Occ-COVID Year 5: Pandemic preparedness - New Risk Assessment & IAQ Solutions (14 June 2024)

Occupational Health Clinics for Ontario Workers Inc.

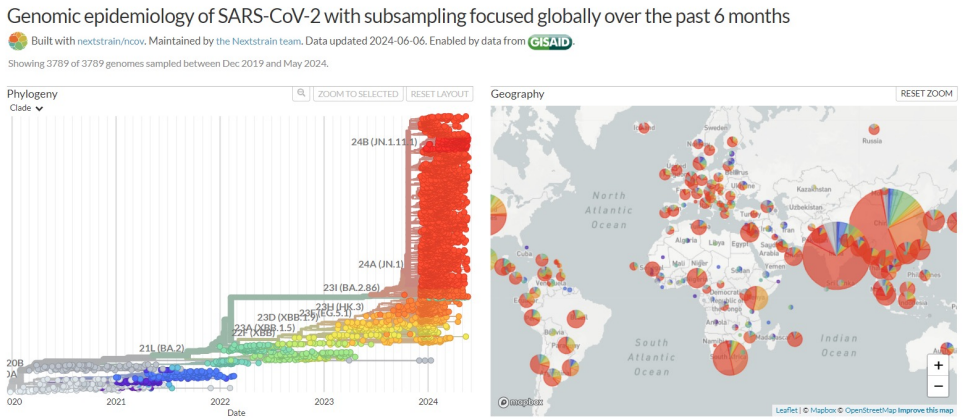
Centres de santé des travailleurs (ses) de l'Ontario Inc.

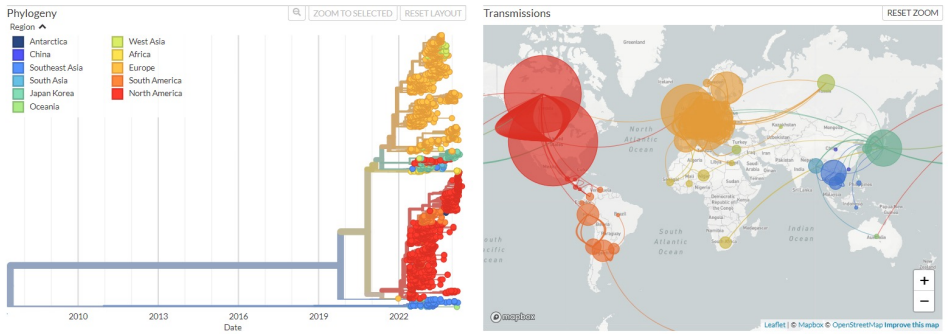
"COVID-19 has killed over 53,000 Canadians, . . . The **probability** of another pandemic occurring within one's lifetime is **roughly 38 percent and may even grow to an extraordinary 76 percent within the next few decades**, . . .and, respiratory pathogens such as COVID and influenza will likely be the cause . . . due to their **high mutation rates** and transmissibility" (Public Policy Forum, 2023).

This webinar is hosted by **Kevin Hedges**, FAIOH, COH, CIH who will discuss the recent WHO risk assessment, and how important it is to monitor indoor air for CO2, temperature and humidity.

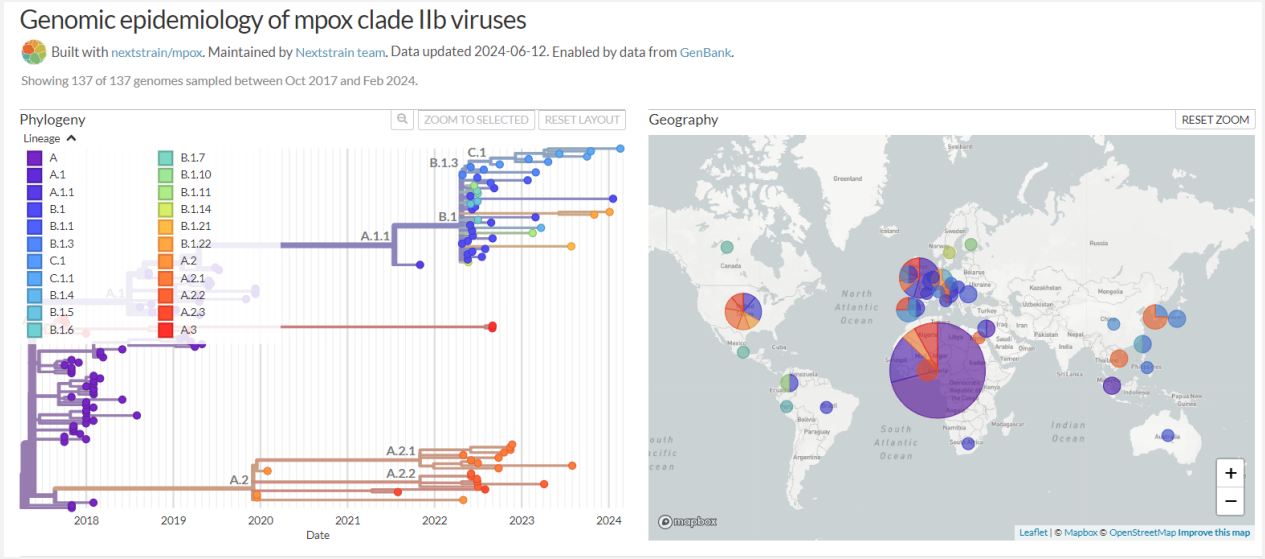
We are also excited to have **Joey Fox** PEng, return.

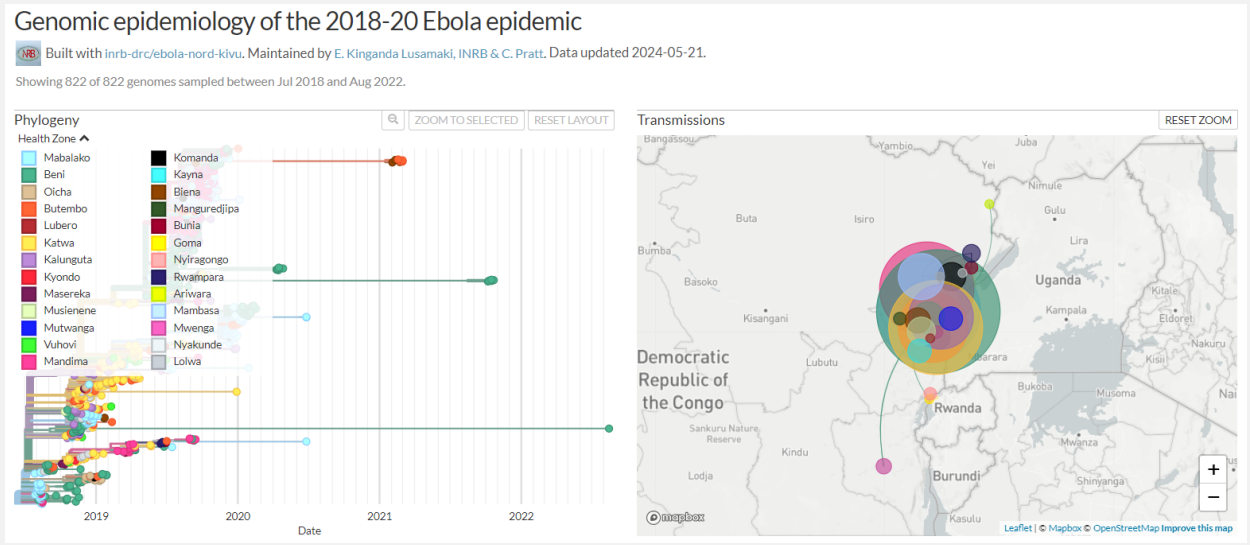
Joey is chair of the Ontario Society of Professional Engineers (OPSE), Indoor Air Quality Advisory Group. He will cover ensuring good indoor air quality, mitigating airborne diseases with ASHRAE 241 and use of UV.





https://nextstrain.org/





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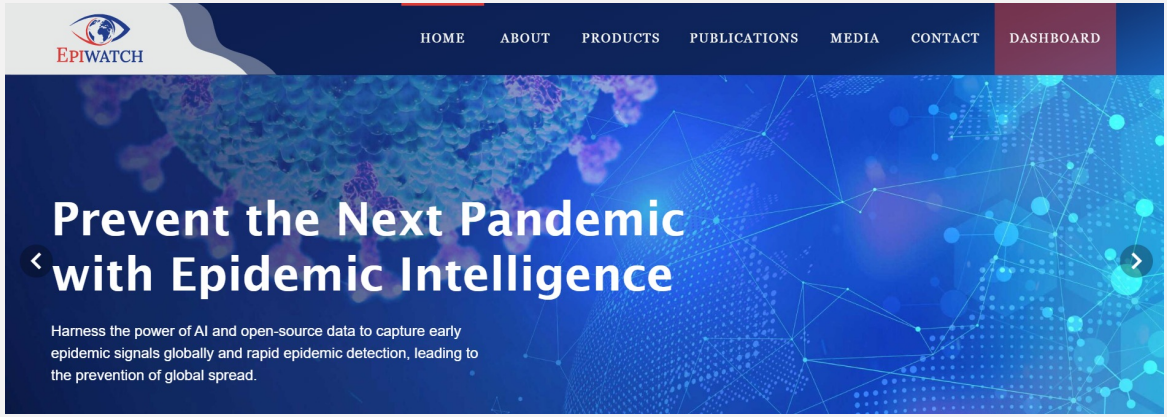
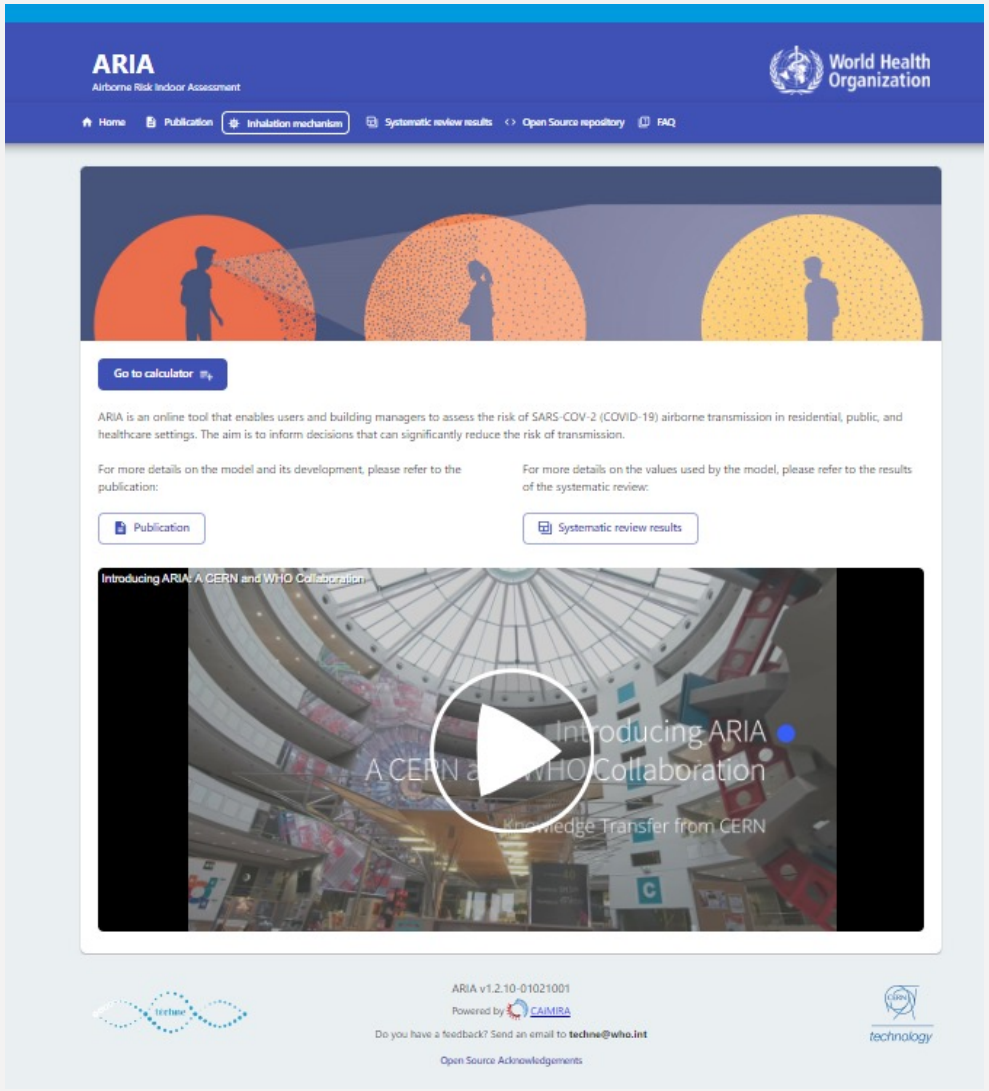
EPIWATCH



https://www.epiwatch.org/

Occupational Health Clinics for Ontario Workers Inc.
Prevention Through Intervention

New Risk Assessment Solutions



Online global risk assessment tool.

Airborne Risk Indoor Assessment (ARIA) is an online tool that enables users and building managers to assess the risk of SARS-COV-2 (COVID-19) airborne transmission in residential, public, and healthcare settings. The aim is to **inform decisions** that can significantly reduce the risk of transmission.

https://partnersplatform.who.int/aria

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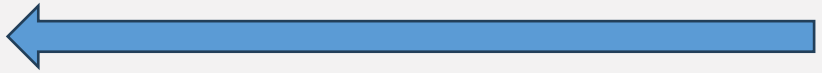
Canadian Aerosol Transmission Coalition

https://www.aerosoltransmissioncoalition.ca/

March 11, 2024

Five key areas of pandemic preparedness,

Canadian Aerosol Transmission Coalition

1) Apply the precautionary principle
2) Strive for elimination versus mitigation
3) Ensure a multi-layered prevention approach 
4) Address the disproportionate impact of pandemics on people in vulnerable situations
5) Strengthen the institutional framework for pandemic planning and response

Ensure a multi-layered prevention approach

Vaccinations are necessary but not sufficient. There is no silver bullet!

More is needed. It takes good indoor ventilation (at least to the ASHRAE 241 standard) and filtering the virus from indoor air. It requires the effective respiratory protection stipulated in Canadian Standard Association (CSA) respirator standard (Z94.4).

This multi-layered approach, with input from occupational health specialists, was recommended by Justice Campbell. It saves lives, prevents illnesses, and reduces closures of businesses and schools — thus, reducing the resulting polarization, and economic and societal impacts.

Layered prevention strategies in public congregate settings, using tools to assess risk, monitor, and clean air, are critical for future health.

ASHRAE Standard 241 (2023) "Control of Infectious Aerosols", now provides requirements to clean the air.

Using **carbon dioxide monitoring** “real time” as a surrogate to assess the quality of the air, will further indicate triggers and interventions required to clean the air.

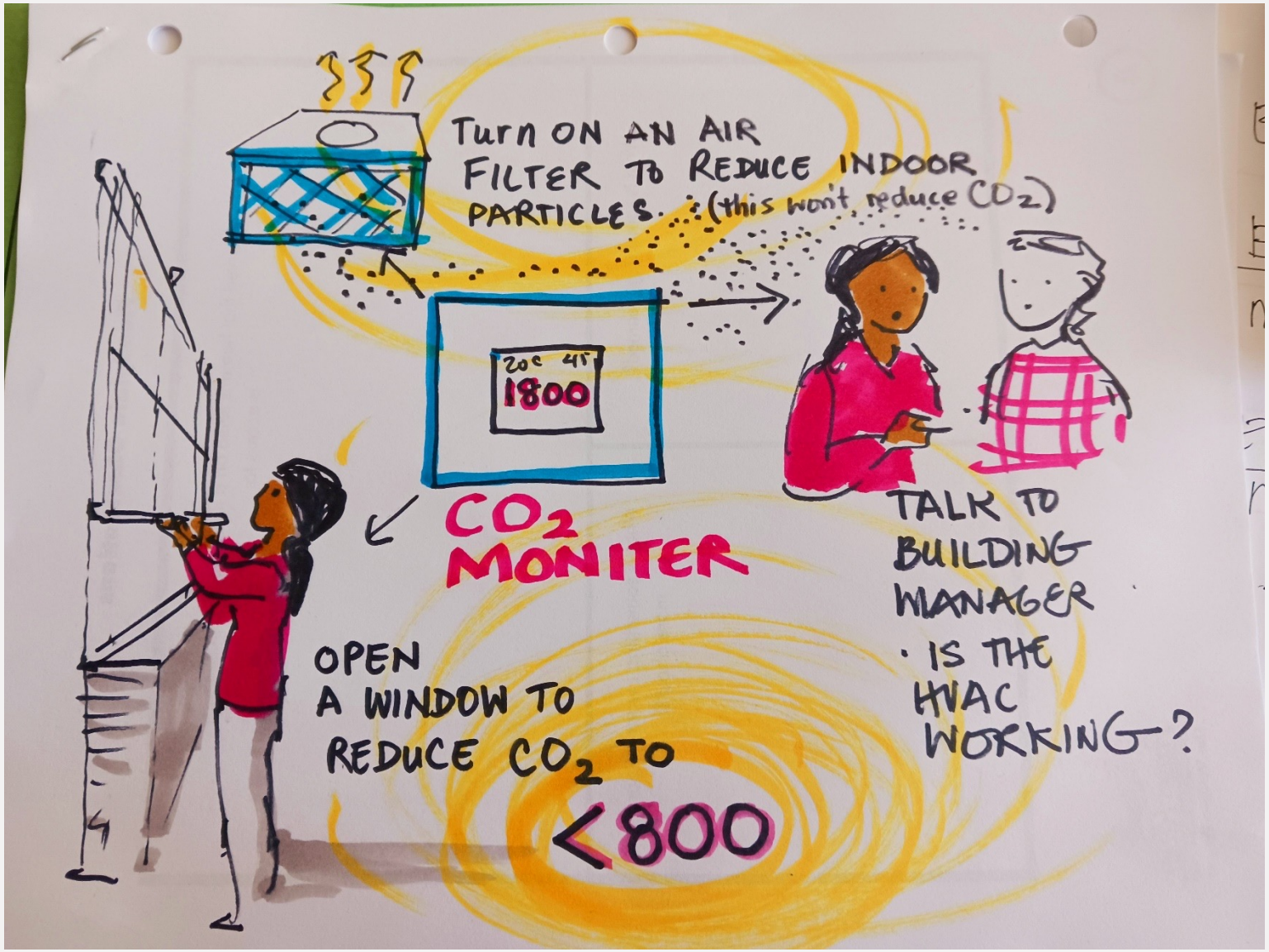
In addition, researchers from the University of Bristol have shown how carbon dioxide increases a virus's lifetime in the air.

Ambient carbon dioxide concentration correlates with SARS-CoV-2 aero stability and infection risk (Haddrell et al. 2024).

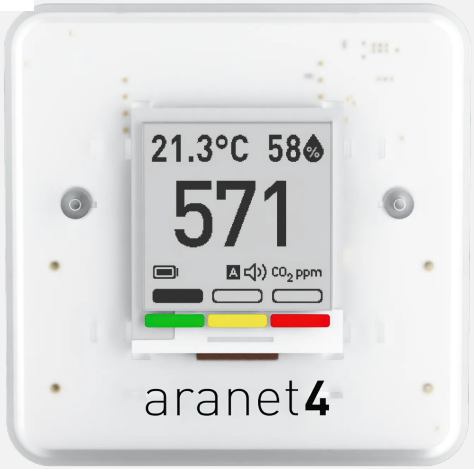
And with global warming it is more important than ever that we monitor indoors, CO2, temperature and humidity.

no problem:	<600 ppm CO_2
possible problem:	600-800 ppm CO_2
probable problem:	800-1000 ppm CO_2
more outdoor air needed:	1000+ ppm CO_2

https://www.ohcow.on.ca/covid-19/ventilation-calculation-tool/#1636726803734-5e447b6e-34ec



The most appropriate portable devices to use in the workplace are non-dispersive infrared (NDIR) CO2 monitors.

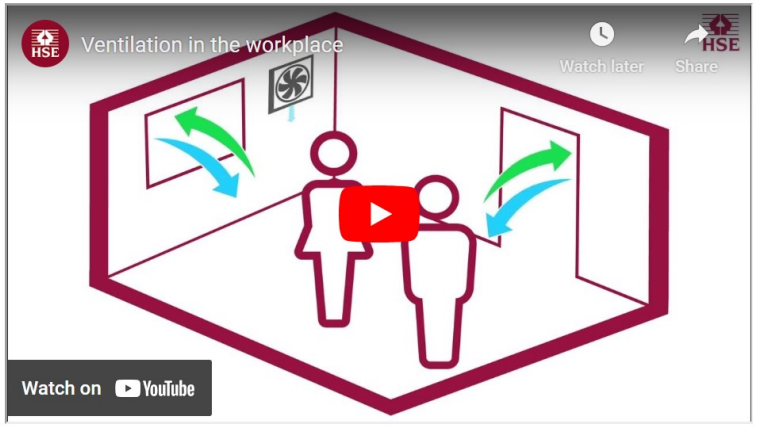


https://x.com/moss_sphagnum/status/1801339327537902056/photo/1

Measure CO_2 (if elevated) → leave premises / air out / provide more fresh air → MERV 13 plus filters recirculated air and or air purifiers

References: UK HSE, Ventilation in the workplace,

The following video gives basic advice on providing adequate fresh air at work.



Overview - Ventilation in the workplace (hse.gov.uk)

- Using CO2 monitors.
- UK EMG-SPI-B: Application of CO2 monitoring as an approach to managing ventilation to mitigate SARS-CoV-2 transmission
- NCCEH Indoor CO2 sensors for COVID-19 risk mitigation: Current guidance and limitations

Clinical Infectious Diseases
MAJOR ARTICLE

Predicting Airborne Infection Risk: Association Between Personal Ambient Carbon Dioxide Level Monitoring and Incidence of Tuberculosis Infection in South African Health Workers

Ruvandhi R. Nathavitharana,[1,a] Hridesh Mishra,[2,3,a] Amanda Sullivan,[1] Shelley Hurwitz,[4] Philip Lederer,[5] Jack Meintjes,[6] Edward Nardell,[7] and Grant Theron[2]

[1]Division of Infectious Diseases, Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, Massachusetts, USA; [2]DSI-NRF Centre of Excellence for Biomedical Tuberculosis Research, South African Medical Research Council Centre for Tuberculosis Research, Division of Molecular Biology and Human Genetics, Stellenbosch University, Cape Town, South Africa; [3]Public Health Research Institute, New Jersey Medical School, Rutgers, The State University of New Jersey, Newark, New Jersey, USA; [4]Division of Infectious Diseases, Brigham and Women's Hospital/Harvard Medical School, Boston, Massachusetts, USA; [5]Uphams Corner Health Center, Boston, Massachusetts, USA; [6]Unit for Infection Prevention and Control, Stellenbosch University and Tygerberg Hospital, Cape Town, South Africa; and [7]Division of Global Health Equity, Brigham & Women's Hospital, Boston, Massachusetts, USA

Background. High rates of tuberculosis (TB) transmission occur in hospitals in high-incidence countries, yet there is no validated way to evaluate the impact of hospital design and function on airborne infection risk. We hypothesized that personal ambient carbon dioxide (CO_2) monitoring could serve as a surrogate measure of rebreathed air exposure associated with TB infection risk in health workers (HWs).

Methods. We analyzed baseline and repeat (12-month) interferon-γ release assay (IGRA) results in 138 HWs in Cape Town, South Africa. A random subset of HWs with a baseline negative QuantiFERON Plus (QFT-Plus) underwent personal ambient CO_2 monitoring.

Results. Annual incidence of TB infection (IGRA conversion) was high (34%). Junior doctors were less likely to have a positive baseline IGRA than other HWs (OR, 0.26; $P = .005$) but had similar IGRA conversion risk. IGRA converters experienced higher median CO_2 levels compared to IGRA nonconverters using quantitative QFT-Plus thresholds of ≥0.35 IU/mL ($P < .02$) or ≥1 IU/mL ($P < .01$). Median CO_2 levels were predictive of IGRA conversion (odds ratio [OR], 2.04; $P = .04$, ≥1 IU/mL threshold). Ordinal logistic regression demonstrated that the odds of a higher repeat quantitative IGRA result increased by almost 2-fold (OR, 1.81; $P = .01$) per 100 ppm unit increase in median CO_2 levels, suggesting a dose-dependent response.

Conclusions. HWs face high occupational TB risk. Increasing median CO_2 levels (indicative of poor ventilation and/or high occupancy) were associated with higher likelihood of HW TB infection. Personal ambient CO_2 monitoring may help target interventions to decrease TB transmission in healthcare facilities and help HWs self-monitor occupational risk, with implications for other airborne infections including coronavirus disease 2019.

Keywords. tuberculosis; tuberculosis infection control (TB-IC); IGRA; carbon dioxide monitoring; health workers.

Conclusions.

HWs face high occupational tuberculosis (TB) risk. Increasing median CO_2 levels (indicative of poor ventilation and/or high occupancy) were associated with higher likelihood of HW TB infection.

Personal ambient CO_2 monitoring may help target interventions to decrease TB transmission in healthcare facilities and help HWs self-monitor occupational risk, with implications for other airborne infections including coronavirus disease 2019.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9383651/

See also https://ghsm.hms.harvard.edu/faculty-staff/edward-anthony-nardell

Shows the application of an upper room UV fixture in a classroom. The fixture is the black box on the upper, left side of the front wall, with blue light visible. Another fixture on the rear wall would contribute to an effective upper room air disinfection zone. © Chaska Stern - TEAM GEWALTMANAGEMENT

Photochemistry and Photobiology, 2021, 97: 493–497

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

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8251047

Independent investigators aerosolized test bacteria into an unoccupied hospital room compared mechanical ventilation, upper room Germicidal UV (GUV), and three commercial room air cleaners.

They found that upper-room GUV was about 9.4 times more cost-effective than mechanical ventilation for the same amount of air disinfection.

https://ghsm.hms.harvard.edu/faculty-staff/edward-anthony-nardell

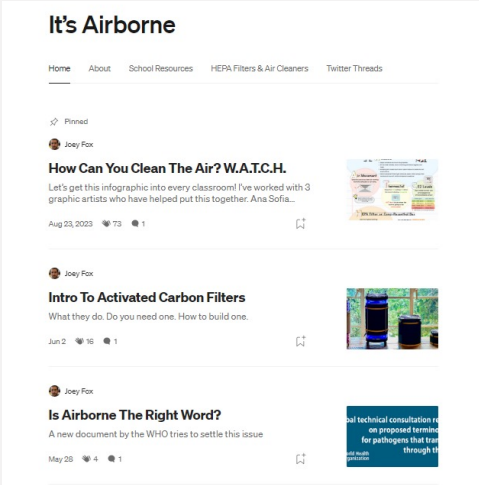
It's Time to Clean Our Indoor Air Properly (TIME)

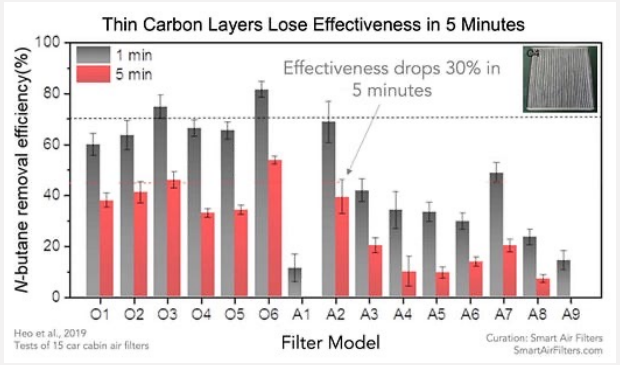
*For current and future viral pathogens like SARS-CoV-19, relatively high levels of "equivalent" ventilation by **supplemental air disinfection** will be needed.*

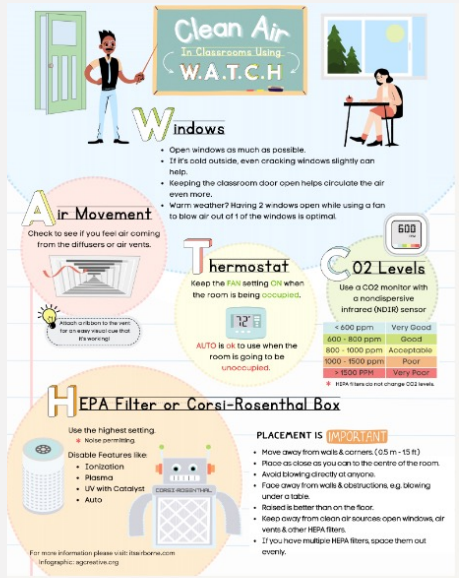
Joey Fox is a professional engineer with over ten years in the Heating, Ventilation, and Air Conditioning (HVAC) industry specializing in schools. He is currently the chair of the indoor air quality advisory committee for the Ontario Society of Professional Engineers.

Throughout the COVID pandemic, he has used his experience to ***educate people about ventilation, filtration and general air cleaning*** *to protect themselves from COVID.*

https://itsairborne.com/







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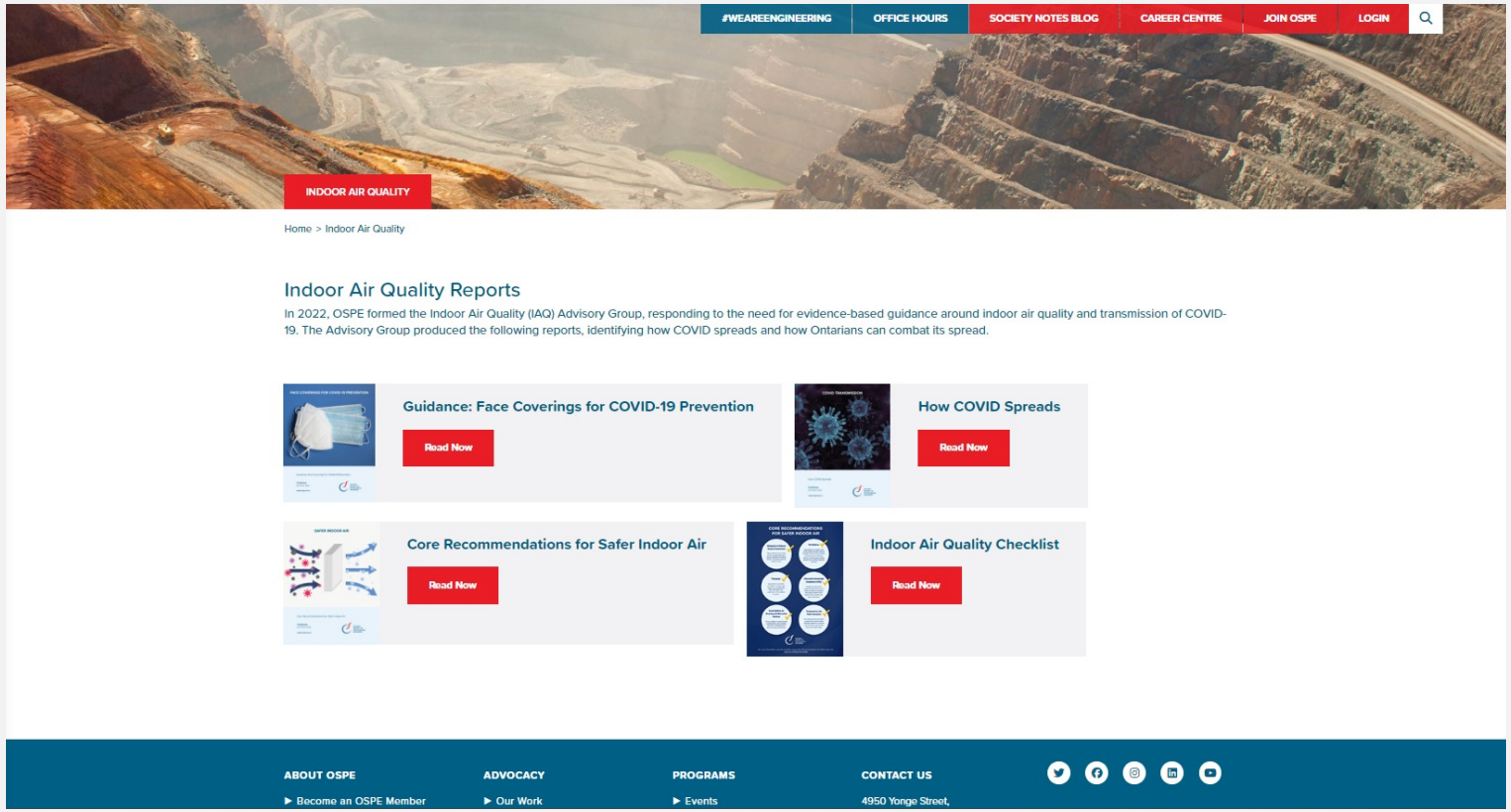
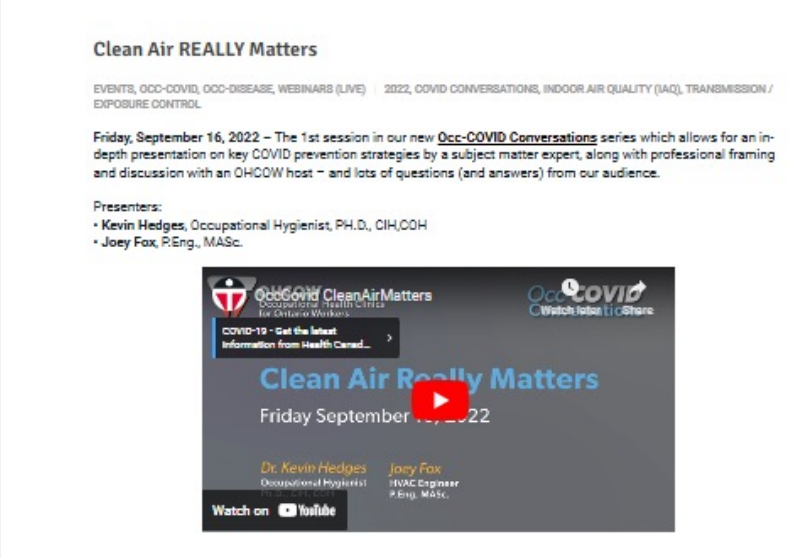


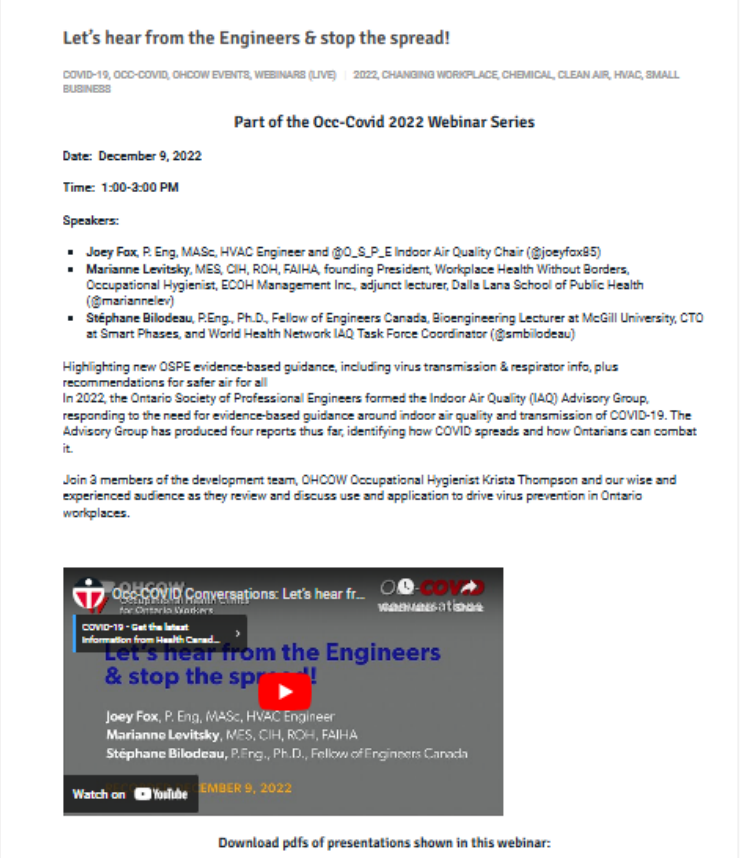
https://ospe.on.ca/indoor-air-quality/

Clean Air Really Matters (September 2022)



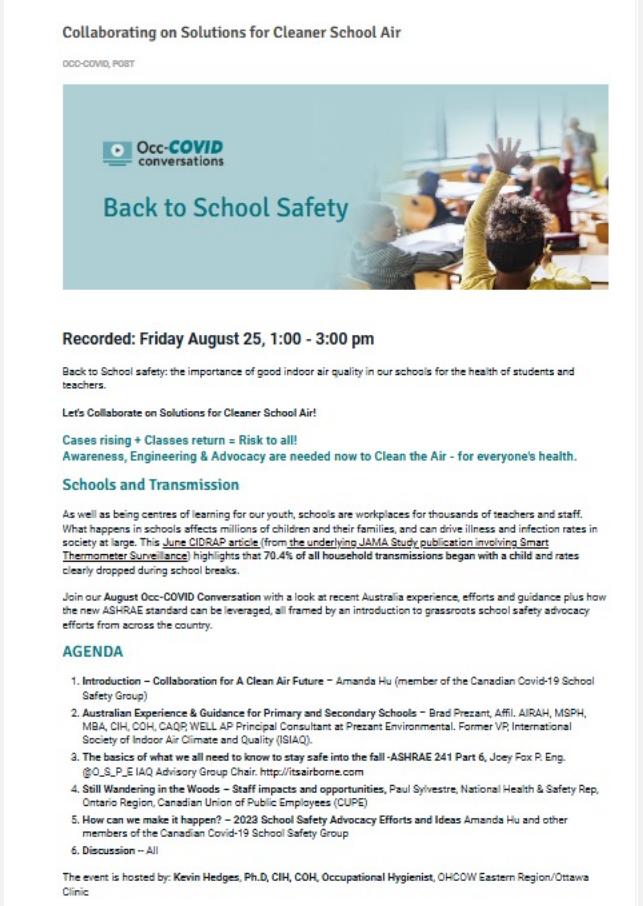
https://www.ohcow.on.ca/posts/clean-air-really-matters/

Lets hear it from the Engineers & stop the spread (December 2022)



https://www.ohcow.on.ca/posts/lets-hear-from-the-engineers-stop-the-spread-occ-covid-webinar/

Back to school safety (August 2023)



https://www.ohcow.on.ca/posts/collaborating-on-solutions-for-cleaner-school-air/