>Reusables (Weekly)</b>
<b>Tonnes Waste</b>	13.2	0.48 (3.6%)	0.07 (0.5%)
<b>\$</b>	\$2,200,000	\$550,000 (25%)	\$150,000 (7%)

Annual per 1,000 HCWs



# CSA Standards for Respirators

## It's a Different World Now.

SARS H1N1 MERS

SARS2

?

?

1982...1993...2002...2011...2018...2023...2028...2033

PANDEMIC

?

?

# Medical Masks



Leak

# Particulate Respirators



Uncomfortable



Hot

**Too hard to breathe through**



# Reusables

# RPE History

# Disposables



Plant-based,  
or Reusable,  
Bioaerosol  
Respirator

ASTM (Latex)

BA1,2,3

Manchurian Flu Spanish Flu

MDRO TB 9/11 SARS H1N1 SARS Ebola MERS SARS2

1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010 2020 2030

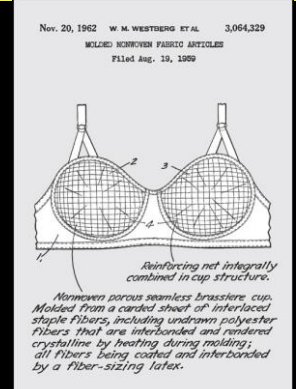
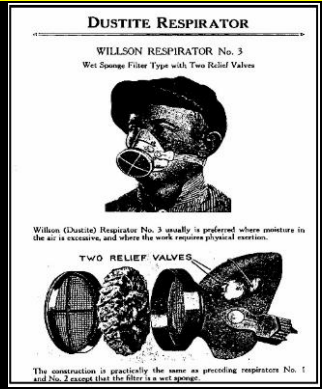
Federal Mines & Safety Act NPPTL Respirator Standard

Non-Woven Textiles

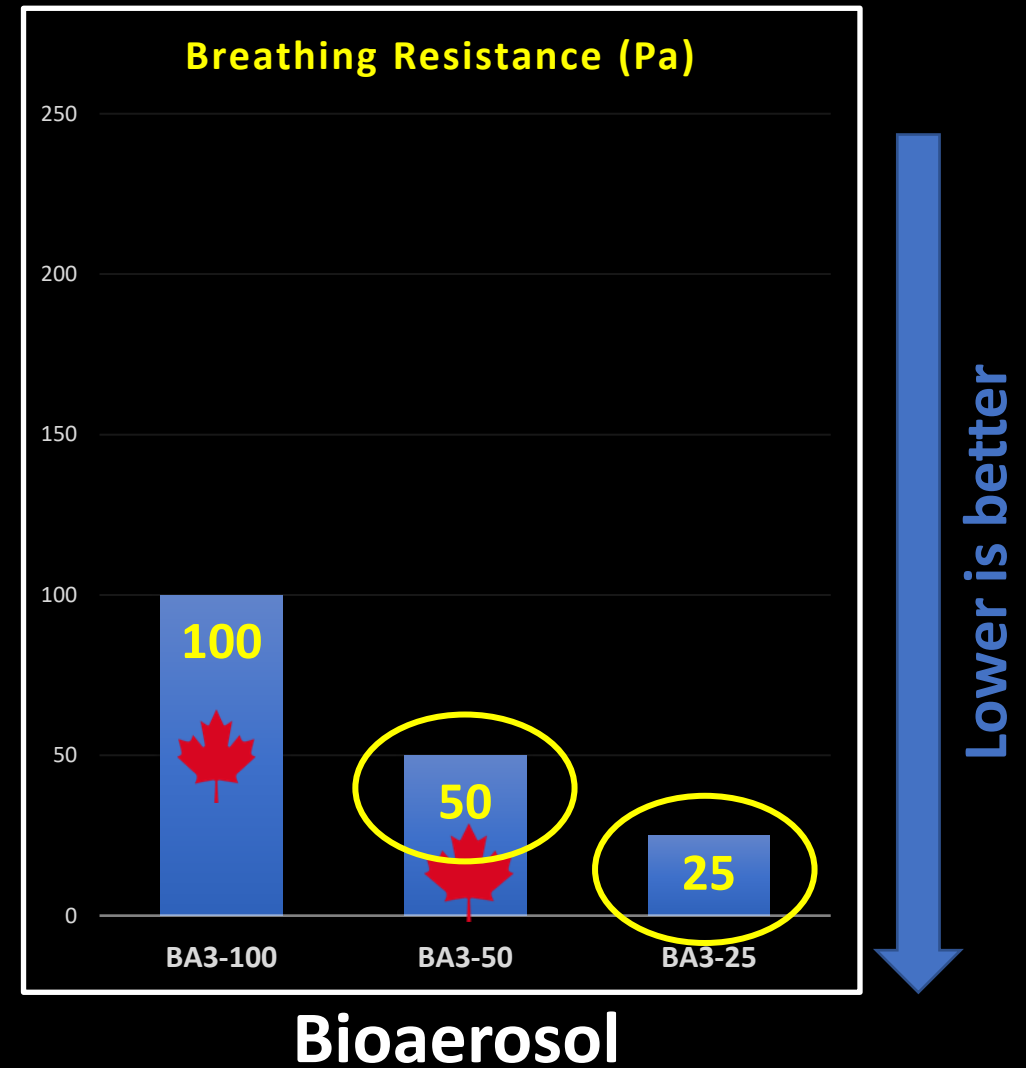
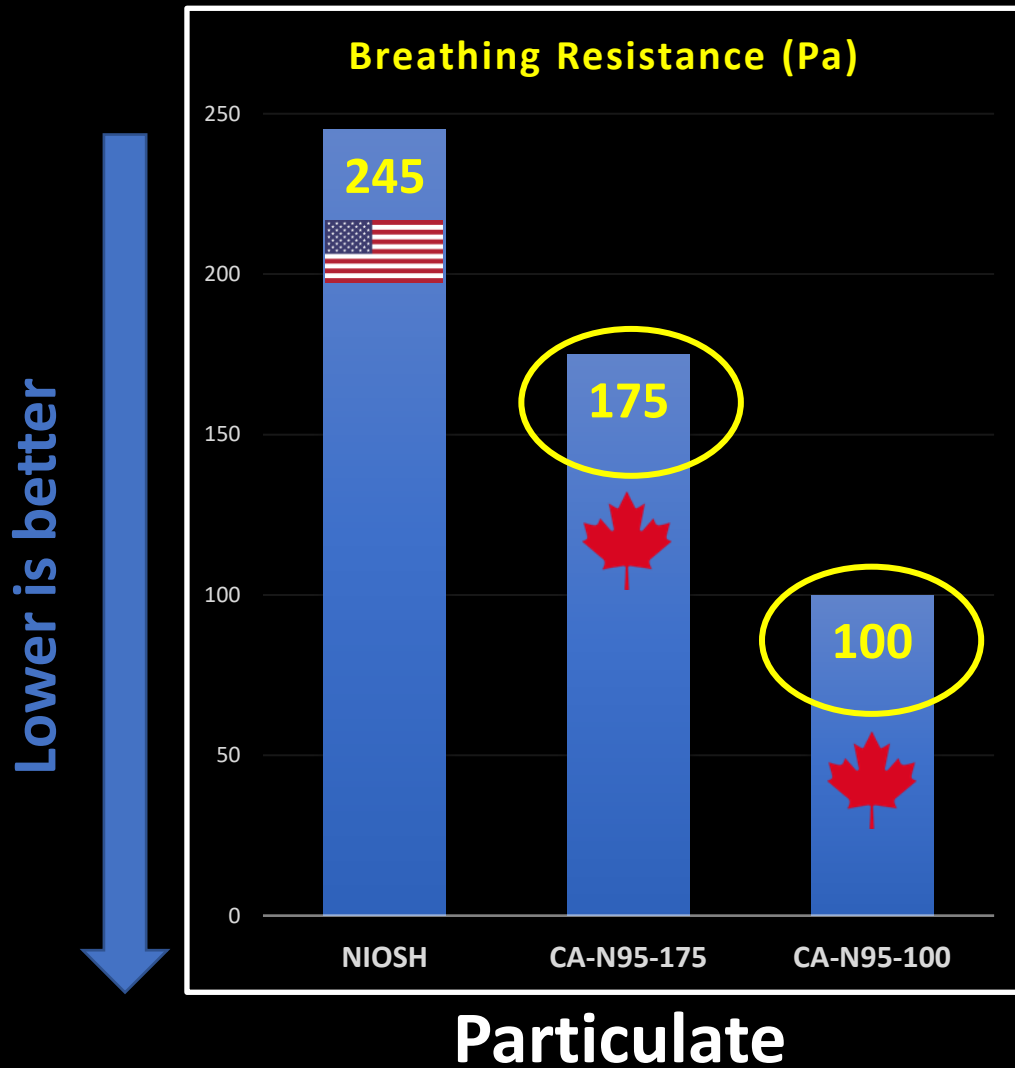
OSHA NIOSH (Salt)

N95

CA-N95



# Breathing Resistance





# Bioaerosol Respirator

$\frac{1}{2}$  the filter material

$\frac{1}{2}$  the waste



# Disposable

Plant-based option



**BA1**

**<5% Leak**



# Disposable

Plant-based option



**BA2**

**<1% Leak**



# Reusable



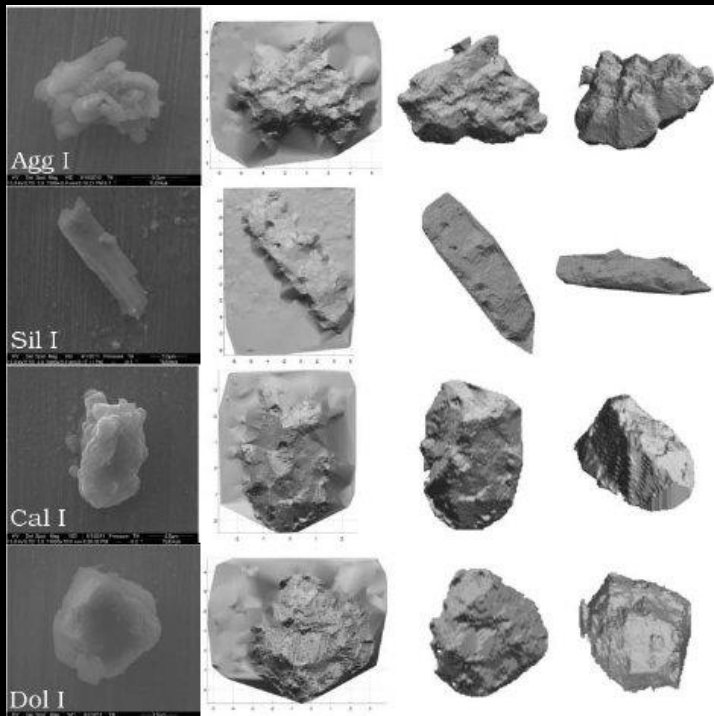
**BA3**



**<0.5% Leak**

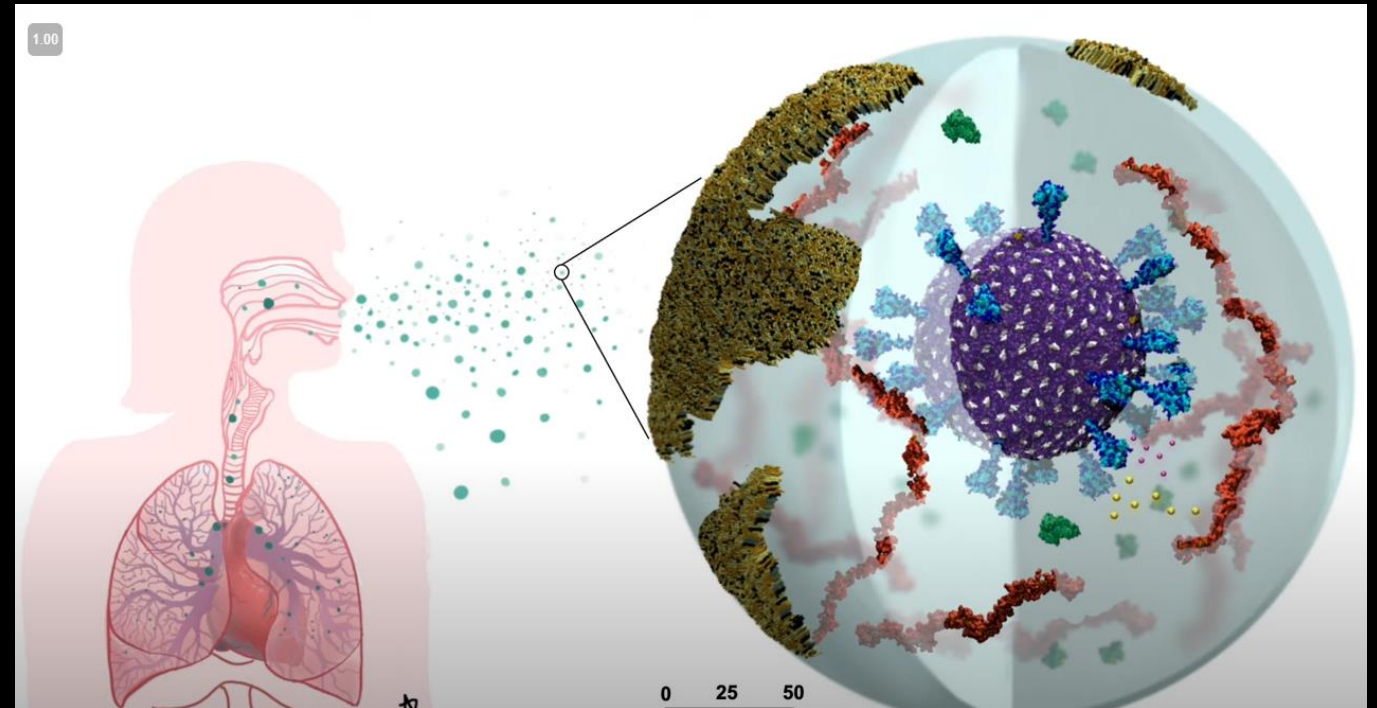
# Particulates

Sharp, hard, heavy, asymmetrical  
10 nm and larger



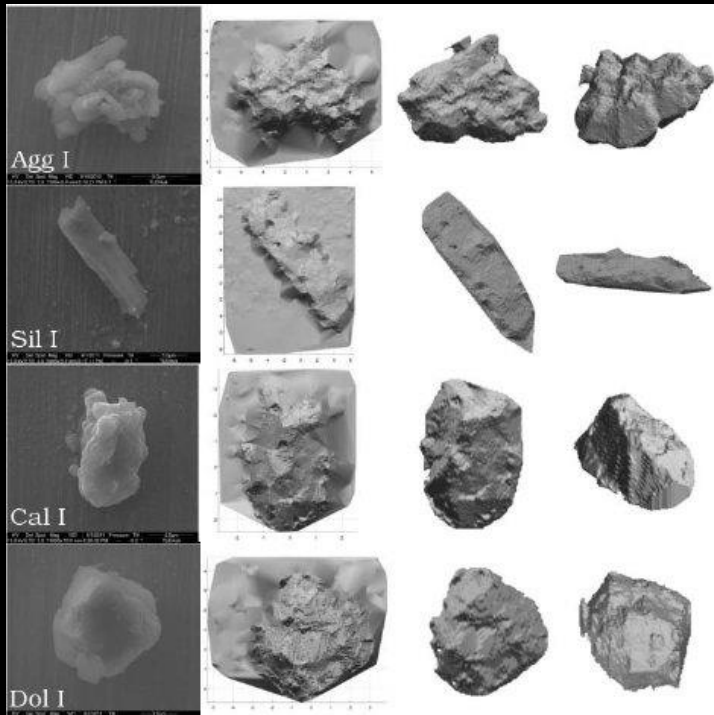
# H2H Bioaerosols

Sticky, watery, light, spherical  
300 nm and larger



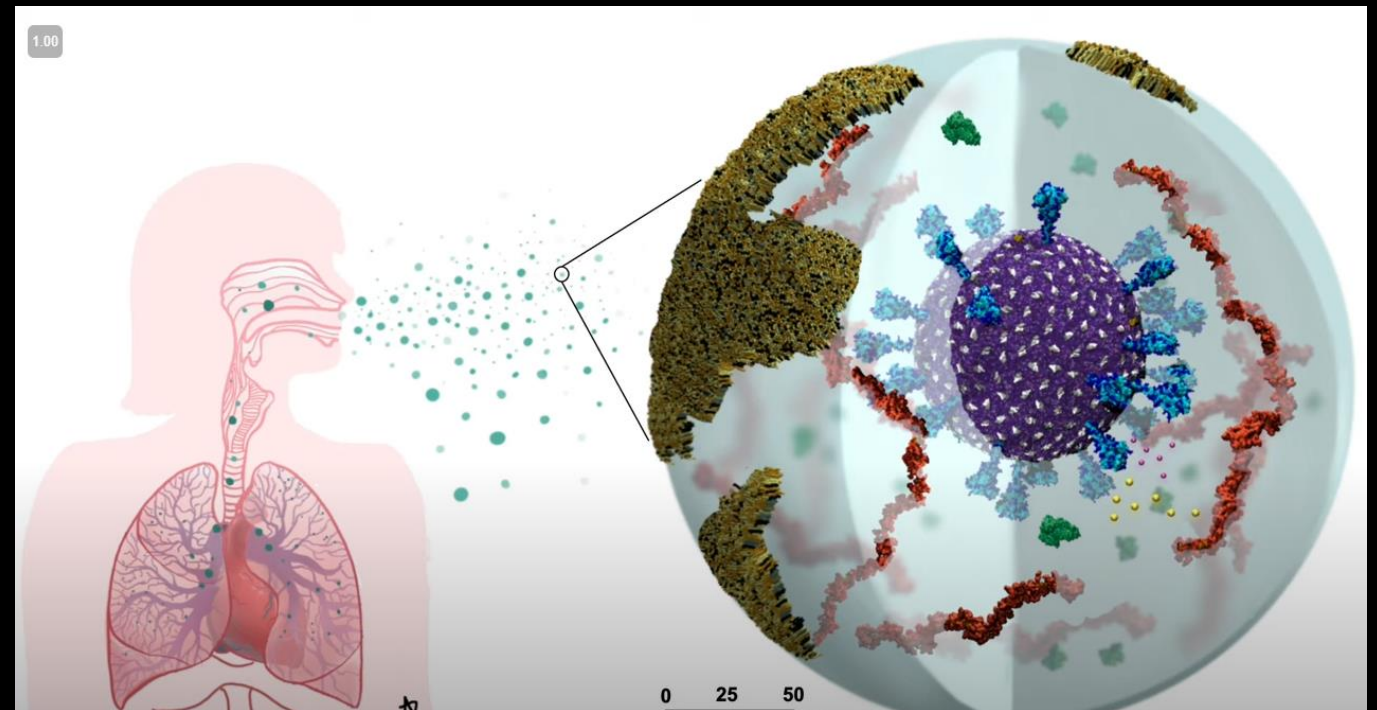
# Particulates

Salt 2.2 g/cm<sup>3</sup>  
Mineral dust 2.6 g/cm<sup>3</sup>



# H2H Bioaerosols

Latex 1.05 g/cm<sup>3</sup>  
Bioaerosol 1.0 g/cm<sup>3</sup>





# H2H Bioaerosol Viral Load

**“85% of the total viral load was emitted in fine aerosols ( $\leq 5 \mu\text{m}$  in diameter)**

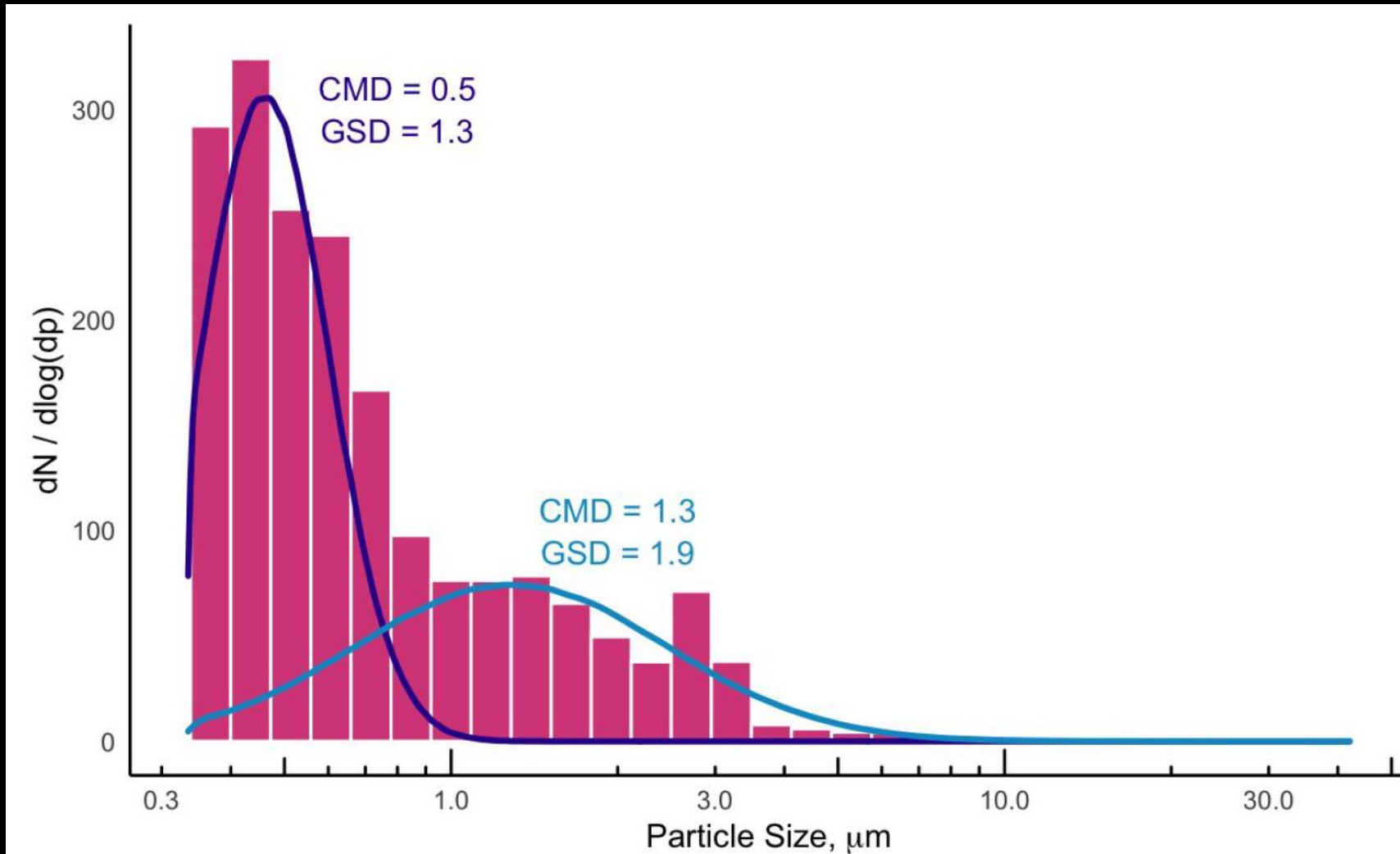
when compared with coarse aerosols ( $> 5 \mu\text{m}$  in diameter), which is consistent with the observation that smaller **particles ( $0.65\text{--}4.7 \mu\text{m}$ ) account for 77–79% of total virus particles** shed by experimentally infected cynomolgus macaques [15]”.

**Viral Load of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) in Respiratory Aerosols Emitted by Patients With Coronavirus Disease 2019 (COVID-19) While Breathing, Talking, and Singing**

Kristen K Coleman, Douglas Jie Wen Tay, Kai Sen Tan, Sean Wei Xiang Ong, The Son Than, Ming Hui Koh, Yi Qing Chin, Haziq Nasir, Tze Minn Mak, Justin Jang Hann Chu ...

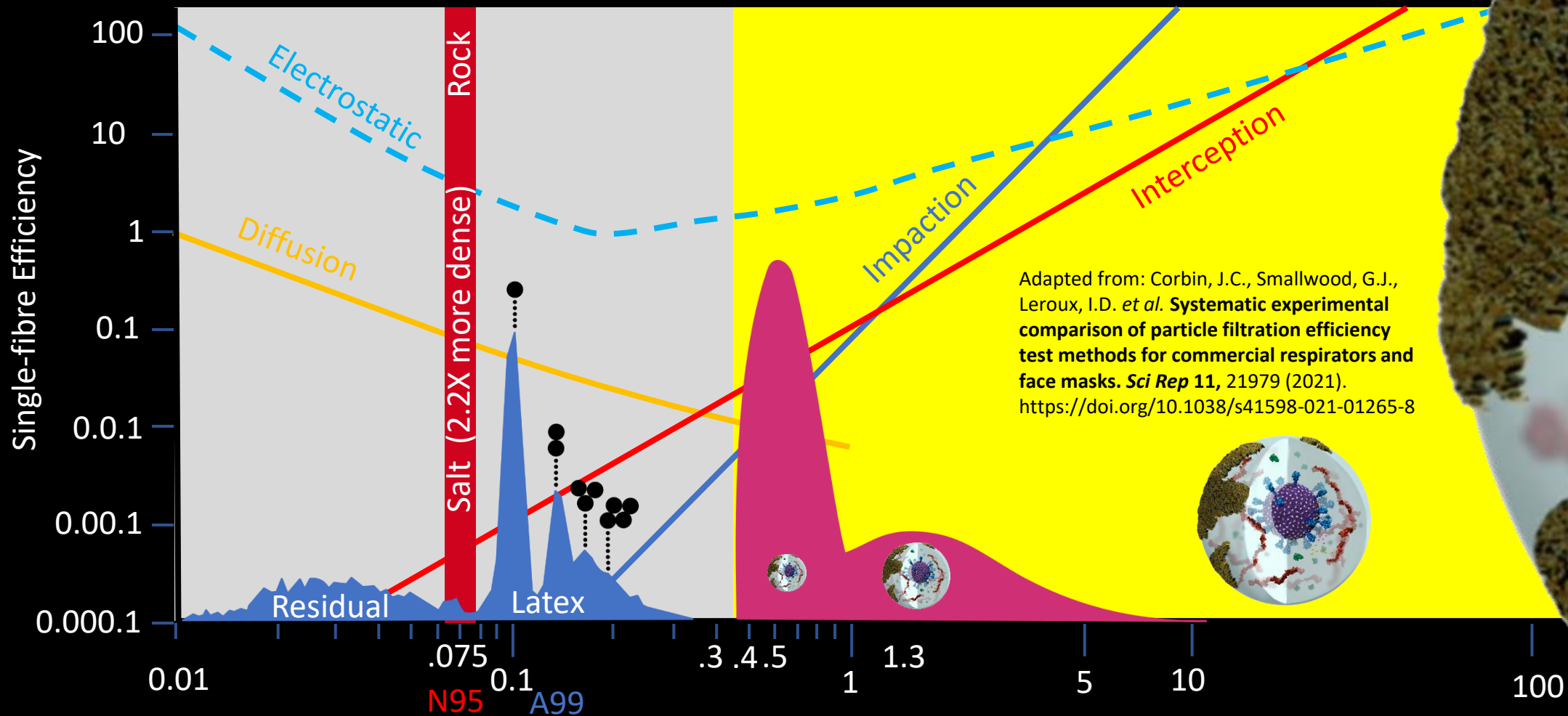
*Clinical Infectious Diseases*, ciab691, <https://doi.org/10.1093/cid/ciab691> Published: 06 August 2021

# H2H Bioaerosol Sizes



1. **Respiratory Aerosol Emissions from Vocalization: Age and Sex Differences Are Explained by Volume and Exhaled CO<sub>2</sub>**
2. Nicholas Good, Kristen M. Fedak, Dan Goble, Amy Keisling, Christian L'Orange, Emily Morton, Rebecca Phillips, Ky Tanner, and John Volckens
3. *Environmental Science & Technology Letters* **2021** 8 (12), 1071-1076
4. DOI: 10.1021/acs.estlett.1c00760

# Filtration Efficiency

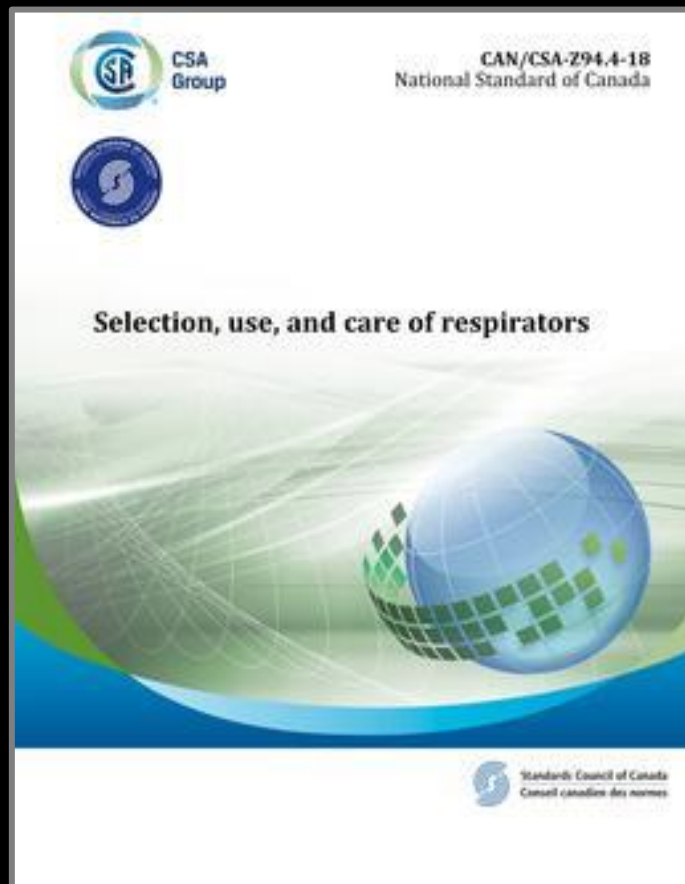


Adapted from: Corbin, J.C., Smallwood, G.J., Leroux, I.D. *et al.* **Systematic experimental comparison of particle filtration efficiency test methods for commercial respirators and face masks.** *Sci Rep* 11, 21979 (2021). <https://doi.org/10.1038/s41598-021-01265-8>





# CSA Selection, care & use of respirators



**Proposed for 2024:**

**Universal Respirator Use in Healthcare Facilities  
(unless PCRA says not needed).**

**Bioaerosol Option**

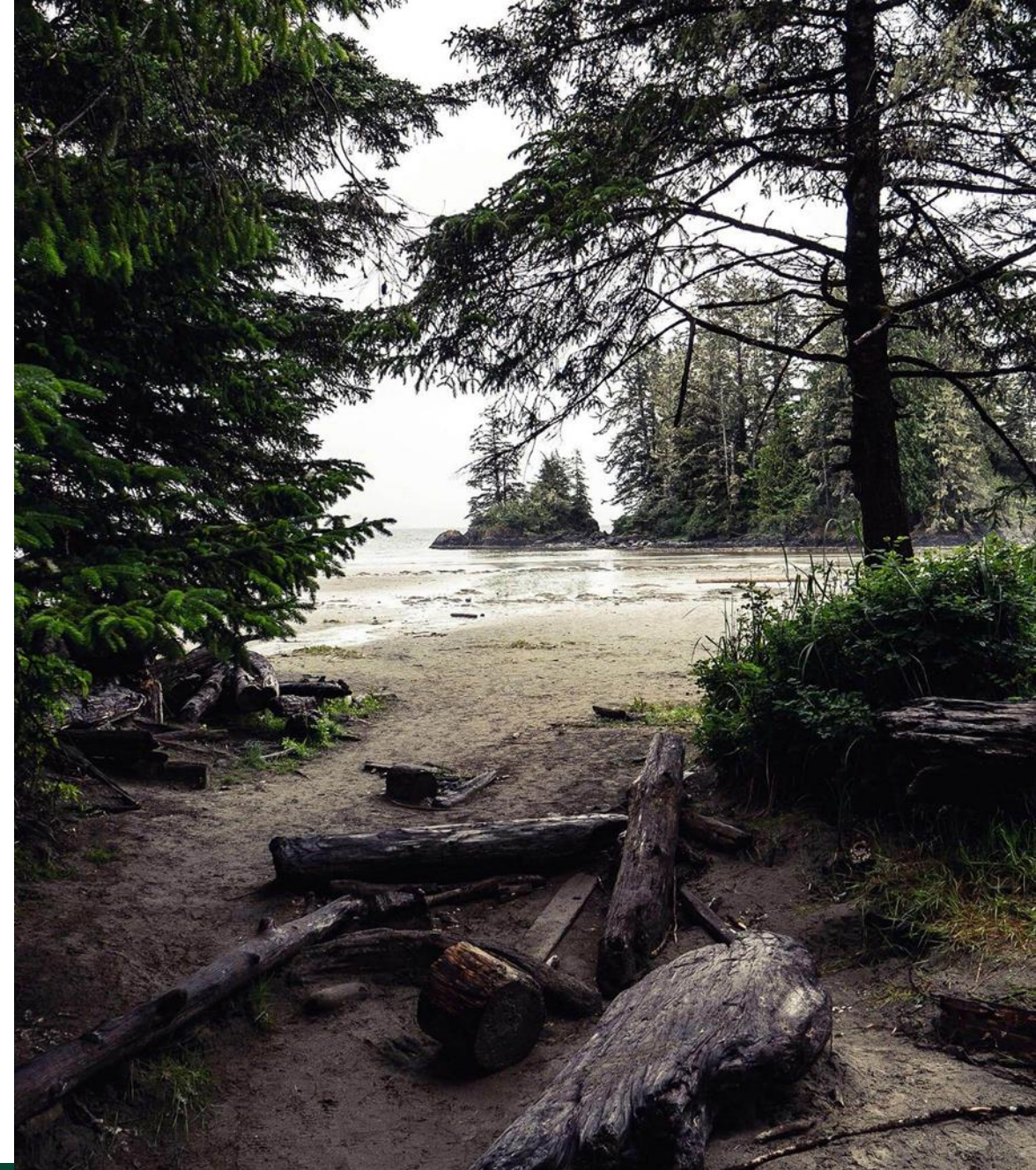
**Consider the environment**

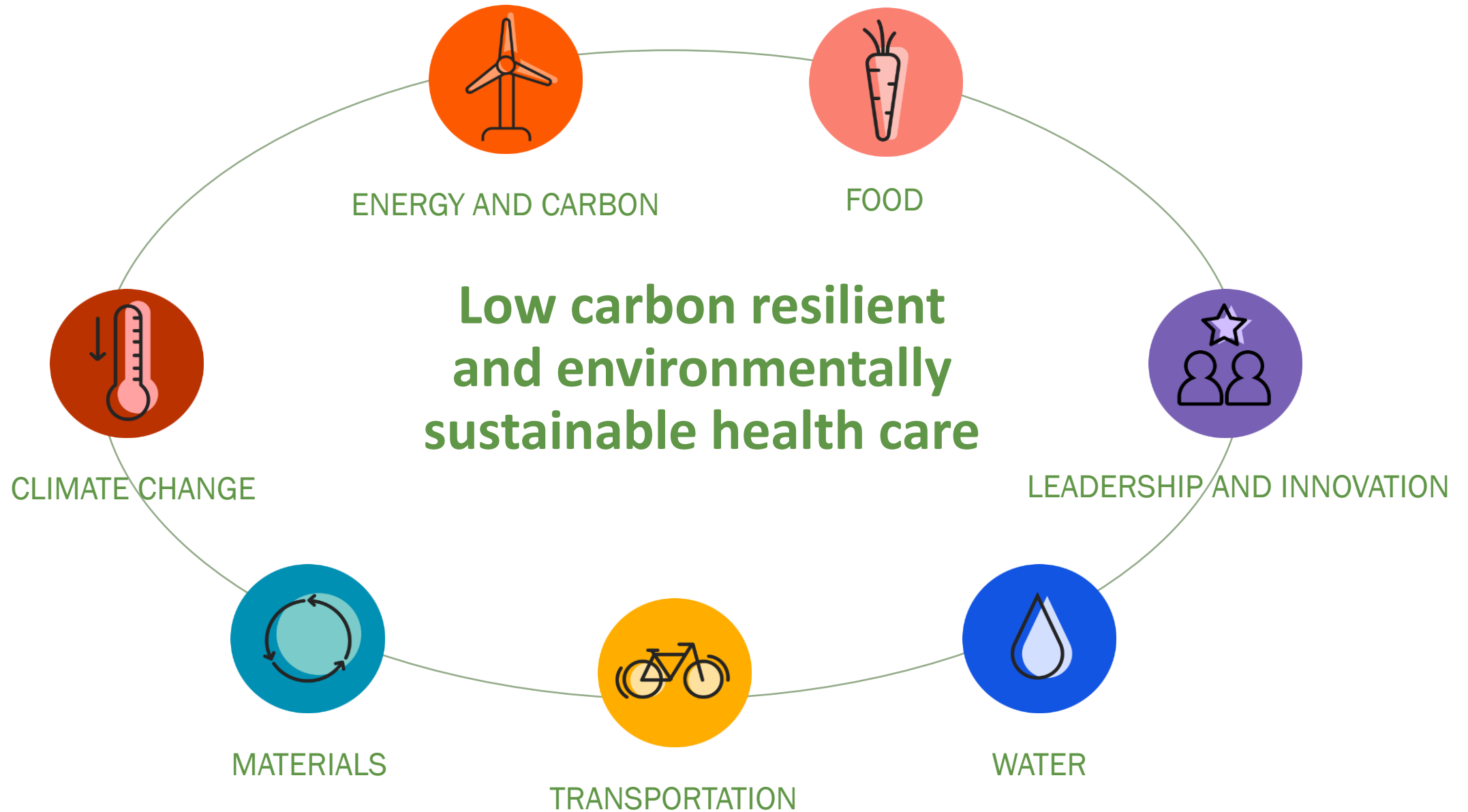
# Reusable and sustainable PPE in B.C.

IPAC Canada National Conference  
Tuesday May 30, 2023

# Energy & Environmental Sustainability (EES) Team

A regional collaboration team that supports low carbon, climate resilient and environmentally sustainable health-care.





# Saving money and the environment

## Background

- ▶ Fraser Health accounts for 75% of Metro Vancouver's disposable gown consumption
- ▶ Before 2020, Surrey Memorial Hospital alone constituted 50% - 75% of Fraser Health's disposable gown usage each week

## Opportunity

- ▶ Supplement the inventory of disposable isolation gown with reusables
- ▶ Track costs and waste to measure impact

## Results

- ▶ By February 2021 reusable gowns comprised 97% of gowns at the site
- ▶ 869,000 disposable gowns kept out of landfill
- ▶ Reusable gowns are **9 times cheaper per use**, leading to **\$2 million of savings** in 6 months.





# Going the extra step

## Background

- ▶ During the global PPE shortage in 2020, St. Paul's Hospital needed a stable supply of surgical gowns
- ▶ Their operating rooms were still running at full capacity and didn't slow down like other sites

## Opportunity

- ▶ A local company provided a reusable surgical gown service, which St. Paul's piloted, the first site to do so in B.C.
- ▶ The gowns come from Ecotex and are sterilized on-site in the MDR

## Results

- ▶ The reusable surgical gowns can be used 100 times then have a new life as a non-sterile isolation gown or warming jacket
- ▶ Reusable gowns provided a stable, reliable supply through the pandemic
- ▶ Increased labour needs, but the benefits are huge: lower cost, lower waste, peace of mind



# Ensuring quality in the PPE Testing Lab

## Background

- ▶ At the onset of the pandemic, there was an immediate increased demand for PPE around the world and it severely disrupted global supply chains
- ▶ Vancouver Coastal Health (VCH) recognized the need for a local lab that could quickly test and validate the effectiveness of PPE

## Opportunity

- ▶ VCH opened Western Canada's first accredited PPE testing lab in just a few months
- ▶ The scope of the lab now includes test methods for respirators, medical masks and gowns.

## Results

- ▶ The lab tests PPE for multiple health care organizations and local manufacturers
- ▶ They have prevented **2.4 million** unsafe respirators and **325,000** unsafe isolation gowns from entering B.C supply chain



# A better end-of-life scenario for PPE

## Background

- ▶ Thousands of masks, gloves and other PPE are disposed of weekly in B.C.
- ▶ The Canadian federal government provided research funding opportunities throughout the pandemic for better recycling options for PPE

## Opportunity

- ▶ In 2021, several B.C. health authorities participated in a mask recycling pilot program
- ▶ Building off the success of the pilot, the B.C. Ministry of Health announced they would fund a provincial PPE recycling program to be launched in June 2023

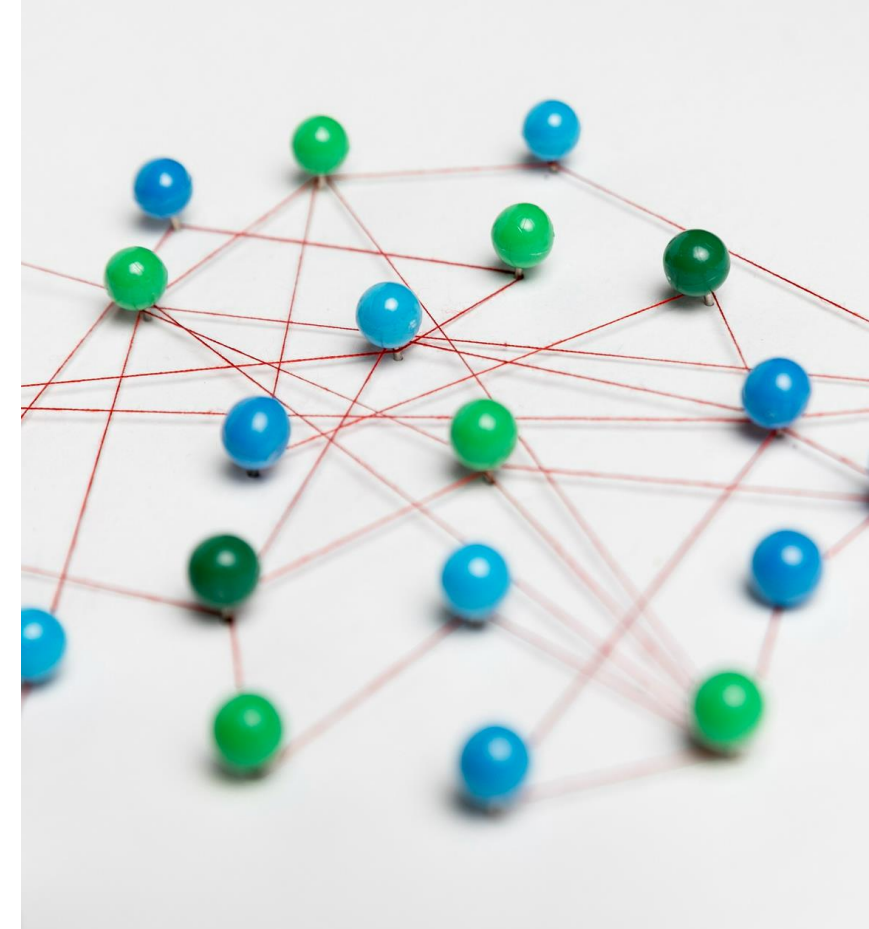
## Results

- ▶ **80 sites** across the province be able to opt-in to the PPE recycling program
- ▶ PPE will be sterilized and pelletized into pellets, to be used in new plastic products



# What's coming up?

- ▶ We want to lessen the negative impact of PPE on planetary health while making the health care system more resilient
- ▶ A **Reusables First** commitment will help get us there
- ▶ We are working with CASCADES:
  - ▶ To do an organizational analysis on clinical and procurement process
  - ▶ To co-create with IPAC a national guideline on the safe use of reusables in health care



# Let's work together

IPAC are our partners in our work, we can't do it without you!



# Thank you!

# Infection Control & Sustainability: Common Challenges, Common Goals

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IPAC Canada 2023 National Conference  
May 30, 2023

# CME Disclosure

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Ed Rubinstein is the Director of Energy & Environment at the University Health Network (UHN) in Toronto, Ontario.

His salary is supported by UHN. He has received no other funding for the research and information he will be presenting.





# Infection Control & Sustainability: Myth vs. Reality

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## **The Myth**

Infection Control & Sustainability are always at odds with each other.

## **The Reality**

There's more in common than you think.



image source: [https://en.wikipedia.org/wiki/Temperate\\_rainforest#/media/File:Windy\\_Bay\\_forest.jpg](https://en.wikipedia.org/wiki/Temperate_rainforest#/media/File:Windy_Bay_forest.jpg)

# Environmental health is a human health (and Infection Control) issue

*“Researchers have shown that **deforestation can drive outbreaks by bringing people closer to wildlife**, which can shed dangerous viruses. Scientists found these dynamics can explain several recent outbreaks of Ebola, including the largest one nearly a decade ago in Guinea, which scientists believe started after a toddler played in a tree that was home to a large colony of bats. The child may have touched something contaminated with saliva or waste from an infected bat, then put his hands in his mouth, inadvertently giving the virus a foothold.”*

 **PROPUBLICA**



# Environmental health is a human health (and Infection Control) issue

*“Climate change, pollution, changes in our weather patterns, more rainfall, more closely packed, dense cities and urban areas - - all of this facilitates the spread of antibiotic resistance.”*



**Climate change is contributing to the rise of superbugs, new UN report says**

By Janelle Chavez, CNN

Updated 9:30 AM ET, Tue February 7, 2023



# Climate change is a human health (and Infection Control) issue



*“...mosquito-borne diseases are already popping up in unexpected places, a shift scientists have attributed in large part to climate change.”*

## Could ‘tiger mosquito’ and climate change bring grim new diseases to Toronto?

New research indicates climate change will send new mosquito species north, and tropical ailments including dengue fever and Zika possibly along with it.



By **Kate Allen** Climate Change Reporter  
Wed., March 1, 2023 | 5 min. read



# Climate change is a human health (and Infection Control) issue



Climate change is forcing wildlife to move north – and they're bringing diseases with them



More interaction between humans and wildlife like ticks mean rise in risk of spreading disease



Darius Mahdavi · CBC News · Posted: Jan 09, 2023 4:00 AM EST | Last Updated: January 9



## Intensity and frequency of extreme novel epidemics

[Marco Marani](#)  , [Gabriel G. Katul](#) , [William K. Pan](#) , and [Anthony J. Parolari](#)  [Authors Info & Affiliations](#)

Edited by Simon Asher Levin, Princeton University, Princeton, NJ, and approved July 15, 2021 (received for review March 21, 2021)

August 23, 2021 | 118 (35) e2105482118 | <https://doi.org/10.1073/pnas.2105482118>

*“...we estimate that the yearly probability of occurrence of extreme epidemics can increase up to threefold in the coming decades.”*

# Climate change is a human health (and Infection Control) issue

**Bloomberg**

*“...global warming had made storms wetter and more intense than they would otherwise have been, hitting already vulnerable communities harder. That, in turn, has led to outbreaks of disease that are worse and harder to stem than would otherwise be the case..”*

## **A Deadly, Overlooked Consequence of Climate Change: Disease**

The largest cholera outbreak in Malawi shows how increasingly extreme weather is having negative impacts on health.



# We want our HVAC systems to work properly: Efficiently delivered air = Healthy air

- Calibrated sensors (humidity, temperature, etc.).
- Clean coils, ducts and filters.
- Calibrated valves and dampers.
- Variable speed drives.
- Balanced airflows (and pressures).
- Building Automation System (BAS) connection for monitoring and control.

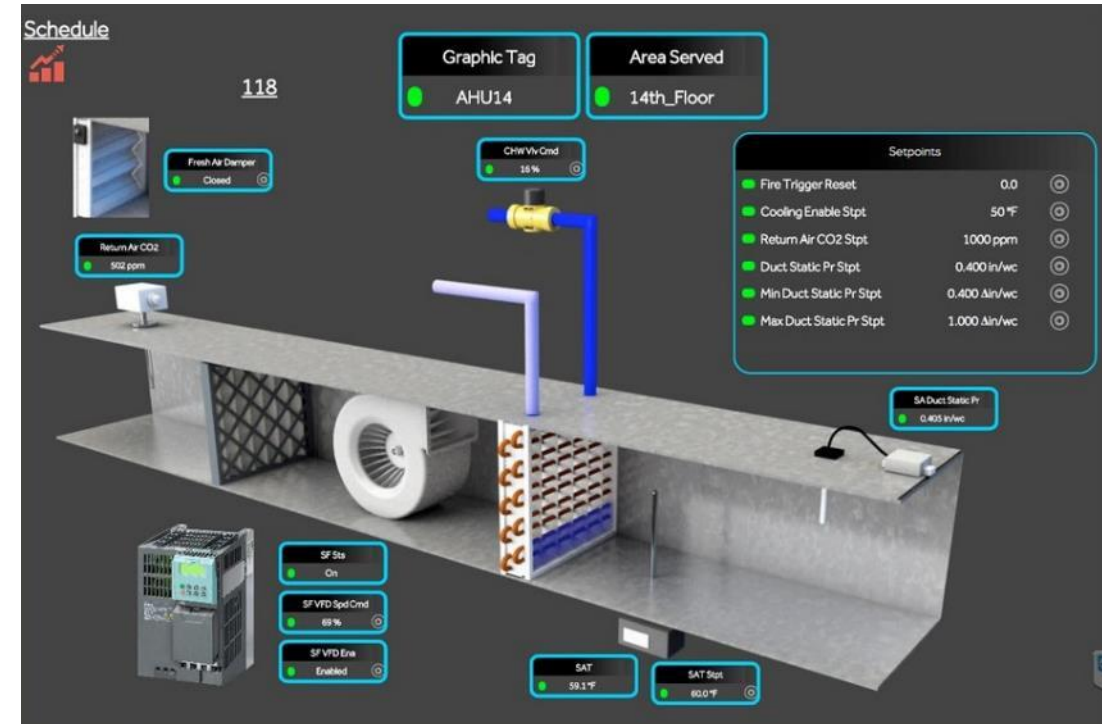


image source: <http://www.prweb.com/>

# It's not the heat, it's the humidity.

Actually, it's the heat too, but poor humidity control is a sign that HVAC is not working properly and can lead to:

- Complaints
- Sweating pipes and ducts...and mould.
- Increased infections

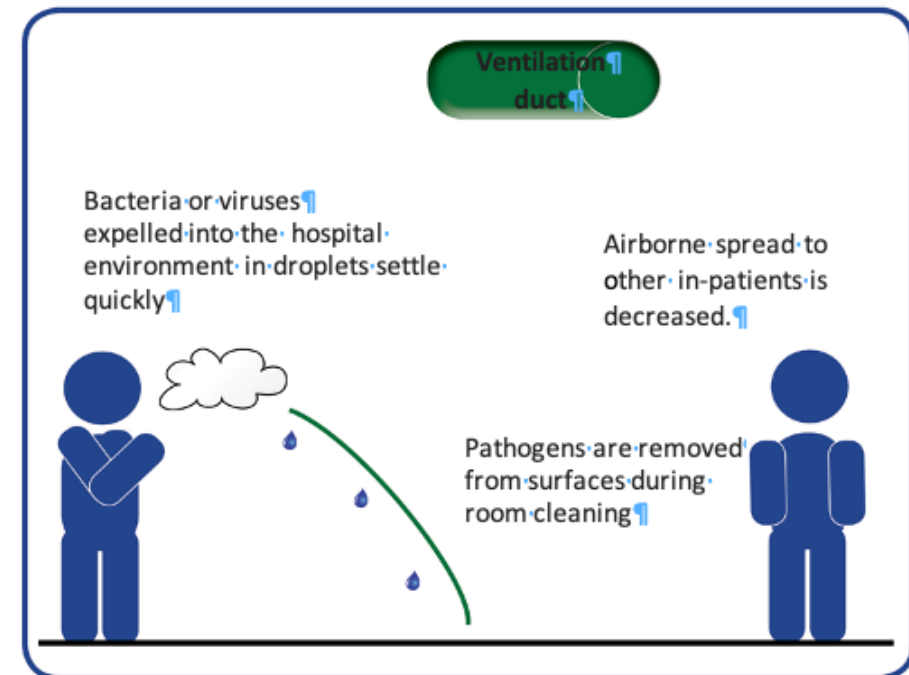
*“Relative humidity maintained between 40-60% decreases airborne transmission of infectious aerosols and optimizes natural respiratory immunity of patients.”*

## Why Water Vapor in Hospitals Matters

October 22, 2020

Stephanie Taylor, MD, CIC

**Infection Control Today**, Volume 24, Issue 10





# There is such a thing as being “too clean”

## SCIENTIFIC AMERICAN®

### Strange but True: Antibacterial Products May Do More Harm Than Good

Antibacterial soaps and other cleaners may actually be aiding in the development of superbacteria.

By Coco Ballantyne on June 7, 2007

*“When bacteria are exposed to triclosan for long periods of time, genetic mutations can arise. Some of these mutations endow the bacteria with resistance to isoniazid, an antibiotic used for treating tuberculosis...”*

[J Toxicol Environ Health B Crit Rev](#). Author manuscript; available in PMC 2018 Sep 6.

PMCID: PMC6126357

Published in final edited form as:

NIHMSID: NIHMS1502440

[J Toxicol Environ Health B Crit Rev. 2017; 20\(8\): 447–469.](#)

PMID: [29182464](#)

doi: [10.1080/10937404.2017.1399306](#)

Triclosan Exposure, Transformation, and Human Health Effects

[Lisa M. Weatherly](#)<sup>1,2</sup> and [Julie A. Gosse](#)<sup>1,2,\*</sup>

*“Many of these studies observed an association between a rise in triclosan exposure and reproductive and developmental defects in infants.”*

# We don't like drugs going down the drain (especially in handwashing sinks)



## Climate change is contributing to the rise of superbugs, new UN report says

By Janelle Chavez, CNN

Updated 9:30 AM ET, Tue February 7, 2023

*“Drug resistance can develop naturally, but experts say the overuse of antimicrobials in people, animals and food production has accelerated the process.”*

- Contamination of natural waterways
- Health and safety risk for municipal (and hospital) workers
- Potential disruption of sewage treatment
- Potential growth of biofilms in sinks



image source: <https://haguewaterofmd.com/>

# We want a safe and secure source of PPE...

[Prev Med](#). 2020 Dec; 141: 106263.

PMCID: PMC7531934

Published online 2020 Oct 2. doi: [10.1016/j.ypmed.2020.106263](https://doi.org/10.1016/j.ypmed.2020.106263)

PMID: [33017601](https://pubmed.ncbi.nlm.nih.gov/33017601/)

Contributing factors to personal protective equipment shortages during the COVID-19 pandemic

[Jennifer Cohen](#)<sup>a,b,\*</sup> and [Yana van der Meulen Rodgers](#)<sup>c</sup>

*“...very large demand shock triggered by acute need in healthcare and panicked marketplace behavior that depleted domestic PPE inventories.”*

*“...encourage development, testing, and production of higher-quality, **reusable** PPE.”*



image source: [www.cpacanada.ca/en/news/pivot-magazine/ppe-waste-environment](http://www.cpacanada.ca/en/news/pivot-magazine/ppe-waste-environment)

# ...that is less harmful to the environment...

## Reducing Hospital-Related PPE and Medical Single-Use Plastic Waste Through Circular Economy Practices

Presentation to *Federal-Provincial/Territorial Sub*

*Working Group on Reducing PPE Waste*

July 20, 2021

Kady Cowan, Project Technical Director

Ed Rubinstein, Project Partner, UHN



The Canadian Coalition  
for Green Health Care  
Coalition canadienne pour  
un système de santé écologique

## Case Study: Huge switch from disposable to reusable isolation gowns



### Metrics

#### Environmental results:

- Close to 900,000 gowns kept out of landfill/incinerator.

#### Financial results:

- Over \$2M savings over a 6 month period
- Plus almost \$50K savings from avoided waste disposal costs.

#### Social results:


- Positive feedback from users relating to quality and comfort.
- Reliable, local, sustainable supply – investing in our region.

### Results

	Acute Care Hospital	
	Proportion in Mar 2020	Proportion in Feb 2021
Disposable gowns	96%	3%
Reusable gowns	4%	97%

- Per use cost for a reusable gown is approximately 9 times cheaper than the per use cost for a disposable gown.
- Positive results from users relating to quality and comfort.
- Reliable, local, sustainable supply into the future.

# ...but recycling alone is not the answer.



CANADA'S  
**NATIONAL  
OBSERVER**

## Canada is drowning in plastic waste — and recycling won't save us

Canadians throw away about 3.3 million tonnes of plastic each year. Only nine percent is recycled.


Part of a *Canada's National Observer* investigation

By Marc Fawcett-Atkinson  
March 9th 2021

THE LANCET  
Planetary Health

COMMENT | VOLUME 5, ISSUE 2, E66-E68, FEBRUARY 01, 2021

## Planetary health care: a framework for sustainable health systems

Andrea J MacNeill  • Forbes McGain • Jodi D Sherman

Open Access • Published: February, 2021 • DOI: [https://doi.org/10.1016/S2542-5196\(21\)00005-X](https://doi.org/10.1016/S2542-5196(21)00005-X)

*“Up to 90% of [medical] product emissions are generated during manufacturing, for which **improved recycling programmes will never compensate.**”*

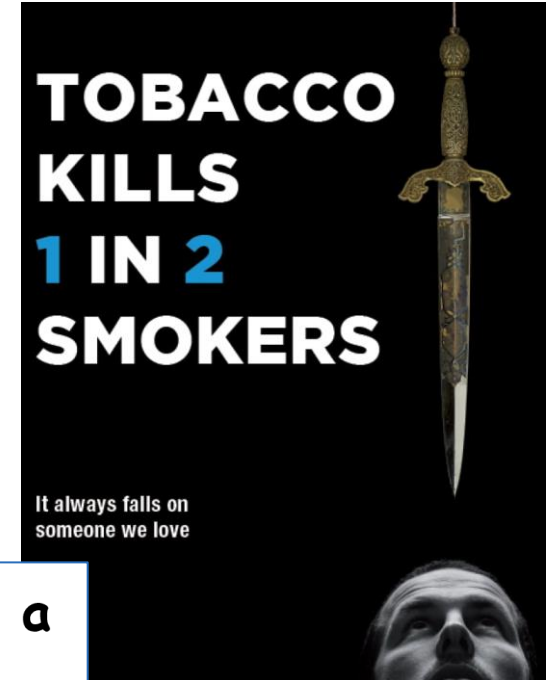
# We are driven by science...



- Decisions based on
- ✓ research
  - ✓ data
  - ✓ “real world” settings

image source: <https://theolivetreeproject.com/what-is-greenwashing/>

...to get people to do what they already know they should be doing...



# ...but are challenged by misinformation...



*“...concept that has been massively distorted online...”*

*“...speaker this night believes a hidden agenda is at play...”*

*“..a small minority...that [are] increasingly vocal...”*

## How 15-Minute City fears came to Canada – and how one politician is trying to walk people through them

Edmonton city Coun. Andrew Knack is trying to push back the tide of misinformation and conspiracy theory in a most old-fashioned way.

By [Alex Boyd](#) Staff Reporter  
Tue., March 7, 2023 | 14 min. read



READ THE CONVERSATION 243





## ...in emotionally charged subjects.

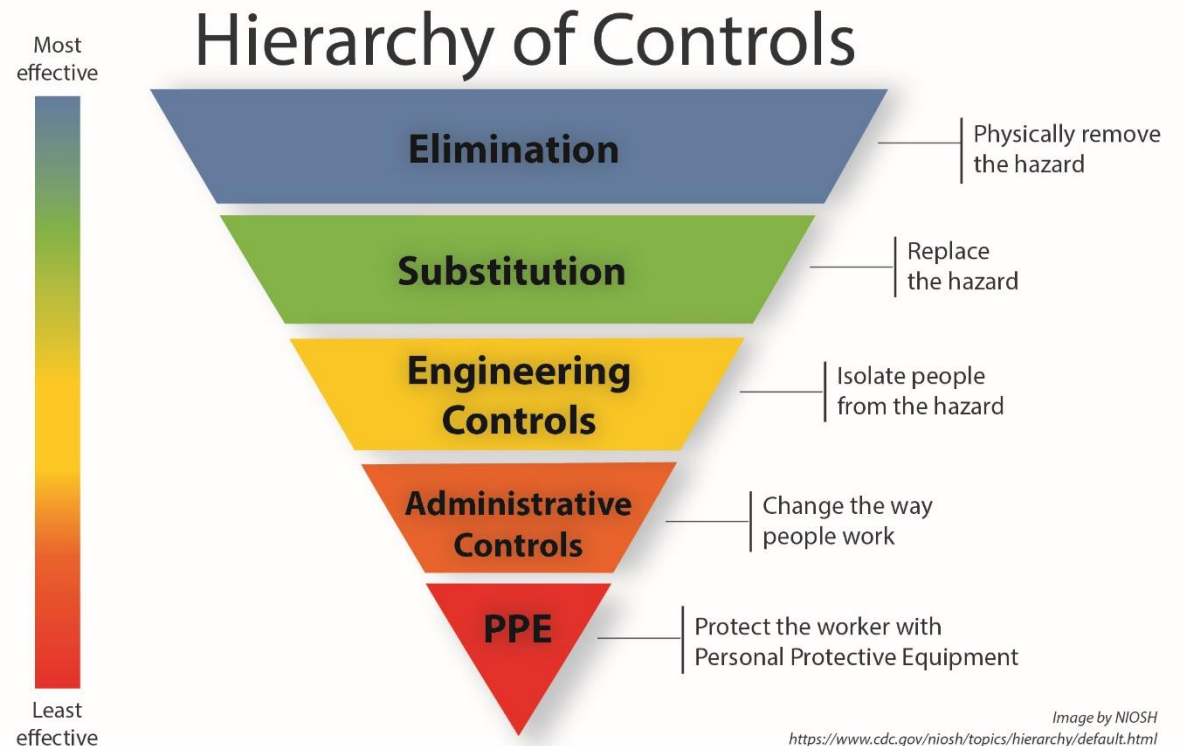
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Myth	Reality
All hospital waste is “infectious”.	Less than 10-15% of hospital waste requires treatment.
Isolation room waste is “infectious”.	Routine precautions required for collection and handling, but treatment <i>usually</i> not required.
You can't recycling in Operating Rooms.	You can!
Recycling food containers and composting attracts bugs.	Improper cleaning attracts pests.



# We know that it's better to design it right in the first place (but sometimes we're late to the party)

Design Element	Result
Spaces that are easier to clean.	Less chemicals for cleaning.
Process and spaces that fit clinician workflow.	Lower chance for "mistakes".
The "right" stuff: <ul style="list-style-type: none"> <li>• Smaller, modular pumps, etc. with N+1 redundancy.</li> <li>• Variable speed drives.</li> </ul>	<ul style="list-style-type: none"> <li>• Fewer unplanned downtimes.</li> <li>• "Soft" start.</li> <li>• Energy efficient.</li> </ul>



# We both dislike nosocomial infections

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*Sustainability is not about “saving the planet”, it’s about preserving human health and quality of life.*

# Thank you

*Ed Rubinstein*  
*Director, Energy & Environment*  
*University Health Network*

*edward.rubinstein@uhn.ca*

***A Healthier World Through A Sustainable Environment***

## Talkin' Trash with UHN

*Free-range, organic, green healthcare ideas*



### From Earth Hour to a Supersized Earth Month

March 24, 2023



### Toronto Western Hospital Steam Boiler Feed Water System Upgrade

March 13, 2023



### Gather your loudest veggies and fruits, its #GreatBigCrunch time!



### Gardening in 24 Square Feet

February 21, 2023

<https://talkintrashwithuhn.com/>



# Saving the world with the right PPE

Dr. Joe Vipond  
May 30<sup>th</sup>, 2023  
IPAC Canada Conference.

# Conflicts of Interest



None declared

# Which change in masking use would make the most impact on the hospitals GHG footprint?

Switching to plant-based mask filters

**A**



**B**

Switching to reusable elastomeric respirators

Using a respirator-style mask instead of a surgical mask for an airborne virus

**C**

**D**

Using as few masks as possible

Sourcing masks from a local manufacturer

**E**



**Correct answer: C**

Using a respirator-style mask instead of a surgical mask for an airborne virus







## **Bob is a 72 M in hospital for a hip replacement**

A retired firefighter, he wants to be more mobile so that he can continue hiking with his 3 children and 8 grandchildren.

# Four Statements of Truth



**COVID is  
Airborne**



**At least 50% of infections  
come from asymptomatic  
patients**

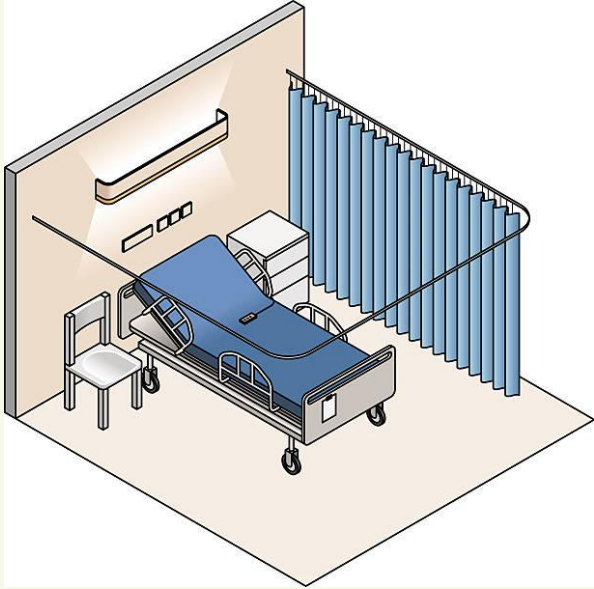


**Aerosols are generated  
by many activities,  
including breathing  
and talking**



**COVID HAIs are  
preventable**





**Postop, Bob is sent to a four person room with curtains separating each patient.**

Two of his roommates are also recovering from ortho surgery, awaiting placement in LTC. One has early dementia and is prone to wandering.

# COVID is Airborne

1

**Superspreading events**

2

**Long range transmission**

3

**Asymptomatic spread**

4

**Safer Outdoors**

5

**HAIs despite C/D PPE**

6

**Aerosol Detection**

7

**Sampled in air ducts**

8

**Animal studies**

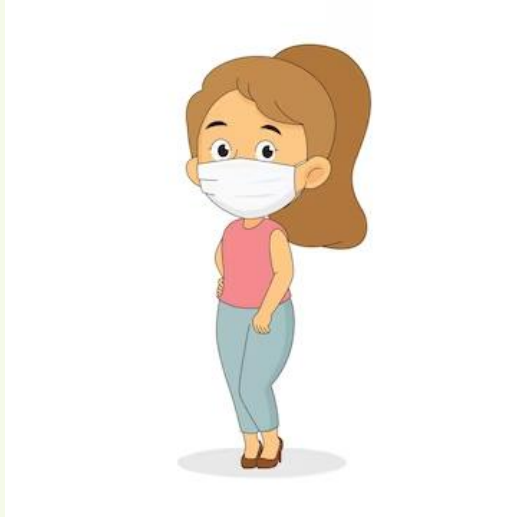
9

**No evidence against**

10

**No evidence for C/D**





## **Bob's Roommate, Ralph, has a bunch of visitors over for an hour on POD 1.**

Ralph's 23 year old daughter, Jennifer, is here three days after a wedding where, unbeknownst to her, she was exposed to covid.



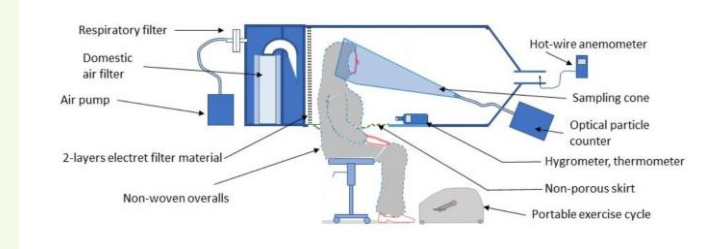
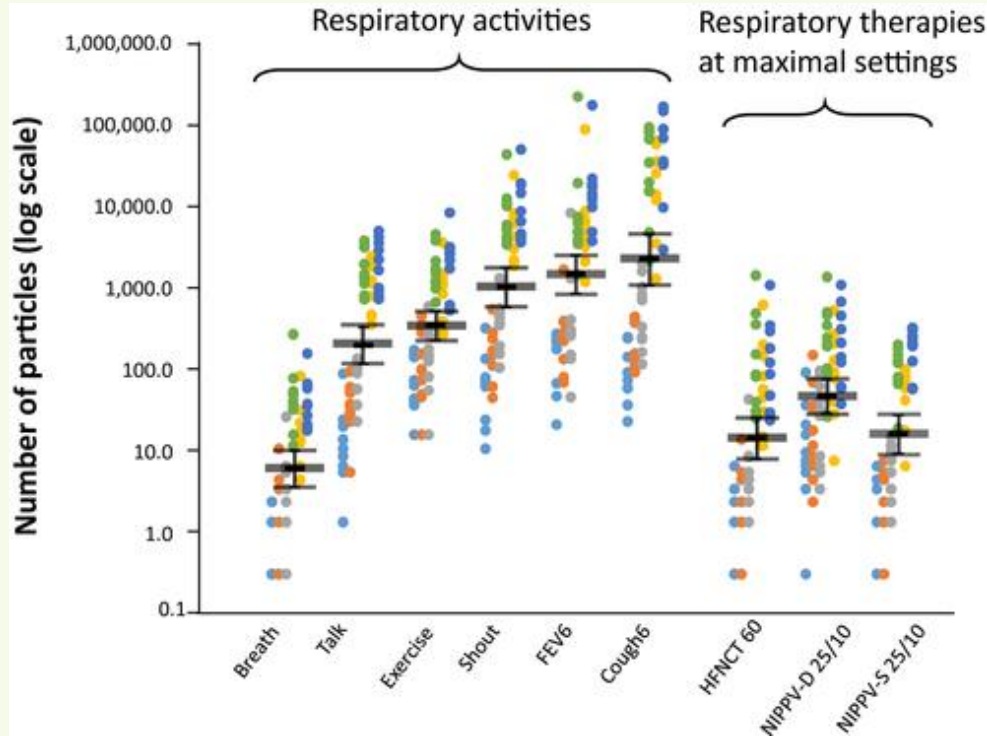
## Asymptomatic Spread

This is the key difference between SARS-CoV1 and SARS-CoV2.

50% of infections come from people that have no symptoms (asymptomatic or presymptomatic)



# Aerosol Generating Behaviours



PUBLICATIONS ▾

**Anaesthesia**  
Peri-operative medicine, critical care and pain

Association of Anaesthetists

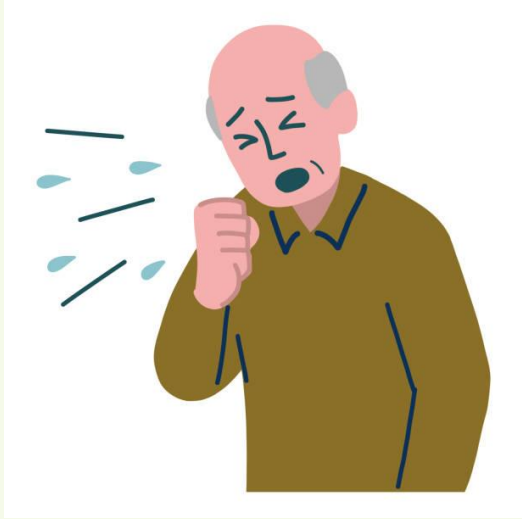
Original Article | [Free Access](#)

**The effect of respiratory activity, non-invasive respiratory support and facemasks on aerosol generation and its relevance to COVID-19**

N. M. Wilson ✉ G. B. Marks, A. Eckhardt, A. M. Clarke, F. P. Young, F. L. Garden, W. Stewart, T. M. Cook, E. R. Tovey

First published: 30 March 2021 | <https://doi.org/10.1111/anae.15475> | Citations: 54

SECTIONS PDF TOOLS SHARE



**POD 3: Scheduled to go home, Bob gets a fever, has a cough, and is increasingly weak.**

A PCR test is +ve for COVID. He can no longer participate in rehab activity and is essentially bedridden.



# HAIs are still occurring

## Acute Care Outbreaks in Alberta

novel coronavirus (COVID-19)

Last Updated: May 16, 2023

There are currently COVID-19 outbreaks at these AHS and Covenant Health acute care facilities.

### Edmonton Zone

- Royal Alexandra Hospital
- Grey Nuns Community Hospital

### Calgary Zone

- Peter Lougheed Centre

### Edmonton Zone

#### Misericordia Community Hospital

#### Royal Alexandra Hospital

There is one unit currently on outbreak at the Royal Alexandra Hospital.

An outbreak declared on one unit on May 1, 2023 has been closed.

An outbreak declared on one unit on May 5, 2023 has been closed.

An outbreak was declared on one unit on May 5, 2023.

- Eleven patients have tested positive for COVID-19.
- One healthcare worker has tested positive for COVID-19.

#### Grey Nuns Community Hospital

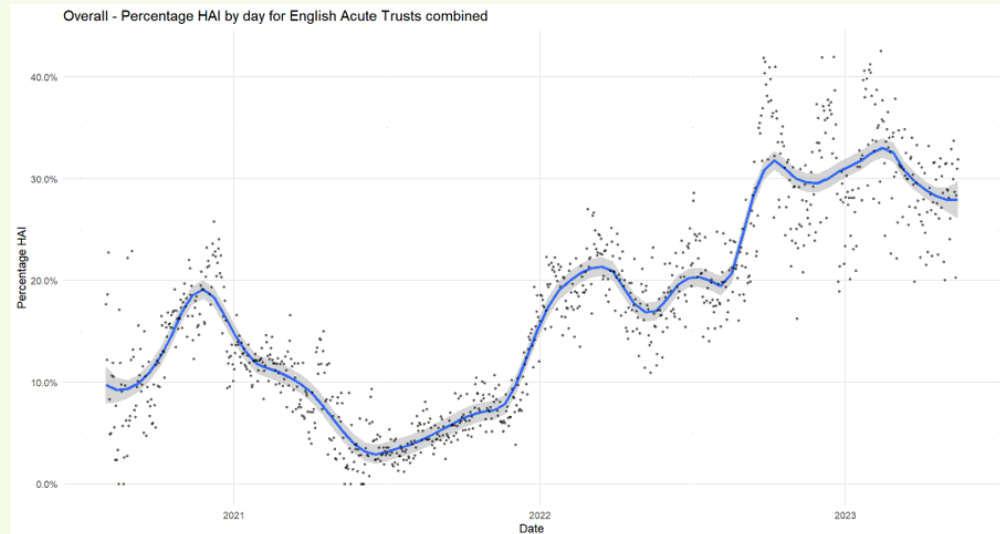
There is one unit currently on outbreak at Grey Nuns Community Hospital.

An outbreak was declared on one unit on May 3, 2023.

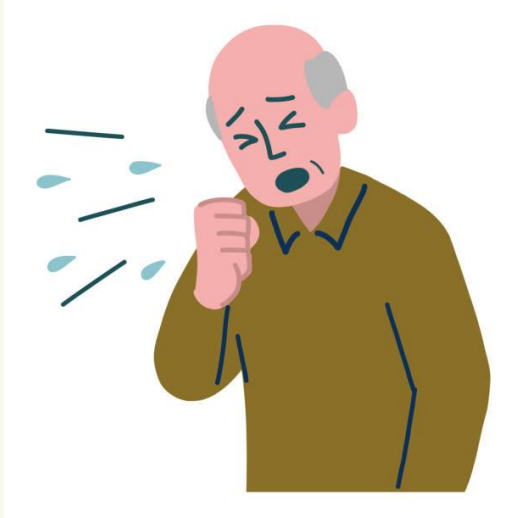
- Twelve patients have tested positive for COVID-19. This is an increase of six since our last update.
- Three healthcare workers have tested positive for COVID-19.

An outbreak declared on one unit on May 3, 2023 has been closed.

Reporting in BC?  
In ON?  
In UK:



# POD 12: Recovered from COVID, recovered from surgery, Bob is sent home.



9 days later than expected, and behind on his rehab schedule.

# CFR of HAI COVID

Pre-Omicron:

HAI had 39-42% CFR  
Vs. 25% for hospitalized  
community acquired

DOUBLING of risk for  
immunocompromised HAIs

The burden of hospital-acquired COVID-19: the Welsh and international experience

Author: Mark Ponsford<sup>A</sup>

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@Outcomes of hospital-acquired SARS-CoV-2 infection in the Canadian first wave epicentre: a retrospective cohort study

Eve Melançon, Marc Brosseau, Anthony Bartoli, Annie-Claude Labbé, Christian Lavalée, Xavier Marchand-Sénécal and Han Ting Wang  
February 01, 2022 10 (1) E74-E81; DOI: <https://doi.org/10.9778/cmajo.20210055>

# CFR of HAI COVID

## Pre-Omicron:

- HAIs had 39-42% CFR
- Vs. 26-35% for hospitalized community acquired
- DOUBLING of risk for immunocompromised HAIs

## Post- Omicron:

- 8.4% CFR (Nov '21-Apr '22)
- 10.6% CFR vs 7.4% Non-HAI (2022)

### The burden of hospital-acquired COVID-19: the Welsh and international experience

Author: Mark Ponsford<sup>A</sup>

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Open Access Article

### Clinical Outcome and Prognosis of a Nosocomial Outbreak of COVID-19

by Sang Hyuk Kim<sup>1,2</sup>, Taehee Kim<sup>1,2</sup>, Hayoung Choi<sup>1,2</sup>, Tae Rim Shin<sup>1,2</sup> and Yun Su Sim<sup>1,2\*</sup>

#### Disease severity by admission and acquisition status 2022 (last updated 26 October, 2022)

Table: Characteristics of COVID-19 Hospital acquired infections in patients (HAIs) in 2022, compared to other COVID-19 cases.

Classification	Total number of cases	Males	Females	Median age, years (IQR)	Known to be aged care residents*	Number admitted to ICU (%)	Number ventilated (%)	Number that died* (%)
Definite and Probable HAI	3,239	1,613 (49.8%)	1,568 (48.4%)	77 (64–86)	270 (8.3%)	47 (1.5%)	15 (0.5%)	344 (10.62%)
Hospitalised – not HAI	20,150	10,058 (49.9%)	9,828 (48.8%)	69 (42–81)	1,811 (9.0%)	986 (4.9%)	308 (1.5%)	1,503 (7.46%)
Not hospitalised	2,436,025	1,025,405 (46.2%)	1,301,164 (53.4%)	38 (20–49)	58,729 (2.4%)	0 (0.0%)	0 (0.0%)	2,519 (0.1%)

Compared to other hospitalised COVID-19 cases in 2022 (i.e. community acquired), patients with hospital acquired infection were:

- older;
- slightly less likely to be an aged care resident\*;
- less likely to be admitted to ICU and ventilated;
- more likely to die (this difference was not statistically significant when adjusted for age,  $p = 0.68$ ).

\*These characteristics most reflect the inpatient cohort from which HAIs arose.

## Other Outcomes of COVID HAIs?

Increased duration of hospital stay?

One study: 27 days vs 16 days for NHA COVID  
-no comparison for equivalent hospital admit  
(hip surgery w/ HAI vs. hip surgery)

Increased risk of readmission?

-significant increase 15% vs. 4% (in first wave)



**Becky, an RN on Bob's ward, gets COVID from caring for him.**

She has a significant risk of longCOVID, and therefore worsening the nursing staffing crisis.

# Risk of LongCOVID

StatsCan Data released Oct '22  
-postOmicron: 10.2% incidence

At higher risk:

-females

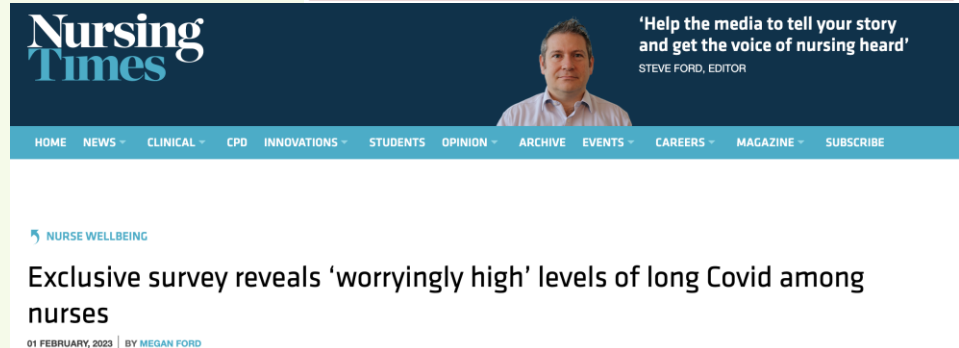
-health care staff

-higher severity of initial infection



The screenshot shows the Statistics Canada website. At the top, there is a search bar and navigation links for 'Subjects', 'Data', 'Analysis', 'Reference', 'Geography', 'Census', 'Surveys and statistical programs', 'About StatCan', and 'Canada.ca'. Below this is a 'The Daily' section with a search bar and several filters: 'In the news', 'Indicators', 'Releases by subject', 'Special interest', 'Release schedule', and 'Information'.

Long-term symptoms in Canadian adults who tested positive for COVID-19 or suspected an infection, January 2020 to August 2022



The screenshot shows the Nursing Times website. The header features the 'Nursing Times' logo and a photo of Steve Ford, Editor, with the text 'Help the media to tell your story and get the voice of nursing heard!'. Below the header is a navigation bar with links for 'HOME', 'NEWS', 'CLINICAL', 'CPD', 'INNOVATIONS', 'STUDENTS', 'OPINION', 'ARCHIVE', 'EVENTS', 'CAREERS', 'MAGAZINE', and 'SUBSCRIBE'. The main content area shows an article titled 'Exclusive survey reveals 'worryingly high' levels of long Covid among nurses' by MEGAN FORD, dated 01 FEBRUARY, 2023. The article is categorized under 'NURSE WELLBEING'.



The screenshot shows a social media post from Lauren Pelley on CBC News. The post is titled 'Long COVID among medical workers may have 'profound' impact on health care, study suggests'. It includes social media sharing icons for Facebook, Twitter, Email, YouTube, and LinkedIn. The text of the post states: '40% of those who didn't require hospitalization for COVID-19 reported having health impacts after 3 months'. The post was published on March 24, 2022, at 2:00 AM MDT and was last updated on March 24, 2022.

# What does this have to do with

## Greening Health Care?

Hospitalization costs \$ and Energy and creates waste!

**ACUTE CARE:** 5.5 kg of solid waste and 45 kg CO<sub>2</sub>-e per hospitalization day

**ICU CARE:** 7.1 kg of solid waste and 138 kg CO<sub>2</sub>-e per bed day

**Disabled staff:** ???? Cost to society





# We can prevent COVID HAIs

01

## Mask Mandates

Shared understanding of the problem and expectations

02

## Improved Ventilation

Ensuring 13+ Air Changes/hour in all spaces

03

## Adding Filtration

Adding HEPA filters to areas with inadequate ventilation

04

## Respirator mask use

Respirator masks are designed as PPE for airborne protection

# CONTACT

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@jvipondmd

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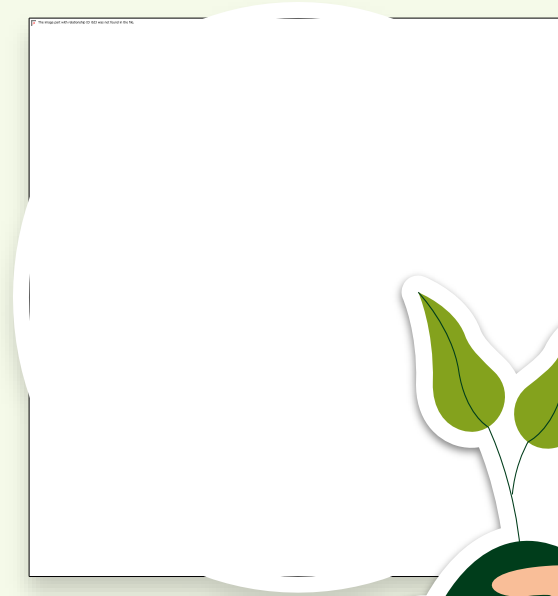
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