SCHOOL OF
CHEMICAL ENGINEERING
College of Engineering, Architecture and Technology

CHE SEMINAR SERIES

Advancing Environmental Inhalation Toxicology Through Interdisciplinary Innovation

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ENGINEERING SOUTH 107

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The health impacts of inhalation exposures present a critical and evolving challenge at the intersection of engineering, environmental science, and public health. Real-world exposures—characterized by complex pollutant mixtures and individual biological variabilities—demand innovative frameworks for detection, understanding, and mitigation. My research integrates advanced aerosol science, bioengineering, and toxicology to tackle these challenges, leveraging interdisciplinary approaches to bridge the gap between environmental exposures and human health outcomes.

This talk will highlight two transformative research avenues. First, I will discuss my work on novel breath-borne biomarkers, pioneering innovative methods for air toxicity monitoring and rapid screening of respiratory infections, including COVID-19. Second, I will present the development and application of a physiologically relevant artificial lung system, which models human inhalation exposures with unprecedented precision, replicating key anatomical and physiological conditions to investigate aerosol deposition, toxicity, and individual susceptibilities.

Looking forward, my research aims to deepen our understanding of the toxic effects, biological mechanisms, and individual susceptibilities to specific exposures, while expanding to encompass the broader exposome in the context of climate change and planetary health. I also aim to develop sustainable mitigation solutions, advancing public health and promoting health equity.

Dr. Haoxuan Chen is a Postdoctoral Fellow in the Department of Environmental Health Sciences at the University of California, Los Angeles (UCLA). His interdisciplinary research integrates aerosol science, bioengineering, and toxicology to investigate the health effects of inhalation exposures and develop innovative monitoring and mitigation strategies.

Dr. Chen earned his Ph.D. in Environmental Science from Peking University in 2020, where he pioneered the use of breath-borne biomarkers for non-invasive exposure assessment and air toxicity monitoring. His doctoral work earned him the Sheldon K. Friedlander Award from the American Association for Aerosol Research (AAAR). During the COVID-19 pandemic, Dr. Chen developed a breath-based screening tool for rapid infection detection, integrating VOC biomarker analysis with machine learning. At UCLA, he has advanced inhalation toxicology by developing a ventilated artificial lung system that replicates human respiratory physiology for real-world exposure simulations.

With multiple publications in leading journals, invention patents and national awards, and extensive experience leading interdisciplinary collaborations, Dr. Chen is committed to advancing engineering solutions for global environmental and public health challenges through collaborative research.