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Leveraging a new generation of mobile bioaerosol monitors: research to practice before, during and after COVID

618

John Lovett &
Mark Hernandez, PhD, PE

Leveraging a New
Generation of Mobile
Bioaerosol Monitors

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... WITH RADIO JOE AND THE ZMAN

John Lovett & Mark Hernandez, PhD, PE
InstaScope CEO & University of Colorado Boulder Professor

This week we took a deep dive into the new generation of mobile bioaerosol monitoring with two leaders of the movement.

John Lovett is the CEO of DetectionTek Holdings the parent company and creators of, InstaScope an air sampling technology for instant mold and air quality assessment results. Developed by the military, applied commercially for indoor air quality, InstaScope is the only optical technology of its kind on the market. Prior to founding DetectionTek Mr. Lovett was CEO of Droplet Measurement Technologies. He has a long history as an entrepreneur, CEO and founder of companies such as Lovett Ski Co. (First commercially produced fiberglass Cross Country skis in US),

The Ski Co., Frank Shorter Running Gear, Allied Marine and Anchor Asset Management.

Dr. Mark Hernandez attained all his engineering degrees from University of California at Berkeley. He is a registered professional civil engineer and an expert on the characterization and control of bioaerosols – both indoors and out. Based at the University of Colorado, he has 25 years of research leveraging forensic science into wide area surveillance and the design of aerosol disinfection systems for the built environment.

Nuggets mined from today's episode:

John, how did you become interested in optical sampling technology? Twenty years ago, John Lovett became interested in mold. After doing a search for suitable technology, John licensed a military technology from the UK which was designed to quickly detect anthrax. John saw a niche for the equipment in the mold inspection market and initially limited availability of the device to ServiceMaster.

John what are the economics of InstaScope? The InstaScope instrument does real time analysis and saves both time and lab fees. The machine can be financed for \$700 per month.

Has the technology been vetted? Dr. Hernandez is one of several academic or military researchers who have vetted the InstaScope technology. Dr. Hernandez has validated the use of InstaScope for civilian purposes bringing technology into practice. When looking under the hood of the device you'll find a fluorescent microscope, particle counter and the "secret sauce" ultraviolet lamps that excite particles. Airborne microbes can and do fluoresce providing an added signal. The microscope, particle counter + the depth and intensity of the fluorescence is used to categorize the air in real time. The percentage of biological load in the air. Nonbiological stuff in the air doesn't fluoresce.

Does the device generate reports? Yes, the instrument generates reports which can be viewed on an iPad. Inspectors will commonly take comparative measurements both indoors and outdoors and throughout buildings to identify the levels to which areas are microbially contaminated.

Tell our audience about your school study? One notable study involved scanning elementary school rooms in Boulder, CO. Encountered different ages of buildings, differing types of HVAC systems, windows which don't open. Legacy schools, old architecturally or historic buildings. Legacy soil, build up of particulate in schools from periods without occupancy.

The instrument's rapid scanning capability identified outlier rooms with the highest percentages of microbial load. Outlier rooms with greater than 1/3 of the total particulate being bio-load all had evidence of water damage!

Studies in school showed differences in resuspension rates for carpeted and uncarpeted areas. By identifying the problem rooms, school districts knew where to focus engineering controls. Portable HEPA air-cleaners with 360° intake reduced airborne particulate and helped mix classroom air.

Integrating IAQ control strategies to reduce the risk of asymptomatic SARS CoV-2 infections in classrooms and open plan offices. by Jensen Zhang

<https://www.tandfonline.com/doi/full/10.1080/23744731.2020.1794499>

Category 3 water is a big issue on water losses. Can the instrument analyze aqueous samples? Dr. Hernandez has studied the aqueous capabilities of the machine. By internally aerosolizing a water sample, the instrument can indicate the present percentage of bio-load (bacteria, fungi, pollen and other particles); which can be very useful in making real-time initial risk assessments. More research work can be done if market justified.

Does the device differentiate between genus or genera? While neither John nor Dr. Hernandez claim the instrument can differentiate between genus or genera. Labs cannot differentiate between penicillin and aspergillus. As microbial hotspots light-up the machine can be used similar to a Geiger counter to pinpoint problem areas. The instrument can be used to sample behind walls. Interestingly, Stachybotrys does fluoresce.

Does the machine measure airborne COVID in real time? Dr, Hernandez is doing research with viable COVID in his lab. Name your microorganism of choice and he likely has it available in his lab.

According to Dr. Hernandez, no instrument can measure, quantify, and enumerate airborne COVID virus indoors in real time. Naked COVID viral particles don't present, COVID particles are always attached to other things.

Dr. Hernandez pointed out that some COVID virus research has recently indicated a correlation between outdoor air pollution (e.g. ozone and particulate) and COVID infection success.

Dr. Hernandez pointed out that there is an abundance of COVID recommendations which don't prove something works. Modeling makes assumptions.

Wildfires? Wildfires have unique particle signatures. Wildfire plumes contain biology, black and brown carbon. More in situ research would need to be done following wildfire.

HVAC system? NADCA worked with Dr. Hernandez to study the effects of HVAC system cleaning on long term particles in occupied spaces. Studies were done on matching HVAC systems in both VT and MI.

Calibration? According to John, InstaScope instruments need to be professionally calibrated twice annually. Dr. Hernandez acknowledged the important work done by Anne Perring on calibration and suggested that it is worthy of becoming a NIST standard. [Schwarz JP, Perring AE, et al., Technique and theoretical approach for quantifying the hygroscopicity of black-carbon-containing aerosol using a single particle soot photometer, *J. Aerosol Sci*, 81, pp110-126, 2015.

<https://www.colgate.edu/about/directory/aperring>

Notable audience comments on today's show:

- Terry Sopher Sr to Everyone: 12:57 PM gratitude to ALL for this terrific, interesting session. As usual IAQ Radio ROCKS
- Ayuba John Bassa to Everyone: 12:58 PM What an opportunity to learn again today. Thanks for share your knowledge and experiences. More grace to you all.
- Dave Luce to Everyone: 12:59 PM Great show!

Z-Man signing off

Trivia question:

Name the term coined by F.C. Meier in the 1930s describing a project involving the study of the life in the air?

Answer: Aerobiology

Answered by: Vic Cafaro Chesterfield, Virginia