2018
NIEHS/EPA Children’s Environmental Health Centers Annual Meeting and Social Media Workshop

October 22 – 23, 2018

NIEHS Building 101, Rodbell Auditorium
Research Triangle Park, N.C.

Sponsored by the National Institute of Environmental Health Sciences and Environmental Protection Agency
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Agenda
October 22-23, 2018
NIEHS Building 101, Rodbell Auditorium • Research Triangle Park, N.C.

NIEHS/EPA Children’s Environmental Health Centers: Raising the Visibility of the Science

Day One – Monday, October 22

8:00 a.m.  Registration (Building 101 Lobby)

9:00 a.m.  Welcome and Introductions (Rodbell Auditorium)
Kimberly Gray, Ph.D., National Institute of Environmental Health Sciences (NIEHS)
Michael Slimak, Ph.D., Environmental Protection Agency (EPA)
Linda Birnbaum, Ph.D., D.A.B.T, A.T.S., Director, NIEHS and National Toxicology Program

Session One – Respiratory/Obesity/Growth and Development (Rodbell Auditorium)
Moderator: Kimberly Gray, Ph.D., NIEHS

9:15 a.m.  Obesity and Diet As Susceptibility Factors for Pollutant Effects in Childhood Asthma
Meredith McCormack, M.D., and Nadia Hansel, M.D., Center for Childhood Asthma in the Urban Environment (CCAUE), Johns Hopkins University

9:40 a.m.  Does Air Pollution Cause Obesity and Metabolic Disease?
Rob McConnell, M.D., Southern California Children’s Environmental Health Center, University of Southern California

10:05 a.m.  Translational Research in the San Joaquin Valley of California
Betsey Noth, Ph.D., Children’s Health and Air Pollutions Study (CHAPS), University of California, Berkeley

10:30 a.m.  Early Stage Investigators (ESI) Poster Discussion I
Five Early Stage Investigators will present their work
(Five-minute presentations with 10 minutes of discussion in three rotations)

Early Childhood Lead Exposure in Relation to Adolescent Sleep Duration: A Longitudinal Investigation (Rodbell A)
Jonggyu Baek, Ph.D., University of Massachusetts

The Early Life Exposome: Associations with Child Lipid Profile (Rodbell B)
Lida Chatzi, M.D., Ph.D., University of Southern California

Serum Accumulation of Polybrominated Diphenyl Ethers Alters Steroid Metabolism in Pregnant African American Women (Rodbell C)
Jolyn Fernandes, Ph.D., Emory University
Prenatal and Postnatal Tobacco Smoke Residue Exposure Disrupts Immune Development in a Mouse Model of Childhood Acute Lymphoblastic Leukemia (Lobby)
Briana Fitch, University of California, San Francisco

An Examination of Non-Nutritive Suck in Relation to Prenatal Environmental Exposures in a Puerto Rican Cohort (Lake View Conference Room)
Emily Zimmerman, Ph.D., Northeastern University

11:30 a.m.  Lunch (Cafeteria)
Early Stage Investigators picture with Linda Birnbaum (Rodbell B)

Noon  Poster Session (Lobby)

Session Two – Growth and Development (Rodbell Auditorium)
Moderator: Cynthia Nolt-Helms, EPA

12:45 p.m.  Impact of Low-Level Arsenic Exposure on Children’s Health
Margaret Karagas, Ph.D., Children’s Environmental Health and Disease Prevention Research, Dartmouth College

1:10 p.m.  Translational Research on Air Pollution and Pesticides and Children’s Heath
Frederica Perera, DrPH, Ph.D., Columbia Center for Children’s Environmental Health, Columbia University Health Sciences

1:35 p.m.  Lifecourse Exposures and Diet: Epigenetics, Maturation, and Metabolic Syndrome
Karen Peterson, D.Sc., University of Michigan Children’s Environmental Health and Disease Protection Center, University of Michigan, Ann Arbor

2:00 p.m.  ESI Poster Discussion II
Five Early Stage Investigators will present their work
(Five-minute presentations with 10 minutes of discussion in three rotations)

Omega-3 and Omega-6 Fatty Acid Intake Modifies Response to Indoor Air Pollution in Children with Asthma (Rodbell A)
Emily Brigham, M.D., Johns Hopkins University

Influences of Early-Life Exposures on the Infant Gut Microbiome in the New Hampshire Birth Cohort Study (Rodbell B)
Anne Hoen, Ph.D., Dartmouth College

Prenatal vs. Postnatal Smoke Exposure: Identifying Predictors of School Age ADHD Symptoms (Rodbell C)
Julia Schechter, Ph.D., Duke University

Urinary Concentrations of Phthalate Metabolites among Pregnant African American Women Residing in the Metropolitan Atlanta Area (Lobby)
Melissa Smarr, Ph.D., Emory University

Untargeted Adductomics of Newborn Dried Blood Spots to Identify Cys34 Modifications to Human Serum Albumin Associated with Childhood Leukemia (Lake View Conference Room)
Yukiko Yano, University of California, Berkeley
Session Three – Perinatal Exposures/Neuro/Immune/Epigenetics (Rodbell Auditorium)

Moderator: Cindy Lawler, Ph.D., NIEHS

3:00 p.m.  **Our Illinois Translation Story**  
*Susan Schantz, Ph.D., University of Illinois Children’s Environmental Health Research Center, University of Illinois, Urbana-Champaign*

3:25 p.m.  **Translational Story of an ASD Clinical Biomarker**  
*Judy Van de Water, Ph.D., Center for Children’s Environmental Health and Disease Prevention, University of California, Davis*

3:50 p.m.  **How CIRCLE Crosses Translational Bridges**  
*Catherine Metayer, M.D., Ph.D., and Todd Whitehead, PhD., Center for Integrative Research on Childhood Leukemia and the Environment (CIRCLE), University of California, Berkeley*

4:15 p.m.  **20 Years in the Field: the CHAMACOS’s Community University Partnership**  
*Asa Bradman, Ph.D., Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS), University of California, Berkeley*

5:00 p.m.  **Adjourn**

6:30 p.m.  **Walking Tour of Durham**  
*Durham Bull Statue, 201 Corcoran Street, Durham*

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Day Two – Tuesday, October 23

Session Four – Pregnancy Cohorts (Rodbell Auditorium)

Moderator: Nica Louie, EPA

9:00 a.m.  **Tobacco Smoke Exposure During Pregnancy: epigenetic and Functional Impacts – From Rats to Humans**  
*Susan Murphy, Ph.D., Neurodevelopment and Improving Children’s Health Following Environmental Tobacco Smoke Exposure (NICHES), Duke University*

9:25 a.m.  **Making the Environment Matter in Health Care**  
*Tracey Woodruff, Ph.D., Pregnancy Exposures to Environmental Chemicals (PEEC) Children’s Center, University of California, San Francisco*

9:50 a.m.  **Perspectives From a New Center: Moving Transdisciplinary Research Teams Along the Translational Framework Continuum**  
*Linda McCauley, Ph.D., Center for Children’s Health, the Environment, the Microbiome, and Metabolomics (C-CHEM2), Emory University*

10:15 a.m.  **Center for Research on Early Childhood Exposure and Development in Puerto Rico**  
*Jose Cordero, M.D., Center for Research on Early Childhood Exposure and Development in Puerto Rico (CRECE), Northeastern University*
10:40 a.m.  **Pediatric Environmental Health Specialty Units (PEHSU) Panel** *(Rodbell Auditorium)*

Moderators: Liam O’Fallon, NIEHS and Martha Berger, U.S. EPA Office of Children’s Health

This panel will be with PEHSU representatives to discuss approaches to raise the visibility of the science and research results and where new opportunities exist.

- Nick Newman, D.O., University of Cincinnati
- Sheela Sathyanarayana, M.D., University of Washington
- Carolyn Murray, M.D., Dartmouth College
- Victoria Leonard, Ph.D., University of California, San Francisco
- Mike Hatcher, DrPH, Agency for Toxic Substances and Disease Registry
- Jose Cordero, M.D., University of Georgia

11:45 a.m.  **Eyes to the Future: Summary and Next Steps**

12:00 p.m.  **Meeting Adjourn**

**Social Media Workshop** *(Rodbell Auditorium)*

Come learn more about how to incorporate social media, an increasingly important outreach tool in public health, into your community outreach and translation work. An expert panel will present on the use of social media for public health outreach followed by interactive training for all levels of users, from beginners to advanced.

1:30 p.m.  **Welcome**

1:40 p.m.  **Panel**

2:40 p.m.  **Break**

2:55 p.m.  **Workshop Session One**

3:55 p.m.  **Break** *(rotate workshops)*

4:05 p.m.  **Workshop Session Two**

5:05 p.m.  **Conclusion and Final Remarks**

5:15 p.m.  **Adjourn**
Meeting Purpose and Map of NIEHS/EPA Children’s Environmental Health Centers
Meeting Purpose:
This year marks 20 years of existence for the NIEHS/EPA Children's Environmental Health Centers Program. In celebration of notable research accomplishments over the years, Center Investigators will come together to describe how they harness impactful science, share how they engage with communities and other stakeholders, and discuss approaches used to raise the visibility of their research findings to protect children and future generations from environmental hazards.

Meeting Theme:
Raising the Visibility of Children's Centers' Science

Impact Report:
NIEHS/EPA Children's Environmental Health and Disease Prevention Research Centers Protecting Children's Health Where They Live, Learn, and Play
NIEHS/EPA Children’s Environmental Health Centers
Columbia University Health Sciences
Columbia Center for Children's Environmental Health

**Center Location:** New York, NY

**Public Health Impacts:** The Columbia Center for Children’s Environmental Health (CCCEH) is studying how common air pollutants called polycyclic aromatic hydrocarbons (PAHs) may affect children’s brain development and risk of obesity. Understanding how PAHs are associated with these outcomes is necessary to ensure the appropriate policies and interventions to protect children’s health.

**Primary Environmental Exposures:** PAHs

**Primary Health Outcomes:** cognitive, emotional, behavioral, and obesity problems

**Center Description & Activities:** Since 1998, the CCCEH has studied the long-term health effects of urban pollutants on children raised in minority neighborhoods of inner-city communities. Investigators have followed a group of children in New York City from the time they were in the womb to determine whether exposure to pollutants might make children more prone to obesity or lead to problems with learning and behavior later in life. These children are now reaching adolescence.

Building on their prior research findings in this group of children, researchers are continuing to test their hypothesis that prenatal exposures to environmental polycyclic aromatic hydrocarbons (PAH) disrupt development and maturation of brain systems that support self-regulation of thought, emotion, and behavior and that these disturbances create vulnerabilities that lead to cognitive, emotional, behavioral, and obesity problems in the vulnerable period of adolescence.

**Center Investigators:**
**Principal Investigators:** Frederica Perera, Dr.P.H., Ph.D. and Bradley S. Peterson, M.D.
**Pediatric Health Specialists:** Rachel Miller, M.D. and Amy Margolis, Ph.D.
**Project 1:** The Impact of PAH Exposure on Adolescent Neurodevelopment: Disruption of Self-regulatory processes. **Project Leader:** Virginia Rauh, Sc.D.
**Project 2:** The Impact of PAH Exposure on Childhood Growth Trajectories and Visceral Adipose Tissue Mass in Adolescence: Linkages to Disrupted Self-regulatory Processes. **Project Leader:** Andrew Rundle, Dr. P.H.
**Project 3:** An MRI Study of the Effects of Prenatal and Early Childhood PAH Exposure on Brain Maturation and Its Mediating Influences on Adverse Adolescent Outcomes. **Project Leader:** Bradley S. Peterson, M.D.
**Community Outreach & Translation Core Leader:** David Evans, Ph.D.
Dartmouth College
Children's Environmental Health and Disease Prevention Research Center at Dartmouth

**Center Location:** Hanover, NH

**Public Health Impacts:** Arsenic naturally occurs in well water in parts of the United States and is harmful to our health. Exposure to arsenic in large or small amounts over time can cause skin lesions, cancer, and other health problems. Researchers at the Dartmouth Children’s Center are conducting research to better understand the effects of arsenic on fetal development and maternal and child health. This research will inform strategies to prevent diseases associated with arsenic exposure.

**Primary Environmental Exposures:** Arsenic in drinking water and food

**Primary Health Outcomes:** Childhood immunity, growth, and neurological development

**Center Description and Activities:**
The Children’s Environmental Health and Disease Prevention Research Center at Dartmouth studies the effects of arsenic exposure on children’s health. Arsenic naturally occurs in well water in parts of the United States and is harmful to our health. It can be present in rocks and soil and exposure can occur through contaminated drinking water, food, or air. Exposure to arsenic in large or small amounts over time can cause skin lesions, cancer, and other health problems. Despite the significant potential public health impact of arsenic, the effect of arsenic exposure on fetal development and maternal and child health is not yet known.

**Center Investigators:**
**Principal Investigators:** Margaret Karagas, Ph.D.
**Pediatric Health Specialist:** John Boyer Moeschler, M.D.
**Project 1: Childhood Immune Function and Exposure. Project 1 Leader:** Margaret Karagas, Ph.D.
**Project 2: Water and Dietary Arsenic Exposure Related to Early Growth and Neurodevelopment. Project 2 Leader:** Kathryn L. Cottingham, Ph.D.
**Project 3: Placental Biomarkers of Exposure and Outcome. Project 3 Leader:** Carmen J. Marsit, Ph.D.
**Community Outreach & Translation Core Leader:** Carolyn J. Murray, M.D.
**Faculty Development Investigator:** Diane Gilbert-Diamond, Sc.D.
Duke University
Neurodevelopment and Improving Children’s Health following Environmental Tobacco Smoke (ETS) exposure (NICHES)

Center Location: Durham, NC

Public Health Impacts: Nearly half of the world’s children are exposed to environmental tobacco smoke (ETS), and this exposure is a major risk factor for attention deficit hyperactivity disorder (ADHD). The NICHES Children’s Center is performing studies to determine how ETS exposure during early life impacts a child’s risk of developing ADHD. This research is expected to improve the understanding of environmental factors associated with ADHD, and identify new targets for developing treatments.

Primary Environmental Exposures: ETS
Primary Health Outcomes: ADHD, neurobehavioral dysfunction, and epigenetics

Center Description and Activities: The NICHES Children’s Center seeks to understand how ETS exposure increases the risk of ADHD through epigenetic alterations. Epigenetic changes modify gene expression without changing the genetic code. Researchers are studying data that comes from children participating in the Newborn Epigenetics Study (NEST), which is following the children of more than 2,500 women who were recruited during pregnancy.
The center integrates animal, cell, and clinical studies to identify how epigenetic changes caused by developmental ETS exposure are expressed in the brain and how these changes influence neurobehavioral dysfunction in children. Center members will determine whether these changes are also detectable in the blood as part of an effort to discern an epigenetic signature of developmental ETS exposure. Center work may result in development of clinically-relevant biomarkers and/or targets for development of novel treatments. The center shares its findings to inform the public about the risks of environmental tobacco smoke exposure on the health of pregnant women, children, and potentially future generations.

Center Investigators:
Principal Investigators: Susan Murphy, Ph.D.
Pediatric Health Specialists: Scott Kollins, Ph.D. Specialties: Clinical psychology
Project 1: Tobacco Smoke Exposure, Epigenetics, and Cognitive Deficits in Children. Project Leader: Bernard F. Fuemmeler, Ph.D.
Project 2: Mechanisms of Neurobehavioral Dysfunction from Developmental Nicotine and Tobacco. Project Leader: Edward Levin, Ph.D.
Project 3: Epigenomic Consequences of Early Life Environmental Tobacco Smoke Exposure. Project Leader: Susan Murphy, Ph.D.
Community Outreach & Translation Core Leader: Rochelle Schwartz-Bloom
Faculty Development Investigator: Julia Schechter, Ph.D.
Emory University
Center for Children's Health, the Environment, the Microbiome, and Metabolomics (C-CHEM2)

Center Location: Atlanta, GA

Public Health Impacts: Multiple toxicants can impact the health of women and their babies, especially those of minority communities. By leveraging data from a cohort of African American women in the metro-Atlanta area, the Center for Children’s Health, the Environment, the Microbiome, and Metabolomics (C-CHEM2) aims to study how the complex interactions between different toxicants may affect infant health and neurodevelopment. These studies may inform interventions to reduce exposure to multiple pollutants in urban, minority populations.

Primary Environmental Exposures: Multiple pollutants and toxicants, including air pollutants, parabens, bisphenol A, phthalates, pesticides, and brominated flame retardants

Primary Health Outcomes: Infant outcomes, preterm birth, and neurodevelopment

Center Description and Activities: Researchers at C-CHEM2 conduct research to understand the complex interactions among components of the prenatal and postnatal environment — toxicant exposures, the microbiome, and the metabolome — and their impacts on birth outcomes and infant health and neurodevelopment. The human microbiome is representative of microbial organisms that reside in the gut, while the metabolome represents the collection of metabolites and small molecules found in the bodily tissues, organs, and cells.

Environmental exposures among residents of the urban Southeast are likely distinctive from people in other parts of the United States; however, no studies have characterized exposures among minorities within this region from birth. C-CHEM2 leverages data and samples from a newly funded cohort of more than 800 African American women and their children living in metropolitan Atlanta to investigate how behavioral factors and the microbiome impact preterm birth and how epigenetics and genetics affect the microbiomes of study participants. The center also leverages rich datasets and resources within the NIEHS-funded Human Exposome Research Center: Understanding Lifetime Exposures (HERCULES) at Emory, and an interdisciplinary team of scientists with expertise in environmental health, neurodevelopment, maternal-child health, and preventive medicine.

Center Investigators:
Principal Investigators: Linda A. McCauley, R.N., Ph.D. and P. Barry Ryan, Ph.D.
Pediatric Health Specialists: Anne Dunlop, M.D. Specialties: Family medicine, preventive medicine
Project 1: Characterizing Exposures and Outcomes in an Urban Birth Cohort (CHERUB). Project Leader: Dana B. Barr, Ph.D. and Anne Dunlop, M.D.
Project 2: Microbiome, Environment, and Neurodevelopmental Delay (MEND). Project Leader: Patricia A. Brennan Ph.D. and Jeannie Rodriguez, Ph.D.
Project 3: Metabolic, Microbiome, and Toxicant-associated Interactions (MATRIX). Project Leader: Elizabeth J. Corwin, Ph.D., RN, FAAN and Dean P. Jones, Ph.D.
Community Outreach & Translation Core Leader: Maeve Howett, Ph.D., APRN, CPNP and Michele C. Kegler, Dr.P.H.
Johns Hopkins University
Center for Childhood Asthma in the Urban Environment (CCAUE)

**Center Location:** Baltimore, MD

**Public Health Impacts:** Asthma and obesity are public health crises that have risen concurrently over the past several decades, especially among low-income minority children in U.S. urban areas. Investigators at the Center for Childhood Asthma in the Urban Environment (CCAUE) are studying how exposure to air pollutants and allergens are associated with asthma-related illnesses in minority children, and how obesity and sleep apnea may increase susceptibility.

**Primary Environmental Exposures:** Indoor and outdoor air pollutants, including particulate matter and allergens

**Primary Health Outcomes:** Asthma

**Center Description and Activities:**
The CCAUE studies how exposures to indoor and outdoor air pollutants and allergens interact with different factors to create asthma-related illnesses among minority children from low-income, inner city neighborhoods.

Obesity has become a worldwide health crisis, and emerging evidence suggests that being overweight may confer increased susceptibility to air pollutants. Obesity is also a strong risk factor for obstructive sleep apnea. Low-income, minority children who live in the inner city face the highest burden of asthma and are at increased risk for obesity and being exposed to air pollutants. Researchers at this center are conducting observations of inner city children and performing animal studies to explore how factors such as obesity and sleep apnea mediate the effects of air pollution susceptibility. By defining new susceptibility factors for asthma, findings from these center projects could potentially impact air quality regulation standards in the U.S. and other countries.

**Center Investigators:**

**Principal Investigators:** Nadia N. Hansel, M.D. and Gregory Diette, M.D.

**Project 1: Obesity as a Susceptibility Factor for the Asthmatic Response to Pollutants. Project 1 Leader:** Meredith McCormack, M.D. and Nadia N. Hansel, M.D.

**Project 2: Novel Exposure Metrics for Assessing the Effects of Ultrafine and Fine Particulate Matter on Asthma in Children. Project 2 Leader:** Kirsten Koehler, Ph.D. and Elizabeth Matsui, M.D.

**Project 3: The Role of Obesity in Biological Responses to Particulate Matter in Mice. Project 3 Leader:** Vsevolod (Seva) Polotsky, M.D. and Wayne Mitzner, Ph.D.

**Community Outreach & Translation Core Leader:** Cynthia Rand, Ph.D.
Northeastern University
Center for Research on Early Childhood Exposure and Development in Puerto Rico (CRECE)

Center Location: Boston, MA

Public Health Impacts: Scientists want to know more about how fetal and childhood development may be harmed by exposure to multiple chemicals in the environment, especially when accompanied by factors like stress. Studies within the Center for Research on Early Childhood Exposure and Development in Puerto Rico (CRECE) will provide novel information on the impacts of multiple exposures, with relevance to both the underserved population of Puerto Rico, and mainland U.S.

Primary Environmental Exposures: Multiple pollutants and pollutant mixtures, including air pollutants, water pollutants, phthalates, volatile organic compounds, phenols, parabens, and other chemicals of emerging concern

Primary Health Outcomes: Prenatal and early childhood health and development, preterm birth

Center Description and Activities:
CRECE studies the impact of mixtures of environmental contaminants and modifying factors on prenatal and early childhood health and development in an underserved, highly exposed population in Puerto Rico. CRECE leverages the rich dataset and infrastructure established in the NIEHS Superfund Research Program Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) study and cohort to examine combined influences of multiple environmental, nutritional, and social factors. As part of the center, 600 children born to women in the PROTECT study are being followed from birth until age 4 to determine the impacts of combined environmental and social factors on their health and development.

Center Investigators:
Principal Investigators: Akram N. Alshawabkeh, Ph.D.
Project 1: Air Pollution Impacts on Neonatal and Early Childhood Development. Project 1 Leader: Helen Suh MacIntosh, Sc.D.
Project 2: Toxicogenomics-based Mechanistic Multimedia Exposure Assessment and Child Development. Project 2 Leader: April Z. Gu, Ph.D.
Project 3: Biomarker Epidemiology of in Utero Environmental Exposures and Child Development. Project 3 Leader: John D. Meeker, Sc.D.
Community Outreach & Translation Core Leader: Phil Brown, Ph.D. and Carmen Milagros Velez Vega, Ph.D.
Center Location: San Joaquin Valley of Fresno, California

Public Health Impacts: The San Joaquin Valley includes many low-income communities and air pollution concentrations often exceed state and federal air quality standards. The UC Berkeley/Stanford Children’s Environmental Health Center strives to understand and reduce air pollution exposure for children in the San Joaquin Valley, and to sustain active partnerships with community organizations that prioritize environmental health.

Primary Environmental Exposures: Ambient air pollutants, endotoxins

Primary Health Outcomes: Asthma, preterm birth, birth defects, immune system development, obesity

Center Description and Activities:
The UC Berkeley/Stanford Children’s Environment Health Center is conducting the Children’s Health and Air Pollution Study (CHAPS) to better understand how exposure to ambient air pollutants leads to health problems such as allergies, obesity, glucose dysfunction, birth defects, and premature birth. Center researchers use data on more than 300,000 births in California’s San Joaquin Valley, a fast-growing region with some of the highest levels of air pollutants in the country. The mountains that surround the area on three sides can trap air pollutants in the valley.

Center members, who include investigators from California State University Fresno and the University of California San Francisco in Fresno, focus on exposure to the common urban air pollutants known as polycyclic aromatic hydrocarbons (PAHs).

Center Investigators:
Principal Investigators: Katharine Hammond, Ph.D.
Pediatric Health Specialist: John R. Balmes, M.D. Specialties: Respiratory health effects of air pollutants
Project 1 (Shaw): Exposure to Air Pollutants, Modifying Genes, and Risk of Birth Defects. Project 1 Leader: Gary M. Shaw, Ph. D.
Project 2 (Nadeau): Mechanisms of Polycyclic Aromatic Hydrocarbon-linked Immunopathogene. Project 2 Leader: Kari Nadeau, M.D., Ph.D.
Project 3 (Balmes): Obesity/Glucose Dysregulation Project. Project 3 Leader: John R. Balmes, M.D.
Community Outreach & Translation Core Leader: Jennifer K. Mann, Ph.D
Public Health Impacts: Researchers in the Center for Integrative Research on Childhood Leukemia and the Environment (CIRCLE) are studying whether chemical exposures in the womb may increase the risk of childhood leukemia, and what changes at the cellular level may lead to the disease. Results from these studies may inform steps that families and health care providers can take to prevent childhood leukemia.

Primary Environmental Exposures: In utero chemical exposures (e.g., pesticides, paints, and solvents)

Primary Health Outcomes: Childhood leukemia

Center Description and Activities:
The UC Berkeley/Stanford Children’s Environment Health Center is conducting the Children’s Health and Air Pollution Study (CHAPS) to better understand how exposure to ambient air pollutants leads to health problems such as allergies, obesity, glucose dysfunction, birth defects, and premature birth. Center researchers use data on more than 300,000 births in California’s San Joaquin Valley, a fast-growing region with some of the highest levels of air pollutants in the country. The mountains that surround the area on three sides can trap air pollutants in the valley.

Center members, who include investigators from California State University Fresno and the University of California San Francisco in Fresno, focus on exposure to the common urban air pollutants known as polycyclic aromatic hydrocarbons (PAHs).

Center Investigators:
Principal Investigators: Catherine Metayer, M.D., Ph.D.
Pediatric Health Specialist: Gary Dahl, M.D. Specialties: Pediatric hematology and oncology
Project 1: In Utero Chemical Exposures, Immune Status, and Childhood Leukemia. Project 1 Leader: Catherine Metayer, M.D., Ph.D. and Xiaomei Ma, Ph.D.
Project 2: Identifying in Utero Exposures That Are Risk Factors for Childhood Leukemia. Project 2 Leader: Stephen M. Rappaport, Ph.D.
Project 3: Prenatal Exposures, Constitutive Genetics, DNA Methylation, and Childhood Leukemia. Project 3 Leader: Joseph L. Wiemels, Ph.D.
Community Outreach & Translation Core Leader: Mark Miller, M.D.
Mouse Model Service Core Leader: Scott Kogan, M.D.
Faculty Development Investigator: Todd Whitehead, Ph.D.
University of California, Berkeley
Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS)

Center Location: Salinas Valley, CA

Public Health Impacts: CHAMACOS is a unique study containing 19 years of data on children's development and environmental exposures in a Latino farmworker community. CHAMACOS research has added to our knowledge of the impacts of pesticides on children's brain development and respiratory health, methods to reduce pesticide exposures, and the interaction of stress and early life adversity on health in chemically exposed populations. Additionally, CHAMACOS has provided information on the effects of numerous other chemicals, such as those found in furniture, plastics, and cosmetics, on multiple aspects of health, including fertility, birth outcomes, timing of puberty, obesity and metabolic syndrome, and epigenetic changes. CHAMACOS is a community based participatory research project that focuses on community engagement and bidirectional learning in all aspects of the research.

Primary Environmental Exposures: Organophosphates, Organochlorines, Bisphenol A, Flame Retardants

Primary Health Outcomes: neurodevelopment and behavior, respiratory symptoms, obesity, and puberty

Center Description and Activities: The Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS) Study is the longest running longitudinal birth cohort study of pesticides and other environmental exposures among children in a farmworker community. CHAMACOS means “little children” in Mexican Spanish, which reflects the population we serve.

Starting in 1999, we enrolled pregnant women living in California's Salinas Valley, one of the most productive agricultural regions in the nation. We have followed these families for 19 years, measuring exposures to pesticides and other chemicals and assessing children’s growth, health, and development every 1-2 years. In 2010-2011, we expanded the study by enrolling additional 9-year-old children into the cohort. More than 600 children continue to participate in the study and will be followed until adulthood. We have recently secured funding to continue this work and are currently focusing on children's neurodevelopment and risk-taking behaviors as participants transition into their late teens and early adulthood. The CHAMACOS Study has spearheaded almost 150 publications, shedding light on critical environmental exposures and health.

Center Investigators:
Principal Investigators: Brenda Eskenazi, Ph.D.

Project 1: How does pesticide exposure affect child development and timing of puberty?
Project 2: How can we measure children’s exposure to pesticides and other environmental toxins?
Project 3: Does pesticide exposure to children cause epigenetic changes that result in abnormal pubertal development?
Center Location: Davis, California

Public Health Impacts: Autism spectrum disorders (ASD) continue to increase at an alarming rate, and current research suggests that interactions among multiple genes, epigenetic factors, and environmental exposures may contribute to an increased incidence of the disease. The UC Davis Center for Children’s Environmental Health and Disease Prevention is using a multidisciplinary approach and working with communities to identify and understand the etiology of ASD. This research could potentially inform development of targeted interventions to improve outcomes for at-risk children and their families.

Primary Environmental Exposures: Neurotoxicants and immunotoxicants, including mercury, polychlorinated biphenyls (PCBs), and polybrominated ethers (PBDEs)

Primary Health Outcomes: ASD and related neurodevelopmental disorders

Center Description and Activities:
The UC Davis Center for Children’s Environmental Health and Disease Prevention works to identify and understand environmental, immunologic, and genetic risk factors that contribute to the incidence and severity of childhood autism spectrum disorders. Researchers are identifying modifiable risk factors for autism using resources from two population studies: Childhood Autism Risk from Genetics and the Environment (CHARGE) and Markers of Autism Risk in Babies - Learning Early Signs (MARBLES). The CHARGE case-control study follows more than 1,600 children and their parents, and the ongoing longitudinal MARBLES study enrolls women who have a biological child with autism spectrum disorder and are pregnant or planning a pregnancy. The body’s immune and neural systems are related, and problems in these systems have been shown to play a role in autism spectrum disorders. Center researchers are using data and specimens from existing studies to define how exposure to pollutants can alter the development of the immune and neural systems through common signaling pathways. Researchers are specifically looking at genetic susceptibility, nutritional status, and epigenetic changes. Epigenetic changes modify gene expression without changing the genetic code.

Center Investigators:
Principal Investigators: Judith Van de Water, Ph.D.
Pediatric Health Specialist: Robin L. Hansen, M.D. Specialties: Respiratory health effects of air pollutants
Project 1 (Hertz-Picciotta): Epidemiology and the Environment in Autism. Project 1 Leader: Irva Hertz-Picciotta, Ph.D.
Project 2 (Lasalle): Perinatal Epigenetic Signature of Environmental Exposure. Project 2 Leader: Janine M. LaSalle, Ph.D.
Project 3 (Water): Immune Environment Interaction and Neurodevelopment. Project 3 Leader: Judith Van de Water, Ph.D.
Project 4 (Pessah): Calcium Signaling Deficits in Autism. Project 4 Leader: Isaac N. Pessah, Ph.D.
Community Outreach & Translation Core Leader: Robin L. Hansen, M.D.
Center Location: San Francisco, California

Public Health Impacts: The Pregnancy Exposures to Environmental Chemicals (PEEC) Children’s Center is dedicated to improving children’s health by identifying and preventing harmful exposures to environmental chemicals during pregnancy. The center is conducting research to learn how prenatal exposures can impact healthy human development, and whether exposure to chronic stress may magnify the impact. By working with multiple stakeholders, research findings inform prevention-oriented action in clinical and policy arenas.

Primary Environmental Exposures: Bisphenol A (BPA), polybrominated diphenyl ethers (PBDEs), perfluorochemicals (PFCs)

Primary Health Outcomes: Human placental and fetal development and growth

Center Description and Activities:
The PEEC Children’s Center is increasing our understanding of how environmental chemicals and chronic stress affect human development in the womb. The research focuses on PBDEs, which are used as flame retardants, and PFCs, a group of compounds used to make products resistant to stains, grease, and water. PBDEs and PFCs are found in virtually all pregnant U.S. women and are implicated in endocrine disruption, placental problems, and adverse birth outcomes such as low birth weight and premature birth.

Center members will leverage UCSF’s unique clinical population, a large group of ethnically and economically diverse pregnant women, which includes Asians and Latinas, who are some of the fastest growing demographic populations in the country. Researchers will also use their established cell and animal models for directly measuring fetal exposures to chemicals during mid-gestation.

Information gained from center research could be used in clinical settings or at the regulatory level for decision making about environmental chemical exposures of pregnant women and their developing offspring. The center will disseminate results to key clinical, policy, and public audiences.

Center Investigators:
Principal Investigators: Tracey Woodruff, Ph.D.
Pediatric Health Specialist: Naomi Stotland, M.D. Specialties in: Obstetrics, gynecology, and reproductive sciences
Project 1: Modeling the Effects of EDCs on the Early Stages of Human Placental Development. Project 1 Leader: Susan Fisher, Ph.D., Michael McMaster, Ph.D., and Joseph F. Costello, Ph.D.
Project 2: Mid-gestational Exposure to EDCs the Effects on Placental Development. Project 2 Leader: Tracey Woodruff, Ph.D.
Project 3: Effects of Edcs and Chronic Psychosocial Stress on Fetal Growth. Project 3 Leader: Tracey Woodruff, Ph.D.
Community Outreach & Translation Core Leader: Annemarie Charlesworth
University of Illinois, Urbana-Champaign  
The University of Illinois Children's Environmental Health Research Center

Center Location: Urbana-Champaign, IL

Public Health Impacts: Endocrine disrupting chemicals (EDCs) found in plastics and personal care products pose a significant risk to young children and adolescents. The University of Illinois Children's Environmental Health Research Center is studying the effects of exposure to EDCs during two critical developmental windows – the prenatal period and puberty – and addressing whether obesity or a high fat diet interacts with EDC exposures to increase risk. The center is also working to communicate research findings to parents, child care providers, health providers and policy makers.

Primary Environmental Exposures: EDCs such as phthalates and bisphenol A (BPA), as well as high fat diet

Primary Health Outcomes: Child development, including neurodevelopmental, neurobehavioral, and reproductive outcomes

Center Description and Activities: 
The goal of the University of Illinois Children's Environmental Health Research Center is to study the effects of exposure to BPA, phthalates, and other chemicals found in plastics and personal care products on neurological and reproductive development and function. The center's research is also addressing whether obesity or a diet high in saturated fats interacts with exposures to these chemicals to increase risk, and whether oxidative stress and/or inflammation play a role in mediating the effects of these chemicals. Exposures during two critical developmental windows – the prenatal period and the adolescent/pubertal period – are being studied in human populations and in parallel animal models. An important goal of the center is to communicate research findings to parents, childcare providers, healthcare providers and policy makers through the Community Outreach and Translation Core.

Center Investigators:
Principal Investigators: Susan Schantz, Ph.D.
Pediatric Health Specialist: Naomi Stotland, M.D. Specialties in: Obstetrics, gynecology, and reproductive sciences
Project 1: Birth Cohort IKIDS: Illinois Kids Development Study. Project 1 Leader: Susan Schantz, Ph.D.
Project 2: Endocrine Disruptors and Diet: Effects on the Developing Cortex. Project 2 Leader: Jodi Flaws, Ph.D.
Project 3: Endocrine Disruptors and Diet: Effects on the Developing Cortex. Project 3 Leader: Janice Juraska, Ph.D.
Community Outreach & Translation Core Leader: Barbara Fiese, Ph.D.
Center Location: Ann Arbor, Michigan

Public Health Impacts: The University of Michigan Children’s Environmental Health Center is studying how obesity, growth, and risk of metabolic syndrome are affected by the interaction of endocrine disrupting chemicals (EDCs) with diet during the critical developmental periods of pregnancy and puberty. Research findings may inform interventions to reduce the impact of EDCs on children’s health.

Primary Environmental Exposures: Mixtures of endocrine disrupting chemicals (EDCs), such as lead, cadmium, bisphenol A (BPA), phthalates

Primary Health Outcomes: Birth outcomes, child weight gain and status, body composition, activity patterns, hormonal levels, sexual maturation, metabolic syndrome

Center Description and Activities:
The University of Michigan Children’s Environmental Health and Disease Prevention Research Center is using population studies and animal models to investigate how mixtures of EDCs interact with diet to influence metabolic health. The center is a collaborative effort between the University of Michigan School of Public Health and Instituto Nacional de Salud Publica in Mexico. Center projects draw upon data from the Early Life Exposures in Mexico to Environmental Toxicants (ELEMENT) study, which includes 200 children and teens that have been followed from before birth to the present. They are also studying participants in the Michigan Mother-Infant Program (MMIP) study.

Exposure to endocrine disrupting chemicals during different periods of child development can affect growth, speed of maturation, and risk of metabolic syndrome - a group of risk factors that occur together and increase the risk for coronary artery disease, stroke, and type 2 diabetes. These effects can be amplified or dampened by dietary intake.

Center researchers are capitalizing on population studies and a mouse model, and their findings will provide a valuable base for designing interventions that reduce the impact of pervasive endocrine disruptors on children's health.

Center Investigators:
Principal Investigators: Karen E. Peterson, Sc.D.
Pediatric Health Specialist: Joyce Lee, M.D. Specialties in: Pediatric endocrinology and diabetes
Project 1 (Meeker): Perinatal and Prepubertal Mixtures, Physical Growth, and Sexual Maturation. Project 1 Leader: John Meeker, Sc.D.
Project 3 (Dolinoy): Developmental Exposures and Diet: Epigenetics of Metabolic Syndrome Risk. Project 3 Leader: Dana Dolinoy, Ph.D.
Community Outreach & Translation Core Leader: Alison Miller, Ph.D.
Faculty Development Investigator: Brisa N. Sánchez, Ph.D.
University of Southern California
Southern California Children’s Environmental Health Center (SC-CEHC)

Center Location: Los Angeles, CA

Public Health Impacts: With expanding roadways and increasing traffic, exposure to near-roadway air pollution is a persistent issue in the Los Angeles area. The Southern California Children’s Environmental Health Center (SC-CEHC) is performing research to understand how near-roadway air pollution impacts the risk of childhood obesity and inflammatory or metabolic issues. The SC-CEHC will work with stakeholders and community organizations to educate families about near-roadway air pollution and potential harms to children’s health, and to encourage strategies to reduce the risk of childhood obesity.

Primary Environmental Exposures: Near-roadway air pollution including elemental carbon and particulate matter

Primary Health Outcomes: Obesity, fat distribution, and adipose tissue inflammation

Center Description and Activities:
The SC-CEHC is using population-based, clinical, and experimental research to understand how near-roadway air pollution might contribute to the development of childhood obesity as well as metabolic and inflammatory abnormalities that increase the risk of type 2 diabetes and cardiovascular disease. The researchers are using the Children’s Health Study (CHS), one of the largest and most comprehensive investigations of long-term effects of air pollution on the respiratory health of children. More than 11,000 school children living in southern California are involved in this ongoing study.
New results from CHS showed that growth trajectory of body mass index (BMI) and obesity risk were associated with prenatal and childhood exposure to the near-roadway air pollution mixture. Thus, the center is investigating the relationship between exposure to ambient particulate air pollution and obesity and its metabolic consequences. The center supports communities and leaders in working toward regulations, transportation policy, and urban design that could reduce the burden of childhood obesity and its later life consequences.

Center Investigators:
Principal Investigators: Rob McConnell, M.D.
Pediatric Health Specialist: Steven Mittelman, M.D., Ph.D. Specialties in: Pediatric endocrinology
Project 1: Effects of Air Pollution on the Development of Obesity in Children. Project 1 Leader: Frank D. Gilliland, M.D., Ph.D.
Project 2: Near-roadway Air Pollution, Adipose Inflammation, and Metabolic Consequences. Project 2 Leader: Rob McConnell, M.D.
Project 3: Longitudinal Effects of Air Pollution on Obesity in Mice. Project 3 Leader: Hooman Allayee, Ph.D.
Community Outreach & Translation Core Leader: Jill Johnston, Ph.D.
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**Poster Session**

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<td>Stephanie Eick</td>
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<td>Deborah Watkins</td>
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<td>Todd Whitehead</td>
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#### 2:00 p.m.  
**Early Stage Investigators Poster Discussion II**

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<td>Yukiko Yano</td>
<td>Lake View Conference Room</td>
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1. Early Childhood Lead Exposure in Relation to Adolescent Sleep Duration: A Longitudinal Investigation

Jonggyu Baek
University of Massachusetts Medical School

Lead (Pb) exposure has been linked to neurocognitive outcomes among children, but has rarely been examined in relation to sleep. Further, prior evidence was based on self-reported sleep questionnaires rather than objective sleep measures, which may bias results. The study population included 395 participants from the Early Life Exposure in Mexico to Environmental Toxicants project, a group of sequentially enrolled birth cohorts from Mexico City. Blood Pb levels measured from ages 1 to 4 years (y) were used to calculate a cumulative measure of childhood lead exposure. A changepoint detection method, called pruned dynamic programming, and our developed algorithm were used to identify heterogenous temporal segments and capture sleep periods. Average sleep duration was assessed once between the ages of 9 and 18 y with wrist accelerometers worn for a continuous 7-day interval. With average sleep duration as the outcome and cumulative lead levels divided into quartiles as the exposure, linear regression models were fitted after adjusting age, sex, and maternal education. Mean (SD) age at follow-up was 14.7 (2.1) y, and 48% were boys. Median (Q1, Q3) cumulative childhood Pb was 13.7 (10.8, 18.0) μg/dL and mean (SD) individual-averaged sleep duration was 7.9 (0.9) hours. There was a statistically significant association between cumulative childhood Pb and sleep duration at follow-up, such that those in the highest quartile of lead exposure had 23 minutes less sleep than those in the 1st quartile (95% CI 7 to 39; P, trend=0.02). Early childhood exposure to Pb may be related to shorter sleep duration during adolescence.

Jansen E, University of Michigan, USA
Baek J, University of Massachusetts Medical School, USA
Banker M, University of Michigan, USA
Banker M, University of Michigan, USA
Cantoral A, National Institute of Public Health, Mexico
Hu H, University of Toronto, Canada
Peterson K, University of Michigan, USA
Tellez-Rojo M, National Institute of Public Health, Mexico
2. The Early Life Exposome: Associations with Child Lipid Profile

Lida Chatzi
University of Southern California

Background: Cardiovascular disease is one of the leading causes of death globally and has origins in childhood. Dyslipidemia, defined as elevation in total cholesterol and triglycerides levels, is a precursor to atherosclerosis and coronary heart disease. Apart from traditional risk factors for dyslipidemia, such as high fat diet and obesity, the contribution of environmental exposures to variations in lipid levels in childhood, is unclear.

Aim: To address for the first time the impact a broad spectrum of environmental exposures on child lipid profiles using an exposome-wide approach.

Methods: Lipid profile was measured among 1284 children from the European HELIX cohort at age 6-11 years. A broad spectrum of more than 100 environmental exposures from the outdoor, indoor, chemical, and lifestyle components of the exposome were assessed during pregnancy and in childhood. Two agnostic methods were applied: an exposome-wide association study (ExWAS) considering the exposures independently, and the deletion-substitution-addition algorithm (DSA) considering all the exposures simultaneously. Results: The ExWAS analysis identified 12 postnatal exposures associated with higher child serum cholesterol levels (p<0.05): 3 organochlorine pesticides, 3 polychlorinated biphenyls (PCBs), one polybrominated diphenyl ether (PBDE 153), 3 perfluorinated compounds, outdoor temperature and potatoes and fish intake. After multiple testing correction, HCB and PBDE 153 remained significant (mean change per IQR increase in exposure: 6.6 mg/dL cholesterol, 95% CI: 4.4 to 8.8 and 5.2 mg/dL, 95% CI: 2.6 to 7.8, respectively); these were the only exposures that were selected using the DSA model. Sixteen postnatal exposures were associated with higher child serum triglycerides levels (p<0.05): DDT, HCB, 5 PCBs, PBDE 153, 2 phenols, 4 phthalate metabolites, outdoor temperature and meat intake. After correction for multiple testing, DDT, HCB and PCBs remained statistically significant and were also confirmed by the DSA. Prenatal exposome was not associated with child lipid levels.

Conclusions: Our results strengthen the evidence for the contribution of early chemical exposures to the impairment of child lipid profile. Preventive measures aimed at lowering the identified ubiquitous chemicals could help to prevent the development of cardiovascular and metabolic abnormalities which are associated with child dyslipidemia.

Vafeiadi M, University of Crete, Greece
Nieuwenhuijsen M, ISGlobal, Institute for Global Health, Barcelona, Spain
Slama R, University Grenoble-Alpes, CNRS, Grenoble, France
Grazuleviciene R, Vytautas Magnus University, Kaunas, Lithuania
Thomsen C, Norwegian Institute of Public Health, Oslo, Norway
Wright J, Bradford Institute for Health Research, UK
McConnell R, University of Southern California
Conti D, University of Southern California
Vrijheid M, ISGlobal, Institute for Global Health, Barcelona, Spain
Chatzi L, University of Southern California
Polybrominated diphenyl ethers (PBDEs) are synthetic chemical flame-retardants. PBDEs were previously used in furniture and foam production, although their manufacture and import was phased out in 2004. PBDE congeners, however, are classified as persistent organic pollutants as they continue to be found in humans and the environment. Literature precedence shows that PBDE-47, 99, 100, 153 are found in >70% of all human milk samples collected from U.S. women and that PBDE-47 is associated with an increased odds of preterm birth. Given their near ubiquitous presence, understanding the metabolic alterations linked with varying levels of exposure to PBDEs provides perspective in biomarker discovery linking PBDE exposure to adverse health outcomes in pregnant women and their children. In this study, high resolution metabolomics (HRM) with liquid chromatography-mass spectrometry was used to identify metabolites and metabolic pathways associated with exposure to PBDE in 201, 8-14 wk pregnant African American women. Serum PBDE-47, 85, 99, 100, 153, and 154 were quantified by GC-MS/MS. Results showed PBDE-47 was the most abundant PBDE congener, at an average of 120ng/g lipid and was highly correlated with PBDE-99 and 100 with a Spearman correlation, \( \rho > 0.7 \). Metabolomics analysis resulted in detection of 16,481 m/z features, which after filtering resulted in 9216 m/z features. Linear regression analysis against serum PBDE-47 concentration resulted in 346 significant m/z features (P < 0.05). Pathway enrichment analysis showed that androgen and estrogen metabolism (P = 0.008), aspartate and asparagine metabolism (P = 0.017), tyrosine metabolism (P = 0.03) and steroid hormone metabolism (P=0.04) as the top significantly altered metabolic pathways. The metabolites were annotated as dehydroepiandrosterone (DHEA) (m/z 289.2164, RT 266.4, [M+H]), a natural steroid hormone produced by the adrenal glands, found to be negatively associated with serum PBDE-47 concentration, while its downstream sex hormone related metabolites, estradiol-17-\( \beta \), 16-glucuronide estriol and 11beta-hydroxandrost-4-ene-3,17-dione were positively associated. These data suggest that persistent environmental chemicals, such as PBDE-47, could influence reproductive health by altering steroid hormone metabolism and causing endocrine disruption in pregnant women within the first trimester.

Fernandes J, Department of Medicine, Emory University
Barr DB, Rollins School of Public Health, Emory University
Corwin EJ, Nell Hodgson Woodruff School of Nursing, Emory University
Li S, Department of Medicine, Emory University
McCauley L, Nell Hodgson Woodruff School of Nursing, Emory University
Ryan PB, Rollins School of Public Health, Emory University
Jones DP, Department of Medicine, Emory University
Dunlop AL, Nell Hodgson Woodruff School of Nursing, Emory University
Background: B-cell acute lymphoblastic leukemia (B-ALL) is the most common childhood cancer. While significant progress has been made in the treatment of B-ALL, the etiology of this disease remains poorly understood. A goal of the Center for Integrative Research on Childhood Leukemia and the Environment (CIRCLE) is to identify the environmental exposures that cause childhood ALL in order to support preventative measures. One of the several household chemicals that CIRCLE investigators have identified as a risk factor for childhood ALL is prenatal and postnatal exposure to tobacco smoke/residue. An important next step in this work is to understand whether and how smoke exposure causes increased development of ALL. Recent epidemiology studies have revealed that parental smoking during gestation modulates the immune system and DNA methylation in the blood of newborns. Therefore, we hypothesize that prenatal and postnatal exposure to tobacco smoke residue (TSR) will increase ALL development by impacting immature B cell frequency and DNA methylation.

Objective: This study aims to determine the impact of prenatal and postnatal exposure to TSR on leukemogenesis, immune status, and DNA methylation in the Cdkn2a/-/- mouse model of childhood ALL. Methods: Pregnant Cdkn2a/-/- female mice and their litters were housed with terrycloth containing TSR (n=20) or no smoke residue (n=19). Flow cytometry was used to measure the frequency of B cell, T cell, and myeloid populations in the peripheral blood, bone marrow, and spleen of 5 week-old male and female littermates. In addition, the bone marrow of 5 week-old pups was collected and transplanted into CD45.2 recipient mice that were followed for survival.

Results: Immature bone marrow B cells and mature splenic B cells were significantly lower (p=0.001 for both populations) in mice exposed to TSR than in the unexposed control group. Significant increases in peripheral blood and splenic T- and myeloid cells were also observed. In addition, a subset of exposed pups were underweight at weaning.

Conclusion: Our findings suggest that impaired bone marrow production of immature B cells may be a mechanism through which TSR exposure increases childhood ALL risk. Future work will be aimed at assessing how TSR impacts the methylation and cytokine profiles of blood cells, determining the carcinogenic potential of TSR within our model of childhood ALL, and sharing these data with our established community partners.

Fitch B, UCSF
Zhou M, UCSF
Snijders A, Lawrence Berkeley National Lab
Mao J, Lawrence Berkeley National Lab

Metayer C, UC Berkeley
Wiemels J, USC
Kogan S, UCSF
5. An Examination of Non-Nutritive Suck in Relation to Prenatal Environmental Exposures in a Puerto Rican Cohort

Emily Zimmerman
Northeastern University

Emerging retrospective data show that infant non-nutritive suck (NNS - sucking on a pacifier with no nutrient being delivered) physiology is linked to childhood language, motor, IQ, and overall neurodevelopment (Adams-Chapman et al., 2013; Malas et al., 2015; Wolthuis-Stigter et al., 2017). In addition, given that delayed sucking can be an indicator of brain injury (Slattery, 2012), NNS is often used as an index of early brain development. Quantitative neuro-assessment tools, like infant NNS, could potentially provide automated data collection critical for early detection of delays. Our Center for Research on Early Childhood Exposure and development (CRECE), which examines how environmental exposures impact the health and development of infants and children living on the heavily-contaminated island of Puerto Rico, has provided an opportunity to test this hypothesis. In CRECE, we are examining if and to what extent NNS is a sensitive indicator of neurotoxicity induced by prenatal exposure to phthalates (a group of chemicals found in personal care products, PVC plastics, and other products) with a projected sample size of n=600. We hypothesized that higher prenatal phthalate exposures would be associated with suck patterns with lower amplitudes, fewer cycles per burst, and lower frequencies, indicating reduced CNS integrity. Maternal prenatal exposure to a range of environmental chemicals is measured throughout pregnancy in urine. Then, a subsample of infants has their NNS sampled using our custom research pacifier between 4-6 weeks, which yields the following NNS data: duration, amplitude (CmH20), frequency, suck burst, such cycles, and cycles per burst. Thus far, data analysis has been completed on 68 participants. Preliminary data reveal that several high molecular weight phthalates, including oxidative di(2-ethylhexyl) phthalate (DEHP) metabolites, were associated with lower NNS frequency. However, only monocarboxynonyl phthalate (MCNP) was statistically significant (r=-.25, p=0.04). Data collection and analysis is ongoing. Results from this study will be the first to prospectively determine the sensitivity of NNS as a quantitative index of prenatal environmental toxicant exposures linked to specific neurodevelopmental delays. Findings could have important clinical implications on the type of assessments utilized in young infants.

Watkins D
Hines M
Huerta-Alvarado G
Rosario-Pabon Z
Feric Z
Manjourides J
Velez-Vega C
Cordero J
Meeker J
Alshwabekah A
6. Omega-3 and Omega-6 Fatty Acid Intake Modifies Response to Indoor Air Pollution in Children with Asthma

Emily Brigham
Johns Hopkins University

Additional contributors: Diette G, Johns Hopkins University; Hansel N, Johns Hopkins University

Introduction/Rationale: Indoor particulate matter (PM) exposure is associated with respiratory morbidity in children with asthma, and additional factors such as diet may influence this relationship. We hypothesized that omega-3 and omega-6 fatty acid intake, as anti- and pro-inflammatory nutrients respectively, would modify the relationship between indoor PM exposure and asthma morbidity in a pediatric cohort.

Methods: Complete data was available on 135 children (ages 5-12) with asthma enrolled in the NIEHS supported AsthmaDIET Study (Baltimore City). Children were evaluated at baseline, 3 months, and 6 months, during which researchers assessed week-long indoor concentration of PM2.5, usual dietary intake (Baltimore-specific food frequency questionnaire used to derive daily omega-3 and omega-6 intake), daily asthma symptoms (trouble breathing, bother, activity limitation), and peripheral blood leukocytes. Summary statistics were calculated for all variables. To determine whether omega-3 and omega-6 intake modified the effect of PM on symptoms/peripheral leukocytes, two-way (omega-3 and PM or omega-6 and PM) interaction terms were modeled using multivariable regression with generalized estimating equations. Omega-6 and omega-3 were included simultaneously in models adjusted for age, gender, BMI, caloric intake, caregiver education, inhaled corticosteroid use, and season.

Results: Mean (SD) age of children was 9.5 (2.2) years, 47% were female, 96% were African-American, roughly half of children (50%) were overweight/obese, and 29% of caregivers did not complete high school. Mean (SD) percent predicted FEV1 was 94% (17%), and 47% used ICS. Median (IQR) omega-6 and omega-3 levels were 4.64 g (3.37 to 6.35 g) and 0.36 g (0.21 to 0.45 g), respectively. Median (IQR) PM2.5 level was 26.8 μg/m3 (19.0 to 40.4 μg/m3). Higher omega-3 intake associated with reduced effect of indoor PM2.5 on daytime symptoms (interaction OR=0.96 per 0.1g increase in omega-3, p<0.01). Conversely, greater omega-6 intake associated with increased effect of indoor PM2.5 on daytime symptoms (interaction OR=1.02 per 1g increase in omega-6, p<0.01) and circulating neutrophil percentage (interaction beta=1.02 per 1 g increase omega-6, p<0.01).

Conclusion: We provide evidence suggesting that dietary intake of omega-3 (protective) and omega-6 (harmful) fatty acids modifies the effect of indoor PM on pediatric asthma.

McCormack M, Johns Hopkins University
Woo H, Johns Hopkins University
Rice J, Johns Hopkins University
Vulcain T, Florida International University
Wu T, Johns Hopkins University
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Geisel School of Medicine at Dartmouth

Since 2009, the New Hampshire Birth Cohort Study (NHBCS) has been enrolling pregnant women in New Hampshire with the goal of studying the impacts of environmental contaminants on maternal and child health. A major focus of the NHBCS and the Dartmouth Children’s Center is understanding the drivers of assembly of the infant gut microbiome. Here we present work from the NHBCS on the early-life nutritional, environmental, and medical exposures that are associated with the composition and function of the gut microbiome in infants. We summarize our recently published work linking the composition of the infant gut microbiome with breastfeeding, delivery mode, maternal diet, and early arsenic exposure. We also offer a glimpse into our ongoing research examining the effects of perinatal antibiotic exposure, longer-term effects of breastfeeding and delivery mode on infant microbiome composition, and our findings related to the exposures shaping the infant gut microbiome functional character using metabolomics and metagenomics. Finally, we present our goals for the NHBCS in understanding the role of the microbiome as a mediator of the effects of environmental exposure on infant and child health outcomes and highlight several novel data analysis methods our group is developing.

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Li Z
Viles W
Emond JA
Christensen BC
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Karagas MR
8. Prenatal vs. Postnatal Smoke Exposure: Identifying Predictors of School Age ADHD Symptoms

Julia Schechter
Duke University Medical Center

Significance: Pre- and postnatal tobacco smoke exposure are associated with ADHD in childhood. However, existing studies are limited by self-reported smoke exposure and using parents as sole reporters of behavior. The current study aimed to clarify this relationship by using prenatal and postnatal cotinine levels and parent and teacher ratings of ADHD symptoms. Impact of child age was also explored.

Methods: Participants were drawn from an ongoing prospective study of pregnant women and children. Maternal prenatal plasma samples and child saliva samples collected at follow-up were assayed for cotinine. Current analyses include 307 women (59% Black, 33.6% White, 7.5% Hispanic/Other) and children (mean age at follow-up=5.12y, SD=1.8, range=3-11, 48.3% male). Mothers (N=307) and teachers (N=201) completed The Behavior Assessment System for Children, 2nd Edition or Preschool version; Hyperactivity and Attention Problem subscale scores were analyzed.

Results: Controlling for relevant covariates, multiple regression analyses indicated that prenatal cotinine was not a significant predictor of Attention or Hyperactivity. Postnatal cotinine predicted parent-reported Hyperactivity, Beta=.19, t(246)=2.75, p=.006, and results remained when controlling for prenatal cotinine exposure. Postnatal cotinine also predicted teacher-rated Attention Problems, Beta=.17, t(168)=2.02, p=.04; however, results dropped to a trend (p=.08) after controlling for prenatal exposure. Notably, for postnatal exposure, child age was found to be a significant moderator of both parent (p=.04) and teacher (p=.004) Attention Problems. Specifically, postnatal cotinine predicted parent, Beta=.30, t(109)=3.11, p=.002, and teacher ratings, Beta=.41, t(74)=3.12, p=.003, for older (> 5 years-old) but not younger (≤ 5 years-old) children. Results remained when controlling for prenatal exposure.

Conclusions: Results indicate early postnatal exposure may have a larger effect than prenatal exposure on childhood ADHD symptoms. Further, postnatal exposure was more strongly predictive of attention problems for older children, suggesting that negative effects from environmental smoke exposure on attention may become more pronounced over time. Study strengths include using a biomarker of smoke exposure and both teacher and parent ratings of child behavior. If confirmed, data can inform prevention efforts and guide health professionals to encourage the reduction of tobacco smoke exposure, even beyond pregnancy.

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9. Urinary Concentrations of Phthalate Metabolites Among Pregnant African American Women Residing in the Metropolitan Atlanta Area

Melissa M. Smarr
Rollins School of Public Health, Emory University

National biomonitoring data of phthalates, a class of non-persistent chemicals ubiquitously used in commercial products, demonstrate higher urinary metabolite concentrations detected among non-Hispanic Black women than non-Hispanic White women. Socio-cultural differences have been hypothesized as the leading factor in exposure disparities but few studies have explored this relationship. We measured urinary concentrations of 10 phthalate metabolites among pregnant African American women residing in Atlanta, Georgia, who provided questionnaire data along with urine samples at three time points. Phthalate metabolites were measured using solid-phase extraction, separation with high performance liquid chromatography, and detection by isotope-dilution tandem mass spectrometry. Geometric means (GM) and 95% confidence intervals (CI) of creatinine-adjusted urinary phthalate metabolite concentrations were estimated to understand chemical class distribution in this cohort. Linear mixed effects models were used to estimate intraclass correlation coefficients (ICCs) and to perform repeated measures ANOVA comparisons of geometric means across study visits and by various maternal demographics and lifestyle behaviors, to account for within-subject correlation. A total of 334 samples from 160 women were analyzed. The frequent detection of phthalates in urine samples (ranging from 88-100%) suggests that exposure is highly prevalent among this cohort of pregnant women. Monoethyl phthalate was the most abundant metabolite [GM (95% CI) = 63 (55-72) ng/μl] and concentrations increased across study visits (p=0.02). ICCs varied widely between creatinine-adjusted phthalate metabolites (ICC range: 0.06-0.54). Urinary concentrations of mono(2-ethyl-5-oxohexyl) and monobenzyl phthalates had the lowest and highest temporal reliability (ICCs =0.06 and 0.54), respectively. Study participants were young (mean age 25 years), single women (89%) with a high school degree or higher (85%). Urinary phthalate concentrations consistently differed by maternal education for all phthalate metabolites, with the highest GMs among women with lowest educational attainment (p <0.001). Additional maternal behaviors by which some metabolite GMs differed included maternal age, marital status, use of mouthwash, brushing teeth, use of cosmetics and perfumes. These findings warrant further research on race/ethnicity-specific relationships between maternal behaviors and urinary phthalate concentrations.

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10. Untargeted Adductomics of Newborn Dried Blood Spots to Identify Cys34 Modifications of Human Serum Albumin Associated with Childhood Leukemia

Yukiko Yano
UC Berkeley

Early-life exposures are likely involved in the etiology of childhood leukemia. However, few risk factors have been established, and the underlying disease mechanisms remain elusive. Metabolism of chemicals from the diet, exposures to xenobiotics, the microbiome, and lifestyle factors (e.g., smoking, alcohol intake) produce electrophiles that react with nucleophilic sites in circulating proteins, notably Cys34 of human serum albumin (HSA). To discover potential risk factors resulting from in utero exposures, we investigated HSA-Cys34 adducts in archived newborn dried blood spots (DBS) that reflect systemic exposures during the last month of gestation. We developed an untargeted adductomics method to detect HSA-Cys34 adducts in DBS via nanoflow liquid chromatography-high resolution mass spectrometry, and validated this methodology with 49 archived DBS collected from newborns whose mothers either actively smoked during pregnancy or were nonsmokers. We then applied this method to analyze 783 archived newborn DBS from the California Childhood Leukemia Study. Data were normalized with a novel method (‘scone’) to remove unwanted technical variation arising from: HSA digestion, blood volume, DBS age, mass spectrometry analysis, and batch effects. We used an ensemble of linear and nonlinear models to identify adducts that discriminated between leukemia cases and controls. Twenty-eight HSA-Cys34 adducts were detected, including Cys34 oxidation products, mixed disulfides with low-molecular-weight thiols (e.g., cysteine, homocysteine, glutathione, cysteinylglycine, etc.), and other modifications. No differences were found in adduct abundances between acute lymphoblastic leukemia cases and controls. However, the Cys34 homocysteine adduct (with loss of H2O) was found to consistently discriminate between acute myeloid leukemia (AML) cases and controls with a mean fold change (case/control) of 0.66. Since homocysteine is an important intermediate in the folate-methionine metabolism, this may point to the involvement of alterations in one carbon metabolism and epigenetic regulations in the etiology of AML. Future integrated analyses with other omics (e.g., genomics, metabolomics, epigenomics) will be key to obtain a full picture of the disease mechanisms of AML and childhood leukemia overall. Funding: NIEHS grants P01ES018172, P50ES018172, R01ES009137, P42ES0470518; US EPA grants RD83451101, RD83615901; Children with Cancer, a registered Charity in the U.K.

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11. Using Facebook “Boost Posts” for Informing Women About the Risks of Exposing Babies to Tobacco Smoke

Paul Bloom
Duke University

Our team created an infographic explaining the increased risks for children of having ADHD if their parents and grandparents were exposed to tobacco smoke (via epigenetics). We have found that the infographic increased knowledge about the content, and increased intentions to reduce exposure of tobacco smoke both during pregnancy and to children in the home. To assess how best to use social media to disseminate our message, we used Facebook “Boost Posts” targeting women interested in pregnancy, prenatal care, and childbirth in 6 states. For 3 states, the post included a simple, one-page image and text from our infographic. For the other 3 states, the post replaced the infographic image with a one-minute video containing the same image and text content with a voice over. The posts were boosted for one week at a cost of $200/state. The number of people reached in a two-week period (the boost week plus another week for data collection) by the posts containing only the graphic plus the explanatory text was over 25,000-30,000. Engagement with these posts was high, as hundreds clicked on a “Like” emoji or other symbols, and hundreds also offered comments and shared the post with others. Overall, these Facebook Boost Posts appeared to be a very cost-efficient way to reach target audiences (approximately $6.60 per thousand) and generate “buzz” about a message. The number of people reached in a two-week period by the posts containing only the video plus the explanatory text was considerably less (~4,000-7,000 people). Engagement with these posts was non-existent, as nobody clicked on a “Like” emoji or other symbols, nor did they offer comments or share the post with others. The numbers who viewed at least a small portion of the video were larger than the number reached - over 10,000 - as this probably reflects people scrolling past the video multiple times. Overall, these Facebook Boost Posts for the video appeared to be a less cost-efficient way to reach target audiences, and they were totally ineffective for generating “buzz.” Boosting a Facebook post that contains a compelling graphic is a cost-efficient way of reaching and engaging target audiences for a message about the dangers to babies of exposure to tobacco smoke. Spending the extra money and effort to put this message in video form on Facebook does not seem worthwhile.

Schwartz-Bloom R, Duke University
12. Associations Between Psychosocial Stress and Oxidative Stress During Pregnancy in the PROTECT Cohort

Stephanie Eick
University of Georgia, College of Public Health

Psychosocial stress during pregnancy has been associated with preterm birth (PTB) and infant neurodevelopment. Oxidative stress may represent one mechanism linking psychosocial stress to PTB. In this preliminary analysis from the Puerto Rico Testsite for Contamination Threats (PROTECT) Cohort, we examined associations between questionnaire measures of psychosocial stress and two biomarkers of oxidative stress: 8-isoprostane and its metabolite. Psychosocial stress was generally measured in the third trimester and included: the Perceived Stress Scale (PSS); Life Experiences Survey (LES); Center for Epidemiologic Studies-Depression (CES-D); two questions about negative neighborhood perceptions (NP); and the ENRICHD Social Support Instrument (ESSI). We included data from 438 mothers who had biomarkers of stress analyzed and who responded to at least one psychosocial stress questionnaire. Responses on each psychosocial stress scale were scored to create a continuous measure where higher scores on each scale, except the ESSI, were indicative of increased psychosocial stress. We then grouped continuous measures into tertiles (i.e., low, medium, and high stress). Young maternal age (ages 18-24) and having public insurance was associated with increased 8-isoprostane and 8-isoprostane metabolite compared to reference groups. Medium compared to high social support was associated with a significant increase in 8-isoprostane (% change=11.6, 95% confidence interval [CI]=1.21-23.1). High compared to low scores on the PSS (% change=-3.92, 95% CI=-14.6-8.07), CESD (% change=-5.82, 95% CI=-16.3-5.93), NP (% change=-3.92, 95% CI=-16.2-10.2), and LES (% change=6.18, 95% CI=-3.73-17.1) were not associated with 8-isoprostane. Our study indicates that few measures of psychosocial stress are associated with increased oxidative stress in pregnant women, although further exploration in a larger sample size is necessary. Additionally, interaction between psychosocial stress and other environmental exposures should be investigated in future studies.

Rosario-Pabon Z
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Alshawabkeh AN
Meeker JD
Cordero JF
Ferguson KK
Tobacco smoke is a complex mixture that includes thousands of compounds. We have characterized the developmental neurotoxicity of the complex mixture of tobacco smoke extract. In the current study we examined the interaction of two of the most biologically active compounds in tobacco, nicotine and benzo[a]pyrene (BaP). In addition, we examined the interaction of these neurotoxic exposures with the most common genetic polymorphism, sex. We found in a rat model that gestational exposure to low chronic doses of nicotine and BaP cause persisting sex-selective behavioral effects. Developmental exposure effects of Sprague-Dawley rats exposed to low doses of BaP and nicotine (0.03 mg/kg/day of BaP and 2 mg/kg/day of nicotine) via osmotic minipumps throughout gestation) were determined. Behavioral function was assessed in a battery of tests through adolescence into adulthood. There were sex-selective effects in four of the behavioral tests. In the elevated plus maze, there was a significant interaction of BaP and sex with BaP treated males showing a trend for increased activity. In the novelty suppressed feeding test, there were significant sex selective effects in males with both nicotine and BaP causing a significant reduction in fear responses such that the normal sex difference in the behavior in this test was eliminated. Both nicotine and BaP treatment caused significant reductions in fear response in males. In the Figure-8 locomotor activity test, there was significant hyperactivity caused by gestational BaP. This eliminated the normal sex difference normally seen in this test. This effect persisted into adulthood. In the attention task, males exposed to nicotine during gestation showed a significant percent hit impairment. BaP reversed this effect. No significant effects were seen with percent correct rejection. These data show that both nicotine and BaP cause persisting sex-selective behavioral effects that persist into adulthood.

The study was supported by the Duke University Children’s Environmental Health and Prevention Center funded by the National Institutes of Health (ES022831), the U.S. Environmental Protection Agency (83543701), and the Duke University Superfund Research Center (ES010356).
14. Personal Fine and Ultrafine Particle Exposures Among Inner-City Children with Asthma

Ehsan Majd
Johns Hopkins University

The PEAK study aims to determine the association of particle size, microenvironment (ME), and peak exposure with respiratory effects in children with asthma. We have conducted personal exposure assessment in a panel of 25 children with asthma, each of whom were followed for 7 days with 4 days of continuous monitoring of personal PM exposure, including ultrafine particles (UFP, diameter less than 0.1 µm) at 10-s resolution, geographic location via GPS, lung function (forced expiratory volume in the first second; FEV1), airway inflammation (urinary LTE4, fractional nitric oxide concentration in exhaled breath; FeNO), and 7 days of asthma symptoms reported via text message. UFP was measured using a Partector (expressed as lung deposited surface area; CH Technologies) and fine PM (PM2.5, mass of particles with diameter less than 2.5 µm) was measured with a MicroPEM (RTI International). PM2.5 and UFP cumulative exposures were dominated by those occurring in the Home. Mean UFP exposure intensities while in Pedestrian transport and Vehicle transport were both greater than 1 and higher than PM2.5. Correlations between PM2.5 and UFP concentrations were examined to evaluate the need for personal UFP exposure monitoring in addition to the commonly-monitored PM2.5. The highest and lowest mean PM2.5/UFP correlation coefficients were observed in the Home (r=0.47) and Vehicle transport (r=0.15) MEs, respectively. Home pollutant correlations were particularly weak (demonstrating high UFP and low PM2.5) during evening hours and coincided with common household activities, such as cooking, cleaning, and burning candles/incense. Linear mixed-effect models were used to examine the effect of UFP exposure and health outcomes. The 24-h averaged UFP exposure was shown to be associated with increased FeNO and decreased FEV1 in children.

McCormack, M, Johns Hopkins University
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Koehler, K, Johns Hopkins University
The Zika virus (ZIKV) is a mosquito-borne illness which results in severe birth defects, seizures, fever, and other health consequences. The groups most at risk are pregnant women and infants, as most of the health consequences develop during gestation. Screening during pregnancy is extremely important, but health care access in rural areas where ZIKV is endemic is often limited. Telehealth and mobile apps have been used in public health to improve access and utilization of health care services. Our goal was to investigate the efficacy of multi-media reminders for reaching pregnant women for ZIKV screening, using prenatal care utilization as a proxy. We performed a systematic review in order to determine the efficacy of multi-media reminders on prenatal care utilization. We included studies that assessed whether text messages or mobile app reminders improved utilization of prenatal care. We included studies that included pregnant women, and included reminders via text messaging or mobile apps and excluded literature reviews, opinion-based papers, and animal studies. Only studies which reported prenatal care visits, specifically 4 or more as the cutoff, were included in the final analysis. The results of the papers were used to create forest plots and determine the overall OR of the remaining studies. Our initial search included 181 papers from Pubmed and 57 papers from the Cochrane Database. After review, four studies were selected for analysis. We found that multi-media reminders had a positive effect on prenatal care utilization, with an overall effect of 1.68 OR[CI 1.18, 2.37]. The results of our findings indicate that multi-media reminders could have a positive effect on the utilization of prenatal care services. Our findings show promise for the use of multi-media reminders in increasing prenatal care utilization. Multi-media reminders could be an effective way to increase screening and services to pregnant women in areas with a high prevalence of ZIKV infection.

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Pobee D
Welton M, University of Georgia
Cordero J, University of Georgia
17. Impact of Hurricanes Irma and Maria on Puerto Rican Maternal and Child Health: Research Programs and Strategies for the Future

Deborah Watkins
University of Michigan

Prior to September 2017 when hurricanes Irma and Maria passed through the Caribbean, Puerto Rico had 200+ hazardous waste sites and significant contamination of water resources, as well as marked disparities in reproductive health. In recent years, Puerto Ricans have had substantially higher rates of preterm birth, low birth weight, and infant mortality compared to the mainland U.S. The Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) Superfund Research Program Center has been investigating prenatal environmental exposures and the high rate of preterm birth on the island since 2010, and the Center for Research on Early Childhood Exposure and Development in Puerto Rico (CRECE) is currently investigating environmental exposures and child development in Puerto Rico. In the aftermath of Irma and Maria, these two NIEHS and EPA funded centers led hurricane recovery efforts in order to ensure the safety and welfare of team members, study participants, community health center partners, and members of the surrounding communities. The PROTECT/CRECE team distributed water filtration systems, diapers, baby food, baby wipes, mosquito nets and repellent, hand sanitizer, and other high priority supplies. These efforts have given our team first-hand experience with the difficulties of long-term recovery and preparedness. In this presentation, we identify access to care, maternal stress, access to potable water, access to nutrition, and climate change as major challenges to maternal and child health following Hurricanes Irma and Maria. In addition, we will explore contaminated drinking water, generator use, packaged foods, and other potential sources of hurricane-related environmental exposures, including PAHs, heavy metals, phthalates, and environmental phenols, among our cohort. Furthermore, we will illustrate the steps we are taking to include disaster preparedness into our programs’ future strategies. The PROTECT/CRECE team’s close proximity to the storms’ impact and recovery allow us to reflect and to prepare for future disasters, using our experiences to improve Puerto Rico’s maternal and child health.

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Cordero J, University of Georgia
18. Rosa and Carlos Plan a Family: A Webpage with Tips for Protecting Children from Leukemia

Todd Whitehead
UC Berkeley

The Community Outreach and Translation Core of the Center for Integrative Research on Childhood Leukemia and the Environment (CIRCLE) has created a digital campaign to promote the message that: “Raising a healthy child begins before the pregnancy!” To support this effort, our new informational webpage (http://circle.berkeley.edu/start-now/) tells the story of Rosa and Carlos as they prepare to start a family. The viewer is provided with tips for avoiding exposure to harmful toxins during the period of time before conception in an effort to empower parents in protecting their children from leukemia. The practical tips provided are based on the rigorous scientific research conducted by CIRCLE as well as other studies from around the world who participate in the Childhood Leukemia International Consortium (CLIC). Thus, the information provided represents the current state-of-the-science and an international consensus for best practices to reduce children’s risk for leukemia. The webpage relies on adaptive web design to show five infographics in a variety of formats for different screen sizes, including mobile devices. The infographics emphasize that it is important to start protecting a child’s health before s/he is even conceived. The characters featured on the page are fun and relatable and the story-telling is designed to be engaging. The information is ready-made to be parsed into small chunks that can be easily distributed on social media. The page also emphasizes the fact that both mothers and fathers play an important role in protecting children from leukemia, starting before conception and continuing into childhood. In other words, Carlos Counts! We are eager to reach out to Latino families with our message, because we have found that Latino children are at the greatest risk for leukemia in California and the gap in incidence rates between ethnicities is growing. As such, the webpage can be viewed in English or Spanish.

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Valenti M, Institute for Global Communications
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19. Integration of Non-Nutritive Suck and Eye Tracking as Markers of Neurodevelopment

Emily Zimmerman
Northeastern University

There is a gap in accurate measures of neurodevelopment in the first year of life. As a result, researchers are restricted to standardized tests that require a tremendous amount of training and time to administer. In addition, these tests often underestimate delays and are poor at predicting future development across preterm and full-term cohorts (1-3). Sensitive tests of early neurofunction are essential as infancy is a critical period of brain growth laying the foundation for all areas in neurodevelopment: communication, motor, socio-emotional, cognitive, and behavioral. Therefore, early neuro-assessment tools that make use of automated data collection and processing, provide quantitative measures of the outcomes, and require very little expertise or training to administer are critical when studying child health outcomes.

Two new and innovative technologies that could address this gap in early neurodevelopmental measures are non-nutritive sucking (NNS) and infrared eye tracking. This research was initiated to demonstrate that together NNS and infrared eye tracking measures can assess a broad range of neurofunctions in young infants and that these approaches are related to measures of environmental exposures. Measures of global neurodevelopment and sensorimotor skills can be predicted through NNS, whereas basic cognitive abilities including working memory, information processing speed, and visual attention can be measured with infrared eye tracking paradigms. These two complimentary technologies have the potential to provide direct, non-subjective measures of neurodevelopment: a feature that is often missing from early standardized testing. Therefore, the aims of this project were to implement the NNS technology (Aim 1) and infrared eye tracking (Aim 2) in five different Environmental influences on Child Health Outcomes (ECHO) cohorts, and use these measures to assess sensorimotor and cognitive function in relation to environmental exposures and maternal stress in both full-term and preterm infant populations. We hypothesize that higher phenol exposures and prenatal stress levels will be associated with poor NNS and eye tracking outcomes. We project to enroll 553 new participants combined with 301 participants with data already collected (n=854) across the five ECHO cohorts over the two-year study period. Thus far, 402 participants have complete eye tracking (n=300) or NNS (n=102). Data collection and analysis are underway. Results from this project will

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