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### **Three Perspectives on how COVID-19 will change the IAQ World**

This week we welcomed three distinguished guests for their perspective on how COVID has changed the IAQ world forever. Critical topics such as how viruses and other infectious diseases are transmitted are being reexamined. *Is it possible that we will go back to the pre-COVID status quo after the pain of the pandemic subsides? What is the most important lesson of the pandemic? What is the most important change that needs to be made to IAQ standards? How will COVID change HVAC system design practice? What is the biggest knowledge gap revealed by the pandemic? What can be done to make better IAQ sustainable? These questions and more were examined during this week's show.*

**Bill Bahnfleth, PhD, PE** is a professor of architectural engineering at the Pennsylvania State University (Penn State) in University Park, PA, where he has been employed since 1994. Previously, he was a Senior Consultant for ZBA, Inc. in Cincinnati, OH and a Principal Investigator at the U.S. Army Construction Engineering Research Laboratory in Champaign, IL. He holds BS, MS, and PhD degrees in Mechanical Engineering from the University of Illinois, where he also earned a bachelor of music degree in instrumental performance. He is a registered professional engineer.

**Kishor Khankari, Ph** is the president and founder of AnSight LLC. As a specialist in Computational Fluid Dynamics (CFD).. A noted expert in his field, he has a Ph.D. in CFD from the University of Minnesota and has regularly published in several technical journals. Dr. Kishor Khankari is an ASHRAE Fellow and ASHRAE Distinguished Lecturer. He is a recipient of ASHRAE Distinguished and Exceptional Service Awards; past President of ASHRAE Detroit Chapter, past Chair of ASHRAE

Research Administration Committee (RAC) and many other esteemed positions and service to the industry.

**Stephanie Taylor, MD, M Arch, CIC-** After working for decades as a physician, Dr. Stephanie Taylor, MD decided to obtain her Master's Degree in Architecture in order to better understand buildings. Dr. Taylor is now the President and founder of Building 4 Health Inc. where her lifelong commitment to human health now focuses on understanding and improving the indoor environment to support the health of all people. She is an InCite Health Fellow at Harvard Medical School, an ASHRAE Distinguished Lecturer and member of the Epidemic Task Force and Environmental Health Committee. She was the recipient of the Engineered Systems, "Women to Watch in HVAC", in 2019.

### **Nuggets mined from today's episode:**

#### ***What is the most important lesson of the pandemic?***

Dr. Taylor - Indoor air quality is hugely impactful to our health. Unless we properly manage the human environment, which is indoors, medical interventions will never achieve the population health success we hope for. To create indoor spaces that truly support occupant health, we need to first make visible the IAQ metrics that are key to our health and then remediate appropriately. Her company is using TSI sensors in their platform to reveals the Health Impact Rating for occupied spaces.

Dr. Banfleth - IAQ is only as important as people think it is. There was no playbook for managing IAQ during a pandemic. We need to think about and plan for future pandemic response. New building designs should plan for pandemics, as pandemics will happen again.

Dr. Khankari - Complimented IAQ Radio+ for raising IAQ awareness and helping society. During Covid, he learned how to live in a cave. Society is ignorant about IAQ.

***Is it possible that we will go back to pre-Covid status quo after the pain of the pandemic subsides?***

Dr- Taylor - After the 1918 pandemic, things went back to normal. We have more media and much faster communication today. The effect of IEQ on the progression of human illness (asthma, autoimmune, allergy) are on the rise.

Dr. Banfleth - Following 9-11, a government official told him, that interest in IEQ will diminish without more incidents of terror.

Dr. Khankari - While good ventilation is often recommended, good ventilation remains undefined. Covid opened many eyes; we need to do much more.

***What will happen when government covid subsidies are gone?***

Dr. Taylor - Government subsidies definitely provide the means to start improving the indoor environment to support health. The motivation to sustain this effort, however, will probably only occur when decisions are made by the people who actually experience health problems from IEQ. The existing financial misalignment between building owners, managers and occupants will need to be overcome if we hope to see continued interest in improving IAQ for health.

Dr. Banfleth - Don't underestimate people going back to normal. Some Covid interventions increased energy use. Can I save money by cutting back on fresh air, switching from MERV 13 filters back to MERV 8, etc. Causes and effects have not been quantitated. It's very costly to retrofit existing HVAC or install new systems. Pressures are to keep existing standards where they are. Some Covid mitigations improved IEQ and resilience. As expected, there are a variety of opinions on the best courses of action. 41% of HVACs in schools need to be repaired or replaced. Start by fixing the basics. We have the technology; we don't need more silver bullets. Split incentives, who pays and who benefits? When the money goes away policy and regulation will be important. Kids with asthma are treated in the ER and then sent right back into homes with poor IEQ. Physicians need to engage. ASHRAE 62.1 focuses on infection. Better integration is needed between standards, thermal comfort, air quality and mold growth. No design standard drives good air circulation or air cleaning.

Dr. Kankari - When infectious aerosols vanish and pain goes away, people will resume normal lives. If not addressed now, we will be unprepared for the next pandemic.

***What is the most important change that needs to be made to IAQ standards?***

Dr. Taylor - Increased emphasis on maintaining a minimum relative humidity level. Numerous studies demonstrate that low humidity contributes to disease transmission. Canada now includes maintaining indoor RH between 40%-60% as a best practice in homes and senior living facilities. Mandate 40%-60% RH in the US.

Dr. Kankari - How we think about standards needs to completely change. Standards are minimum standards. We need to move away from prescriptive standards to performance standards that practitioners can be held to.

***What is the biggest knowledge gap revealed by the pandemic?***

Dr. Taylor - Clinicians are missing from the IAQ discussion. Human health professionals need to be brought into the fold.

Dr. Banfleth - Research is thin on epidemiology. Which may account for the long delay in WHO acknowledging aerosol transmission.

Dr. Kankari - Computational Fluid Dynamics (CFD), visualizing air flows. CFD is a valuable tool being utilized from aerospace to manufacturers of vacuum cleaners. Put microscopes in buildings to see the contaminants. A viewpoint from a different perspective, bottom up rather than top down considering more than ventilation and filtration, e.g. air is the primary carrier while contamination sources remain in the building

***What is the most important change that needs to be made to design practice?***

Dr. Banfleth - There are constraints on energy use. IEQ should drive the lifecycle evaluation.

Dr. Kankari - Bottom up design, design buildings for the occupants. Consumers aren't engaged because they are ignorant about the connection between building

design and IEQ. Clean air is a fundamental human right. Unfortunately, low bid drives the process. Building design should be performance driven.

Dr. Taylor - Create buildings that are shelters. Human senses do not perceive most harmful indoor air components or off-gassing from surface materials. Use continuous monitoring to create visibility of the health impact of indoor spaces so that appropriate remediation can take place when needed.

***What can be done to make better IAQ sustainable?***

Dr. Taylor - Keys to maintaining human health: manage the indoor air chemistry, manage the indoor microbiome (humans release 37 million microbes per hour) and support diverse microbiomes indoors. Put people at the center of buildings. Put sensors in all buildings.

Dr. Bahnfleth - Quantitative risk management criteria:

- What is acceptable?
- How to calculate air changes?
- Do we need more than a HEPA?

A healthy building is also sustainable. Focus on source control and energy recovery. Energy use doesn't stop when occupants leave the building. Deliver better air to the breathing zone. Have multiple HVAC operating modes including a pandemic or wildfire mode.

Dr. Kankari - What are the major contaminants indoors? What are the major sources of contaminants indoors? Very little is known about Sars/Covid. NIOSH and EPA publish exposure limits. More study is needed on acceptable exposure limits. What type of air mixing HVAC diffusers do we need? Do we need diffusers? WE need innovative out of the box thinking. Just buying and putting an air cleaner on the floor in a corner, isn't cleaning the air...its functioning more as a vacuum cleaner. We need clean air in the breathing zone. Educate people about what IEQ is. Educate people on why understanding IEQ is important. Energy efficiency is important.

**Final thoughts:**

Dr. Banfleth - Educate occupants. Educate designers. Educate building owners and operators. Educate healthcare people and industrial hygienists.

Dr. Kankari - Focus on people. Be occupant centric. Bring divergent fields together to create healthy, energy efficient, sustainable buildings.

Dr. Taylor - Energy efficiency is visible to building owners because monthly reminders come in the form of bills they have to pay. Creating visibility of health benefits of good IEQ will raise awareness and have the same effect.

***Z-Man signing off*****Trivia question:**

What percentage of people confirmed to have Covid-19 develop mild or moderate symptoms?

Answer: 80%

Answered by: Don Weekes