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Microbiology Laboratories

Lisa M. Brosseau, ScD, CIH
Control Banding & COVID-19

Dr. Brosseau, now retired, was a professor at the University of Illinois at Chicago (UIC) School of Public Health from 2015 to 2018, where she was director of the Illinois Education and Research Center, which supported graduate and continuing education for occupational health and safety professionals and community outreach activities. She was also director of the UIC Center for Healthy Work.

Dr. Brosseau began her career as an academic researcher and educator at the University of Minnesota School of Public Health, where she directed the Industrial Hygiene Program. Her early research focused on the performance of respirator filters when exposed to hazardous aerosols such as silica and asbestos, and later expanded to include biological and infectious organisms. Her more recent research focused on respirator fit, using real-time methods and simulated workplace tasks to better understand how fit is influenced by realistic head and body motions. She continues to serve as a mentor and technical advisor on research projects and for businesses and organizations, including the Center for Infectious Disease Research and Policy (CIDRAP) at the University of Minnesota.

Dr. Brosseau has authored more than 100 peer-reviewed publications and book chapters, delivered numerous platform research presentations, and has been an invited speaker at numerous local, national and international conferences and workshops. She has written several articles for

CIDRAP focused on respiratory protection for healthcare and other workers during outbreaks and pandemics.

Nuggets mined from today's episode:

Tell us a little about your background, how did you end up involved in IH? Originally Lisa wanted to be an oceanographer and was then inspired by Rachel Carson to become an environmental researcher and academic. Industrial Hygiene provides opportunities to solve problems and help people.

How can we get more young people interested in IH? Firstly, the science of solving problems is fun. Well suited for those interested in public health. IH provides the opportunity to be a frontline worker: protecting people, solving problems and doing important work.

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What is the origin of control banding? Control Banding started in pharma where highly hazardous chemicals and materials are used. There was some animal toxicity data on these materials and little epidemiology information. To protect workers, it was necessary to allocate materials and tasks into bands that provide guidance.

What is Control Banding? "Control banding (CB) is a technique used to guide the assessment and management of workplace risks. It is a generic technique that determines a control measure (for example dilution ventilation, engineering controls, containment, etc.) based on a range or "band" of hazards (such as skin/eye irritant, very toxic, carcinogenic, etc) and exposures (small, medium, large exposure). It is an approach that is based on two pillars; the fact that there are a limited number of control approaches, and that many problems have been met and solved before. CB uses the solutions that experts have developed previously to control occupational chemical exposures, and suggesting them to other tasks with similar exposure situations. It is an approach that focuses resources on exposure controls and describes how strictly a risk needs to be managed. NIOSH considers CB a potentially useful tool for small businesses.

Control banding must be used in conjunction with health and safety practices such as substitution. Substitution for a less hazardous chemical is still highly recommended to prevent exposure. It is important to note that Control Banding is NOT a replacement for experts in occupational safety and health nor does it eliminate the need to perform exposure monitoring. CB highly recommends the use of professionals to provide recommendations. The

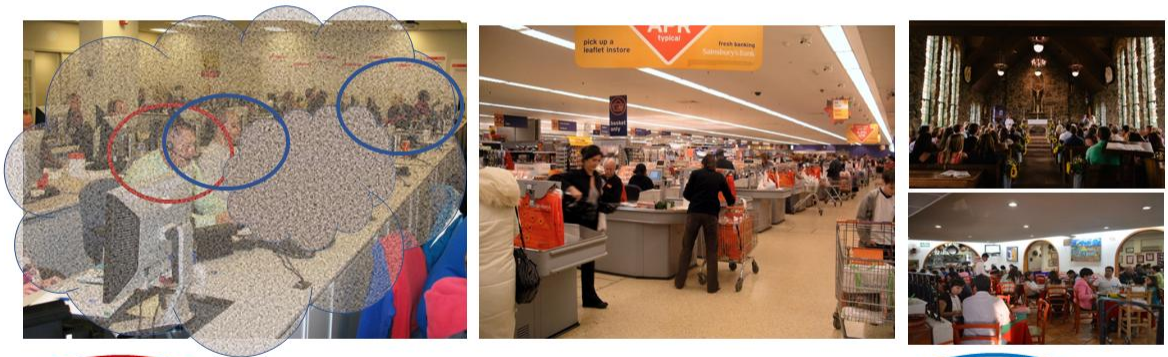
fourth band specifically recommends seeking professional assistance for highly hazardous exposures - NOTE: This is only true for some control banding models. Furthermore, CB recommends exposure monitoring to follow the CB intervention to ensure the installed controls are working properly." – [cdc.gov]

[PDF of PowerPoint Presented During Show]

Examples of Source Controls

- Remove workers from workplace – remote work
- Screening & testing to identify infected individuals
  - Not guaranteed to work if there are people without symptoms
- Adjust work schedules to limit the number of people in a space

Source-Pathway-Receptor



Examples of Pathway Controls

- Barriers that interrupt flow of infectious aerosols from source to receptor
  - Need to be careful about changing airflow from HVAC system
- Increase the amount of dilution air (air changes per hour)
- Separate "clean" and "dirty" sides
- Use distancing
  - But coughs and sneezes can easily travel beyond 6 feet
  - Small particles can be easily distributed throughout a space
- Use local exhaust ventilation to capture infectious aerosols at the source
- Use high efficiency portable air cleaners to remove particles near the source and improve air mixing and cleaning throughout the space

MAY NEED A COMBINATION & MANY REQUIRE EXPERTISE TO SELECT AND MEASURE EFFECTIVENESS

Examples of Receptor Controls

- Control booths
  - Often used in hazardous processing plants
  - May be a problem if occupied by more than one person
- Personal protective equipment
  - Respirators (not face coverings or surgical masks)
- Enclosed separately ventilated spaces (cabs, offices, etc.)

Aim to Lower Exposure Level

GOAL

Reduce exposure to as low as possible by selecting additional control strategies from the source and pathway categories and reducing reliance on PPE

Sietsema, Margaret, et al. "A control banding framework for protecting the US workforce from aerosol transmissible infectious disease outbreaks with high public health consequences." Health security 17.2 (2019): 124-132.

Brosseau LM, Rosen J, Harrison R. Selecting Controls for Minimizing SARS-CoV-2 Aerosol Transmission in Workplaces and Conserving Respiratory Protective Equipment Supplies. Annals of work exposures and health. 2020 Aug 21.

Band	Control Options
A	Source – Do these first! Pathway – May be prudent Receptor – Not necessary
B	Source – Do these first! May require multiple options Pathway – Do these next & may require multiple options Receptor – Only if source and pathway controls are not effective
C	Source – Do these first! May require multiple options Pathway – Do these next & may require multiple options Receptor - May be prudent

Exposure = Likelihood & Duration

Likelihood	Daily Duration		
	D1 (0-3 hours)	D2 (3-6 hours)	D3 (>6 hours)
L1 (Unlikely Exposure)	E1	E1	E1
L2 (Possible Exposure)	E2	E2	E3
L3 (Likely Exposure)	E2	E3	E3

L1 – Unlikely exposure – worker does not come in contact with infectious individuals
L2 – Possible exposure – worker has numerous contacts who may be infectious
L3 – Likely exposure – Working directly with infectious individuals

Control Band

Exposure Rank	Risk Rank			
	R1	R2	R3	R4
E1	A	A	A	B
E2	A	B	B	C
E3	A	B	C	C

Risk Group 3 = Agents associated with serious or lethal human disease for which preventive or therapeutic interventions may be available

Accounts for both the degree of harm and the availability of prophylaxis: https://my.absa.org/Riskgroups

City Bus Driver

- Interacts with many people each workday
- Many may be infectious (even without fever or symptoms)
- Work 8 hr per day

Likelihood	Daily Duration		
	D1 (0-3 hours)	D2 (3-6 hours)	D3 (>6 hours)
L1 (Unlikely Exposure)	E1	E1	E1
L2 (Possible Exposure)	E2	E2	E3
L3 (Likely Exposure)	E2	E3	E3

Possible Exposure (L2) and > 6 hr Duration (D3) = E3 Exposure Level

E3 Exposure Level & Risk Rank R3

	Risk Rank			
Exposure Rank	**R1**	**R2**	**R3**	**R4**
E1	A	A	A	B
E2	A	B	B	C
E3	A	B	C	C

Band	Control Options
A	Source – Do these first! Pathway – May be prudent Receptor – Not necessary
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Control Band C
Requires Multiple Source and Path Controls

- Source Controls
  - Impossible to limit who boards the bus
  - Face coverings will not limit emission of small particles
- Path Controls
  - Build a separately ventilated enclosure for the bus driver
- Receptor Controls
  - Bus driver should wear a respirator if required to be near or in close contact with customers

May be prudent to use PPE, but only after source & pathway controls are implemented.

COVID19, humidity and temperature? While COVID19 viability appears to be impacted by temperature and humidity component, there is no evidence that these variables are playing any role during the pandemic. Over time COVID19 may become one of several circulating human coronaviruses and may exhibit a seasonal component then.

How do you see the progression of things getting back to normal what do we need to be careful about? What should we focus more on? Wearing cloth makes will not flatten the curve and is magical thinking. Getting back to normal will require focus on more and better under the ceiling ventilation, individual room filtration rather than trying to improve the HVAC system, among other things.

Additional Dr. Brosseau comments:

- Regarding COVID19, aerosol exposure appears to be more important than contact or droplet exposure. We are seeing asymptomatic transmission and transmission occurring beyond 6' distances. Data supports aerosol transmission. Aerosol transmission means inhalation. Humans emit a range particles sized from < 1 micron to > 100 microns. Small particles can remain suspended in air for hours and days. We don't know the infectious dose. We think that it can be as low as 100-200 virions.
- Bus drivers are essential workers. For the first time during Lisa's career, IHs are also considered essential workers.
- The WHO organization doesn't require respirators for healthcare workers (HCW) unless there is spread between HCW or for healthcare workers performing aerosol generating procedures. Lisa, opines healthcare workers need higher levels of respiratory PPE and may not require Tyvek suits.
- Lisa is an advocate for more and better ventilation and use of portable air cleaners.
- Cloth masks are mechanical filters and require multiple layers to achieve high filter, which makes them difficult to breathe through.

Airborne disinfection? Constant cleaning and disinfection is magical thinking.
Z-Man added "There is considerable evidence that glycol vapors produce significant decreases in numbers of viable airborne bacteria under relatively wide conditions of relative humidity and temperature when properly and continuously dispensed by a vaporizing device so as to maintain suitable concentrations in the air of enclosed spaces." https://www.epa.gov/pesticide-registration/efficacy-data-and-labeling-requirements-air-sanitizers

Lisa's response to Z-Man's addition: [NOTE: I do not endorse or support this recommendation. While glycol may be relatively non-toxic, at high concentrations I believe it is a respiratory irritant. I would never recommend this for a home with children or for patients or people with respiratory health

conditions. There is no reason to spray anything in a space if you can use a portable air cleaner equipped with a high efficiency filter to remove particles from the space and induce higher air exchange rates at the same time.]

Z-Man's clarification- Under FIFRA the EPA requires oral, dermal and inhalation toxicity testing for all active ingredients and registered formulations. 5% propylene glycol, 95% water is not a high concentration. Air filtration devices are great, and they have limited zones of efficacy; 'the corner of the living room is the most forsaken place in a home'. Placing an air filtration on the floor in the corner of a room may provide a false sense of security. My reasoning behind the 5% propylene glycol recommendation is to do everything possible protect my 92 year old mom who resides in an assisted living facility. In addition to air filtration devices we also run humidifiers with 5% propylene glycol. I provided the link the EPA website which includes references providing the history of this technology. People should do their own research and make decisions accordingly.

Z-Man signing off

New Trivia Question:

Name the book title which was inspired by a poem by John Keats, "La Belle Dame sans Merci"?
Answer: Silent Spring by Rachel Carson