

IMPACTING US CHEMICAL POLICY AND ENVIRONMENTAL HEALTH

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*The 2007 CHE/UCSF Summit brought together 400+ scientists, clinicians, policy makers, media, NGO/community groups to set a visionary agenda for addressing environmental threats to health. The “Shaping our Legacy” plan developed there over 20 years ago still guides our work today – creating research to answer pressing environmental health questions, translating science into improved clinical care, and supporting policy that addresses health and health equity. The summit also launched our organization, The UCSF Program on Reproductive Health and the Environment (PRHE). CHE was and still is an integral connector those of us in the scientific/clinical/health environmental space working to transition from a society that **treats** chronic disease to one that **prevents** it.*

Chemical pollution threatens the health of our planet and everyone who lives on it. Despite this, the manufacture and production of chemicals has continued to increase, 350,000+ chemicals and chemical mixtures registered worldwide have led to extensive and disproportionate exposures, and generations of children being born pre-polluted.

In the United States, the 1976 Toxic Substances Control Act (TSCA), called “one of the most important pieces of ‘preventive medicine’ legislation” ever passed by Congress, was the primary legal authority to reduce harmful chemical exposures. Unfortunately, the law and its implementation was ineffective, causing state and local jurisdictions to create a patchwork of gap-filling regulations. This set up the most recent significant shift for our work in US chemical policy, the 2016 amendments to TSCA via the Frank Lautenberg Chemical Safety for the 21st Century Act. In the 40 years between enactment of TSCA and its 2016 amendments, EPA regulated **fewer than 10** of the 86,000+ chemicals on the market; amended TSCA promised an immense opportunity to fix the mistakes of the past and protect the public’s health.

Amended TSCA requires EPA: evaluate chemicals on a specific schedule, account for risks to “potentially exposed or susceptible subpopulations” like children, pregnant people, and workers, use the “best available” science, and determine if a chemical poses an “unreasonable risk” without considering cost. However, the 2016 law preempts states from taking action on chemicals evaluated by EPA and leaves many decisions related to the specifics of implementing up to EPA, leaving it vulnerable to political interference and scientific integrity concerns. For example, under amended TSCA, the industry is not required to provide data on the health effects for chemicals already on the market, and new chemicals have limited review. This is unlike the European Union, where every chemical on the market must



provide a minimum data set of health effects information order to stay on the market.

Following the goals laid out in the CHE/UCSF Summit, PRHE has been engaged in the implementation amended TSCA as the primary public policy that influences exposures to toxic chemicals. We have submitting dozens of scientific public comments with hundreds of collective signatures, publishing manuscripts analyzing the law and its impacts and developing

actionable recommendations for EPA. As such, we have **five scientific principles for hazard and risk assessment** to guide our work to make chemical policy incorporate the most up to date science and account for real-world risks and protect public health for years to come.

To do this Decision-makers must:

1. Make manufacturers pay for data collection on the chemicals they currently or will produce
2. Stop treating a lack of data like a lack of hazard, exposure, or risk
3. Better identify and protect populations disproportionately exposed and/or more susceptible to harmful chemicals
4. Not assume a “safe” or “no-risk” level of chemical exposure in the diverse general population
5. Evaluate and account for conflicts of interest in risk and hazard assessments

The goals of environmental laws and policies like amended TSCA often aspire to protect health, but to date it has fallen short of ensuring equitable, socially just safeguards. If EPA fails to correct its mistakes, it will continue to underestimate risk, recreating the same inefficiencies as the original law and continuing to endanger our health and our environment for years to come.

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 RESEARCH

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 every 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 prevention of environmentally related disease, always preferable than treatment and cures.



Linda S. Birnbaum 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.