

# Environmental Health Initiative

## University of California, San Francisco

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### Executive Summary

*The Environmental Health Initiative (EHI)* is a collaborative transdisciplinary network of academics across UCSF committed to solving the growing burden of chronic diseases by identifying and preventing harmful environmental exposures. Our goal is to improve health throughout the lifespan of individuals and populations. We will accomplish this by:

- Nurturing and sustaining a network of academics across departments and schools at UCSF to facilitate transdisciplinary environmental health research collaborations;
- Supporting transdisciplinary training of junior researchers;
- Conducting high impact research to fill key gaps in knowledge that currently prevent us from optimizing our efforts to reduce harmful environmental exposures;
- Translating, communicating and disseminating the science and evidence-based approaches for prevention to key stakeholders.

### Background

The rapid rise in chemical manufacturing and usage since the mid-20<sup>th</sup> century has brought unprecedented exposures into our daily lives. Despite widespread contamination of our air, water, food, and consumer products, we have yet to understand how industrial chemicals in our bodies impact our health. A growing body of evidence from cellular, tissue, animal and human studies demonstrates that chemical exposures can have lifelong consequences. Starting with development, exposures occurring during this most sensitive period have been linked to the increasing incidence of multiple childhood diseases, including asthma, neurodevelopmental disorders, childhood cancer, diabetes and obesity. Prenatal, childhood and adult exposures can also contribute to adult diseases such as cancer, neurological impairments and heart disease. Finally, recent work suggests that effects of exposures do not stop at the individual, but can be transmitted to generations to come. The relationship between toxic chemicals and health is complex, and heightened by other environmental factors, such as diet, poverty and stress. Over 300 chemicals have already been shown to affect health through a variety of mechanisms, including direct effects on cell function, endocrine disruption, mutagenesis and epigenetic modifications, but this is only a fraction of the chemicals that may be present in our bodies. This nascent field of research and research translation is poised to grow as scientists, clinicians, and the public search for answers to the growing burden of chronic disease. Expertise and collaborations between areas as diverse as epigenetics, human development, advanced monitoring methods, policy, and the health of vulnerable populations is required to make progress in this complex and important area.

### Transdisciplinary Collaboration to Advance Science and Improve Health

The EHI will nucleate, support and coordinate a robust program of transdisciplinary research and science translation at UCSF to answer the following key questions in this field and, thereby, lead to improved health:

- Which chemicals comprise the highest and most frequent exposures?
- Which chemicals have the potential to adversely affect human development and subsequent health?
- What are the most effective evidence-based interventions and preventive actions for reducing chemical exposures and their associated effects on health?
- How can we best identify those most vulnerable, such as those in poverty, and ameliorate the effects of chemical exposures?

## Why UCSF?

UCSF is a world-renowned health sciences campus dedicated to advancing health worldwide. As the leading public university for NIH funding, the UCSF medical school and graduate school consistently rank among the best in the country. UCSF is also a source of innovative ideas that generate scientific and medical breakthroughs, and houses expertise in diseases of childhood and aging linked to environmental exposures: cancer, diabetes, asthma, and neurodevelopmental disorders. The EHI leverages the existing research and research translation expertise of the Program on Reproductive Health and the Environment (PRHE) and the Center for Reproductive Sciences within the Department of Obstetrics, Gynecology and Reproductive Sciences with academic partners all across the UCSF campus including the departments of Pediatrics, Neurology, Medicine, and Global Health Sciences and the Sabre-Sandler Asthma Basic Research Center, the UCSF Diabetes Center, and the Philip R. Lee Institute for Health Policy. By embedding environmental health within the fabric of UCSF, we will harness the power of the health sciences to tackle a growing problem of our time. Ultimately, the integration of environment with health care is essential to the UCSF vision of holistic treatment. The integration of environment with public health prevention is essential to build lasting changes that address the impacts of harmful chemical exposures on health at a global level.

## Our Partners

EHI builds from robust and existing partnerships that developed through the Program on Reproductive Health and the Center for Reproductive Sciences. This includes a network of academics, federal and state partners (USEPA, NIH, CDC/NCEH, CalEPA, California Department of Public Health, IARC); Health Professional Societies (the American College of Obstetricians and Gynecologists, American Society for Reproductive Medicine, and the International Federation of Gynecology and Obstetrics among others); and nongovernmental organizations both across the U.S. and in Europe. Our partnerships facilitate connections between the groups to strengthen a multi-disciplinary research strategy, a shared understanding of the science, and enhanced ability to communicate the science effectively and efficiently.

## Our Leadership

**Tracey Woodruff, Ph.D., MPH** is Professor in the Department of Obstetrics, Gynecology, and Reproductive Sciences and Philip R Lee Institute for Health Policy Studies at UCSF and the Director of the Program on Reproductive Health and the Environment. She has done extensive research and policy development on environmental health issues, with a particular emphasis on early-life development. Her research includes evaluating prenatal exposures to environmental chemicals and related adverse pregnancy outcomes, and characterizing developmental risks. She has authored numerous scientific publications and book chapters, and has been quoted widely in the press, including USAToday, the San Francisco Chronicle, and WebMD. She was previously at the US EPA, where she was a senior scientist and policy advisor in the Office of Policy, and author of numerous government documents. She is an Associate Editor of Environmental Health Perspectives. She was appointed by the governor of California in 2012 to the Science Advisory Board of the Developmental and Reproductive Toxicant (DART) Identification Committee.

**Diana J. Laird, PhD.** is Associate Professor in the Department of Obstetrics, Gynecology, and Reproductive Sciences and Eli and Edythe Broad Center of Regeneration Medicine and Stem Cell Research at UCSF, where she runs a basic science laboratory. She is a geneticist and developmental biologist whose research focuses on the formation of the reproductive system, the earliest precursors of egg and sperm, and their interaction with the environment. In 2010 she was a recipient of the NIH New Innovator Award.

## Our Approach

We aim to grow, expand and sustain the EHI by first leveraging intellectual capital inside UCSF across schools, departments and centers and then expanding to outside partners to ultimately achieve the vision of healthier environments. This requires support of collaboration across UCSF and stimulation of research in critical areas. We will grow and sustain the EHI specifically through:

- Establishing and supporting a team of experts: Led by Drs. Tracey Woodruff and Diana Laird, the team will organize a concrete set of activities to ensure overall functioning of the initiative, organize and manage a steering committee, and support joint meetings and seminars to optimize collaboration and cross-pollination of ideas across campus. They will also facilitate a communications plan to disseminate scientific findings and prevention activities to key stakeholders and the public.
- Develop the next generation of scientists and clinicians: Our goal is to establish a postdoctoral fellowship program to support 3-5 scholars for two-three years. We also propose to take advantage of changes to the medical school curriculum to embed environmental health within the new Bridges program and to concurrently work with nursing education.
- Establish a Science Innovation Fund to support small grants to pilot innovative transdisciplinary projects on key environmental health topics. These are intended catalyze new and larger high-impact grants.

Our larger goal is a set of interlinked high-impact projects to fill key gaps in knowledge that prevent us from optimizing our efforts to reduce harmful exposures. We propose projects in the following theme areas:

1. Identify what and how people are exposed to environmental chemicals. This project will (a) apply next-generation biomonitoring methods to identify and measure a broad range of chemical exposures found in the population, with a focus on pregnant women and children as this represents the most critical period for development and future health risks; and (b) identify the major exposure sources (industry, consumer products, food, etc.) of chemicals measured with our biomonitoring methods.
2. Use basic laboratory science to identify which and how pollutants harm health. This project will develop and evaluate rapid *in vitro* tests to identify chemicals that may adversely affect development and human health along the lifespan. The most promising tests will be used to rapidly screen chemicals to identify those that may be harmful and those that may not be.
3. Apply epidemiology and population science to investigate developmental chemical exposures and harmful effects on health. This project will (a) leverage existing epidemiologic data to enhance our ability to evaluate developmental pollutant exposures and adverse effects throughout the lifecourse; (b) strategically invest in select pregnancy cohorts to expand our current epidemiologic database and fill in key data gaps in understanding of developmental chemical exposures and adverse health effects.
4. Identify the environmental causes of the health disparities. We propose to use human epidemiologic studies to evaluate how environmental chemicals can exacerbate disparities in health outcomes and increase the load and difficulty of the effects of poverty on health.
5. Translate, communicate and promote evidence-based real-world solutions to reduce and prevent harmful chemical exposures and deliver measurable health improvements. We propose to invest in a series of projects that will identify and communicate who is most vulnerable and at risk from environmental exposures to better inform prevention efforts; improve our tools to measure the benefits of preventing harmful chemical exposures; identify tactics used to obfuscate scientific information through our newly created Chemicals Industry Documents library; and develop evidence-based recommendations to prevent toxic chemical exposures. We will also support training programs to train scientists, clinicians and community leaders in how to effectively promote science based policy.

With this strategic set of initiatives, we can produce measurable reductions in the exposures that harm the population's health. We have a great opportunity to act now to reduce the environmental burden on chronic disease across the lifespan.