UNIVERSITY OF DELAWARE
DELAWARE ENERGY INSTITUTE

DEI SEMINAR

ZOOM: HTTP://WWW.UDEL.EDU/0012791

TUESDAY, FEBRUARY 4, 2025

11:00 AM

366 CLB

PHILIP DEMOKRITOU

RUTGERS UNIVERSITY

BIO

Dr. Demokritou's fundamental research focuses on understanding how nanoparticles interact with biological and environmental systems. His pioneer research on particle health effects sheds light on how the physicochemical and morphological properties and structure of both environmental nanoparticles and engineered nanomaterials (ENMs) define their bioactivity and toxicological footprint in general and their impact on human health. Additionally, his nanoscience research goes beyond assessing the nano-bio interactions and focuses on understanding, manipulating, and applying nanoscale materials and phenomena to address major environmental and public health challenges of the 21st century in **food safety and security, agrichemical delivery, airborne infectious diseases, obesity, climate change and sustainability**. Dr. Demokritou is the founding Director of two interdisciplinary research Centers at Harvard University: 1) Harvard-NIEHS Nanosafety Research Center and; 2) Center for Nanotechnology and Nanotoxicology (*www.hsph.harvard.edu/nano*). *(continued on page 2)*

FROM PLASTICS TO MICRO-NANOPLASTICS: POTENTIAL ENVIRONMENTAL HEALTH IMPLICATIONS

TALK

Micro- and nanoplastics (MNPs) are the byproducts of the environmental degradation of plastics across their life cycle. Mounting evidence of increasing MNP contamination of our natural environments, including contamination of the food chain, drinking water, and air makes human population exposure inevitable. More alarmingly, emerging evidence from human biomonitoring studies also confirmed the presence of MNPs in human tissues and organs including, placenta, blood, lungs among others. While epidemiological studies linking MNP exposures to disease outcomes are lacking, there is an urgency to assess the bioactivity and toxicological footprint of environmentally relevant "real world" MNPs and identify potential health risks. This presentation will focus on a number of ongoing research projects in the Nanoscience and Advanced Materials Center (NAMC) with an emphasis on MNP ingestion. Findings will include the fate of environmentally relevant MNPs in the gastrointestinal tract (GIT) and their bioactivity using advanced small intestinal epithelium (SIE) cellular models coupled with simulated digestions and animal in-vivo models. *(continued on page 2)*

Bio (continued)

He is also the founding Program Director of the Harvard-Nanyang Technological University/ Singapore Sustainable Nanotechnology Initiative (2016-2022). He is also the founder of the Rutgers Nanoscience and Advanced Materials Research Center at Rutgers University. In the past, he served as a co-PI of the Harvard-EPA PM Health Effect Center (1999-2010, US EPA star grant) and the Director of the Harvard-Cyprus International Institute for the Environment and Public Health from 2005-2008. He served as PI, co-PI, or co-investigator on several grants funded by NIH, EPA, NIOSH, NSF, USDA/NIFA, CPSC, and EU research framework (FP7). He holds more than a dozen international/US patents and inventions and is a co-founder of DIETRICS. He is a co-author of two books, numerous book chapters, and more than 230 articles in leading journals in nanoscience, particle health effect, and aerosol engineering fields. Dr. Demokritou's innovative research was highlighted in major mainstream media and online magazines, including articles published in the Economist, NanoWerk, Chemistry world, The Scientist, ACS C&EN News, MIT News, Harvard Gazette, and NPR news. Dr. Demokritou is currently the Henry Rutgers Chair and Professor in Nanoscience and Environmental Bioengineering at Rutgers Biomedical Health Sciences and Division Chair at the Environmental Occupational Health Sciences Institute (EOHSI). Before joining Rutgers in September 2021, he was a Professor at TH Chan School of Public Health at Harvard University for 25 years. He is also the founding co-editor in chief of NanoImpact (Elsevier).

Talk (continued)

Data will be presented to answer hypothesis-driven questions such as: 1) Does ingestion of MNPs cause direct toxicity, inflammation, or altered function within the GIT. 2) Can MNPs cross the intestinal barrier to enter the circulation? 3) Do ingested MNPs interfere with digestion or absorption of nutrients? 4) Can MNPs concentrate and act as delivery vehicles for other toxic environmental pollutants (EPs), or impair intestinal barrier function, thereby increasing the bioavailability of toxicants? 5) Can ingested MNPs translocate to the placenta and fetal tissues?. Findings from our studies suggest that MNPs can bypass biological barriers and cause significant toxicity, and underscore the urgent need for additional detailed and in depth studies of the potential hazards of ingested MNPs.