RESEARCH SYMPOSIUM

Room 208 Breakout Session 2 Abstracts

Andrew Metcalf, assistant professor, Environmental Engineering and Earth Sciences

Air Pollution

COVID-19 has highlighted the need for cleaner indoor environments. Airborne transmission of COVID-19 and other infections can be reduced by engineering controls that remove contaminants from the air through either flushing indoor space with fresh external air or cleaning of the air through filtration or other mechanisms. However, there is no clear guidance on the optimal method for doing this. The objective of our research is to develop a method for rapidly determining the cleaning performance of a building's ventilation system and to develop a procedure for recommending an appropriate set of mitigation steps that will significantly reduce the risk of airborne pathogen transmission. This talk presents results from the successful completion of a SERCEEES grant to study indoor air pollution in Clemson University classrooms. The grant established a collaboration between CE and EEES faculty to initiate a more wholistic approach to looking at indoor air quality, from how to characterize what is there to how to determine feasible mitigation strategies to improve classrooms on campus. This talk will discuss both the research results and the strategies for collaboration within the newly formed School of Civil and Environmental Engineering and Earth Sciences.

Congyue Annie Peng, Research Assistant Professor, Bioengineering

Genes, Genomes, Pathogens, Peptide, and Cell Therapy

SARS-CoV-2 pandemic has prompted the need for laboratories with the flexibility to handle a rapid increase of diagnostics demand. The Clemson University Research and Education in Disease Diagnostics and Intervention (REDDI) laboratory is founded in that response. With a Clinical Laboratory Improvement Amendments (CLIA) certification that ensures testing quality and a research development lab that extends the pathogen detection and disease intervention capabilities, REDDI lab provided services and collaboration for the university and the community in virus mitigation and variant monitoring. Here, we present the challenges and opportunities on pathogen related diagnostics and variant monitoring when the causal organisms remain elusive to the symptomatic patients. We focus our efforts in genomics and epidemiological surveillance of the respiratory pathogens through targeted enrichment and next-

generation sequencing. We also highlight our efforts in student training on clinical validation and therapeutics development for diagnostics and treatment of other diseases.

David Ladner, associate professor, Environmental Engineering and Earth Sciences

Water, Environment, and Sustainability

Based on recent awards of two large federal grants from USDA and NSF with $11.5M in funding, Clemson University has been thrust into the national forefront of research on controlled environment agriculture (CEA) using non-conventional water resources. Our CEA approach involves hydroponic cultivation of food crops using greenhouse or modular containers with controlled conditions of light, temperature, fertigation, and water quality. The two non-conventional water resources being considered include reclaimed municipal wastewater, constrained by microbial and chemical risks to consumers, and saline waters (e.g., brackish groundwater; tidally-influenced bays, estuaries, and river deltas), constrained by salt tolerance of crops and salinity management. Integration of reclaimed wastewater into CEA involves a novel wastewater treatment scheme, anaerobic membrane bioreactor with UV light disinfection, to ensure food safety while delivering irrigation water containing in situ nutrients at low-energy/-cost, while integration of saline waters involves a new concept of agricultural-sector desalting, partial desalination, with breeding to increase salt tolerance of crops and salinity management of brines though a salt gradient solar pond. Both research projects are being advised by a stakeholder group including farmers/growers, government, and consumers as well a scientific advisory committee. We propose establishment of a campus-wide consortium as a means of promoting cross-project synergies as well as recruitment of additional colleagues and stakeholders to pursue further funding, e.g., consideration of urban storm water runoff, constrained by presence of heavy metals, pesticides, and hydrocarbons, as another non-conventional water resource in CEA, and integration of constructed wetlands into CEA for salinity/water quality management.