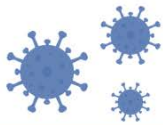


Organizing
bodies:



There is still time to address aerosol transmission of COVID-19

January 4, 2020

Dear Dr. Theresa Tam, Hon. Patty Hajdu, Premiers and Medical Officers,

We are a group of physicians, scientists, occupational health and safety experts, engineers and nursing professionals who have been following the COVID-19 developments closely. We are deeply concerned by the recent increase in cases and hospitalizations across Canada. We urge you to update the provincial COVID-19 guidelines, workplace regulations and public communication to reflect the science – COVID-19 spreads through inhaled aerosols.

In July of 2020, 239 international scientists brought this issue to the world stage¹. Since the publication of their letter, some progress has been made gaining recognition from the World Health Organization, Centre for Disease Control and Public Health Agency of Canada for aerosol transmission of COVID-19². However, this has not resulted in any significant improvement in workplace protection for Health Care Workers (HCWs) and other essential workers. There also continues to be a lack of public messaging at the provincial level to reflect the risk of transmission in shared room air. While other countries promote avoiding the 3 C's (closed spaces, crowded places and close-contact settings), we continue to focus on deep-cleaning and two-metre physical distancing. With winter upon us, our activities are moving indoors and it is therefore imperative that workplaces, public institutions and individuals understand the risk of aerosol transmission as well as the actions that can be taken to combat it.

The rapid global spread of COVID-19 has sparked unprecedented cross-disciplinary research. Contributions from the fields of engineering, life science, aerosol science, medicine, occupational hygiene and epidemiology are driving a paradigm shift in our understanding of aerosol transmission of respiratory viruses, including COVID-19.

The evidence is now overwhelming - aerosol transmission of COVID-19 is common and is an important route of transmission.³⁻⁶ This was elegantly summarized by Fang et al: "perhaps the biggest surprise about the issue of airborne spread of SARS-CoV2 is that it has been surprising to so many people".⁴ Virus-laden aerosols frequently infect susceptible contacts at close proximity where they are most concentrated – like smoke. In suboptimally ventilated environments, infectious aerosols can accumulate in shared room air and reach dangerous concentrations. Control strategies targeting close-proximity transmission, such as physical distancing and effective face-fitted masks, are key to reduce short-range aerosol transmission risk. For transmission in shared room air, ventilation and air filtration are critical additional measures, as expelled aerosols build up in poorly ventilated spaces. We know that many workplaces, buildings and residences in our communities have substandard ventilation.

With this evolving science, the importance of monitoring and improving ventilation has become increasingly clear. The September 28, 2020 report by Canada's Chief Science Advisor Expert Panel on





COVID-19 summarizes high-yield short-term and long-term goals to reduce indoor transmission of COVID-19 and improve indoor air quality.⁷ Despite this report, there continues to be a lack of attention to the importance of ventilation at the provincial and federal levels.

The acknowledgement of aerosol transmission also calls into question the provincial directives for personal protective equipment for HCWs and other essential workers. Most HCWs and essential workers in Canada continue to use “droplet and contact precautions”, wearing poorly-fitted surgical masks, even in high-risk settings. A letter from the Workplace Health Without Borders international board of directors to Dr. Theresa Tam in April 2020 highlights these concerns well.⁸

To reflect the current scientific evidence, we call on provincial leaders to:

- ❖ **Update COVID-19 guidance to address the risk of aerosol transmission of COVID-19**
- ❖ **Promote strategies to reduce transmission risk in private homes and businesses through clear public health messaging and education**
 - Avoid the “3 C’s”, indoor mask wearing even when distanced, routinely opening windows to refresh the air, regular HVAC maintenance and filter replacement, turning on available vented range hoods and bathroom exhaust fans
- ❖ **Mandate and fund ventilation assessments and upgrades of essential public institutions such as schools and long-term care homes**
- ❖ **Ensure that no high risk healthcare worker (HCW) or other essential worker is denied access to a fit-tested respirator (N95, elastomeric or equivalent)**
 - Risk assessment by HCWs should go beyond the presence of “aerosol generating procedures” and should take into consideration aerosol generating behaviours (ie. shouting, singing, coughing, sneezing, heavy breathing), proximity to the patient, time spent with the patient, building air quality, and patient compliance with masking for source control
 - Risk assessment for other essential workers should consider crowding, close contact, presence of aerosol generating behaviours, and building air quality
- ❖ **Recommend and deploy carbon dioxide (CO₂) monitors as a surrogate measure of inadequate ventilation to reduce long-range transmission risk in shared room air**
 - During a TB outbreak, CO₂ concentrations above 1000 PPM significantly increased the risk of becoming infected with TB.⁹ Improving the building ventilation to a CO₂ concentration of 600 PPM stopped the outbreak in its tracks.
- ❖ **Include appropriately sized portable air filtration (HEPA) units or low-cost homemade devices using MERV-11/13 filters and box fans as options for filtering out bioaerosols indoors when ventilation is suboptimal**
- ❖ **Engage engineers and other ventilation specialists to develop clear ventilation standards for indoor institutions and integrate these standards into the reopening guidelines for businesses with a higher risk of aerosol transmission (e.g. restaurants, bars and gyms)**

Specific strategies to reduce indoor aerosol transmission of COVID-19 are adeptly summarized in Canada’s Chief Science Advisor Expert Panel on COVID-19 bioaerosol report⁷, the Occupational Safety





and Health Administration (OSHA) Alert¹⁰, the Harvard TC Chan Risk Reduction Strategies for Reopening Schools Report¹¹, the CDC’s “COVID-19 Ventilation in Buildings” guidance¹², the European CDC’s “Heating, Ventilation and Air-conditioning Systems in the Context of COVID-19: First Update”¹³, and the “ASHRAE Position Document on Infectious Aerosols”¹⁴.

Experts warn that future respiratory viral pandemics are likely.¹⁵ Investing in ventilation, indoor air quality and appropriate personal protective equipment now will save lives and prevent economic hardship in the future. Germany is investing €500m to improve ventilation systems in public buildings.¹⁶ China implemented airborne precautions for HCWs in January 2020. Italy, New Zealand, and Japan have all accepted and promote aerosol messaging. The public health “sanitary reformers” of the late 1800s led the way in overcoming water-borne diseases like cholera and typhoid fever through investments in sewer systems and water treatment plants.¹⁷ We are certain that there were those who thought the task at hand was insurmountable. When the history of Canada’s response to COVID-19 is written, we hope that our country is once again viewed as a public health innovator.





Disclaimer: The views and opinions expressed in this letter are those of the individual signatories and do not necessarily reflect the official policy or position of any agency/institution.

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Karen Messing	Ph. D., O.C. (Officer)	Montréal	QC
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Matthias Schoettle	PhD in Computer Science	Montréal	QC





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Occupational Health and Safety Scientists and Professionals			
Name	Credentials and Affiliations	City	Province
Nic Aulmann	BNursing, MOccMed,H&S CRSP	Nanaimo	BC
Courtney Gendron	MPH	Vancouver	BC
Masood Ahmed	MS, CIH, CRSP	Hamilton	ON
Xin Nuo Bai	MPH Occupational and Environment Health	Toronto	ON
Adeeta Badoo	BSc. Natural Sciences	Brampton	ON
Phil Bigelow	MHSc, PhD, ROH	Waterloo	ON
James Brophy	PhD, University of Windsor	Windsor	ON
Marilyn Brownlee	MScN, COHN(C), COHN-S/CM. CRSP	Toronto	ON
Andrew Cutz	DIH, CIH	Markham	ON
Patricia Dufour	Masters degree Quality Health and Safety	Newmarket	ON
Rob Fernandes	Certified Industrial Hygienist	Georgetown	ON
Mariana Grinblat	M.Sc., M. Eng.	Toronto	ON
Todd Irick	M.Sc., CIH	Carleton Place	ON
Nancy Johnson	OHS healthcare specialist (retired)	Sudbury	ON
Margaret Keith	PhD, University of Windsor	Emeryville	ON
Matea Kokorovic	MPH CIH	Toronto	ON
Murray Lawrence	BSc	Hamilton	ON
Yang Luo	M.Sc Occupational & Environmental Hygiene	Toronto	ON
Ellen MacEachen	PhD	Waterloo	ON
Kenneth Major	M.Sc.(A)., CIH, ROH	Kingston	ON
Charles Pilger	MSc, MEng, CIH(Ret'd) ROH (Ret'd)	Toronto	ON
Robert Rae	M.Eng. , CIH, ROH	Mississauga	ON
Linda Raes	CIH	Sarnia	ON
Lydia Renton	B.Sc., CIH, ROH, FAIHA	Ottawa	ON
Luca Romano	BSc.	Vaughan	ON
Paul Sampara	MEng ROH	Fonthill	ON
Vinay Sharma	National union Staff	Toronto	ON
Umair Siddiqui	BASc Occupational Health and Safety	Pickering	ON
Rob Strang	Engineer, ROH	Orangeville	ON





Dorothy Wigmore	MS	Kitchener	ON
Nancy E. Wilk	MHSc CIH	Millgrove	ON
Stéphane Archambault	MScA, ROH	Repentigny	QC
Robert Bourbonnais	MSc Hygiene Environment, DESS toxicologie, DSA	Laval	QC
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Carole Larose	M.sc.a	Montréal	QC
Sylvain Lequoc	M.Sc.A.	Montreal	QC
Ana Maria Seifert	PhD en sante communautaire	Montreal	QC
Robert Sinclair	Bachelor of Applied Science. Occupational/Industrial Hygiene, Safety and Environment	Dollard-des-Ormeaux	QC
Andre Tartre	M.Sc.A., CIH	Montreal	QC
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Loïc Wingert	PhD	Montréal	QC
Wayne Wood	MScA, Occupational Health	Montreal	QC
Lauren Bradshaw	MSc Occupational Health, CRSP, CSP	Regina	SK

Applied Science and Engineering

Name	Credentials and Affiliations	City	Province
Robert Bean	Ret. APEGA & ASET	Calgary	AB
Scott Tavernini	MSc. Mechanical Engineering	Edmonton	AB
Adair Thompson	Engineer, MBA	Fort McMurray	AB
Brian Robertson	PhD Physics; Prof. Emeritus, Mechanical & Materials Engineering	West Vancouver	BC
George Skinner	P.Eng., M.Sc. Mechanical Engineering	New Westminster	BC
S. L. Wong	Engineer	Vancouver	BC
Mika Solway	BSc civil/environmental engineering	Fredericton	NB
Aaron Smith	Engineer	Halifax	NS
Karine St-Germain	Mechanical engineering, PA LEED BD+C	Halifax	NS
Erin Dixon	MASc	Toronto	ON
David Elfstrom	P.Eng.	Simcoe	ON
Barry Hunt	BSc	Kitchener	ON
Tom Kovendi	Civil Engineering	Oro-Medonte	ON





Michael Loughry	Engineer	Toronto	ON
Susan Fern Macdougall	M.Sc Occupational Health, CRSP	North York	ON
Paul Machuk	Engineer	Mississauga	ON
Hugh Montgomery	BSc. Mechanical Engineering	Toronto	ON
Ilvana Montgomery	Electrical Engineer	Toronto	ON
Vladimir Motovilov	PhD, M.Sc. Senior Engineering Specialist Airbus	St-Laurent	ON
Randy Park	B.Sc. physics, M.Eng. Engineering Physics	Toronto	ON
Susan Rowley	Engineer	Toronto	ON
Christine Shea	MASc	Mississauga	ON
Daniel Shea	P.Eng	Richmond Hill	ON
Cara Sloat	B.A.Sc., Building Services Engineer (HVAC), mASHRAE	Toronto	ON
Nicolas Smit	BLs, Elastomeric Respirator Advocate	Sudbury	ON
Aaron Soh	H.BCs Physics and Statistics	Kitchener	ON
Dominic Vita	P.Eng.	London	ON
Cheryl White	P. Eng	Toronto	ON
Andrew M. Wilson	P.Eng.(ON,NT,NU), CEM	Kitchener	ON
Julie Beausejour	Engineer	Montreal	QC
Denis Boudreau	Bachelor of Electrical Engineering	St-Lazare	QC
Sabrina Castelli	M.Sc.A. hydrogéologie env., chimiste, Microbiologiste Agréée, biologiste	Québec	QC
Michaël Côté	Ing., P.Eng., Fellow d'Ingénieurs Canada	Gatineau	QC
Manuelle Croft	Ingénieure, LEED AP O+M, BCxP, RCx, ENV SP	Montréal	QC
Sarah Dorner	Ph.D., ing.	Montréal	QC
Nicolas Drouin	Bachelor of Engineering - Mechanical	Baie-D'Urfe	QC
Carl Emanuel Ferrara	P.Eng	Montréal	QC
Natalia Motovilova	Former Senior Engineering Specialist, Russian State Space Center, Design Bureau, Moscow Technical University. Master Diploma	St-Laurent	QC
Henriot M Sabourin	ingénieur	Montréal	QC
Alain Trahan	P.Eng.	Terrebonne	QC
Karim Yaghmour	M.A.Sc. Electrical Engineering	Sherbrooke	QC
Nursing Professionals			
Name	Credentials and Affiliations	City	Province
Lesley Bell	BScN, MBA	Toronto	ON





Michelle Brosseau	RN DipAd Ed	LaSalle.	ON
Erna Bujna	Occupational Health & Safety Specialist, Ontario Nurses' Association (Retired)	Kingsville	ON
Linda Haslam-Stroud	RN	Utterson	ON
Jean Kuehl	Registered Nurse	Kitchener	ON
Clea Lang	M.Sc. NP	Toronto	ON
Stacey Papernick	Occupational Health and Safety Specialist (previous position) Ontario Nurses' Association	Toronto	ON
Valerie Rzepka	NP- PHC, BScN, MSc. DLSHTM	Toronto	ON
Linda Silas	President of the Canadian Federation of Nurses Unions	Ottawa	ON
Barb Wahl	Past President Ontario Nurses Association; BA	Waterloo	ON
Keir White	BScN	Barrie	ON
Lesley Wylie	RN, MHSM	Toronto	ON
Isabelle Arsenault	Nurse	Lasalle	QC
Sarah Bachand	Technicienne	Montreal	QC
Denise Lavallee	B Sc inf. M. Ed	Ste-Béatrix	QC
Coline Saillard	Infirmière Puéricultrice	Montréal	QC
Melissa Tremblay	Bac	Lachine	QC

Supporting Signatures from International Physicians, Scientists, Occupational Health and Safety Professionals, Engineers and Nursing Professionals:

International Physicians, Scientists, Occupational Health and Safety Professionals, Engineers and Nurses			
Name	Credentials and Affiliations	City	Country
Karen Cohn	MS CIH	Oakland	CA - USA
David F. Eldredge	BSc Molecular/Microbiology	Heber City	UT - USA
Maarten De Cock	MSc Biology	Antwerpen	Belgium
Trish Greenhalgh	FMedSci (UK)	Oxford	UK
Lucía Lara	Engineer	Horgen	Switzerland
Katrin Rabiei	MD, PhD	Gothenburg	Sweden
Jeffery K Smith	IAQA, ISHRAE, CASANZ/Geographer/Consultant	Geneva	Switzerland





Supporting Signatures from Other Canadian Professionals:

Other Professionals			
Name	Credentials and Affiliations	City	Province
Dan Furst	LL.B.	Calgary	AB
Maria Infante	PhD Resource Management and Environmental Studies	Edmonton	AB
Kate Busby	Architect AIBC AAA MArch BEDS	Vancouver	BC
Tracy Casavant	BASc (Chml Hons), MES	Vancouver	BC
Cillian Collins	Architect	Vancouver	BC
Susan Z Martin	BA in Health Information Science	Victoria	BC
Ian Robertson	Master of Architecture (M.Arch)	Vancouver	BC
Michael Wisla	CD, MAEd, ASP, CRM	New Westminster	BC
Marie-Noëlle Ryan	PhD Philosophy	Moncton	NB
Julia M. Wright	PhD, FRSC	Halifax	NS
Hugh Armstrong	PhD, Professor Emeritus, Carleton University	Ottawa	ON
Joshua Atienza	HBSc in Biochemistry and Molecular Biology	Toronto	ON
M Becker	B. Sc	Dundas	ON
Michael Benoit	Dip	Brampton	ON
Colline Blanchard	BScPharm	Ottawa	ON
Glenn Butler	WUCC, local 314	Oshawa	ON
Isabelle Carpenter	Cadet	Fort Albany	ON
Patty Coates	President, Ontario Federation of Labour	Toronto	ON
Bill Comeau	M.Math	Niagara	ON
Vance Coulas	Vice President Unifor 3011	Rockland	ON
Leiya Dobson	BSc Human Kinetics	Ottawa	ON
Tracie Edward	B.Sc. (Biology), B.Ed., Coordinator Health and Safety Services ETFO	Toronto	ON
Agnieszka Filipek	UFred COHSES program	Thunder Bay	ON
Barry Fowlie	Workers Comp/Health and Safety	Guelph	ON
Julie Goldenson	Ph.D.	Toronto	ON
John Helson	BA	Oshawa	ON
Judy Howarth	ONFCN	Sault Ste. Marie	ON
Michael Hurley	President Ontario Council of Hospital Unions-CUPE	Toronto	ON
Ryan Imgrund	BSc (Hons), BEd	Georgina	ON





Michal Kapral	Master of Health Informatics	Toronto	ON
Steve Khan	Honours Bachelor of Arts	Toronto	ON
George T. Kitching	BSc., MSc.	Windsor	ON
Leesa Klich	MSc	Kitchener	ON
Dean Lasak	Air Balancing Technologist	Carlisle	ON
Peter Leventis	MSc, PhD, PA (CCCPA)	Toronto	ON
Carrie Loughry	MBA	Toronto	ON
Alan Majer	MBA	Toronto	ON
Jane McArthur	M.A, PhD(ABD) Sociology Environmental and Occupational Health	Tecumseh	ON
Michael McDonald	FSA, FCIA	Ottawa	ON
David McRobert	B.Sc., MES, LL.B.	Peterborough	ON
Jonathan Mesiano-Crookston	BSch, JD	Toronto	ON
Sean O'Brien	None	Ottawa	ON
Katie Osborne	BA, B.Ed (teacher)	Oshawa	ON
Howard Pakosh	BSEE Electrical Engineering	Burlington	ON
Connor Power	BA/COHS	Toronto	ON
Inderdeep Sidhu	MS	Mississauga	ON
Brenda Snider	SEIU Local 1 Canada	Richmond Hill	ON
Andrew Thomson	M.Arch, OAA, MRAIC	Barrie	ON
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Leah Ugulini	Registered Dental Hygienist	Fonthill	ON
Ryan Utter	M.A.	Ottawa	ON
Linda Vannucci	Lawyer/Co-Director, Workers' Health And Safety Legal Clinic	Toronto	ON
Katrina Wheaton	BSc BEd Assistant Department Head Bargaining and Contract Services OECTA	Toronto	ON
Andy Wong	BASc Systems Design	Markham	ON
John Wylie	Ph.D physics university of Toronto	Toronto	ON
Robert Belanger	Bsc informatique	Longueuil	QC
Magalie Bouchard	PhD en sémiologie	Montréal	QC
Jean-Francois Brodeur	Paramedic, Health and Safety Representative	Montreal	QC
Philippe Crevier	Gestion stratégique SST - U Sherbrooke	Montréal	QC
Élisabeth Cyr	Maîtrise	Québec	QC
France Delagrave	M.Sc. en éducation, chargée de dossiers de santé publique	Berthier-sur-Mer	QC





	(retraîtée)		
Gerald Denley	BA	Gatineau	QC
Patrick Déry	Analyste en politiques publiques	Laval	QC
Sophie Desz	Sage-femme DE (France)	Montreal	QC
Vincent Dinh	MASc electronics engineering (in France)	Montréal	QC
Alain Doiron	BAC Génie Électrique	Montréal	QC
Olivier Drouin	M.Sc and founder of CovidEcolesQuebec	Montreal	QC
Hélène Dumas	Baccalauréat en microbiologie	Notre-Dame-De-L'Île-Perrot	QC
Isabelle Gagné	MASc chemical engineering	Gatineau	QC
Johanne Heppell	Bac. en philo, études de maîtrise en philo	Plaisance	QC
Judith Huot	Première vice-présidente FSSS-CSN	Montréal	QC
Cindy Johnson	Hygiéniste dentaire	Lachine	QC
Russell Johnson	CEGEP Diploma	Carignan	QC
Begot Karine	Salubrité	Montreal	QC
Caroline Killson	médecin vétérinaire et éthicienne/ m.v., M.A(bioéthique))	Brossard	QC
Élyse Laflamme	BSc occupational therapist	Montréal	QC
Linda Lapointe	Inhalothérapeute	Ville de Québec	QC
Catherine Leclerc	PhD en sciences humaines/PhD in Humanities	Montréal	QC
Daniel Lepine	Inhalotherapeute	Repentigny	QC
Mathieu Marion	D. Phil. Oxon.	Montréal	QC
Paul Mendes-Gagnier	Préposé en entretien ménager	Charlemagne	QC
Pascale Merlet	MSc Administration de la santé	Laval	QC
Alessandra Mezzetti	PhD - Organic Chemistry	Gatineau	QC
Elena Motovilova	MM	Saint-Laurent	QC
Christian Naud	Fédération des professionnelles-CSN	Québec	QC
Pierre Newberry	B. Comp Sci and Engineering	Westmount	QC
Charles Nguyen	DEC	Montreal	QC
Michel Paquette	Ph.D. Philosophy (Decision theory)	Montréal	QC
Maxime Richard	Baccalauréat en biochimie de l'Université Laval 2008	Havre-Saint-Pierre	QC
Mathieu Rousseau	Bacc. psychologie	Montreal	QC
Nathalie Roussy	Hygiéniste dentaire	Longueuil	QC
Danny Roy	Fédération des professionnelles- CSN	Québec	QC





Line Saad	MBA	Montreal	QC
Arlene Saint-Prix	Bachelors and masters in Literature, Education and Translation	Montréal	QC
Michel Seymour	PhD. en philosophie	Montreal	QC
Étienne St-Jean	Ph.D. Administration, professeur titulaire, UQTR	Trois-Rivières	QC
Debra Tacium	B.A, DMV	Sherbrooke	QC
Alexandre Triquet	CEO, Tridan CBRNE	Montreal	QC

Supporting Signatures from Other International Professionals:

Other International Professionals			
Name	Credentials and Affiliations	City	Country
Theo Allen	BSc Mathematics	North Castle	NY - USA
Bronwyn Barry	Architect	San Francisco	CA - USA
Rabbi Kara Tav	Rabbi, Chaplain	New York City	NY - USA

Organizing bodies:

Masks4Canada
www.masks4canada.org

Canadian Registration Board of Occupational Hygienists (CRBOH)
<https://www.crboh.ca/>

Workplace Health Without Borders
<https://www.whwb.org/about-us/>

Le collectif COVID-STOP
<http://www.covid-stop.ca/>

Mission Panache

Participating bodies:

Occupational Hygiene Association of Ontario
<https://www.ohao.org>

Endcoronavirus.org
<https://www.endcoronavirus.org>





CovidisAirborne.org
<https://www.covidisairborne.org>

The Champlain Region Family Council Network (CRFCN)
<https://www.champlainfamilycouncils.ca>

Ontario North Family Councils Network (ONFCN)
<https://fco.ngo/connecting-councils/council/ontario-north-family-council-network>

Ontario Federation of Labour
<https://ofl.ca/>

Service Employees International Union Local 1 Canada
<https://seiuhealthcare.ca/portfolio-item/seiu-local-1-canada-constitution/>

Ontario Council of Hospital Unions-CUPE
<https://ochu.on.ca>

Canadian Federation of Nurses Unions
<https://nursesunions.ca>

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