We deeply value our collaboration with CHE and other partners to support using the best science to protect communities disproportionately exposed to toxic chemicals and ensure that we can all live our healthiest lives.

Tracey Woodruff, PhD, MPH is a leading scientist who has produced seminal research on how harmful chemicals and pollutants impact health, pregnancy, and child development, including the first international study to document the effects of air pollution and preterm birth and the first to document toxic chemicals in pregnant women and newborns. A national expert in chemical and regulatory policy, Dr. Woodruff was a senior scientist and policy advisor for the U.S. EPA's Office of Policy prior to joining UCSF.

Swati Rayasam, MSc is a Science Associate on the Science & Policy team at PRHE. She has been one of the leads on the team for PRHE's work to ensure EPA's implementation of the Toxic Substances Control Act protects the health of communities disproportionately impacted by toxic chemical pollution such as incarcerated people, people with disabilities, and BIPOC communities. She has expertise in federal and international policy, exposure science, community-guided science, science translation/communication, toxics, infectious disease, and water, sanitation, and hygiene (WASH).

PAST AND FUTURE ENVIRONMENTAL HEALTH RESERACH

Linda S. Birnbaum, PhD

While the potential impact of the environment on our health has been recognized for thousands of years, the need to use a multi- and trans- disciplinary approach has only been recognized relatively recently. Exposures must be broadly defined and inclusive – the environment includes social and economic factors, as well as natural stressors, pollutants, infectious agents, and nutrition. The newspaper story of environmental health includes the who, what, when, where, why, and how of exposures and populations. Another key understanding is that noncommunicable, chronic disease – notwithstanding the recent focus on the COVID pandemic – pose the greatest threat to human health throughout the world. Cancer, heart disease, obesity, and type 2 diabetes have increased dramatically and are impacted by our environment. Neurodevelopmental disorders such as autism spectrum and ADHD are on the rise.

Both our environment and our genes determine our health. Air pollution is the greatest environmental cause of morbidity and mortality, but pollution of water and soil also have significant impacts. And pollution can impact ever organ and tissue in our body and at every life stage. The vulnerability of the developing organism has been recognized within the past twenty years – but there are multiple developmental stages, ranging from preconception through aging. The key role of epigenetics controlling gene expression and its malleability has only been recognized relatively recently. The key role of the microbiome and the role of stem cells are under intense investigation. The realization that effects can occur at very low doses when the endocrine system is perturbed has led us to understand that environmental impacts can occur within the general population. And that many exposures can have long term effects which may not be known for many years, and some can impact future generations.

Key disciplines in environmental health include toxicology, exposure science, and epidemiology. There is a need to better link these fields. New approaches are transforming toxicology, such as the use of new approach methodologies (e.g., cell-based, computational, etc.) which will reduce the use of experimental animals as models for human health – although when effects are seen in multiple species in multiple tissues and at various ages, it is unlikely that at least some humans are not also susceptible. Exposure science is being transformed by exposomics, the totality of exposure over a lifetime. Environmental sensors can measure external exposures, and internal exposures are being monitored by increased use of biomonitoring, both agnostic and targeted. Metabolomics, proteomics, lipidomics, and glycomics all provide insight into impacts of various exposures. The recognition that exposures are always to multiple stressors – chemical, physical, social, economic, and of course climate - is transforming how we view cumulative exposures.

Systematic review allows evidence integration from human, animal, and mechanistic studies. The use of key characteristics is helping to predict adverse effects by looking at key bioactivity profiles of stressors. Key characteristics involves pattern recognition, something at which people are very good, and allows a more holistic use of mechanistic understanding in predicting disease. Accurate prediction can lead to preventionof environmentally related disease, always preferable than treatment and cures.

Linda S.Burnbaum is the former Director of the National Institute of Environmental Health Sciences and the National Toxicology Program. She was granted Scientist Emeritus Status at NIH when she retired and is also a Scholar in Residence at the Nicholas School of the Environment, Duke University.